MOTION AND RIGIDITY OF THE CARIBBEAN PLATE

AND GEODETIC OBSERVATIONS OF

DOMINICA, LESSER ANTILLES

by

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Dedication

For Paul

Acknowledgements

I would like to express the deepest appreciation to my committee chair, Glen Mattioli for accepting a non-traditional student, introducing me to geodesy, and providing me with great opportunities for science and adventure. I would like to thank my committee members for their input and guidance. I thank my parents, Jim and Annette Tomlin for their support over these many years and for taking me to my first volcano at the age of three. I still remember the smell and have ever since been intrigued with how the Earth works. My entire family has always provided me with the love and support needed to achieve goals, my house is back open for pool parties! Thanks go to my sons, Harrison and Houston, who both served as outstanding field hands in Dominica. And most of all, I thank my husband, Paul, without whom, this literally would not have been possible. His expertise in all things technical, as well as his ability to “hold down the fort” has afforded me the luxury of doing the things I love.

November 22, 2013

Abstract

MOTION AND RIGIDITY OF THE CARIBBEAN PLATE,

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The University of Texas at Arlington, 2013

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The currently accepted kinematic model of the Caribbean plate presented by DeMets et al. (2007), is based on velocities from 6 continuous and 14 campaign GPS sites. This work attempts to refine the current plate model by evaluating data from an expanded number of stations with an improved spatial distribution. As a measure to better constrain the eastern margin, a study has been conducted on the island of Dominica, which includes campaign GPS data collected over the last decade. The analysis of data from 117 sites includes campaign data in addition to the data from the continuous GPS stations that comprise COCONet. An updated velocity field for the Caribbean plate is presented and an inversion of the velocities for 24 sites yields a plate angular velocity that differs from previously published models. It is determined that a 2-plate model for the Caribbean is a more suitable fit of the data, which suggests that the Caribbean is undergoing deformation within its interior. Analyses for possible east-west deformation across the Lower Nicaraguan Rise and Beata Ridge are presented.

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Chapter 1

Tectonic Setting

1.1 The Caribbean Plate

The Caribbean began to develop less than 200 Ma ago with the breakup of Pangaea (Burke, 1988). Following the opening of the Gulf of Mexico in the mid-late Jurassic, the proto-Caribbean ocean formed as North and South America moved away from each other in Early Cretaceous (Ross and Scotese, 1988). A subduction zone was created as the eastward motion of the Caribbean plate met the rifting of the Atlantic. Reconstructions by Mann et al. (2007), from 165 Ma to the present, provide an overview of the tectonic history of this region (Figure 1-1, Figure 1-2, Figure 1-3, Figure 1-4). The late Jurassic (165 Ma) reconstruction shows the landmasses prior to the separation of North and South America and the rotation of the Maya block southward. At this time, an eastward dipping subduction zone formed the western margin of the Americas. In the early Cretaceous, the proto-Caribbean seaway was beginning to form as extension between North and South America progressed. As the Cretaceous period continued, much of the proto-Caribbean crust was consumed by the advancement of the Guerrero-Caribbean arc from the west (Figure 1-2). During the late Cretaceous, the Caribbean large igneous province (CLIP) was formed by volcanism associated with the Galapagos hotspot (Figure 1-2). The province is characterized by a number of volcanic plateaus separated by deep basins of thinner crust with volcanic under-plating (Mauffret and Leroy, 1997). $^{40}Ar/^{39}Ar$ age determinations place the main pulse of flood-basalt magmatism at 89 Ma, followed by a second pulse at ca. 75 Ma (Hoernle et al., 2004). As the Cretaceous period ended, the Caribbean arc was situated next to the thick buoyant CLIP and the two continued to migrate northeastward until part of the arc collided with the Bahaman carbonate platform in the Eocene.

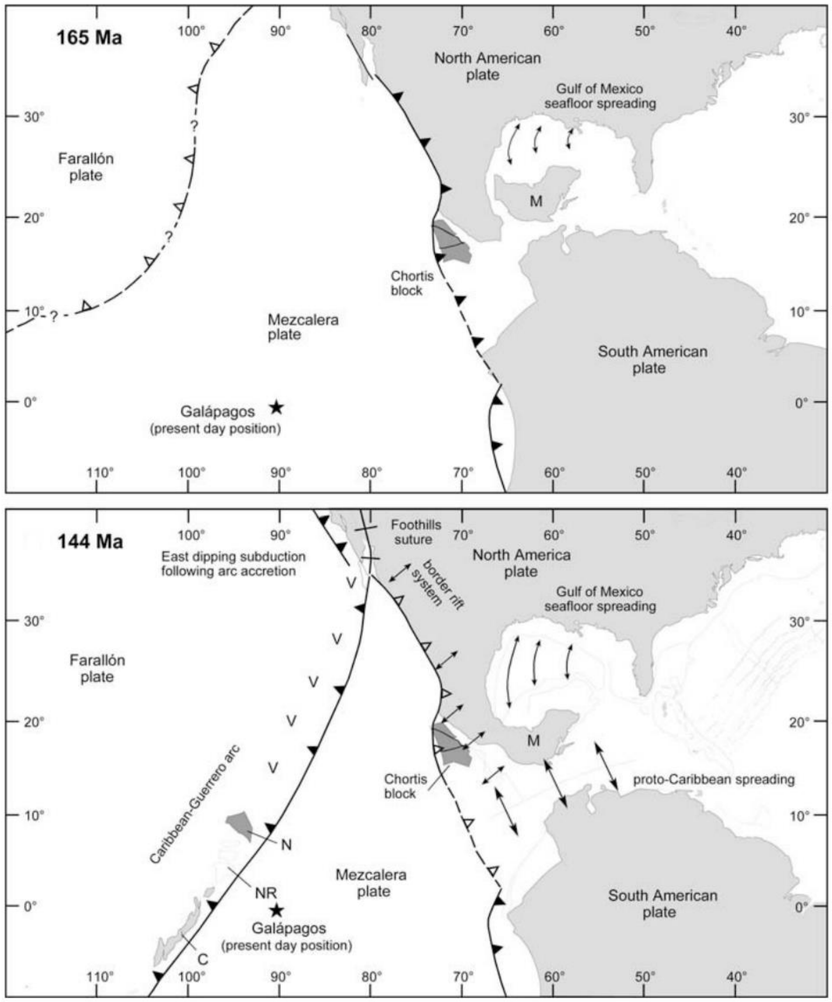

Figure 1-1 Reconstructions of the Caribbean at 165 Ma and 144 Ma
Key to abbreviations: N=Nicaragua, NR=Nicaraguan rise, C=Cuba, M=Maya block, G=Guerrero terrane, CLIP=Caribbean large igneous province, Y=Yucatán basin, CT=Cayman trough, and LA=Lesser Antilles. Countries of Costa Rica and Panama correspond to approximate area of Chorotega block; countries of Honduras, Nicaragua, and Guatemala correspond to Chortis block. (Mann et al., 2007)

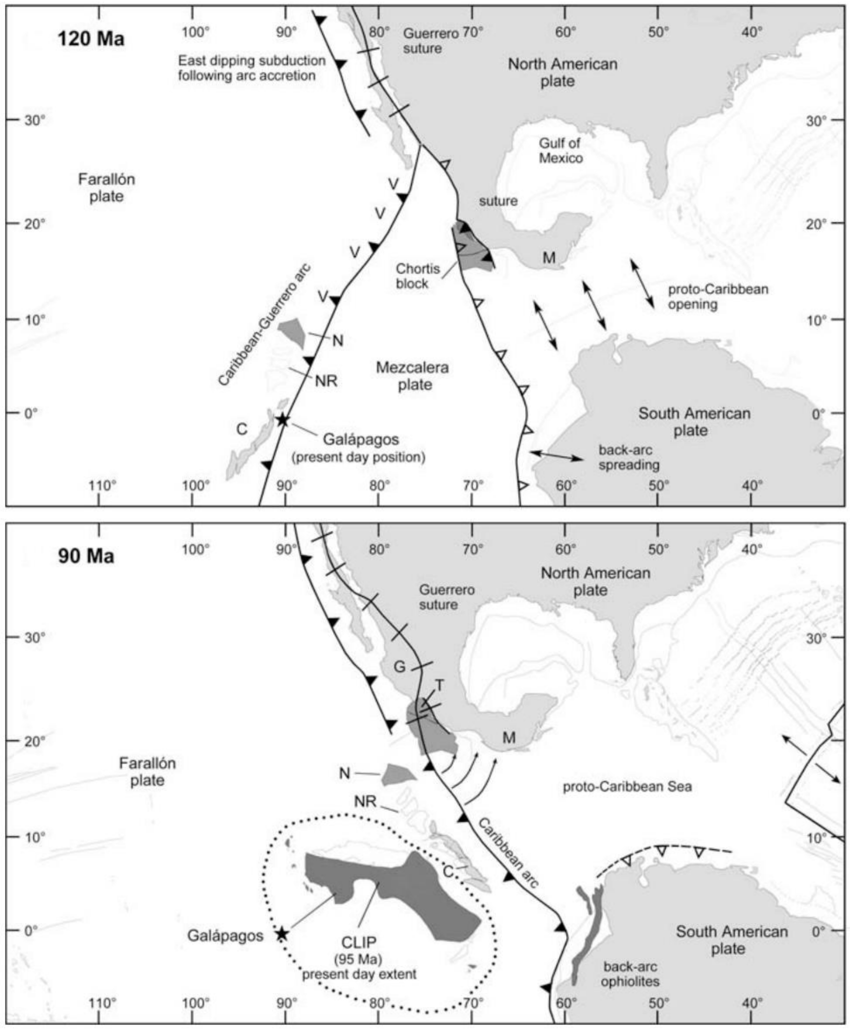

Figure 1-2 Reconstructions of the Caribbean at 120 Ma and 90 Ma
Key to abbreviations: N=Nicaragua, NR=Nicaraguan rise, C=Cuba, M=Maya block, G=Guerrero terrane, CLIP=Caribbean large igneous province, Y=Yucatán basin, CT=Cayman trough, and LA=Lesser Antilles. Countries of Costa Rica and Panama correspond to approximate area of Chorotega block; countries of Honduras, Nicaragua, and Guatemala correspond to Chortis block. (Mann et al., 2007)

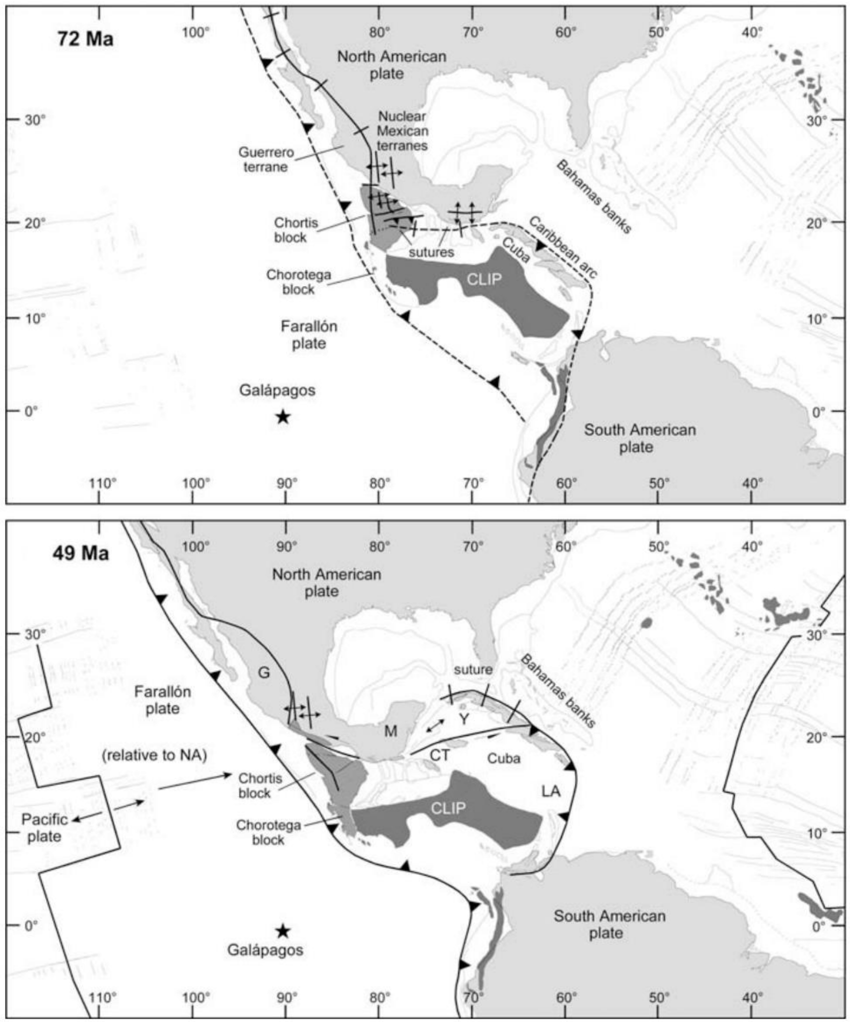

Figure 1-3 Reconstructions of the Caribbean at 72 Ma and 49 Ma
Key to abbreviations: N=Nicaragua, NR=Nicaraguan rise, C=Cuba, M=Maya block, G=Guerrero terrane, CLIP=Caribbean large igneous province, Y=Yucatán basin, CT=Cayman trough, and LA=Lesser Antilles. Countries of Costa Rica and Panama correspond to approximate area of Chorotega block; countries of Honduras, Nicaragua, and Guatemala correspond to Chortis block. (Mann et al., 2007)

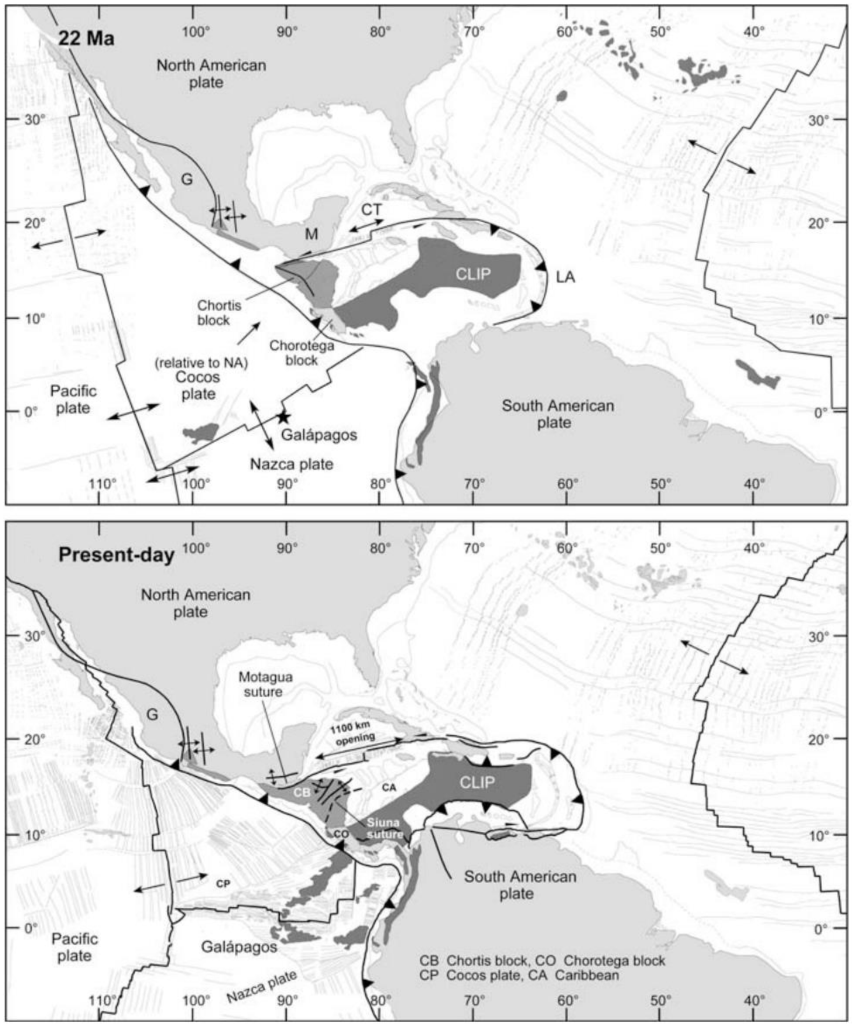

Figure 1-4 Reconstructions of the Caribbean at 22 Ma and today
Key to abbreviations: N=Nicaragua, NR=Nicaraguan rise, C=Cuba, M=Maya block, G=Guerrero terrane, CLIP=Caribbean large igneous province, Y=Yucatán basin, CT=Cayman trough, and LA=Lesser Antilles. Countries of Costa Rica and Panama correspond to approximate area of Chorotega block; countries of Honduras, Nicaragua, and Guatemala correspond to Chortis block. (Mann et al., 2007)

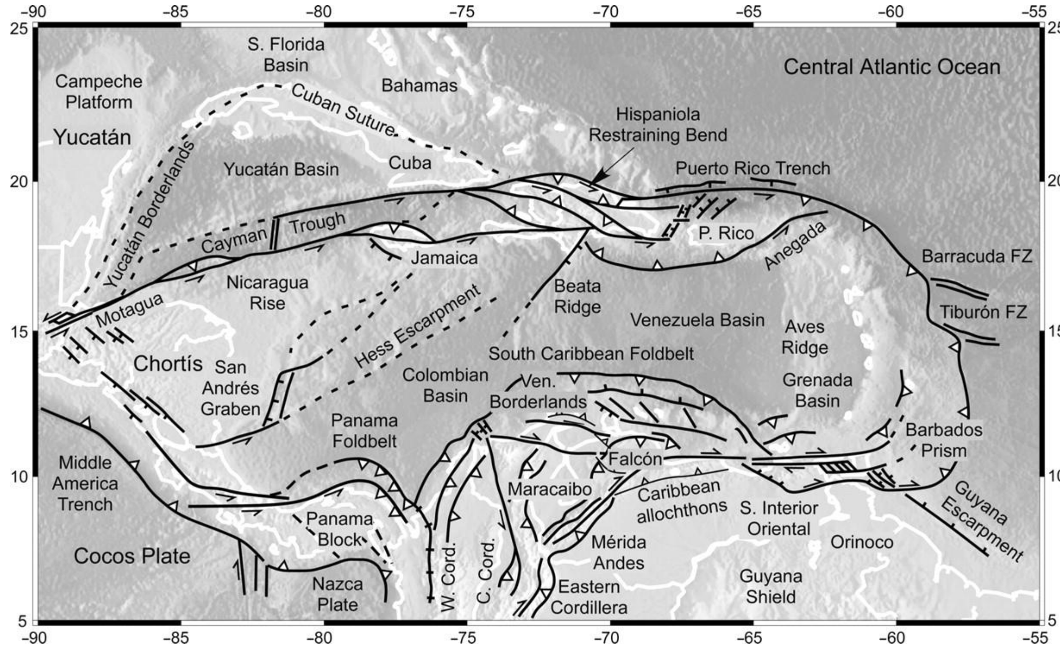

Figure 1-5 Tectonic setting of the Caribbean plate.
(Giunta and Orioli, 2011)

Today, the eastern edge of the Caribbean plate is marked by a westward dipping subduction zone that has produced the Lesser Antilles (LA) island arc, an approximately 850 km long volcanic island arc that trends north-south and extends from Venezuela in the south to the Greater Antilles (Puerto Rico-Virgin Islands platform) in the north. The LA arc is a result of the North and South American plates being subducted beneath the Caribbean plate. The Greater and Lesser Antilles are separated by the Anegada Passage, a probable Neogene graben complex (Bouysse et al., 1990). To the west of the Lesser Antilles Arc lies the Grenada Basin, which is bordered on its western side by the Aves Ridge.

2.2 Dominica and the Central Lesser Antilles

The Lesser Antilles Island arc has a complex history, and has probably been active since the Early Cretaceous (Bouysse, 1988). With the onset of the early Eocene, the volcanic landscape began to develop. Its trace can be identified from Grenada, in the south, to Anguilla, in the north; however, the arc does not display uniform morphology along its entire length. The Dominica Passage, a deep (1200 m) structure that cuts through the arc serves as a marker between the distinct morphologies of the northern and southern portions of the arc (Bouysse et al., 1990). The current arc is considered to be composed of two segments, each with unique characteristics. The section north of Martinique experiences high seismicity (Smith et al., 2013) (Figure 1-6), has a history of large magnitude earthquakes (Wadge and Shepard, 1984), and a subduction rate of ~2cm/yr (DeMets et al., 2000; 2007) along a slab that dips 50°- 60°. The segment that extends south of St. Lucia has not had large historical earthquakes, nor does it experience the seismic activity that the north does (Figure 1-6). The subduction in the southern segment is slower and shallower than in the north (1.8 cm/yr at 45°- 50°) (DeMets et al., 2010). North of Dominica, the 50 km wide Kallinago depression separates two distinct volcanic chains (Figure 1-7). The outer arc, to the east, is the remnant of earlier volcanism and is known as the Limestone Caribees, while the inner arc, known as the Volcanic Caribees, to the west, began activity in the Burdigalian (~20 Ma) and is still active today. South of Dominica, the older and younger igneous arcs are superimposed. The Tiburon and Barracuda, aseismic ridges, both of which trend ESE-WNW, are currently being subducted beneath the Lesser Antilles Arc.

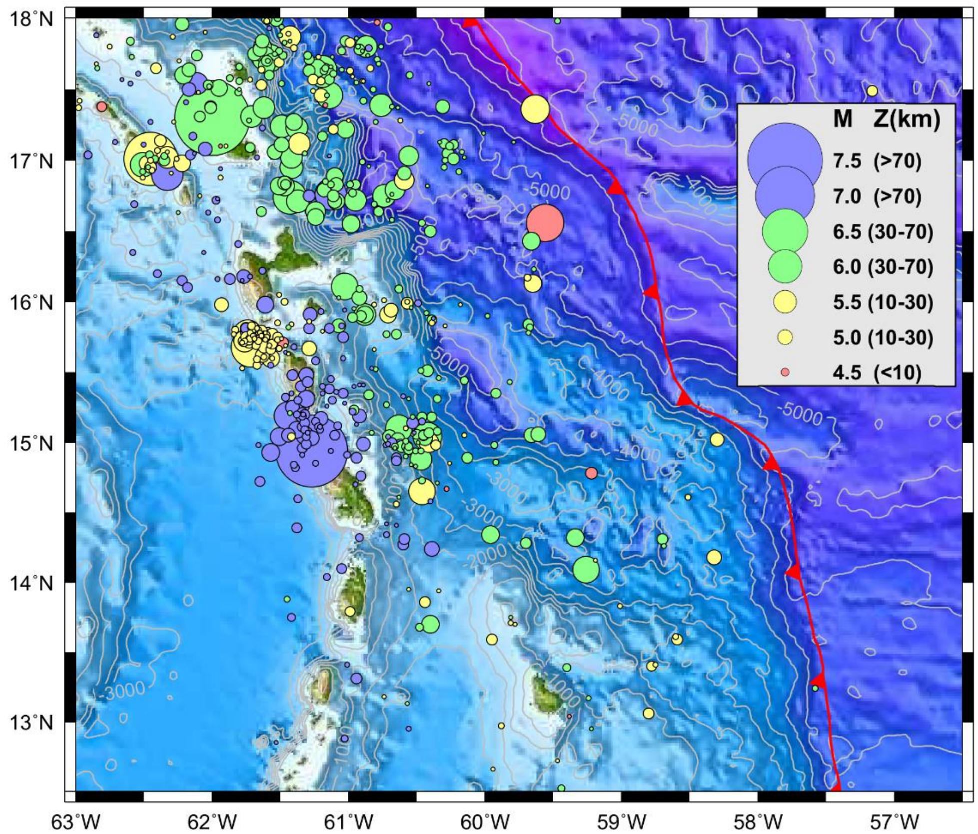

Figure 1-6 Lesser Antilles Arc regional seismicity
(Smith et al., 2013, DeMets et al., 2010, Mann et al., 2002)
Figure reproduced from Smith et al., 2013: Regional seismicity from the IRIS and NEIC catalogs for all earthquakes of magnitude greater than M4 from 1906 to 2010. Magnitudes are shown as scaled circles and the hypo central depths and coded using the colors shown in the legend in the upper right. Topography and bathymetry from ETOPO1, which were reformatted and released by NOAA (http://www.ngdc.noaa.gov/mgg/global/global.html). Contours are in meters. The trace of the intersection of the crystalline lithospheres of the North American or South American plates and the overriding Caribbean plate is modified from Mann et al., 2002. Note the increased seismicity north of 15°N and the high concentration of shallow crustal seismicity along the arc.

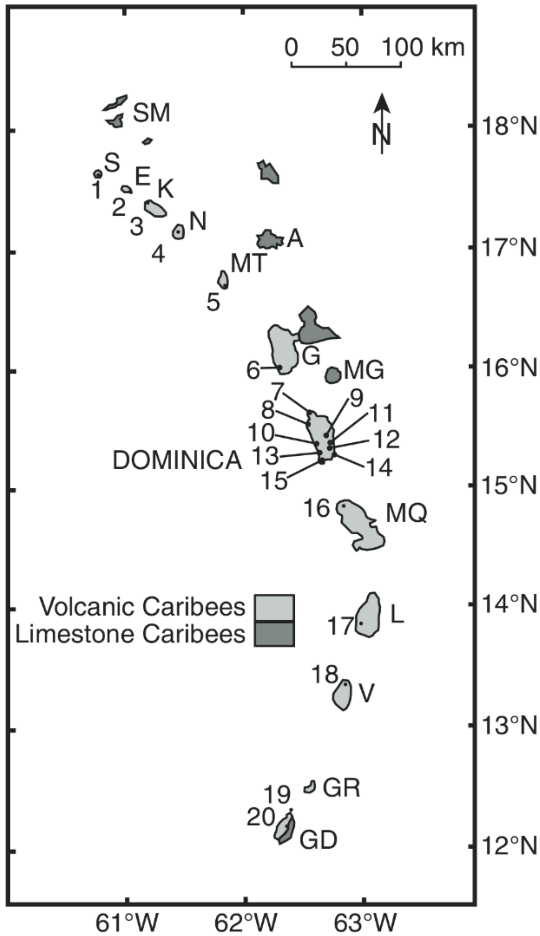

Figure 1-7 Map of Lesser Antilles
Reproduced from Smith et al. (2013): Map showing location of potentially active volcanoes: 1-Mount Scenery; 2-The Quill; 3-Mount Liamuiga; 4-Nevis Peak; 5-Soufrière Hills; 6-La Soufrière; 7-Morne aux Diables; 8-Morne Diablotins; 9-Morne Trois Pitons; 10-Wotten Waven caldera; 11-Valley of Desolation; 12-Watt Mountain; 13-Morne Anglais; 14-Grand Soufrière Hills; 15-Morne Plate Pays; 16-Mount Pelée; 17- Soufrière volcanic center; 18- Soufrière; 19-Kick ‘em Jenny (submarine); Mount St. Catherine. Also shown is the subdivision of the Lesser Antilles into Limestone Caribee and Volcanic Caribee island arcs (after Roobol abd Smith, 2004). Islands are S-Saba; E-St. Eustatius; SM-St. Martin; K-St. Kitts; N-Nevis; MT-Montserrat; A-Antigua; G-Guadeloupe; L-St. Lucia; V-St. Vincent; GR-Grenadines; GD-Grenada.

Of particular interest here is the island of Dominica (Figure 1-8). The predominantly andesitic volcanic island sits in the Central Lesser Antilles, either side of which, differences exist in the tectonics and the resulting morphology of the arc system. At this location in the arc, the subducted slab has a dip angle of ~50°- 60° and subduction is nearly normal (James, 2008). The Wadati-Benioff zone is at its deepest here, with earthquakes reaching a maximum depth of ~210 km (Smith et al., 2013). Dominica should be free from significant arc-parallel extension that is present both to the north, due to sinistral oblique subduction, and to the south, due to dextral oblique subduction (DeMets et al., 2000).

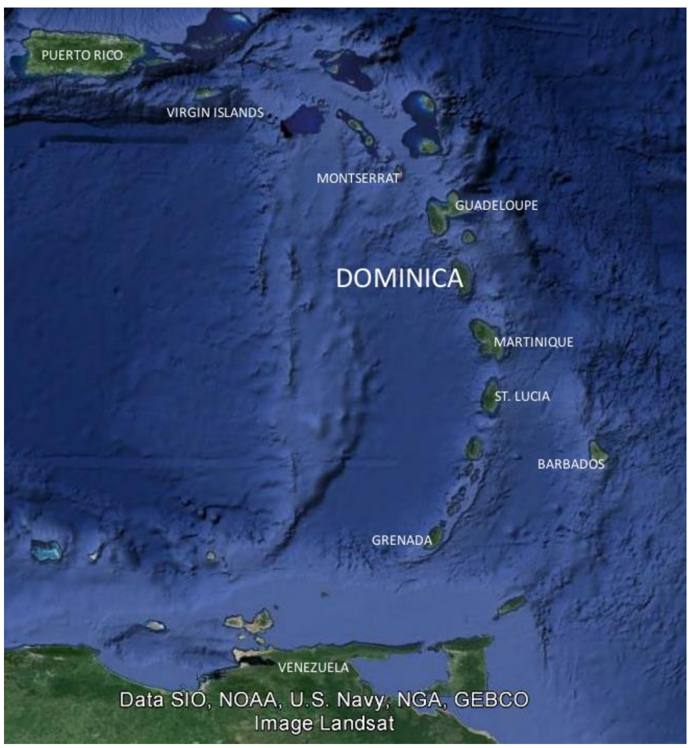

Figure 1-8 Location of Dominica within the Lesser Antilles

Chapter 2

GPS Data

2.1 Campaign GPS Data Acquisition

GPS data from the Island of Dominica have been collected during GPS campaigns that began in 2001. The University of Arkansas Geodesy Lab began geodetic measurements of the Island by installing and occupying nine sites (James, 2008). Expansions of the network have been completed over the years; three sites were added in 2003, six were added in 2004, five were added in 2006, and the final four were added in 2007 to complete the 27 site network (James, 2008). Each of the sites consists of a stainless steel Bevis pin drilled and then epoxied into bedrock, a building, or other edifice deemed stationary with reference to the surrounding landscape. Details regarding each individual site are available in the site descriptions located in the Appendix of this manuscript.

A variety of equipment was used to collect GPS data. During the 2011 and 2012 field campaigns, 4 types of mounts were used: 0.2 m and 0.5 m spike mounts, a 1.5 m tetrapod, and a standard surveyor's tripod with a tribrach. The type of mount used for any given site was dictated by the environment of the individual sites. The receiver/antenna combination was either an Ashtech μ-Z receiver with a Dorn-Margolin choke ring antenna or a Trimble R7 receiver with a Zephyr geodetic antenna. Both receivers are dual frequency and record L1 and L2 code and phase data. A typical 12 volt lead-acid car battery with a solar panel was used to power each station. Data was collected at each site for three consecutive UTC days with a 30 second sampling interval and an elevation mask of 10°. At the end of a site occupation, the data from the receiver was downloaded using receiver specific software onto a laptop and transferred to the server at UTA using WinSCP.

2.2 Continuous GPS Data Acquisition

Continuous GPS data were obtained from the open data archive at UNAVCO (www.unavco.org). Since the focus of this work is the Caribbean, the data collected are from sites within the Continuously Operating Caribbean Observational Network (COCONet - http://coconet.unavco.org). COCONet is an NSF–funded, internationally collaborative effort aimed at developing a large-scale geodetic and atmospheric infrastructure in the Caribbean that forms the backbone for a broad range of geoscience and atmospheric investigations (Braun et al., 2012)

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2.3 GPS Data Processing

All GPS data for this study have been processed using an absolute point positioning strategy using GIPSY-OASIS II (versions 6.1.2 and 6.2). GIPSY (GNSS-Inferred Positioning SYstem) and OASIS (Orbit Analysis and SImulation Software), together, comprise a software package that has been developed by the Jet Propulsion Laboratory (JPL) and is maintained by the Near Earth Tracking Applications and Systems groups. For our purposes, this software will be used for terrestrial positioning (Webb and Zumberge, 1995; Gregorius, 1997; Turner, 2010). The initial calculated positions are non-fiducial and in the free frame, or satellite reference frame. These positions are then translated, rotated, and scaled into the International GNSS Service 2008 (IGS08), using X-files from JPL (Zumberge et al., 1997), and then into a more useable, plate-based reference frame with the DeMets et al. (2000, 2007) version of the GPS-derived Euler pole for the Caribbean to examine site velocities relative to the fixed Caribbean plate.

GIPSY – OASIS II (GOAII) was developed to solve for precise positions from GPS data collected in the field and consists of numerous individual programs and modules that can be tailored to suit the needs of any user. For GOAII to be used, the raw data, or GPS observables, must be converted from the receiver specific formatting to the Receiver Independent Exchange Format (RINEX) using TEQC (Estey and Meertens, 1999) and named according to GIPSY format, which then allows the data to be run in an automated manner using a UNIX script originally authored by Charles DeMets and significantly modified over the years by Glen S. Mattioli. Turner (2003) provides a detailed description of the steps involved in the processing of GPS data using GIPSY-OASIS II software to calculate precise point positions, these steps are presented here with minor modifications.

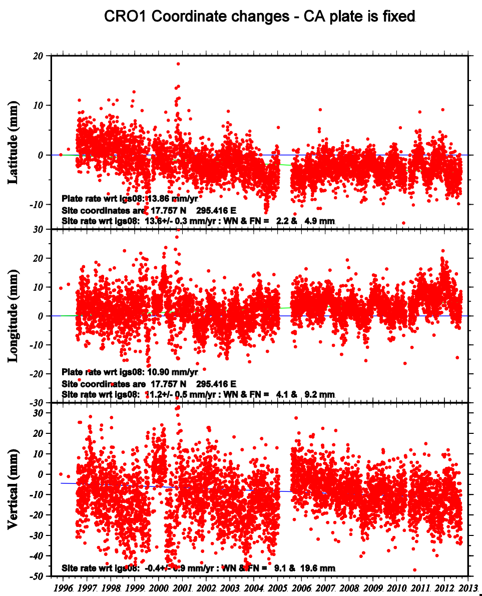
1. The program Ninja translates the rinex files into a FORTRAN binary file, removes outliers, and detects cycle slips. The data are decimated into 300 second intervals and data for each satellite are merged into a qm file.
2. Individual qm files are merged into a single file, the QMfile, by the program merge_qm. A namelist is created from the QMfile called qregress.nml.
3. The qregress.nml namelist is used to derive qregress, which does the physical modeling of the receiver measurements. In our analysis scheme, qregress uses final precise satellite orbits, clocks, and earth orientation parameters provided by JPL. Qregress applies the physical models (receiver location time dependence, tidal effects, polar motion and earth rotation, nutation, procession, perturcation, rotation, geocenter offset, and coordinate scaling) to the orbits and observations and outputs a regress file, rgfile, which contains the parameter partials and nominal values.
4. The rgfile is used by the program wash_nml to create a wash.nml file. The rgfile and the wash.nml files are the input for the preprefilter, prefilter, and filter modules. The filter module runs the Square Root Information Filter, which processes small batches of data sequentially and produces the accume.nio, smooth.nio, and uinv.nio files.
5. Smapper follows the filtering process and smoothes and maps the covariance, sensitivity, and solution of the parameter estimation.
6. Postfit computes the post-fit data residuals.
7. Postbreak searches for cycle slips missed by Ninja and modifies the QMfile if cycle slips are detected and reruns GIPSY.
8. Edtpnt2 adds or deletes data points to or from the filtered solution to remove outliers. After Edtpnt2 is run, smapper and postfit are rerun.
9. The stacov module produces the final solution files in text format.

2.4 GOAII - 6.1.2 vs. 6.2

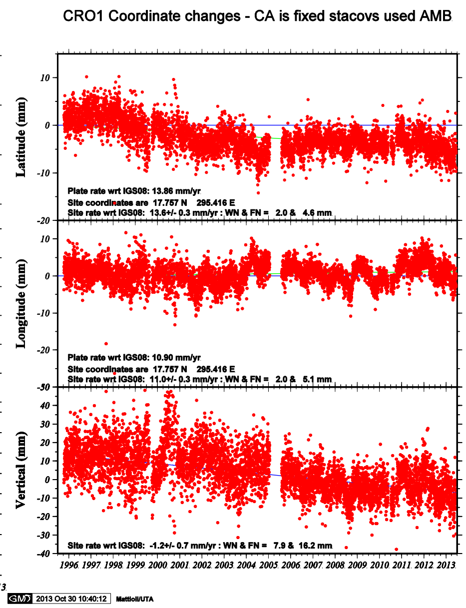
The data were initially processed using GOAII version 6.1.2, but discrepancies prompted an evaluation of the processing system, whereby, it was determined that version 6.2 generated more precise results. The 6.2 version provides for the resolution of the ambiguity that exists within the first cycle of data collected by the GPS receivers. The most notable improvement is seen in the vertical velocity component, which is a result of the software and processing scheme incorporating the antenna's absolute phase center information into the analysis, in addition to using VMF1 grid files for tropospheric estimates. Figure 2-1 compares time series for site CRO1, using various versions of the GOAII software: a) version 6.1.2, b) version 6.2 with ambiguity resolution and c) version 6.2 without ambiguity resolution. Note that for sites with large amounts of data (CRO1 has almost 18 years of continuous data), the north and east components of the velocity show very little variation. The vertical velocity in this example is -0.4 ± 0.9 mm/yr when processed with version 6.1.2 versus -1.2 ± 0.7 mm/yr when processed with version 6.2, which incorporates the phase center specifications for the antenna used at this site. For sites with fewer data (CN07 has been collecting data for approximately 1 year), larger variations are seen in all three velocity components. Figure 2-2 compares time series for the site CN07 using various versions of GOAII: a) version 6.1.2, b) version 6.2 with ambiguity resolution, c) version 6.2 without ambiguity resolution, and d) version 6.2 with ambiguity resolution and an antenna offset correction. It is interesting to note that even when using version 6.2, which incorporates the antenna phase center information, there still exists, in some cases, an offset in the time series due to a change in the antenna type. On January 30, 2013 at site CN07, the antenna was changed from a Trimble model 57971 to a Trimble model 59800. An offset in the vertical component is apparent in Fig. 2-2 (b) and the correction for the offset can be seen in Fig. 2-2 (d). Table 2-1 outlines the velocity values generated by the various versions of the software for both of these sites. It is clear to see that for sites with shorter observation time spans, the variations in the processing have a much larger impact on the result. The most obvious discrepancy for site CN07 is in the vertical component where there is an approximately 22 mm difference between the result that was calculated using the absolute phase center information for the two different antennas and the result that also made a correction for the offset that still existed after the absolute phase centers were considered. Inconsistencies are expected to be more commonly observed in the vertical component; however, for CN07, we also see a significant variation in the east component, which is nearly within error of the previous estimates, but still is noteworthy. For this study, if an offset was observed and corrected, the final velocity values used for the kinematic analysis were those generated by the version 6.2 with ambiguity resolution and offset corrections. Offset corrections can be seen in the times series in Appendix B.

Table 2-1 Velocity summary for sites CRO1 and CN07
Values generated with various versions of GOAII relative to ITRF08.

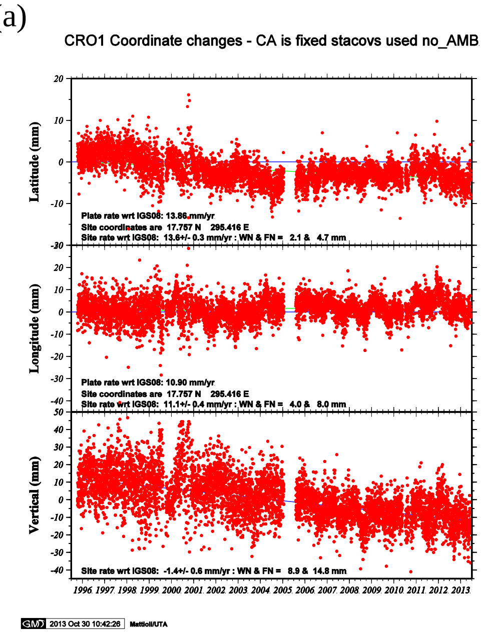
SITE CRO1 (observation span 17.67 yr)	rate in mm/yr		
GOAII version	north	east	vertical
6.1.2	13.6 ± 0.3	11.2 ± 0.5	-0.4 ± 0.9
6.2 without ambigiuity resolution	13.6 ± 0.3	11.1 ± 0.4	-1.4 ± 0.7
6.2 with ambigiuty resolution	13.6 ± 0.3	11.0 ± 0.3	-1.2 ± 0.7
SITE CN07 (observation span 1.09 yr)	rate in mm/yr		
GOAII version	north	east	vertical
6.1.2	7.3 ± 1.4	-3.4 ± 2.1	-28.5 ± 8.0
6.2 without ambigiuity resolution	8.3 ± 1.3	-8.3 ± 1.8	25.1 ± 5.4
6.2 with ambigiuty resolution	8.5 ± 1.3	-6.5 ± 1.5	24.5 ± 5.2
6.2 w/amb and offset correction	9.4 ± 1.3	-4.3 ± 1.4	2.3 ± 3.0



(a)

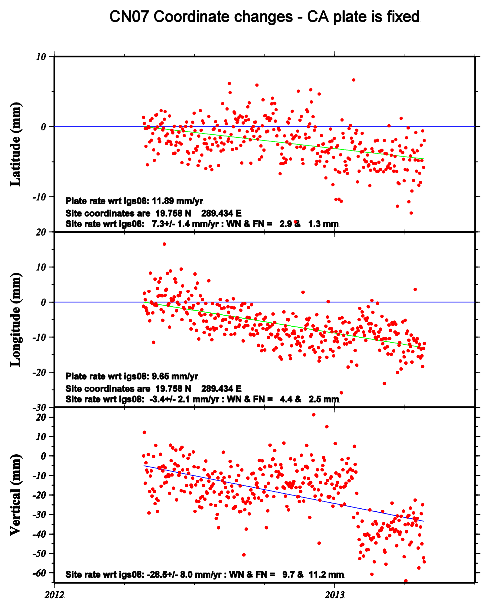


(b)

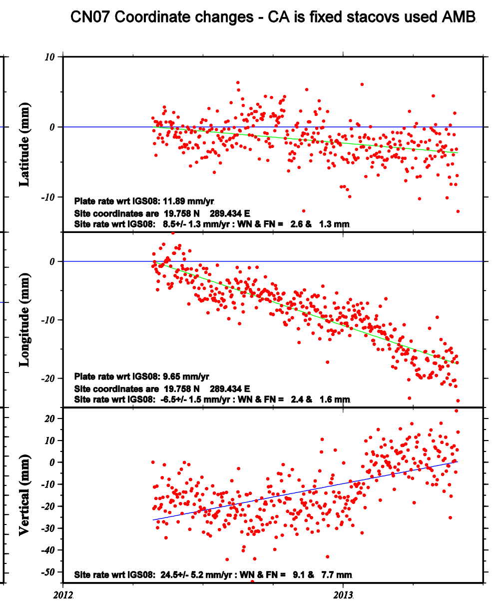


(c)

Figure 2-1 Comparative time series for site CRO1.
a) GOAII version 6.1.2 b) GOAII version 6.2 with ambiguity resolution
c) GOAII version 6.2 without ambiguity resolution. CRO1 is located on St. Croix.



(a)



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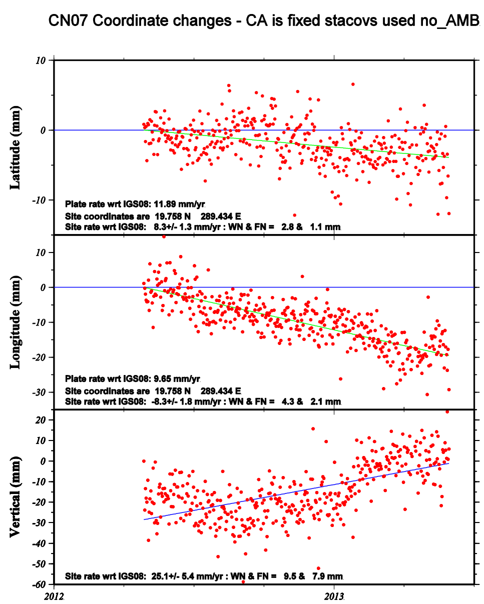
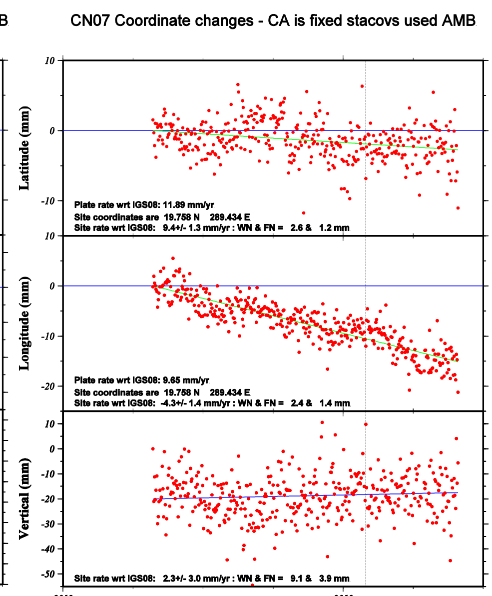


(c)



(d)

Figure 2-2 Comparative time series for site CN07.
CN07 is located in Puerto Plata, Dominican Republic. a) GOAII v. 6.1.2 b) GOAII v. 6.2 with ambiguity resolution c) GOAII v. 6.2 without ambiguity resolution d) v. 6.2 with ambiguity resolution and offset correction. Vertical dashed line marks the antenna change from TRM57971 to TRM59800, no radome is used at this site.

Chapter 3

Geodetic Observations of Dominica, Lesser Antilles

3.1 Introduction

Although people living in close proximity to volcanoes have always been able to observe changes in the Earth's surface prior to an eruption, it has only been within the last century that measurements of ground deformation have been used to infer subsurface activity. It is the desire of volcanologists, who work in the field of monitoring volcano behavior, that precise surface deformation measurements may one day be used as a predictive tool to forecast eruptions. Today, surface displacements can be measured using space-based observing platforms and these measurements are routinely used in numerical models that evaluate the rheologic and geometric conditions (Poland et al., 2006).

The Commonwealth of Dominica is a volcanic island located in the central portion of the Lesser Antilles Arc on the eastern edge of the Caribbean Sea (Figure 3-1). The Island is approximately 750 km^2 and has one of the highest concentrations of potentially active volcanoes in the world (Smith et al., 2013).

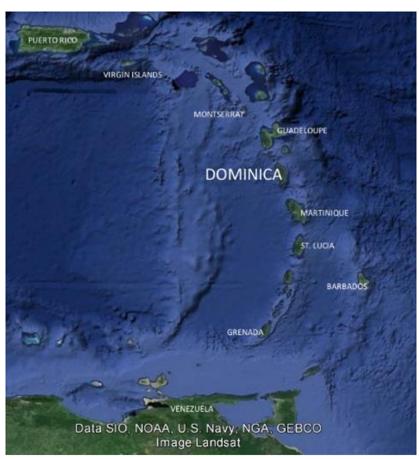


Figure 3-1 Location of Dominica

As a result of earthquake swarms in the southern portion of the Island in 2001, the University of Arkansas Geodesy Lab completed the installation and occupation of nine sites in the summer of 2001. Expansions of the Dominica GPS network have included three additional sites in 2003, six additional sites following a seismic swarm in 2004, and the final four sites were added in 2007 to complete the 27 station network (James, 2008) (Figure 3-4**)**. Analysis of the data collected between 2001 and 2007, appeared to indicate that a geodetic signature was emerging as a result of some type of intrusive igneous activity (James, 2008), perhaps the pressurization of a shallow magma chamber. The residual velocities for Dominica were still relatively small with respect to their errors in 2008. Field campaigns were conducted during the summers of 2011 and 2012, during which 22 of the previously established 27 sites were re-occupied. Specifics regarding each individual site are located in Appendix A of this manuscript. The additional data has reduced the site velocity errors to reasonable values in order to make a conclusion regarding the relationship between geodetic signatures observed and any tectonic, seismic, or volcanic activity on Dominica.

3.2 Volcanic History of Dominica

The volcanics on the Island are predominantly andesitic and display a range of morphologies, which indicates a variation in eruption style through time. The geology of the Island (Figure 3-2) can be divided into 4 stratigraphic divisions based on age: Division 1 (upper Miocene) is dominated by mafic volcanism; Division 2 (upper Pliocene to lower Pleistocene) is characterized by the development of two large stratovolcanoes over a 2 million year period; Division 3 (lower to upper Pleistocene) represents a general hiatus in major activity, and Division 4 (upper to Pleistocene to Holocene) is characterized by the formation of numerous Pelean centers throughout the island (Smith et al., 2013). The igneous activity that began as minimally contaminated basaltic magmas ponding at the crust-mantle boundary was followed by fractionation and rise of the magma, which generated distinct basic and intermediate suites. The mid-crustal magma chambers that sat below the stratovolcanoes then served as barriers to the continued rise of magma, which resulted in the Division 3 quiescence. The magma eventually found its way around the chambers as numerous sills were emplaced into the lower crust. The sills served to reactivate the volcanism, which was then dominated by andesitic and dacitic composition. A mid-crustal batholith was postulated to exist below Dominica as a result of the amalgamation of the various chambers and an illustration of evolution is presented in Figure 3-3 (Smith et al., 2013). Dominica’s volcanics are in contrast to a typical system, where each individual volcano is underlain by an independent volcanic system, with a unique composition, that, over a period of 0.5-1 million years will evolve and eventually become extinct (Christiansen, 1979). It has been proposed that when a magma reaches a crystallization state of >50%, that magma can no longer be erupted (Carmichael, 2002). This means that what was once a feeder system for a volcano can become the barrier to more magma rising, and even if the magma finds its way to the surface, it remains geochemically distinct from other volcanic centers (Gunn et al., 1974, Smith and Roobol, 1990). Such is not the case with Dominica, where the products of the numerous volcanic centers are remarkably homogeneous, which suggests that magma mixing within the batholith was very efficient (Smith et al., 2013). This same type of system, on a smaller scale, can be seen under the Soufriere Volcanic Complex on St Lucia (Schmitt et al., 2010). The development of an extensive zone of melting due to a sustained mantle basalt flux is attributed to the fact that the leading edge of the Caribbean plate is undergoing near normal convergence with the subducting North and South American plates (Smith et al., 2013). Convergence becomes more oblique as one moves away from Dominica, both to the north and the south along the Lesser Antilles (DeMets et al., 2000; 2007). Another factor that will support a sustained flux of material from the mantle is the steeply descending slab that is seen at Dominca. The Waditi-Benioff Zone beneath central and western portions of the island are deeper than that for any other island, with the exception of a small portion beneath northern Martinique (Smith et al., 2013). Also unique to Dominica are calderas, which are not common in oceanic island-arc settings (Hughes and Mahood, 2008). The calderas at Morne Trois Pitons and Wotten Waven are evidence that the system has had the capability of generating large-scale eruptions. These two calderas along with Morne Diablotins have generated a total volume of ignimbrite in excess of 60 km^3 (Carey and Sigurdsson, 1980). Geothermal features coincident with the “seismo-thermal” zones indicate that the system is still active, and currently, the country, with the assistance of Iceland, is drilling test wells to ascertain the viability of harnessing the Island’s geothermal potential.

The last magmatic eruption on Dominica was ~450 years ago and current active volcanism is concentrated in “seismo-thermal” zones, which are a reflection of the “live” portions of the amalgamated batholith. It stands to reason that monitoring this system will not only provide data about surface deformation related to igneous activity, but would also provide valuable information for Dominica’s emergency management response teams, in the event that the current status of the system changes in the near future.

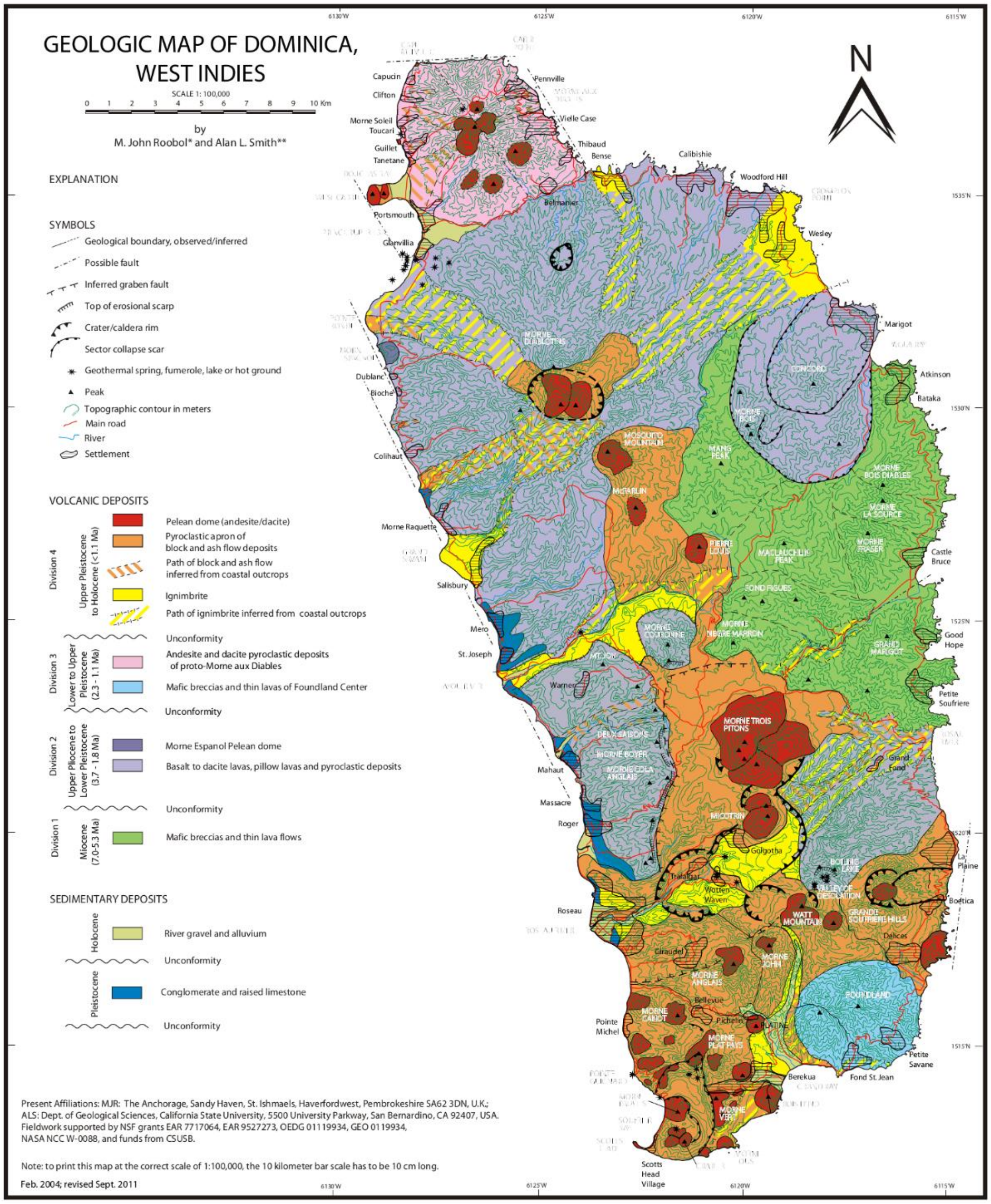


Figure 3-2 Geologic map of Dominica from Smith et al. (2013)

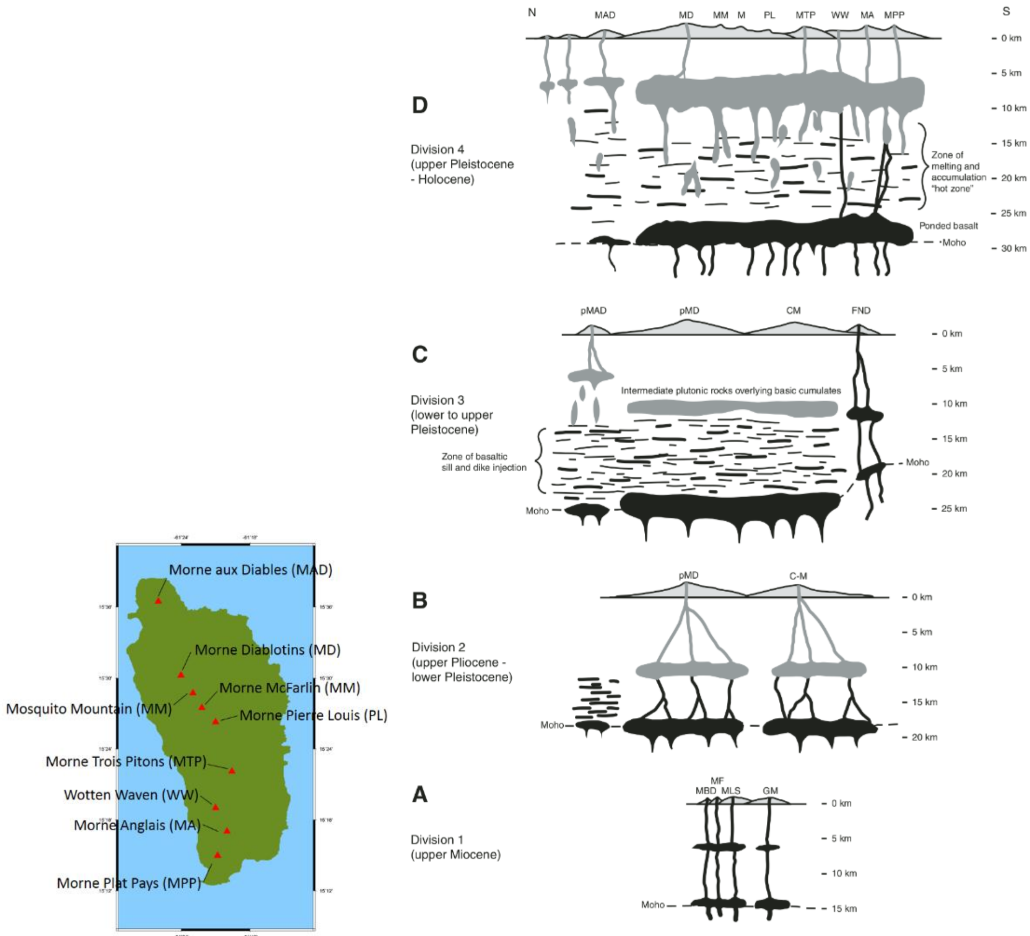


Figure 3-3 A petrogenic model for the geologic evolution of Dominica (Smith et al., 2013). Site map at left. Diagrammatic sketches to show the development of magmatic systems on Dominica over time. Horizontal and vertical scales are the same, height of volcanic centers not to scale. **(A) Stratigraphic Division 1** – upper Miocene: independent volcanic systems involving ponding of mantle-derived basalt at the crust mantle boundary (~15 km) and mid-crustal magma chambers that become more developed over time; MBD-Morne Bois Diables, MF-Morne Fraser, MLS-Morne La Source, GM-Grand Marigot. **(B) Stratigraphic Division 2** – upper Pliocene to lower Pleistocene: two separate volcanic systems - proto-Morne Diablotins (pMD) in the north and Cochrane-Mahaut (CM) in the south. More extensive development of basaltic accumulation zone at crust-mantle boundary (~18 km) and well-developed mid-crustal magma chambers under each center. Mantle derived basaltic magmas continue to reach surface from lower accumulation zone. Initiation of basaltic sill and/or dike injection under future proto-Morne aux Diables**.(C) Stratigraphic Division 3** – lower to upper Pleistocene: development of large crust-mantle zone of accumulation (26 km) beneath most of Dominica and formation of a mid-crustal “proto-pluton” under proto-Morne Diablotins (pMD) and Cochrane-Mahaut (CM) centers that effectively blocks the rise of

Figure 3-3 continued:
new magma, causing termination of activity at these centers. Continued influx of basaltic magma accommodated by the injection of lower crustal sills and/or dikes that has the effect of progressively heating up the lower crust. Development of a zone of melting and magma accumulation under proto-Morne aux Diables stratovolcano (PMAD) in the north. Rise of basaltic magma through unaltered oceanic crust (Moho = ~20 km) in the south produced a mid-crustal magma chamber that was the source for the Foundland stratovolcano (FND). **(D) Stratigraphic Division 4** – upper Pleistocene to Holocene: Increase in mantle flux continues injection of sills and/or dikes beneath most of southern and central Dominica, producing a "hot zone" under the island and generation of intermediate and hybrid magmas. The "proto-pluton" is no longer a barrier to the rise of intermediate magmas. Greatest flux is under southern Dominica, as suggested by the presence of most of the potentially active centers and the caldera-forming eruptions of Morne Trois Pitons (MTP) stratovolcano and Wotten Waven caldera (WW). Mid-crustal magma chambers expand and eventually merge to form mid-crustal batholith under most of the island. Expansion of magmatic system beneath Morne aux Diables (MAD) to form new volcanic zone under northern Dominica and the surrounding seafloor. MD-Morne Diablotins, MM-Mosquito Mountain, M-Morne Anglais, MPP-Morne Plat Pays. Format for sketches modified from de Silva (2008). Figure reproduced from Smith et al. (2013).

3.3 Results

A time series plot has been generated for each campaign GPS observation station (Figure 3-4) in Dominica and these are presented in Figure 3-5 through Figure 3-24. The results were analyzed with an absolute point positioning strategy using GOAII version 6.2, and final precise orbits, clocks and earth orientation parameters obtained from Jet Propulsion Laboratory (JPL). The reference frame used was IGS08. The plots include all available data for the particular site, the red dots are the daily position estimates, the blue lines are the predicted plate rates in IGS08 held fixed (horizontal) and the green lines are the least squares best fit site rates in IGS08 with respect to the Caribbean plate rate (CA). White noise (WN) and and flicker noise (FN) amplitudes are lowest in the north direction and highest in the vertical, and it has been established that white noise in the vertical component is higher for stations located in tropical regions ($\pm 23^{\circ}$) (Mao et al., 1999). Table 3-1 is the velocity summary for the Dominica campaign

GPS sites; note that FN values are at the default level and that the default estimate for Random Walk Noise (RWN) is fixed at 1 mm/sqt (yr) of monument noise.

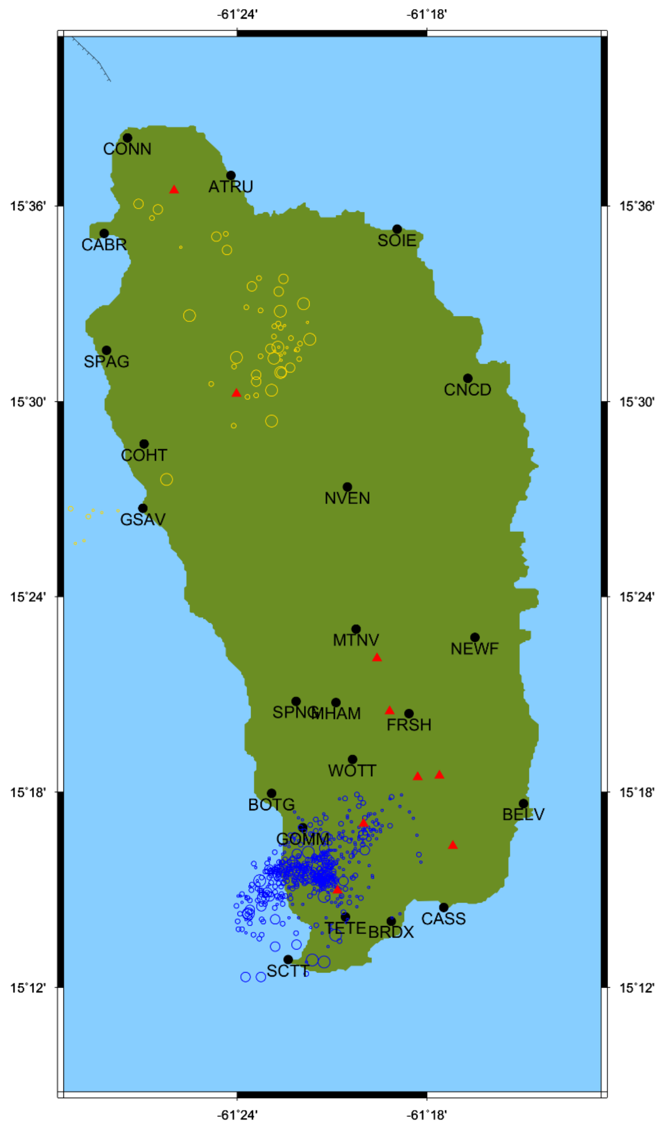


Figure 3-4 Dominica campaign GPS site location map
Black dots indicate the location of GPS sites with associated marker name, red triangles are volcanic centers, gold circles mark the 2001 seismic swarm and blue circles mark the 2004 seismic swarm. Epicenter data courtesy of the Seismic Research Unit at the University of the West Indies.

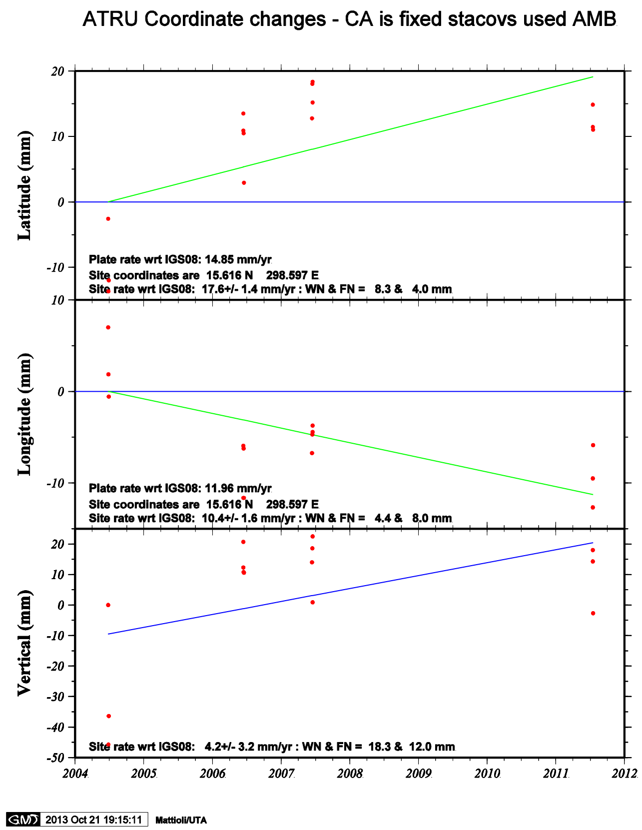


Figure 3-5 Time series for site ATRU

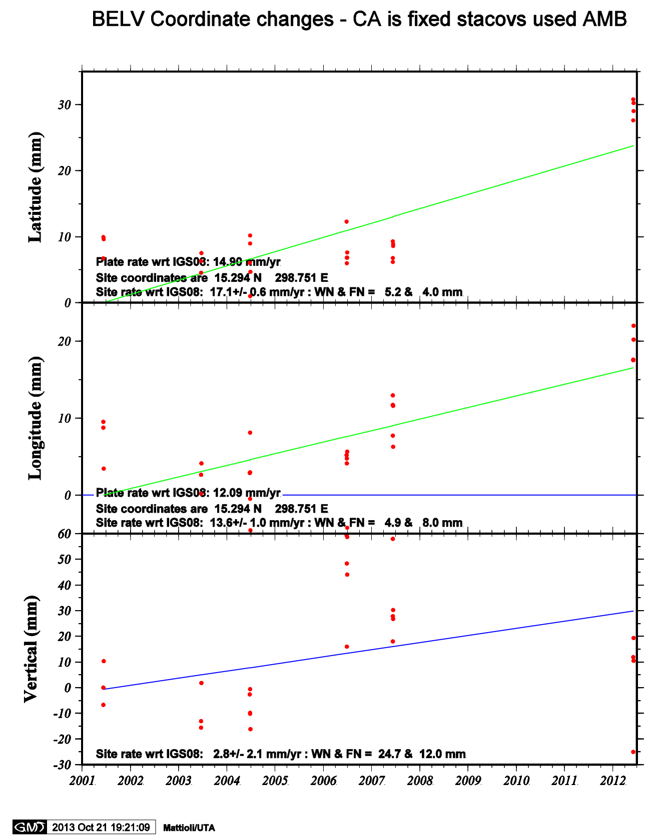


Figure 3-6 Time series for site BELV

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

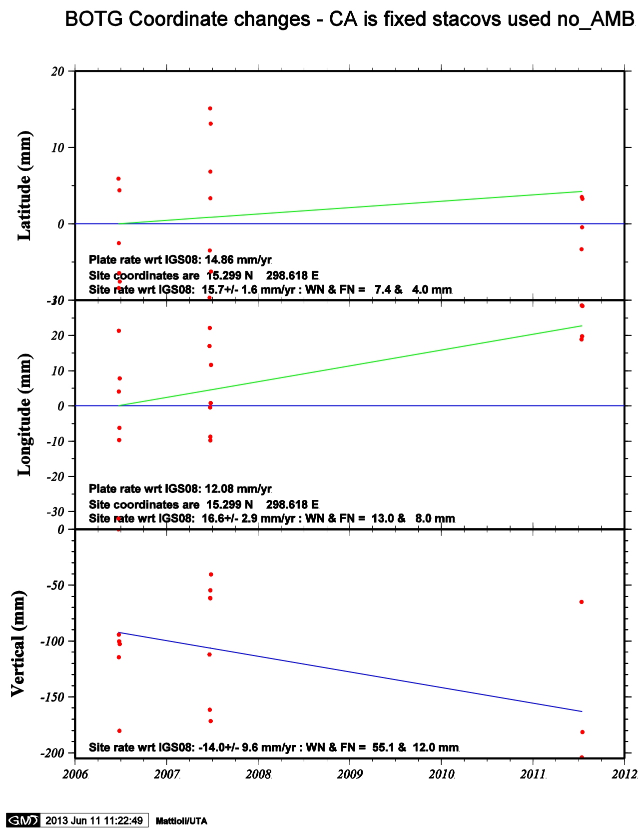


Figure 3-7 Time series for site BOTG

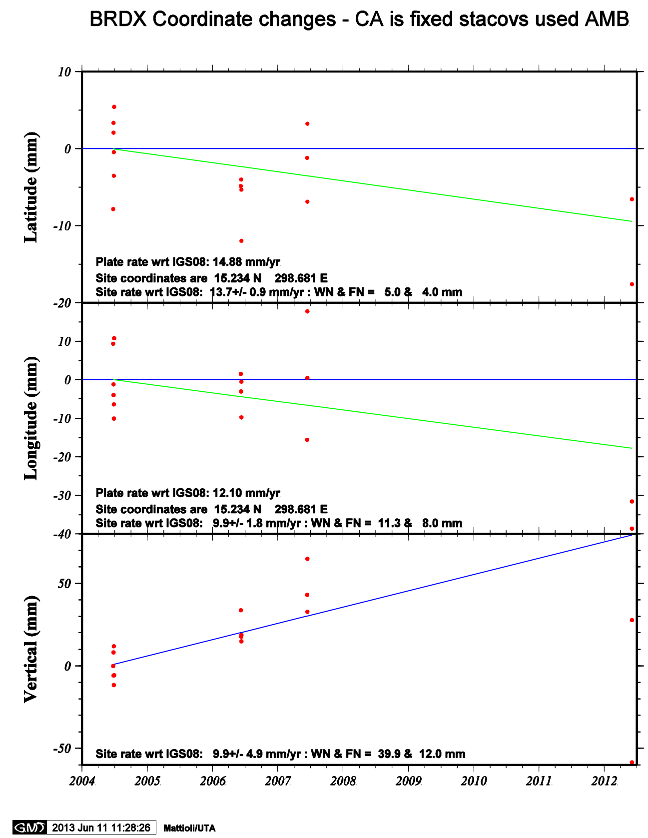


Figure 3-8 Time series for site BRDX

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

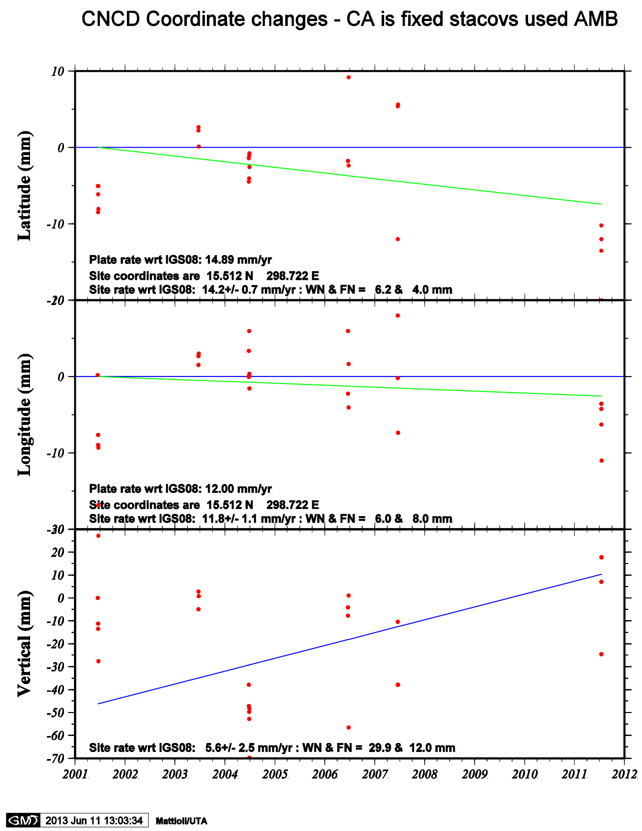


Figure 3-9 Time series for site CNCD

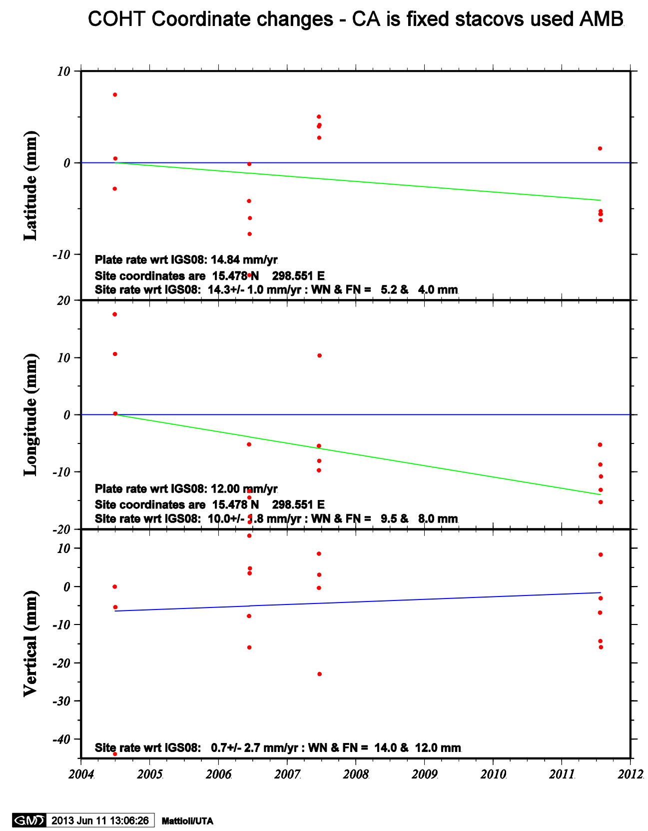


Figure 3-10 Time series for site COHT

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

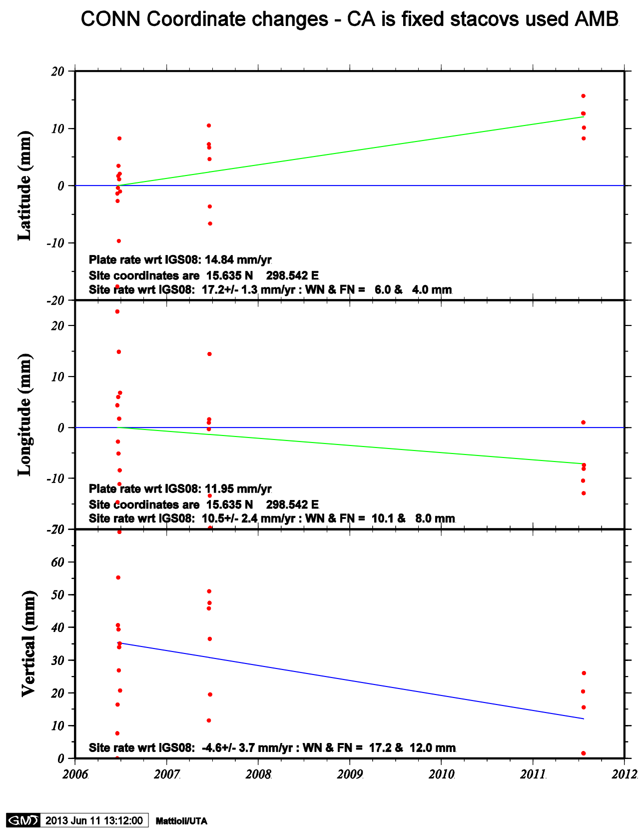


Figure 3-11 Time series for site CONN

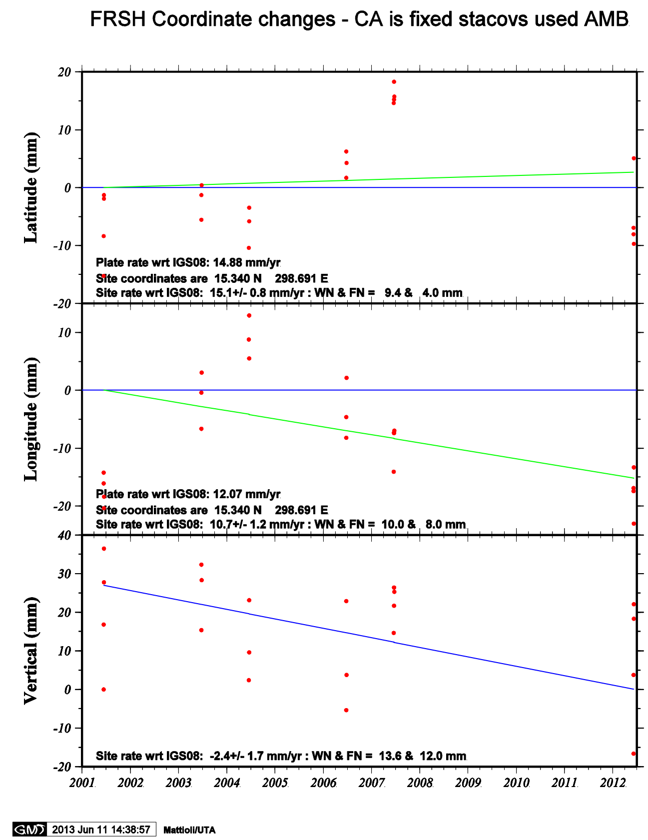


Figure 3-12 Time series for site FRSH

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

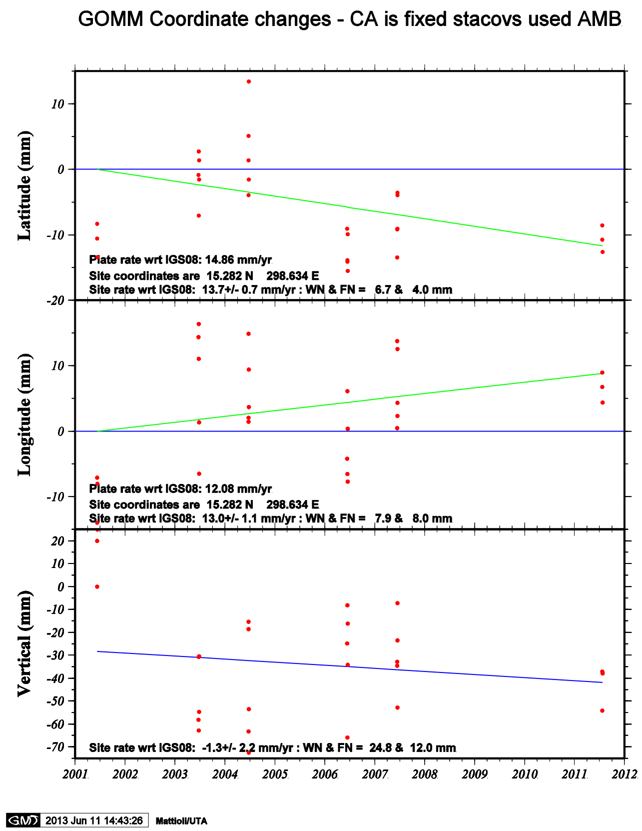


Figure 3-13 Time series for site GOMM

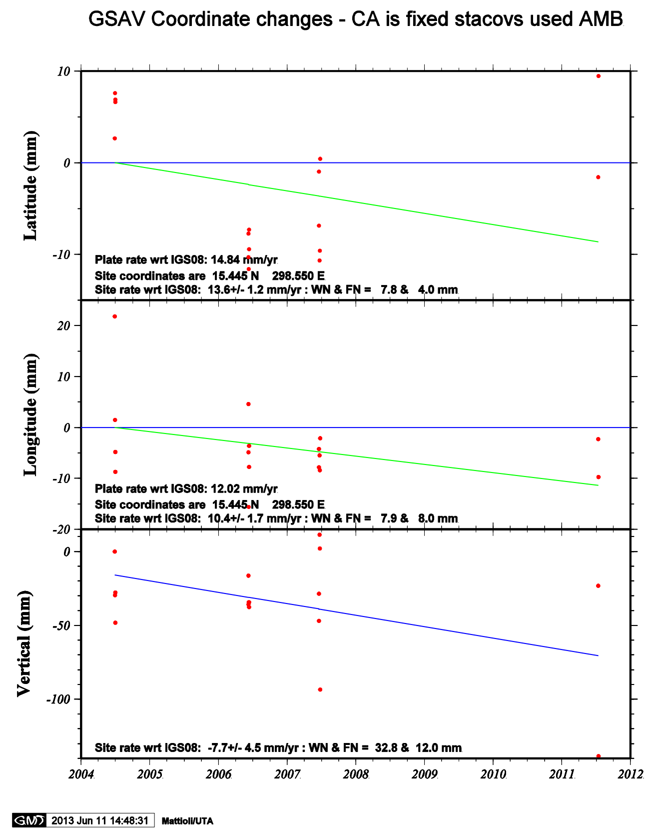


Figure 3-14 Time series for site GSAV

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

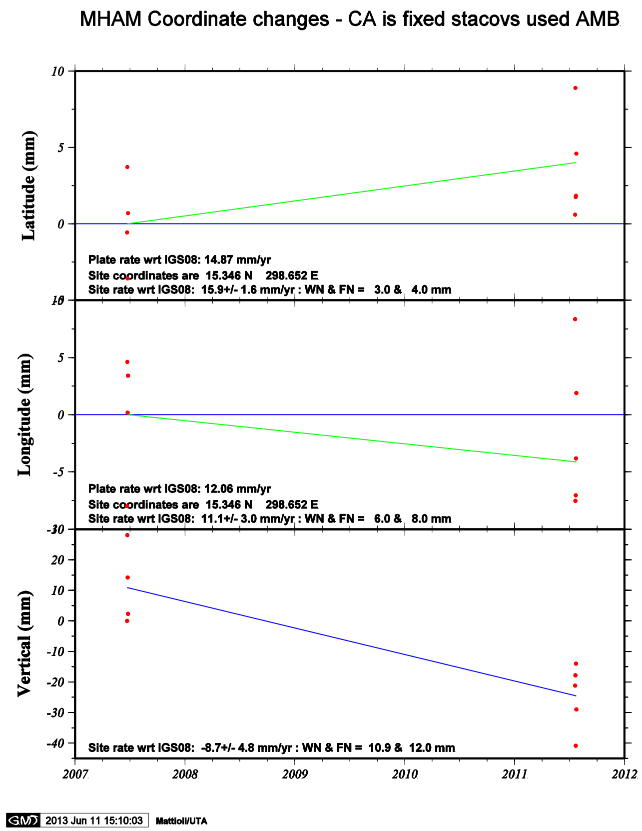


Figure 3-15 Time series for site MHAM

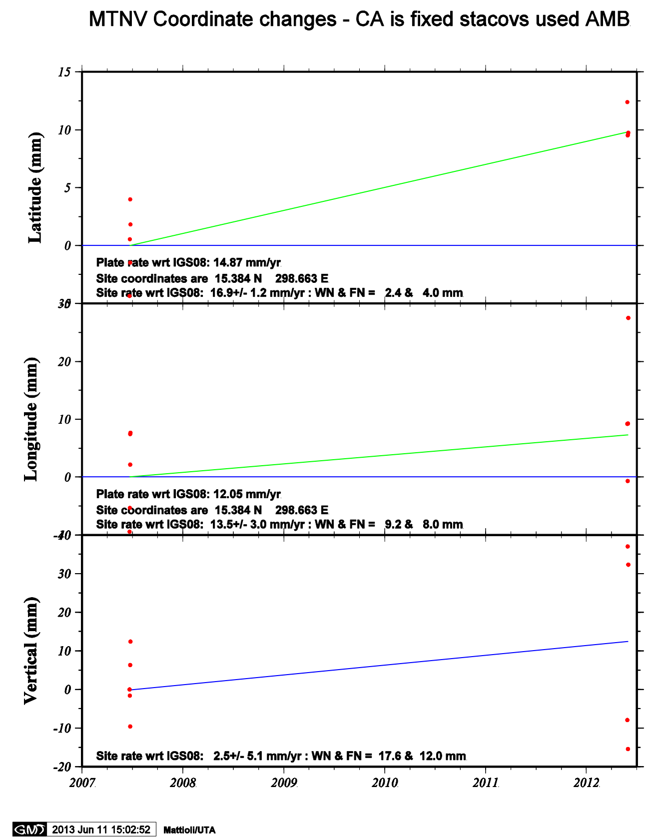


Figure 3-16 Time series for site MTNV

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

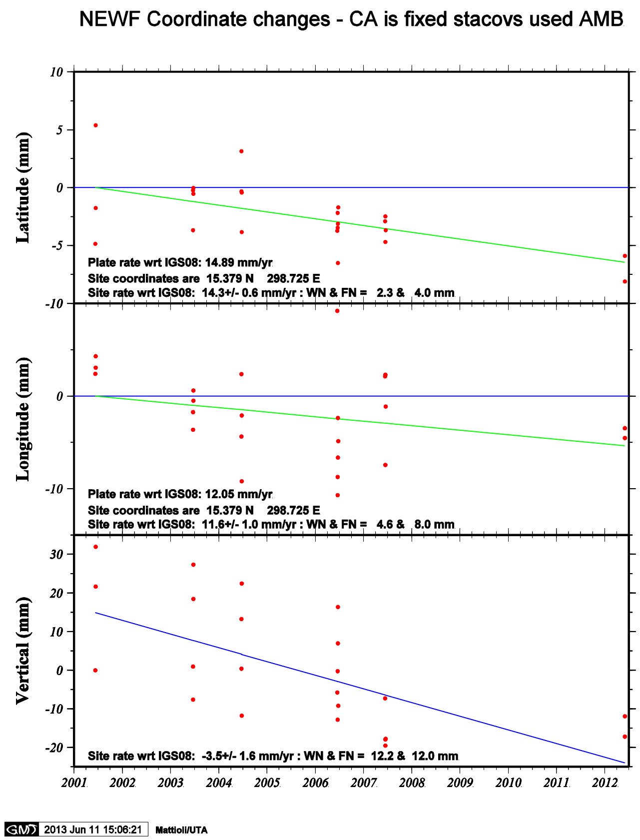


Figure 3-17 Time series for site NEWF

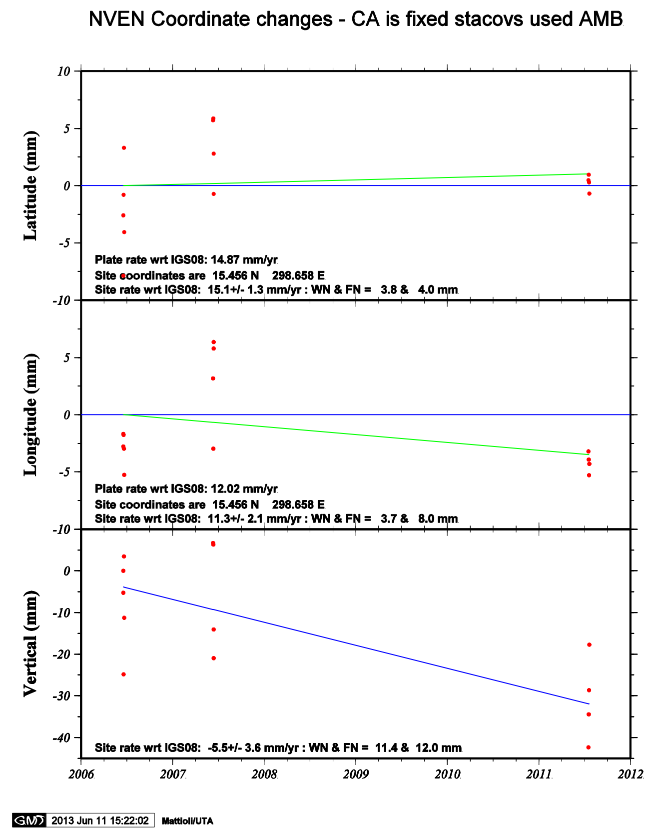


Figure 3-18 Time series for site NVEN

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

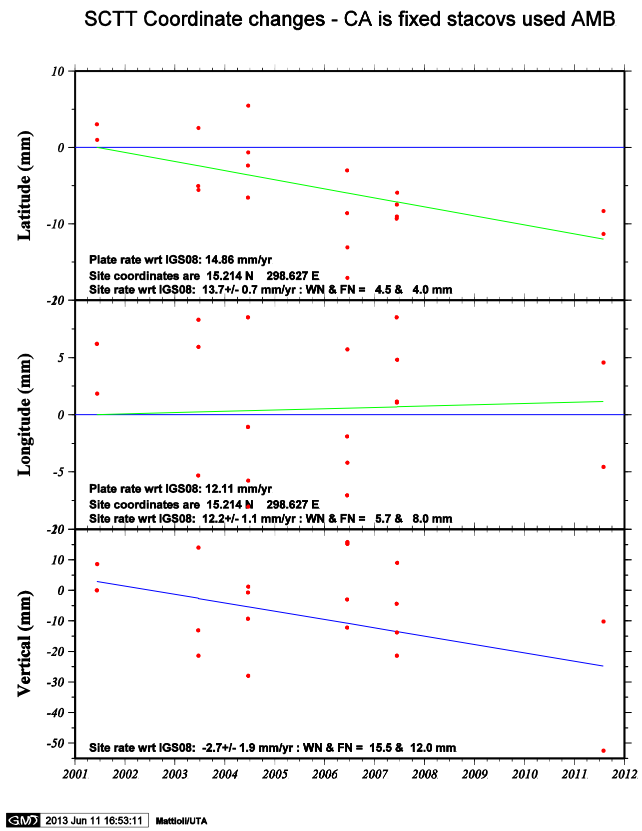


Figure 3-19 Time series for site SCTT

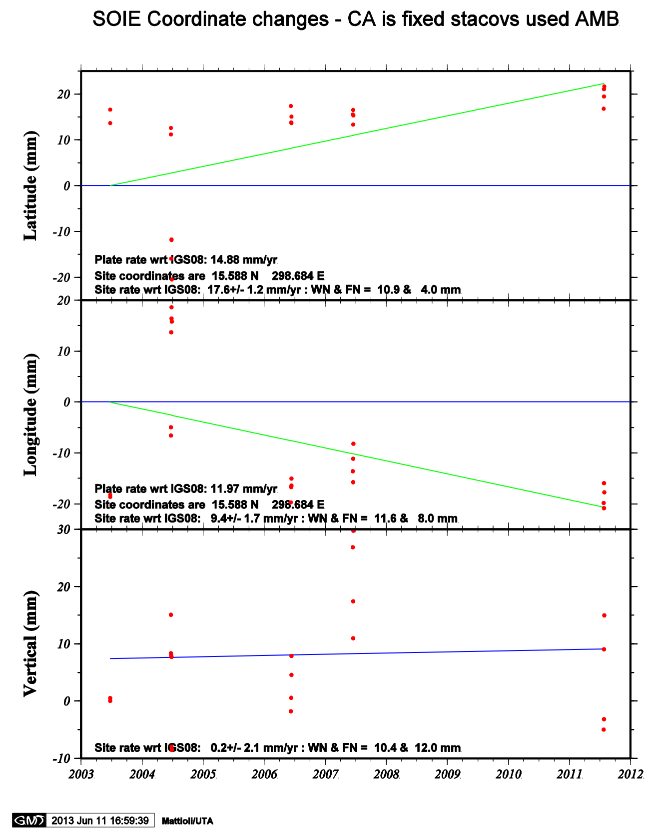


Figure 3-20 Time series for site SOIE

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

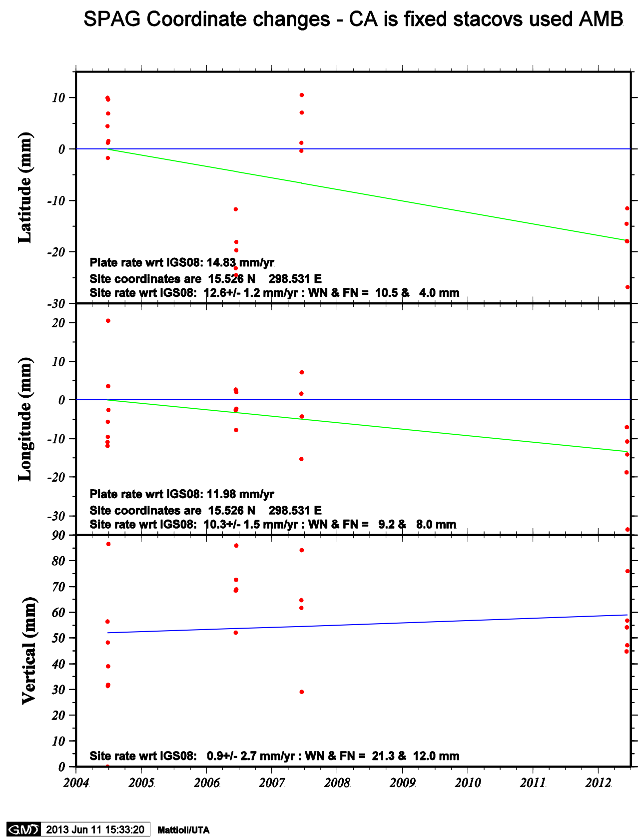


Figure 3-21 Time series for site SPAG

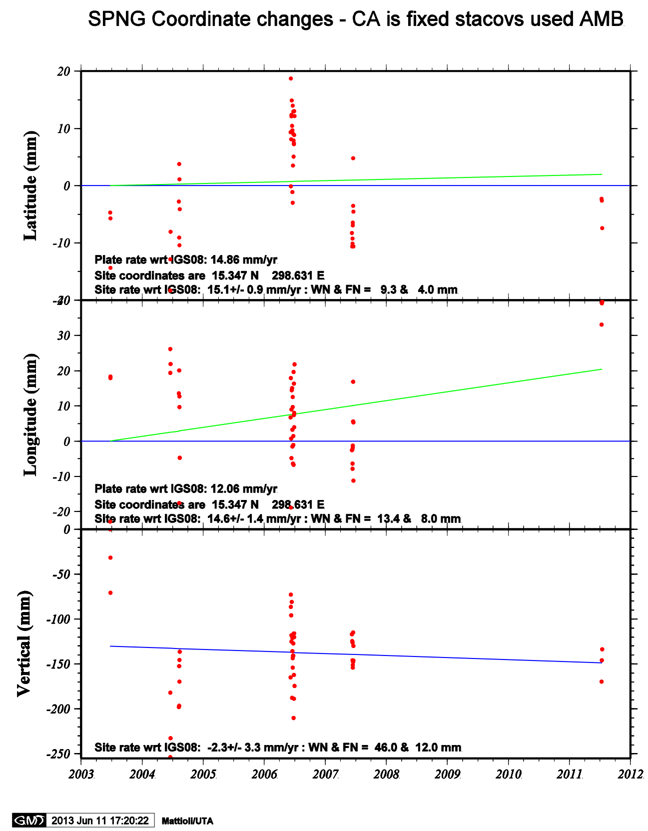


Figure 3-22 Time series for site SPNG

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

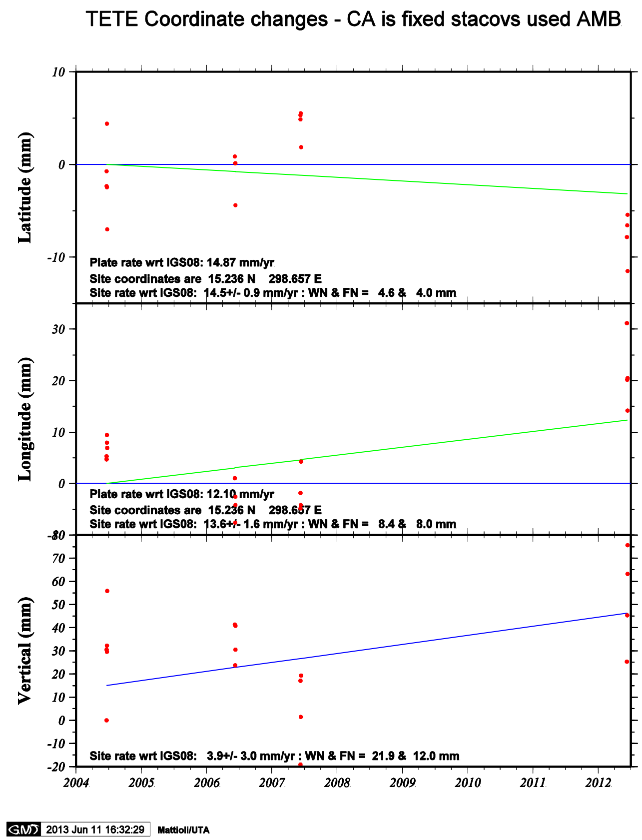


Figure 3-23 Time series for site TETE

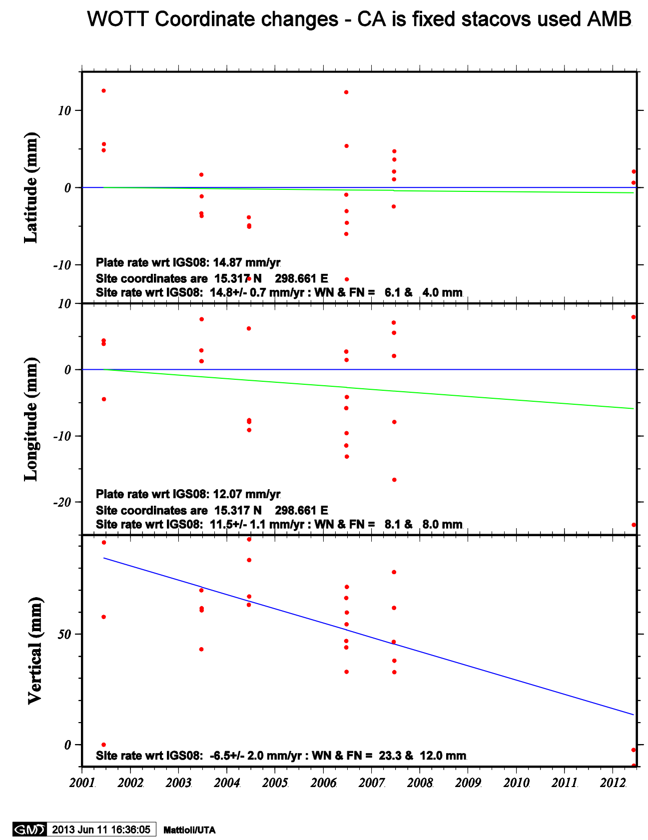


Figure 3-24 Time series for site WOTT

Red dots are the daily position estimates (16 – 24 hr occupations). The blue lines are the predicted plate rates in IGS08 held fixed (horizontal). The green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA). WN = white noise and FN = flicker noise estimates.

Table 3-1 Dominica site velocity summary

Sites are sorted by time span of data available. Location is given in degrees of latitude (Lat), longitude (Long) and height above ellipsoid (HAE) in meters. North (Vn), East (Ve), and vertical (Vv) velocities are presented in a fixed-Earth reference frame as well as a fixed-Caribbean reference frame (revised from DeMets et al., 2007, personal communication to Glen S. Mattioli). WN= white noise, FN=flicker noise and rwn=random walk. Note that all flicker noise values are the default since the number of observations falls below the threshold.

Site ID	Lat (N)	Long (E)	HAE (m)	IGS2008 (mm/yr) - No Common Mode Correction													CAR rate		CAR Fixed Velocity (mm/yr)							Span	Obs
				Vn	Err	WN	FN	Ve	Err	WN	FN	Vv	Err	WN	FN	rwn	Vn	Ve	Vn	Err	Ve	Err	Vv	Err	Epoch	Years	No.
FRSH	15.340	298.691	724.100	15.1	0.8	9.4	4.0	10.7	1.2	10.0	8.0	-2.4	1.7	13.6	12.0	1.0	14.88	12.07	0.22	0.80	-1.37	1.20	-2.40	1.70	2001.4452-2012.4358	10.9906	21
BELV	15.294	298.751	161.098	17.1	0.6	5.2	4.0	13.6	1.0	4.9	8.0	2.8	2.1	24.7	12.0	1.0	14.90	12.09	2.20	0.60	1.51	1.00	2.80	2.10	2001.4397-2012.4303	10.9906	25
WOTT	15.317	298.661	229.847	14.8	0.7	6.1	4.0	11.5	1.1	8.1	8.0	-6.5	2.0	23.3	12.0	1.0	14.87	12.07	-0.07	0.70	-0.57	1.10	-6.50	2.00	2001.4452-2012.4331	10.9879	25
CASS	15.241	298.709	-33.596	14.0	0.6	4.4	4.0	11.8	1.1	7.8	8.0	0.2	1.8	14.9	12.0	1.0	14.89	12.10	-0.89	0.60	-0.30	1.10	0.20	1.80	2001.4288-2012.4167	10.9879	20
NEWF	15.379	298.725	143.599	14.3	0.6	2.3	4.0	11.6	1.0	4.6	8.0	-3.5	1.6	12.2	12.0	1.0	14.89	12.05	-0.59	0.60	-0.45	1.00	-3.50	1.60	2001.4425-2012.4194	10.9769	23
SCTT	15.214	298.627	21.765	13.7	0.7	4.5	4.0	12.2	1.1	5.7	8.0	-2.7	1.9	15.5	12.0	1.0	14.86	12.11	-1.16	0.70	0.09	1.10	-2.70	1.90	2001.4342-2011.5795	10.1452	19
CABR	15.586	298.530	97.718	11.1	0.9	10.2	4.0	12.1	1.3	13.1	8.0	5.1	3.1	40.4	12.0	1.0	14.83	11.96	-3.73	0.90	0.14	1.30	5.10	3.10	2001.4342-2011.5767	10.1425	26
GOMM	15.282	298.634	209.167	13.7	0.7	6.7	4.0	13.0	1.1	7.9	8.0	-1.3	2.2	24.8	12.0	1.0	14.86	12.08	-1.16	0.70	0.92	1.10	-1.30	2.20	2001.4397-2011.5575	10.1178	26
CNCD	15.512	298.722	-24.548	14.2	0.7	6.2	4.0	11.8	1.1	6.0	8.0	5.6	2.5	29.9	12.0	1.0	14.89	12.00	-0.69	0.70	-0.20	1.10	5.60	2.50	2001.4534-2011.5411	10.0877	25
SOIE	15.588	298.684	-34.642	17.6	1.2	10.9	4.0	9.4	1.7	11.6	8.0	0.2	2.1	10.4	12.0	1.0	14.88	11.97	2.72	1.20	-2.57	1.70	0.20	2.10	2003.4726-2011.5685	8.0959	20
SPNG	15.347	298.631	306.878	14.7	0.9	9.7	4.0	16.1	1.9	23.2	8.0	-6.4	3.5	48.5	12.0	1.0	14.86	12.06	-0.16	0.90	4.04	1.90	-6.40	3.50	2003.4753-2011.5329	8.0575	47
TETE	15.236	298.657	414.407	14.5	0.9	4.6	4.0	13.6	1.6	8.4	8.0	3.9	3.0	21.9	12.0	1.0	14.87	12.10	-0.37	0.90	1.50	1.60	3.90	3.00	2004.4658-2012.4495	7.9836	17
SPAG	15.526	298.531	324.523	12.6	1.2	10.5	4.0	10.3	1.5	9.2	8.0	0.9	2.7	21.3	12.0	1.0	14.83	11.98	-2.23	1.20	-1.68	1.50	0.90	2.70	2004.4795-2012.4467	7.9672	21
BRDX	15.234	298.681	244.109	13.7	0.9	5.0	4.0	9.9	1.8	11.3	8.0	9.9	4.9	39.9	12.0	1.0	14.88	12.10	-1.18	0.90	-2.20	1.80	9.90	4.90	2004.4768-2012.4249	7.9481	15
COHT	15.478	298.551	239.061	14.3	1.0	5.2	4.0	10.0	1.8	9.5	8.0	0.7	2.7	14.0	12.0	1.0	14.84	12.00	-0.54	1.00	-2.00	1.80	0.70	2.70	2004.4904-2011.5685	7.0781	17
ATRU	15.616	298.597	-35.766	17.6	1.4	8.3	4.0	10.4	1.6	4.4	8.0	4.2	3.2	18.3	12.0	1.0	14.85	11.96	2.75	1.40	-1.56	1.60	4.20	3.20	2004.4822-2011.5411	7.0589	14
GSAV	15.445	298.550	8.936	13.6	1.2	7.8	4.0	10.4	1.7	7.9	8.0	-7.7	4.5	32.8	12.0	1.0	14.84	12.02	-1.24	1.20	-1.62	1.70	-7.70	4.50	2004.4904-2011.5329	7.0424	16
CONN	15.635	298.542	57.543	17.2	1.3	6.0	4.0	10.5	2.4	10.1	8.0	-4.6	3.7	17.2	12.0	1.0	14.84	11.95	2.36	1.30	-1.45	2.40	-4.60	3.70	2006.4589-2011.5575	5.0986	22
NVEN	15.456	298.658	293.570	15.1	1.3	3.8	4.0	11.3	2.1	3.7	8.0	-5.5	3.6	11.4	12.0	1.0	14.87	12.02	0.23	1.30	-0.72	2.10	-5.50	3.60	2006.4589-2011.5493	5.0904	13
BOTG	15.299	298.618	-21.352	15.1	1.7	7.9	4.0	14.9	2.8	12.1	8.0	-0.9	9.1	52.1	12.0	1.0	14.86	12.08	0.24	1.70	2.82	2.80	-0.90	9.10	2006.4726-2011.5384	5.0658	17
MTNV	15.384	298.663	526.173	16.9	1.2	2.4	4.0	13.5	3.0	9.2	8.0	2.5	5.1	17.6	12.0	1.0	14.87	12.05	2.03	1.20	1.45	3.00	2.50	5.10	2007.4699-2012.4139	4.9441	9
MHAM	15.346	298.652	616.336	15.9	1.6	3.0	4.0	11.1	3.0	6.0	8.0	-8.7	4.8	10.9	12.0	1.0	14.87	12.06	1.03	1.60	-0.96	3.00	-8.70	4.80	2007.4726-2011.5603	4.0877	9

3.4 Data Analysis and Discussion

In order to evaluate the current data and compare it to data collected by previous researchers, all position estimates must be in the same reference frame. Figure 3-25 shows the site velocities published by James (2008), generated using data from 2001 through 2007, processed as absolute point positions with GIPSY-OASIS II (GOAII) v. 5, in the IGS2005 reference frame using final precise Earth orientation parameters, clocks and orbits from JPL. These initial results suggested that there may be observable surface deformation on Dominica. For example, in the northern part of Dominica, sites CONN, ATRU, SOIE, and CABR appear as if they may be pointed away from a crustal magmatic source, which may be an indicate the inflation of that source. The errors for these velocities, as indicated by the red ovals in the figure are too large, however, to make any robust conclusion. In fact, in most cases, the errors are as large, or larger, than the values themselves. The IGS2005 data products were deprecated by JPL in August 2011. A major reprocessing effort was undertaken by the JPL orbit analysis group (Desai et al., 2012) to generate new orbits, clocks and ephemerides using updated Earth models including solid Earth tides and loading, tropospheric models, and absolute phase center corrections for both the GPS SV emitters and ground based tracking stations.

Accordingly, since I collected data post 2011 and wanted to take advantage of the new JPL data products in IGS08, I reprocessed all the data from Dominica as well as across the Caribbean using the same methods, models and GOAII version as used by JPL. The data presented here is in the IGS08 reference frame. Figure 3-26 presents James' data reprocessed using GOAII (v. 6.2) in the IGS08 reference frame. The reprocessing with the updated software and new reference frame are broadly similar. The minimal effect of the upgraded software may partially be due to the fact that the

Dominican GPS sites do not use radomes. A radome will effect the GPS signal, which must be corrected properly, and it has been shown that with the new processing software, the misreporting of the type of radome in the metadata produces erroneous results. A notable difference in azimuth is seen at sites SPAG and BOTG, but the variations fall within error. Figure 3-27 is the James (2008) data plus data collected during the 2011 and 2012 field seasons. These are processed with GOAII version 6.2 in the IGS08 reference frame. It is clear to see that the additional data has drastically reduced the velocity errors for all the sites. Nine of the sites have a decade's worth of data, which now allows confident conclusions about the surface velocity field to be made.

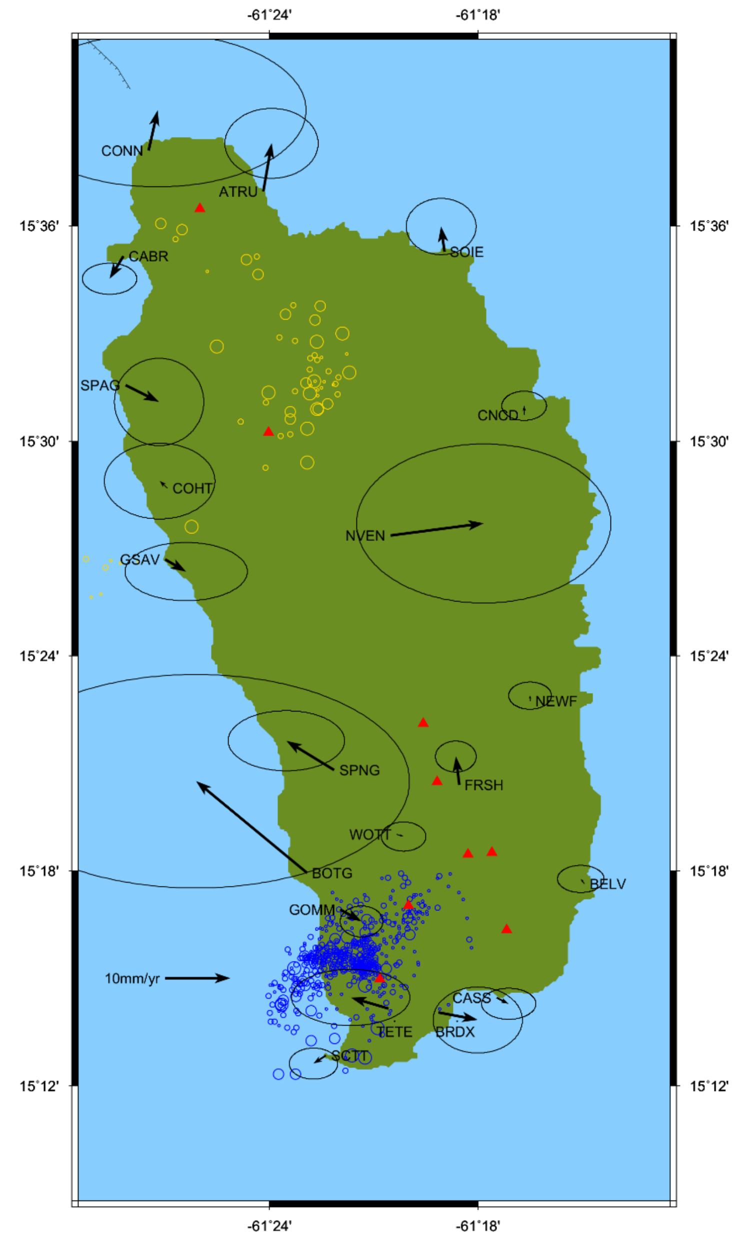


Figure 3-25 Dominica horizontal velocities reported by James (2008)
Values are 2001-2007 data processed with GIPSY-OASIS II (v. 5) in the IGS05 reference frame. Red triangles are volcanic centers, blue circles are epicenters of 2001 seismic swarm, yellow circles are epicenters of 2004 seismic swarm (data courtesy of the Seismic Research Center at the University of the West Indies). Error ellipses are 1 σ.

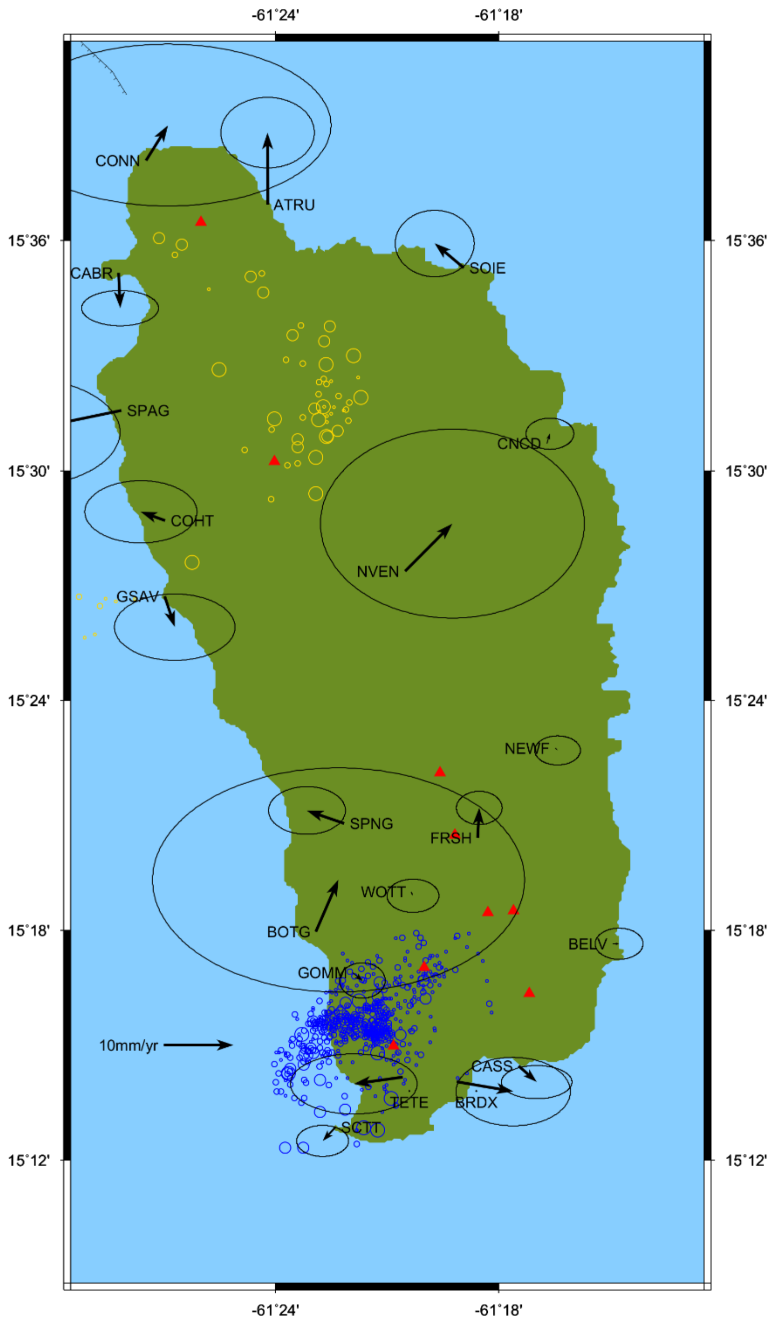


Figure 3-26 Dominica horizontal velocities (2001-2007).
Values are 2001-2007 data reprocessed with GIPSY-OASIS II (v 6.2) in the IGS08 reference frame. Red triangles are volcanic centers, blue circles are epicenters of 2001 seismic swarm, yellow circles are epicenters of 2004 seismic swarm (data courtesy of the Seismic Research Center at the University of the West Indies). Error ellipses are 1 σ.

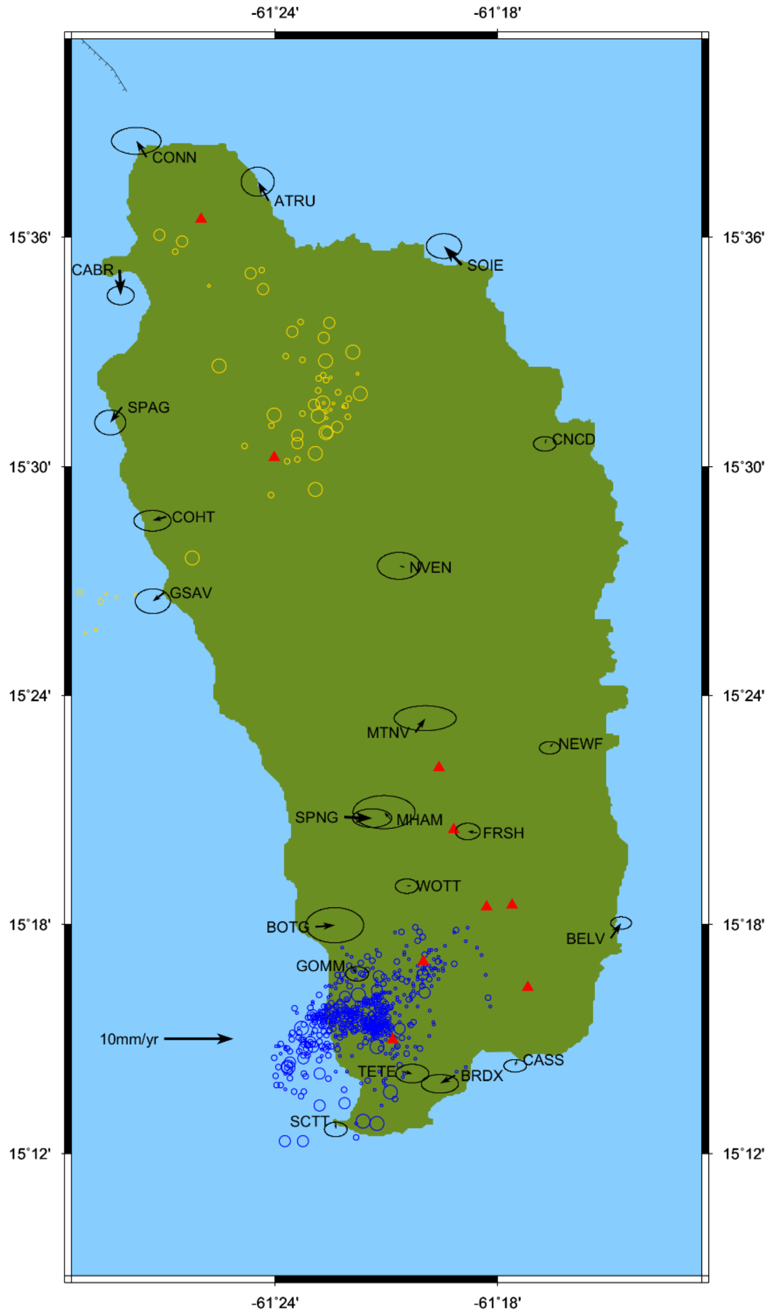


Figure 3-27 Dominica residual horizontal site velocities (2001-2012).
Values are 2001-2012 data, processed using GIPSY-OASIS II (v. 6.2) in the IGS08 reference frame. Red triangles are volcanic centers, blue circles are epicenters of 2001 seismic swarm, yellow circles are epicenters of 2004 seismic swarm (data courtesy of the Seismic Research Center at the University of the West Indies). Error ellipses are 1 σ.

Although most of the Dominica site velocities do not exhibit significant residual velocity, some minor motion can be identified. In Figure 3-28 A, the northern sites of SOIE. ATRU, and CONN seem to have a sinistral motion with respect to sites CABR, SPAG, COHT and GSAV along the trace delineated by the 2004 seismic swarm, which is designated by yellow circles. This motion is consistent with data presented by Smith et al., 2013 and the models of van Benthem, 2013. In Figure 3-28, image C shows focal mechanisms for earthquakes in the central Lesser Antilles. Note the shallow earthquake focal mechanisms in the area of Dominica, Figure 3-28 C (colored yellow in a red oval), the majority of which indicate sinistral strike slip motion (Smith et al., 2013). Although the convergence at Dominica is considered nearly normal, there is a slight obliquity to both the CA-NA and CA-SA relative motion vectors defined by MORVEL (DeMets et al., 2010) and presented by Smith et al. (2013) (Figure 3-28 B). For a rate of 20 mm/yr, a simple calculation of the obliquity of convergence yields an arc-parallel rate of ~3.5 mm/yr to the northwest. Northwest motion on the forearc side would generate sinistral motion along faults in the area of the 2004 seismic swarm. Van Benthem (2013) presents a map of principle stress directions for the Caribbean. Note the location of Dominica (Figure 3-28 B), with the principle stress arrows in the vicinity, indicating a tensional environment. The conditions here are consistent with those necessary for the emplacement of a NW-trending dike, as is seen on Monserrat to the north (Wadge et al.1984; Mattioli et al.; 1998; Linde et al., 2010).

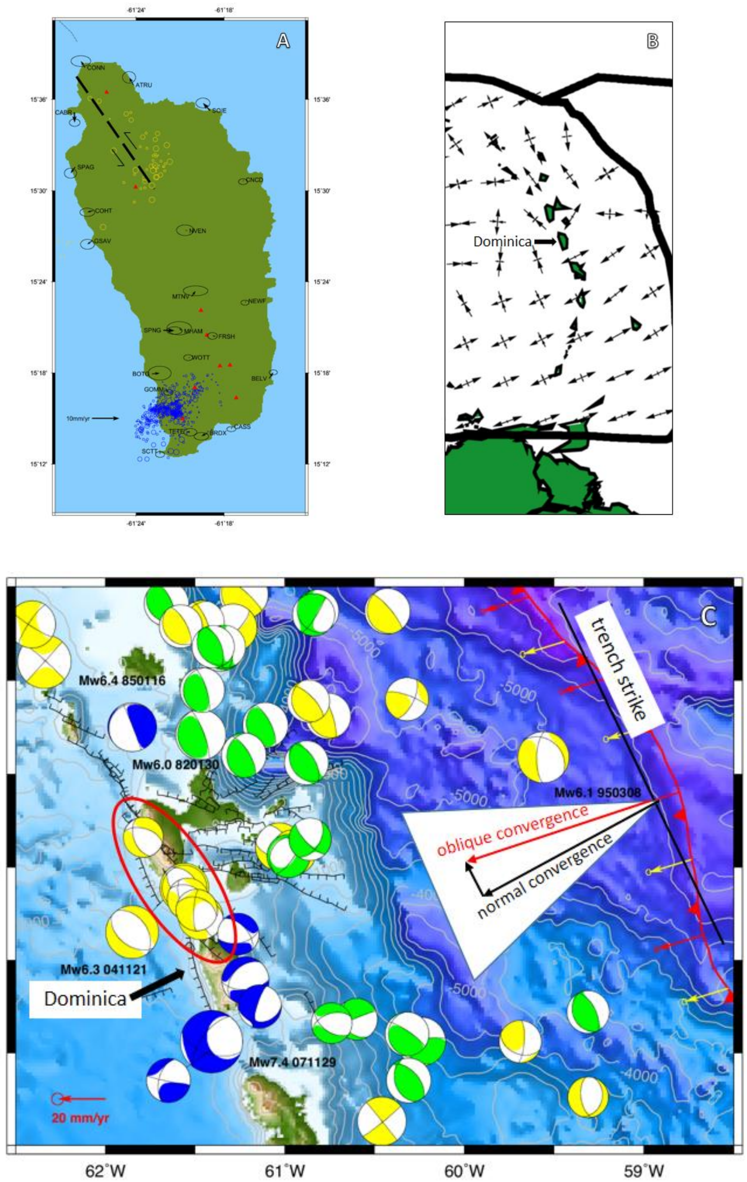


Figure 3-28 Dominica surface deformation
(A) Dominica velocity map as described in Figure 3-27 with possible sinistral strike-slip motion marked by dashed black line. (B) Principal stress directions (van Benthem, 2013). (C) Focal mechanisms are from the Global CMT project (Ekstrom et al., 2012, http://www.globalcmt.org). Mapped faults are from various sources including Feuillet et al., 2002 and Roobol and Smith, 2004. Moment tensor solutions are color coded as follows: yellow (shallow, 10-30 km), green (intermediate, 30-70 km), and blue (deep, >70 km). Yellow vectors indicate South America-Caribbean motion and red vectors indicate North America-Caribbean motion (DeMets et al., 2010). Figured modified based on Smith et al. (2013).

If you ignore the direction of the residual velocity, in general, the horizontal velocities (Figure 3-27) in the northern part of Dominica are greater than in the south, while the vertical component velocities show the opposite, such that, velocities in the south are greater than in the north (Figure 3-29). The central, eastern portion of the island, consisting of sites CNCD, NVEN, NEWF, MHAM, FRSH and WOTT appear to be very stable, with almost zero motion with respect to the Caribbean plate. The lack of movement at WOTT is surprising however, since it is close to currently active geothermal features and the location of geothermal test wells. SPNG and BOTG show small easterly directed motion, but there does not seem to be any distinguishable pattern among the horizontal velocities of the southern sites with respect to the 2001 seismic swarm (designated by blue circles). The vertical velocity field, however, may show a pattern such that the sites north (SPNG, WOTT, MHAM, FRSH, BOTG, and NEWF) of the 2001 seismic swarm show subsidence, while the sites (BELV, BRDX, and TETE) south of the swarm show uplift (Figure 3-29). The subsidence demonstrated by sites WOTT and MHAM may be attributed to the fact that they are located within, or on the borders of, caldera structures identified in Figure 3-2. The elongate pattern seen in the distribution of motion associated with the seismic swarms could also be consistent with the emplacement of dikes.

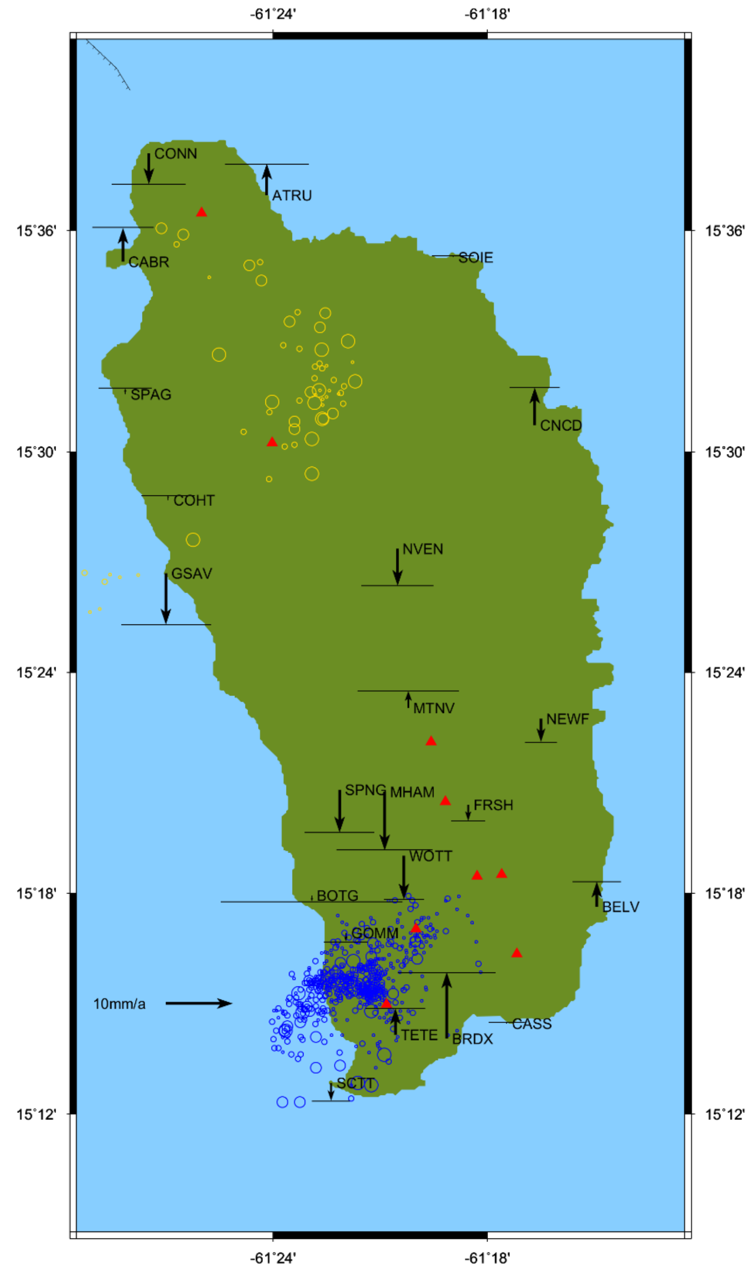


Figure 3-29 Dominica vertical site velocities (2001-2012)
Values are 2001-2012 data, processed using GIPSY-OASIS II (v. 6.2) in the IGS08 reference frame. Black arrows indicate up or down vertical motion, thin black line at the end of each arrow is the 1 σ error associated with that vector. Red triangles are volcanic centers, blue circles are hypocenters of 2001 seismic swarm, while yellow circles are hypocenters of 2004 seismic swarm.

3.5 Conclusion

GPS data collection on the Island of Dominica has proven to be challenging in a variety of ways. The climate is conducive to high weathering rates, the infrastructure is generally substandard, and the topography and vegetation make observations nearly impossible in many areas. Yet, despite the challenges, over a span of a decade, teams have been successful collecting high precision GPS data. Evaluation of the data by James (2008) after the 2007 field season suggested that a recognizable surface deformation signature, associated with recent shallow seismicity, was going to emerge. Figure 3-26 and Figure 3-27 are horizontal velocity maps of the Dominica campaign GPS data. Figure 3-26 is the data used by James, 2008, reprocessed in IGS08, and Figure 3-27 is the same data plus additional epochs of data collected in 2011 and 2012. It is clear that the addition of the 2011 and 2012 data has served to reduce the error on the horizontal velocities significantly. It is also evident that there is no significant and easily discernable signature related to volcanic processes present in the velocities. The velocity field for Dominica indicates that the points measured are generally tracking the motion of the Caribbean plate. If, in fact, there is subtle subsurface igneous activity, it has been demonstrated that intermittent (bi-annual) campaign GPS is not an effective monitoring tool to observe subtle surface deformation changes in a tropical environment. The last eruptions on Dominica occurred approximately 450 years ago, and since then, the island has only experienced shallow seismic swarms, geothermal activity and phreatic activity (Smith et al., 2013). The low deformation rate observed here suggests that a majority of the batholith is partially solidified, and that any volcanic activity is a result of basaltic injection at the base of the batholith (Smith et al., 2013). Perhaps Dominica is entering a new phase in its volcanic history, one that will be dominated by the behavior of its mid-level island-arc batholith. The fact that there seems to be no significant residual surface deformation in Dominica relative to the Caribbean plate, suggests that inclusion of the velocities from Dominica may help define the motion of the eastern part of the Caribbean plate.

Chapter 4

The Caribbean Plate

4.1 Introduction

One of the issues distinctive to the Caribbean plate, which renders the determination of its motion problematical, is the lack of any subaerial landmass in its interior. In an attempt to study and mitigate the natural hazards that occur in the Caribbean, the Continuously Operating Caribbean GPS Observational Network (COCONet) was initiated in 2011 (Braun et al., 2012). The purpose of this NSF-funded international consortium is to develop a large-scale geodetic and atmospheric infrastructure in the Caribbean to serve as the backbone for a wide range of geoscience investigations. The network currently collects data from a combination of 60+, previously established and newly installed stations. COCONet data, in conjunction with campaign GPS data will be analyzed to evaluate the motion and rigidity of the Caribbean plate. Since the campaign GPS data from Dominica has shown that the island is closely tracking the Caribbean plate at a majority of the 27 sites, data from some of those sites will be useful in constraining the motion of the easternmost edge of the plate. All data from the Caribbean sites were processed as described in Chapter 2. Figure 4-1 is a map showing the locations of the sites used for this study; Table 4-1 and Table 4-2 are velocity summaries of those sites.

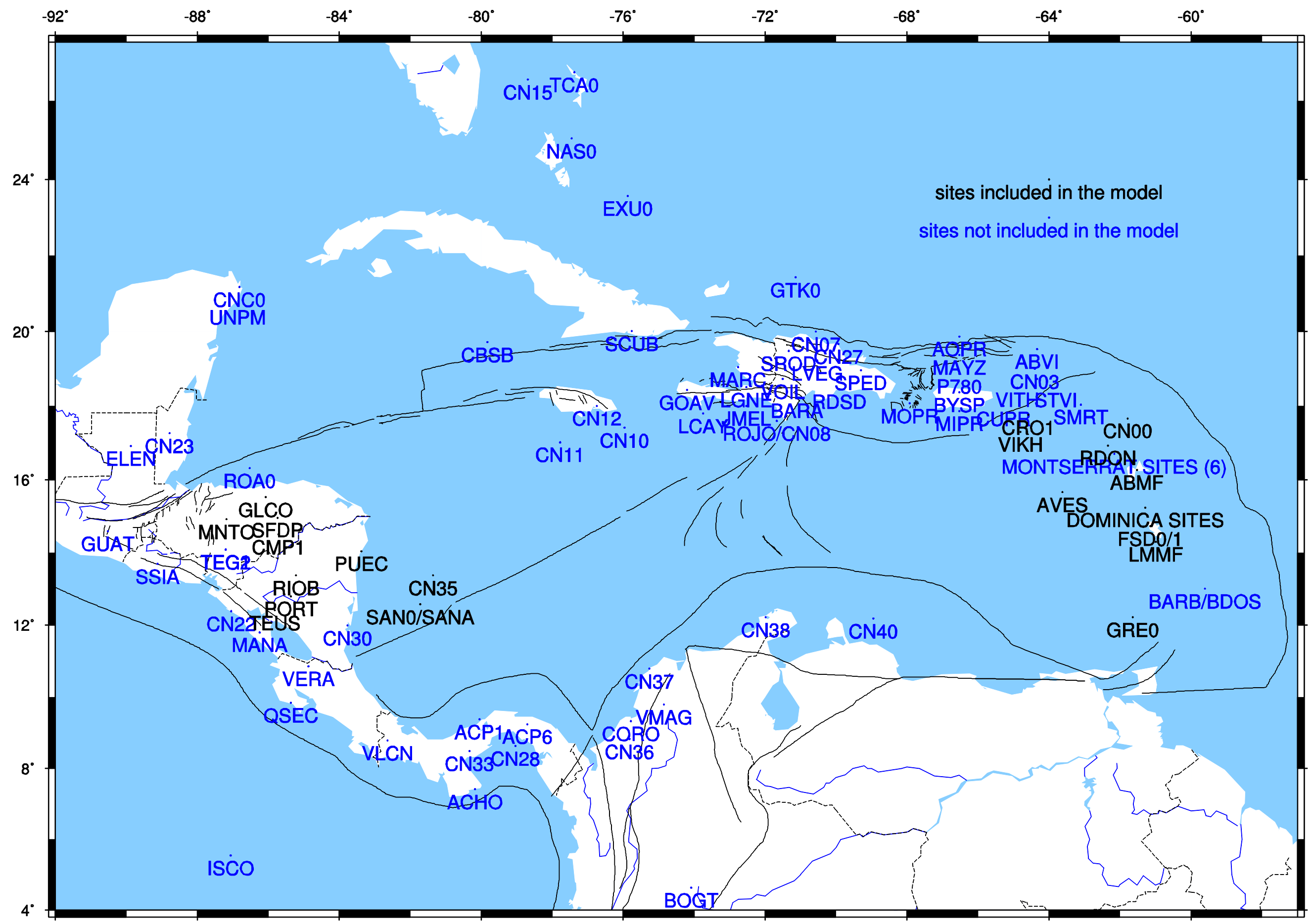


Figure 4-1 Caribbean GPS station site map

Site locations available from UNAVCO at http://www.unavco.org. Black lines delineate putative faults, site names in black were used for inversion.

Table 4-1 Caribbean velocity summary, sorted by site ID.

Site name	Site ID	Lat (N)	Long (E)	HAE (m)	IGS2008 (mm/yr) - No Common Mode Correction													CAR rate		CAR Fixed Velocity (mm/yr)							Span	No. Obs
					Vn	Error	WN	FN	Ve	Error	WN	FN	Vv	Error	WN	FN	RWN	Vn	Ve	Vn	Error	Ve	Error	Vv	Error	Epoch	Years	
Les Abymes, Guadeloupe	ABMF	16.262	298.472	-27.688	14.4	0.8	2.3	2.2	12.0	0.9	2.4	2.7	2.5	2.3	8.2	8.9	1.0	14.81	11.70	-0.41	0.80	0.30	0.90	2.50	2.30	2010.6671-2013.511	2.8438	977
Anegada, Virgin Islands	ABVI	18.730	295.668	-37.653	15.2	0.8	2.3	1.4	8.5	1.1	3.4	2.7	0.3	2.3	6.5	6.9	1.0	13.94	10.54	1.26	0.80	-2.04	1.10	0.30	2.30	2011.0973-2013.3822	2.9849	832
Achotines, Panama	ACHO	7.415	279.827	33.074	10.7	1.2	2.4	1.6	32.8	1.6	2.4	2.7	-1.0	3.2	6.7	5.9	1.0	8.46	14.39	2.24	1.20	18.41	1.60	-1.00	3.20	2011.3849-2012.7582	1.3733	490
Sherman, Panama	ACP1	9.371	280.050	10.390	11.3	0.6	2.2	2.4	17.0	0.6	2.1	2.3	-0.7	1.1	7.0	6.3	1.0	8.54	13.59	2.76	0.60	3.41	0.60	-0.70	1.10	2008.8156-2013.4260	4.6105	1245
Panama	ACP6	9.239	280.592	941.097	12.2	0.9	2.8	5.1	17.1	0.6	2.2	2.6	-0.5	1.1	6.7	6.8	1.0	8.74	13.60	3.46	0.90	3.50	0.60	-0.50	1.10	2008.7883-2013.4260	4.6378	1659
Montserrat	AIRS	16.741	297.786	82.208	13.5	1.0	3.3	12.5	12.3	1.0	6.1	11.9	-4.3	2.8	12.8	35.7	1.0	14.60	11.47	-1.10	1.00	0.83	1.00	-4.30	2.80	2004.2309-2013.4288	9.1979	2440
Arecibo Observatory, PR	AOPR	18.347	293.246	317.458	13.6	1.3	2.3	1.6	8.7	1.2	2.4	1.4	0.1	2.3	8.0	3.1	1.0	13.16	10.51	0.44	1.30	-1.81	1.20	0.10	2.30	2012.1926-2013.4096	1.2170	443
Aves Island Venezuela	AVES	15.667	296.382	-38.928	14.2	1.3	3.0	4.0	11.3	2.3	2.4	8.0	-1.4	3.9	11.9	12.0	1.0	14.17	11.79	0.03	1.30	-0.49	2.30	-1.40	3.90	1994.3740-1998.2479	3.8740	28
Barahona, DR CANAPE site	BARA	18.209	288.902	3.909	13.2	6.5	14.9	22.3	33.7	26.9	42.6	92.7	0.9	21.3	55.2	72.9	1.0	11.71	10.27	1.49	6.50	23.43	26.90	0.90	21.30	2011.0014-2013.4288	2.4274	824
Barbados	BARB	13.008	300.391	-40.885	17.1	1.9	2.6	3.6	8.1	1.0	2.3	1.4	-4.3	3.8	9.0	7.7	1.0	15.39	13.00	1.71	1.90	-4.90	1.00	-4.30	3.80	1999.5000-2001.1164	1.6164	333
Barbados	BDOS	13.088	300.391	-40.859	15.2	0.5	2.0	4.0	14.2	0.8	2.1	9.3	-0.8	1.2	7.4	14.1	1.0	15.39	13.00	-0.19	0.50	1.20	0.80	-0.80	1.20	2004.4440-2013.3932	8.9492	2258
Bggy, Antigua	BGGY	17.045	298.139	353.631	15.4	0.4	2.3	5.2	9.9	0.3	2.3	4.0	-1.5	0.5	7.1	8.9	1.0	14.71	11.38	0.69	0.40	-1.48	0.30	-1.50	0.50	1998.6123-2012.9986	14.3863	3851
Bogota, Columbia	BOGT	4.640	285.919	2574.510	15.8	0.6	2.1	13.4	0.4	0.6	2.4	13.7	-42.9	1.7	8.2	41.3	1.0	10.67	15.59	5.13	0.60	-15.19	0.60	-42.90	1.70	1994.8781-2013.4288	18.5507	4096
Bayamon Science Park, PR	BYSP	18.408	293.839	47.156	13.2	0.9	2.6	1.4	9.1	0.9	2.3	1.6	1.5	2.1	7.8	5.3	1.0	13.36	10.53	-0.16	0.90	-1.43	0.90	1.50	2.10	2011.3932-2013.4096	2.0164	621
Cayman Brac, Cayman Islands	CBSB	19.712	280.167	-9.158	2.9	0.5	2.4	3.3	-8.3	0.7	2.7	6.1	-1.2	1.1	6.8	11.2	1.0	8.59	9.11	-5.69	0.50	-17.41	0.70	-1.20	1.10	2005.8836-2013.4288	7.5452	2052
UW-Madison site in Honduras	CMP1	14.509	274.285	389.225	5.4	1.7	4.6	4.0	11.7	2.4	4.2	8.0	-6.8	5.2	15.3	12.0	1.0	6.37	11.22	-0.97	1.70	0.48	2.40	-6.80	5.20	2000.1926-2005.4068	5.2142	6
Barbuda	CN00	17.669	298.214	-24.029	12.6	3.8	2.0	4.0	11.2	7.4	2.3	8.0	18.6	11.1	7.3	12.0	1.0	14.74	11.15	-2.14	3.80	0.05	7.40	18.60	11.10	2012.6407-2013.4096	0.7689	282
North Sound British Virgin Islands	CN03	18.491	295.598	286.355	25.3	12.5	2.1	4.0	23.8	24.1	2.6	8.0	21.3	37.4	7.2	12.0	1.0	13.92	10.63	11.38	12.50	13.17	24.10	21.30	37.40	2013.1466-2013.3822	0.2356	86
Puerto Rico, Dominican Republic	CN07	19.758	289.434	-34.216	9.4	1.3	2.6	1.2	-4.3	1.4	2.4	1.4	2.3	3.0	9.1	3.9	1.0	11.89	9.65	-2.49	1.30	-13.95	1.40	2.30	3.00	2012.3210-2013.4096	1.0886	394
Cabo Rojo, Dominican Republic	CN08	17.903	288.326	-19.168	10.1	1.3	2.4	1.1	11.8	1.6	3.0	1.5	7.7	5.0	8.5	6.7	1.0	11.51	10.36	-1.41	1.30	1.44	1.60	7.70	5.00	2012.3320-2013.3411	1.0091	353
Morant Cay, Jamaica	CN10	17.415	284.029	-18.422	7.6	1.0	2.2	1.2	9.6	1.2	2.2	1.8	-0.7	2.9	6.6	5.8	1.0	10.00	10.33	-2.40	1.00	-0.73	1.20	-0.70	2.90	2011.7164-2013.2342	1.5178	552
Pedro Cay, Jamaica	CN11	17.021	282.216	-12.814	6.5	0.9	2.1	1.2	9.2	1.1	2.1	2.0	-2.2	3.1	6.5	7.3	1.0	9.34	10.41	-2.84	0.90	-1.21	1.10	-2.20	3.10	2011.7219-2013.4288	1.7068	620
UWI, Jamaica	CN12	18.005	283.251	167.861	3.5	1.3	3.0	1.6	3.4	1.4	2.9	1.8	-24.8	2.6	10.9	3.7	1.0	9.72	10.03	-6.22	1.30	-6.63	1.40	-24.80	2.60	2012.1598-2013.4288	1.2689	460
Grand Bahama, Bahamas	CN15	26.557	281.307	-29.072	4.4	1.3	2.7	1.6	-11.3	1.2	2.2	1.4	-5.7	3.9	8.4	6.9	1.0	9.01	6.05	-4.61	1.30	-17.35	1.20	-5.70	3.90	2011.4753-2012.8128	1.3375	414
Poneloya, Nicaragua	CN22	12.384	272.955	26.478	7.6	1.2	2.3	1.5	-1.5	1.5	2.4	2.3	6.6	4.8	7.1	8.8	1.0	5.86	12.13	1.74	1.20	-13.63	1.50	6.60	4.80	2012.1107-2013.4288	1.3181	439
Belmopan, Belize	CN23	17.261	271.221	53.228	-6.2	1.5	2.4	1.1	-5.9	1.8	2.5	1.6	19.6	3.6	7.5	3.6	1.0	5.18	9.89	-11.38	1.50	-15.79	1.80	19.60	3.60	2012.5669-2013.4288	0.8618	303
Cabo Frences Viejo, Dom. Rep.	CN27	19.667	290.060	-23.107	8.7	1.6	3.1	1.0	-3.9	1.6	2.9	1.1	38.4	4.2	9.5	3.7	1.0	12.10	9.74	-3.40	1.60	-13.64	1.60	38.40	4.20	2012.6298-2013.4260	0.7962	289
Contadora, Panama	CN28	8.625	280.966	23.426	4.8	28.7	2.3	4.0	-0.2	53.0	1.9	8.0	-12.1	-84.8	6.4	12.0	1.0	8.88	13.92	-4.08	28.70	-14.12	53.00	-12.10	-84.80	2013.1986-2013.3055	0.1068	40
Bluefield, Nicaragua	CN30	11.994	276.228	27.749	-0.3	1.2	2.7	1.5	8.3	1.4	2.8	1.9	-1.0	3.8	8.8	6.5	1.0	7.11	12.38	-7.41	1.20	-4.08	1.40	-1.00	3.80	2012.1189-2013.4288	1.3099	464
Perenome, Panama	CN33	8.487	279.673	74.384	10.8	2.1	3.4	4.3	20.0	1.9	2.7	3.7	-2.3	3.2	9.3	6.6	1.0	8.40	13.95	2.40	2.10	6.05	1.90	-2.30	3.20	2011.8616-2013.4288	1.5671	569
Old Town, Columbia	CN35	13.376	278.637	45.597	3.0	4.0	2.2	4.0	9.2	7.7	2.3	8.0	16.2	11.6	7.3	12.0	1.0	8.02	11.85	-5.02	4.00	-2.65	7.70	16.20	11.60	2012.6899-2013.4288	0.7389	268
Monteria, Columbia	CN36	8.820	284.179	12.923	7.7	4.1	2.4	4.0	8.8	7.9	2.6	8.0	-1.2	11.9	7.5	12.0	1.0	10.05	13.92	-2.35	4.10	-5.12	7.90	-1.20	11.90	2012.6325-2013.3493	0.7168	262
Galerazamba, Columbia	CN37	10.793	284.737	-0.923	22.7	4.0	2.5	4.0	8.8	7.6	2.4	8.0	15.5	11.5	7.2	12.0	1.0	10.25	13.14	12.45	4.00	-4.34	7.60	15.50	11.50	2012.6462-2013.4205	0.7744	205
Cerrejon, Columbia	CN38	12.222	288.012	8.191	9.5	3.9	1.9	4.0	12.8	7.4	2.2	8.0	12.2	11.2	7.6	12.0	1.0	11.40	12.69	-1.90	3.90	0.11	7.40	12.20	11.20	2012.6626-2013.4288	0.7662	277
Curacao	CN40	12.180	291.042	31.014	12.0	1.0	2.1	1.9	12.9	0.9	2.2	1.6	1.9	2.3	6.6	5.7	1.0	12.43	12.84	-0.43	1.00	0.06	0.90	1.90	2.30	2011.5521-2013.4260	1.8740	677
Cancun, Mexico	CNC0	21.175	273.179	-2.186	0.3	0.5	1.7	2.1	-9.0	0.6	1.6	3.1	-1.0	1.2	6.2	8.8	1.0	5.94	8.13	-5.64	0.50	-17.13	0.60	-1.00	1.20	2007.4233-1012.7719	5.3486	1752
Corozal, Columbia	CORO	9.328	284.712	153.367	11.2	1.2	2.1	1.5	10.0	1.2	2.3	1.7	4.0	3.8	7.7	7.2	1.0	10.24	13.73	0.96	1.20	-3.73	1.20	4.00	3.80	2011.9904-2013.4041	1.4137	510
St. Croix, Virgin Islands	CRO1	17.757	295.416	-34.070	13.6	0.3	2.0	4.6	11.0	0.3	2.1	5.2	-1.2	1.0	8.4	24.2	1.0	13.86	10.90	-0.26	0.30	0.10	0.30	-1.20	1.00	1995.7822-2013.4260	17.6438	12070
Culebra Island, PR	CUPR	18.307	294.717	-32.502	13.6	0.6	2.3	1.8	9.1	0.6	2.3	1.9	-1.2	1.3	7.1	7.1	1.0	13.64	10.63	-0.04	0.60	-1.53	0.60	-1.20	1.30	2008.8320-2013.4096	4.5776	674
Santa Elena, Guatemala	ELEN	16.916	270.132	115.966	1.2	0.4	1.9	5.0	-7.8	0.4	1.8	4.6	0.4	2.4	6.7	37.9	1.0	4.76	10.02	-3.56	0.40	-17.82	0.40	0.40	2.40	2001.9356-2013.4288	11.4932	2870
Exuma Intl Airport, Bahamas	EXU0	23.564	284.127	-21.823	5.1	0.5	2.0	2.1	-9.4	0.5	1.9	2.2	-1.0	0.9	6.3	6.8	1.0	10.03	7.62	-4.93	0.50	-17.02	0.50	-1.00	0.90	2007.4918-2013.4288	5.9370	1826
Martinique Volcano Observatory	FSD0	14.735	298.853	481.809	15.8	1.2	4.3	4.0	13.1	3.2	15.4	8.0	-7.0	13.9	80.8	12.0	1.0	14.93	12.30	0.97	1.30	-0.30	3.70	-6.90	13.70	1994.3986-1999.8671	5.4685	14
Martinique Volcano Observatory	FSD1	14.735	298.853	498.170	16.3	1.7	6.2	4.0	13.3	2.1	4.7	8.0	-0.4	4.2	14.7	12.0	1.0	14.93	12.30	1.17	1.70	2.50	2.70	0.30	3.80	1994.4096-1999.8671	5.4575	9
Montserrat	GERD	16.795	297.806	123.390	13.2	2.4	2.5	30.6	11.5	0.6	3.8	7.0	-2.6	2.5	9.3	32.0	1.0	14.61	11.45	-1.41	2.40	0.05	0.60	-2.60	2.50	2004.2309-2013.4288	9.1979	2383
UW-Madison site in Honduras	GLCO	15.030	273.930	659.995	7.1	0.9	7.9	4.0	10.8	1.8	16.1	8.0	-1.6	2.2	16.2	12.0	1.0	6.23	10.98	0.87	0.90	-0.18	1.80	-1.60	2.20	2000.1790-2010.4671	10.2882	13
Petit Goave, Haiti	GOAV	18.428	287.135	-6.485	15.2	1.5	2.6	3.1	8.2	1.3	2.2	2.5	-8.7	3.1	9.3	6.7	1.0	11.10	10.07	4.10	1.50	-1.87	1.30	-8.70	3.10	2010.2041-2011.8781	1.6740	519
Grenada	GRE0	12.222	298.360	14.363	15.2	0.5	2.1	2.5	13.6	0.5	3.4	2.9	-1.6	1.1	7.8	8.9	1.0	14.78	13.19	0.42	0.50	0.41	0.50	-1.60	1.10	2007.4863-2013.4260	5.9397	4214
Grand Turk	GTK0	21.433	288.855	-32.969	6.2	0.5	1.6	2.5	-8.1	0.5	1.6	2.4	-1.3	1.0	5.6	7.7	1.0	11.69	8.90	-5.49	0.50	-17.00	0.50	-1.30	1.00	2007.4863-2013.4288	5.9425	1654
Guatemala City, Guatemala	GUAT	14.590	269.480	1517.611	3.2	0.4	2.0	5.2	5.2	0.5	2.0	6.8	-1.0	0.8	6.4	14.4	1.0	4.50	11.07	-1.30	0.40	-5.87	0.50	-1.00	0.80	2000.5751-2013.4288	12.8536	4192
Cocos Island, Costa Rica	ISCO	5.544	272.944	7.915	75.4	1.2	3.0	2.9	50.1	1.1	3.2	2.3	-0.7	4.8	11.4	13.8	1.0	5.85	15.06	69.55	1.20	35.04	1.10	-0.70	4.80	2011.3822-2013.4288	2.0466	733
Jacmel, Haiti	JMEL	18.235	287.464	4.655	9.7	0.8	2.3	1.4	6.1	0.9	2.2	2.1	-1.5	1.8	8.6	5.2	1.0	11.21	10.17	-1.51	0.80	-4.07	0.90	-1.50	1.80	2010.1986-2012.4932	2.2945	636
Les Cayes, Haiti	LCAY	18.188	286.246	-15.484	10.0	0.8	2.3	1.4	7.6	0.9	2.2	2.1	-20.7	1.6	7.5	4.7	1.0	10.78	10.12	-0.78	0.80	-2.52	0.90	-20.70	1.60	2010.2096-2012.7473	2.5377	497
Leogane, Haiti	LGNE	18.508	287.369	0.437	6.1	2.4	1.9	4.0	2.6	4.5	1.5	8.0	-6.8	7.2	9.4	12.0	1.0	11.18	10.05	-5.08	2.40	-7.45	4.50	-6.80	7.20	2010.1932-2011.8781	1.6849	49
Aeroport Aime, LeLamentin	LMMF	14.595	299.004	-29.292	15.0	0.8	2.5	2.2	12.5	0.9	3.2	2.8	-2.4	2.5	9.7	9.9	1.0	14.98	12.36	0.02	0.80	0.14	0.90	-2.40	2.50	2010.6671-2013.5110	2.8438	1023
La Vega, Dominican Republic	LVEG	19.222	289.469	76.586	7.3	0.7	2.2	1.2	0.5	0.8	2.1	1.8	-0.5	2.2	8.3	7.2	1.0	11.90	9.88	-4.60	0.70	-9.38	0.80	-0.50	2.20	2011.0014-2013.4288	2.4274	832
Managua, Nicaragua	MANA	12.149	273.751	68.683	8.0	0.5	2.0	8.3	6.9	0.4	2.0	4.9	-3.7	1.0	7.2	17.5	1.0	6.16	12.26	1.84	0.50	-5.36	0.40	-3.70	1.00	2000.3648-2013.4288	13.0640	4104
St. Mare, Haiti	MARC	19.052	287.242	405.123	4.1	1.6	2.2	4.0	0.3	3.0	2.5	8.0	-2.0	4.4	7.2	12.0	1.0	11.13	9.81	-7.03	1.60	-9.51	3.00	-2.00	4.40	2010.1959-2012.4522	2.2563	238
Mayaguez Pier PR	MAYZ	18.218	292.841	-40.706	14.0	0.9	2.5	2.9	9.2	0.7	2.4	1.9	0.4	1.5	8.4	6.0	1.0	13.03	10.53	0.97	0.90	-1.33	0.70	0.40	1.50	2010.1027-2013.4096	3.3068	567
Caja de Muertos Island, PR	MIPR	17.866	293.473	-40.213	13.6	0.5	1.9	1.5	9.6	0.6	1.8	1.9	0.3	0.9	7.2	4.3	1.0	13.24	10.71	0.36	0.50	-1.11	0.60	0.30	0.90	2008.3566-2013.3055	4.9489	391
UW-Madison site in Honduras	MNTO	14.917	273.619	654.437	6.7	0.6	1.1	4.0	11.0	1.1	2.0	8.0	-1.7	2.2	13.1	12.0	1.0	6.11	11.02	0.59	0.60	-0.02	1.10	-1.70	2.20	2000.1680-2010.4671	10.2991	9
Mona Island, PR	MOPR	18.077	292.069	-41.688	11.4	0.7	2.1	0.8	8.9	0.7	2.1	1.3	-3.0	1.2	7.3	3.2	1.0	12.78	10.54	-1.38	0.70	-1.64	0.70	-3.00	1.20	2008.8210-2011.6452	2.8242	346
Nassau, Bahamas	NAS0	25.053	282.538	-22.906	4.6	0.6	2.0	3.0	-9.3	0.5	1.8	2.4	-2.1	1.0	6.7	7.2	1.0	9.46	6.83	-4.86	0.60	-16.13	0.50	-2.10	1.00	2007.4808-2013.4288	5.9479	1707
Northwest Bluff, Montserrat	NWBL	16.820	297.797	144.493	23.8	1.5	2.5	1.8	10.9	1.5	3.2	1.7	16.4	3.0	8.5	3.9	1.0	14.61	11.44	9.19	1.50	-0.54	1.50	16.40	3.00	2012.3238-2013.4288	1.1050	372
Montserrat	OLVN	16.750	297.772	38.724	14.6	1.0	3.3	12.2	12.4	1.3	6.7	15.5	-3.9	2.1	13.4	26.1	1.0	14.60	11.47	0.00	1.00	0.93	1.30	-3.90	2.10	2004.1790-2013.3000	9.1210	2463
Ponc, Puerto Rico	P780	18.075	293.421	151.990	13.4	0.4	2.2	8.9	9.6	0.6	3.3	3.1	-0.3	1.3	8.1	9.6	1.0	13.22	10.63	0.18	0.40	-1.73	0.60	-0.30	1.30	2008.4057-2013.4260	5.0203	3618
El Porton, Nicaragua	PORT	12.573	274.633	452.966	7.1	0.6	4.2	4.0	9.4	0.9	4.7	8.0	-3.0	1.5	13.5	12.0	1.0	6.50	12.09	0.60	0.60	-2.69	0.90	-3.00	1.50	2000.6134-2012.5697	11.9563	22
Puerto Cabezas, Nicaragua	PUEC	14.042	276.618	21.070	6.1	1.1	1.4	4.0	11.0	2.0	2.1	8.0	-0.6	3.5	10.8	12.0	1.0	7.26	11.50	-1.16	1.10	-0.50	2.00	-0.60	3.50	2001.0397-2006.1630	5.1233	13
Santo Domingo, Dom. Rep.	QSEC	9.840	274.643	15.030	26.8	0.7	2.2	5.7	14.0	0.9	2.1	8.1	-6.3	0.8	7.6	7.5	1.0	6.50	13.28	20.30	0.70	0.72	0.90	-6.30	0.80	2006.3219-2013.4288	7.1068	2155
Montserrat	RCHY	16.704	297.847	310.900	12.7	1.9	2.5	2.6	11.4	1.5	3.2	1.7	9.0	2.9	9.1	3.8	1.0	14.62	11.49	-1.92	1.90	-0.09	1.50	9.00	2.90	2012.3238-2013.4288	1.1050	401
Redonda, Antigua	RDON	16.934	297.654	104.098	14.7	1.5	2.2	2.1	10.4	1.3	2.4	1.6	6.5	4.0	7.5	6.8	1.0	14.56	11.39	0.14	1.50	-0.99	1.30	6.50	4.00	2012.3975-2013.4288	1.0312	325
Santa Domingo, Dom. Rep.	RDSD	18.461	290.089	-11.232	7.8	1.4	2.4	1.1	11.5	1.2	2.2	0.8	19.5	3.2	8.3	3.6	1.0	12.11	10.24	-4.31	1.40	1.26	1.20	19.50	3.20	2012.4549-2013.4288	0.9738	338
Nicaragua	RIOB	12.921	274.779	236.853	8.7	2.5	4.2	4.0	11.8	4.3	6.0	8.0	0.6	7.7	14.2	12.0	1.0	6.56	11.94	0.14	2.50	-0.14	4.30	0.60	7.70	2000.6025-2003.1521	2.5496	12
Roatan, Honduras	ROA0	16.318	273.473	7.893	8.7	0.6	2.0	3.9	13.6	0.9	1.9	6.5	-2.8	1.5	6.8	12.6	1.0	6.06	10.38	2.64	0.60	3.22	0.90	-2.80	1.50	2007.3575-2013.4534	6.0959	1832
Cabo Rojo, DR CANAPE site	ROJO	17.904	288.325	-20.336	9.1	0.9	3.5	4.0	9.1	1.6	4.7	8.0	6.0	7.1	52.7	12.0	1.0	11.51	10.36	-2.41	0.90	-1.26	1.60	6.00	7.10	1994.3959-2001.1466	6.7507	16
San Andres, Columbia	SAN0	12.580	278.284	7.762	6.9	0.6	1.8	3.4	12.5	0.6	1.9	3.5	-0.1	0.9	6.1	6.1	1.0	7.88	12.19	-0.98	0.60	0.31	0.60	-0.10	0.90	2007.9356-2013.4288	5.4932	1764
San Andres Isl., Colombia	SANA	12.524	278.271	3.330	7.2	0.7	2.5	4.0	13.1	1.1	3.8	8.0	10.5	9.9	121.7	12.0	1.0	7.88	12.21	-0.68	0.70	0.89	1.10	10.50	9.90	1994.1082-2003.2699	9.1616	22
Observatorio Geodinamico, Cuba	SCUB	20.012	284.238	18.911	3.9	1.0	2.6	2.8	-6.5	1.0	2.5	3.0	0.5	2.3	8.9	8.6	1.0	10.07	9.20	-6.17	1.00	-15.70	1.00	0.50	2.30	2010.6671-2013.4288	2.7616	798
UW-Madison site in Honduras	SFPD	14.966	273.755	1589.586	6.6	1.4	1.6	4.0	11.3	2.4	1.2	8.0	-6.5	4.0	5.4	12.0	1.0	6.16	11.00	0.44	1.40	0.30	2.40	-6.50	4.00	2000.1762-2004.5369	4.3607	6
Saint Marten, Netherlands Antilles	SMRT	18.042	296.891	-34.548	15.4	0.5	2.1	2.6	9.3	0.6	3.3	3.7	-1.2	1.2	8.1	9.6	1.0	14.33	10.90	1.07	0.50	-1.60	0.60	-1.20	1.20	2007.3904-2013.4288	6.0384	2181
San Pedro de Macoris, Dom. Rep.	SPED	18.461	290.694	-24.205	9.0	0.8	2.1	1.6	6.5	0.8	2.2	1.5	-1.5	2.3	8.0	7.5	1.0	12.32	18.46	-3.32	0.80	-11.96	0.80	-1.50	2.30	2011.0014-2013.4288	2.4274	850
Santiago Rodriguez, Dom. Rep.	SROD	19.475	288.659	96.752	5.0	0.7	2.1	1.1	-0.9	0.9	2.2	2.3	-0.6	1.6	7.3	5.1	1.0	11.62	9.72	-6.62	0.70	-10.62	0.90	-0.60	1.60	2011.0014-2013.4288	2.4274	774
Ilopango Airport, El Salvador	SSIA	13.697	270.883	624.313	8.0	0.8	2.0	13.2	6.7	0.5	2.0	6.8	2.0	0.8	6.8	13.2	1.0	5.05	11.50	2.95	0.80	-4.80	0.50	2.00	0.80	2001.1219-2013.4288	12.3068	2466
St. Thomas, Virgin Islands	STVI	18.340	295.030	-23.549	13.9	0.6	3.2	2.4	9.0	0.7	2.3	3.0	-0.9	1.4	8.1	7.8	1.0	13.74	10.64	0.16	0.60	-1.64	0.70	-0.90	1.40	2008.8210-2013.4096	4.5886	886
Abaco, Bahamas	TCA0	26.741	282.617	-28.862	4.0	1.3	1.9	1.3	-10.5	1.2	1.9	1.1	-0.6	2.6	7.1	3.4	1.0	9.49	6.06	-5.49	1.30	-16.56	1.20	-0.60	2.60	2007.4863-2008.5669	1.0806	390
Tegucigalpa, Honduras	TEG1	14.090	272.794	949.122	10.4	1.9	2.6	2.6	20.7	2.8	2.9	4.0	6.5	2.9	8.2	3.7	1.0	5.79	11.37	4.61	1.90	9.33	2.80	6.50	2.90	2000.6680-2001.8096	1.1416	294
Tegucigalpa, Honduras	TEG2	14.090	272.794	949.081	3.9	1.4	2.8	3.5	8.0	1.5	2.7	3.7	0.4	4.7	7.8	13.2	1.0	5.79	11.37	-1.89	1.40	-3.37	1.50	0.40	4.70	2011.3219-2013.3137	1.9918	707
Teustepe, Nicaragua	TEUS	12.410	274.186	151.672	5.9	0.6	4.7	4.0	9.7	0.9	3.3	8.0	-2.5	1.4	7.1	12.0	1.0	6.33	12.15	-0.43	0.60	-2.45	0.90	-2.50	1.40	2000.5888-2012.5724	11.9836	23
Trants, Montserrat	TRNT	16.764	297.837	-25.557	14.0	1.7	2.1	20.8	11.5	0.5	2.8	4.8	-3.6	2.4	8.9	29.5	1.0	14.62	11.47	-0.62	1.70	0.03	0.50	-3.60	2.40	2004.2500-2013.4288	9.1760	2142
Puerto Morelos, Mexico	UNPM	20.869	273.132	-2.366	0.3	0.5	1.6	2.3	-9.1	0.5	1.7	2.2	-0.8	1.2	5.6	9.0	1.0	5.92	8.27	-5.62	0.50	-17.37	0.50	-0.80	1.20	2007.6014-2013.4288	5.8274	1405
Vera Cruz, Costa Rica	VERA	10.854	275.131	61.936	11.0	2.4	2.4	12.8	14.1	1.4	2.2	6.9	-1.3	1.7	7.1	9.0	1.0	6.69	12.85	4.31	2.40	1.25	1.40	-1.30	1.70	2009.5849-2013.4288	3.8438	1320
St. Croix, Virgin Islands	VIKH	17.716	295.202	-8.357	13.6	0.6	3.5	4.0	10.8	0.4	2.3	2.0	-1.0	0.9	8.4	8.2	1.0	13.80	10.90	-0.20	0.60	-0.10	0.40	-1.00	0.90	2006.6425-2013.4068	6.7644	2170
St. Thomas, Virgin Islands	VITH	18.343	295.031	2.444	14.5	0.5	3.1	2.2	8.9	0.5	2.2	2.3	-1.1	0.9	7.6	8.4	1.0	13.74	10.64	0.76	0.50	-1.74	0.50	-1.10	0.90	2006.6288-2013.4918	6.8630	2266
Volcan, Panama	VLCN	8.785	277.361	1440.118	15.4	1.5	3.2	3.6	23.2	1.3	3.0	3.0	0.2	4.2	11.0	11.9	1.0	7.54	13.78	7.86	1.50	9.42	1.30	0.20	4.20	2011.3767-2013.4288	2.0521	638
Magangue, Columbia	VMAG	9.287	285.153	58.654	14.9	1.3	2.2	1.4	9.4	1.4	2.7	1.4	12.7	3.2	7.6	4.4	1.0	10.40	13.76	4.50	1.30	-4.36	1.40	12.70	3.20	2012.3320-2013.4288	1.0968	398
Voila, Haiti	VOIL	18.529	287.691	238.555	9.8	0.9	2.5	2.7	3.2	1.0	2.2	3.5	-1.8	1.9	8.2	7.1	1.0	11.29	10.06	-1.49	0.90	-6.86	1.00	-1.80	1.90	2010.1521-2013.0068	2.8548	1000
Dominica campaign site	ATRU	15.616	298.597	-35.766	17.3	1.9	9.0	4.0	11.0	1.7	3.9	8.0	4.7	4.2	19.2	12.0	1.0	14.85	11.96	2.45	1.90	-0.96	1.70	4.70	4.20	2004.4850-2011.5411	7.0561	7
Dominica campaign site	BELV	15.294	298.751	161.098	17.2	0.7	4.5	4.0	13.5	1.1	5.0	8.0	3.7	2.4	20.7	12.0	1.0	14.90	12.09	2.30	0.70	1.41	1.10	3.70	2.40	2001.4425-2012.4276	10.9851	12
Dominica campaign site	BOTG	15.299	298.618	-21.352	15.1	1.7	7.9	4.0	14.9	2.8	12.1	8.0	-0.9	9.1	52.1	12.0	1.0	14.86	12.08	0.24	1.70	2.82	2.80	-0.90	9.10	2006.4726-2011.5384	5.0658	17
Dominica campaign site	BRDX	15.234	298.681	244.109	13.7	0.9	5.0	4.0	9.9	1.8	11.3	8.0	9.9	4.9	39.9	12.0	1.0	14.88	12.10	-1.18	0.90	-2.20	1.80	9.90	4.90	2004.4768-2012.4249	7.9481	15
Dominica campaign site	CABR	15.586	298.530	97.718	11.1	0.9	10.2	4.0	12.1	1.3	13.1	8.0	5.1	3.1	40.4	12.0	1.0	14.83	11.96	-3.73	0.90	0.14	1.30	5.10	3.10	2001.4342-2011.5767	10.1425	26
Dominica campaign site	CASS	15.241	298.709	-33.596	14.0	0.6	4.4	4.0	11.8	1.1	7.8	8.0	0.2	1.8	14.9	12.0	1.0	14.89	12.10	-0.89	0.60	-0.30	1.10	0.20	1.80	2001.4288-2012.4167	10.9879	20
Dominica campaign site	CNCD	15.512	298.722	-24.548	14.2	0.7	6.2	4.0	11.8	1.1	6.0	8.0	5.6	2.5	29.9	12.0	1.0	14.89	12.00	-0.69	0.70	-0.20	1.10	5.60	2.50	2001.4534-2011.5411	10.0877	25
Dominica campaign site	COHT	15.478	298.551	239.061	14.3	1.0	5.2	4.0	10.0	1.8	9.5	8.0	0.7	2.7	14.0	12.0	1.0	14.84	12.00	-0.54	1.00	-2.00	1.80	0.70	2.70	2004.4904-2011.5685	7.0781	17
Dominica campaign site	CONN	15.635	298.542	57.543	17.2	1.3	6.0	4.0	10.5	2.4	10.1	8.0	-4.6	3.7	17.2	12.0	1.0	14.84	11.95	2.36	1.30	-1.45	2.40	-4.60	3.70	2006.4589-2011.5575	5.0986	22
Dominica campaign site	FRSH	15.340	298.691	724.100	15.1	0.8	9.4	4.0	10.7	1.2	10.0	6.0	-2.4	1.7	13.6	12.0	1.0	14.88	12.07	0.22	0.80	-1.37	1.20	-2.40	1.70	2001.4452-2012.4358	10.9906	21
Dominica campaign site	GOMM	15.282	298.634	209.167	13.7	0.7	6.7	4.0	13.0	1.1	7.9	8.0	-1.3	2.2	24.8	12.0	1.0	14.86	12.08	-1.16	0.70	0.92	1.10	-1.30	2.20	2001.4397-2011.5575	10.1178	26
Dominica campaign site	GSAV	15.445	298.550	8.936	13.6	1.2	7.8	4.0	10.4	1.7	7.9	8.0	-7.7	4.5	32.8	12.0	1.0	14.84	12.02	-1.24	1.20	-1.62	1.70	-7.70	4.50	2004.4904-2011.5329	7.0424	16
Dominica campaign site	MHAM	15.346	298.652	616.336	15.9	1.6	3.0	4.0	11.1	3.0	6.0	8.0	-8.7	4.8	10.9	12.0	1.0	14.87	12.06	1.03	1.60	-0.96	3.00	-8.70	4.80	2007.4726-2011.5603	4.0877	9
Dominica campaign site	MTNV	15.384	298.663	526.173	16.9	1.2	2.4	4.0	13.5	3.0	9.2	8.0	2.5	5.1	17.6	12.0	1.0	14.87	12.05	2.03	1.20	1.45	3.00	2.50	5.10	2007.4699-2012.4139	4.9441	9
Dominica campaign site	NEWF	15.379	298.725	143.599	14.3	0.6	2.3	4.0	11.6	1.0	4.6	8.0	-3.5	1.6	12.2	12.0	1.0	14.89	12.05	-0.59	0.60	-0.45	1.00	-3.50	1.60	2001.4425-2012.4194	10.9769	23
Dominica campaign site	NVEN	15.456	298.658	293.570	15.1	1.3	3.8	4.0	11.3	2.1	3.7	8.0	-5.5	3.6	11.4	12.0	1.0	14.87	12.02	0.23	1.30	-0.72	2.10	-5.50	3.60	2006.4589-2011.5493	5.0904	13
Dominica campaign site	SCTT	15.214	298.627	21.765	13.7	0.7	4.5	4.0	12.2	1.1	5.7	8.0	-2.7	1.9	15.5	12.0	1.0	14.86	12.11	-1.16	0.70	0.09	1.10	-2.70	1.90	2001.4342-2011.5795	10.1452	19
Dominica campaign site	SOIE	15.588	298.684	-34.642	17.6	1.2	10.9	4.0	9.4	1.7	11.6	8.0	0.2	2.1	10.4	12.0	1.0	14.88	11.97	2.72	1.20	-2.57	1.70	0.20	2.10	2003.4726-2011.5685	8.0959	20
Dominica campaign site	SPAG	15.526	298.531	324.523	12.6	1.2	10.5	4.0	10.3	1.5	9.2	8.0	0.9	2.7	21.3	12.0	1.0	14.83	11.98	-2.23	1.20	-1.68	1.50	0.90	2.70	2004.4795-2012.4467	7.9672	21
Dominica campaign site	SPNG	15.347	298.631	306.878	14.7	0.9	9.7	4.0	16.1	1.9	23.2	8.0	-6.4	3.5	48.5	12.0	1.0	14.86	12.06	-0.16	0.90	4.04	1.90	-6.40	3.50	2003.4753-2011.5329	8.0575	47
Dominica campaign site	TETE	15.236	298.657	414.407	14.5	0.9	4.6	4.0	13.6	1.6	8.4	8.0	3.9	3.0	21.9	12.0	1.0	14.87	12.10	-0.37	0.90	1.50	1.60	3.90	3.00	2004.4658-2012.4495	7.9836	17
Dominica campaign site	WOTT	15.317	298.661	229.847	14.8	0.7	6.1	4.0	11.5	1.1	8.1	8.0	-6.5	2.0	23.3	12.0	1.0	14.87	12.07	-0.07	0.70	-0.57	1.10	-6.50	2.00	2001.4452-2012.4331	10.9879	25

Table 4-2 Caribbean velocity summary, sorted by site occupation length

Site name	Site ID	Lat (N)	Long (E)	HAE (m)	IGS2008 (mm/yr) - No Common Mode Correction													CAR rate		CAR Fixed Velocity (mm/yr)							Span	No. Obs
					Vn	Error	WN	FN	Ve	Error	WN	FN	Vv	Error	WN	FN	RWN	Vn	Ve	Vn	Error	Ve	Error	Vv	Error	Epoch	Years	
Bogota, Columbia	BOGT	4.640	285.919	2574.510	15.8	0.6	2.1	13.4	0.4	0.6	2.4	13.7	-42.9	1.7	8.2	41.3	1.0	10.67	15.59	5.13	0.60	-15.19	0.60	-42.90	1.70	1994.8781-2013.4288	18.5507	4096
St. Croix, Virgin Islands	CRO1	17.757	295.416	-34.070	13.6	0.3	2.0	4.6	11.0	0.3	2.1	5.2	-1.2	1.0	8.4	24.2	1.0	13.86	10.90	-0.26	0.30	0.10	0.30	-1.20	1.00	1995.7822-2013.4260	17.6438	12070
Bggy, Antigua	BGGY	17.045	298.139	353.631	15.4	0.4	2.3	5.2	9.9	0.3	2.3	4.0	-1.5	0.5	7.1	8.9	1.0	14.71	11.38	0.69	0.40	-1.48	0.30	-1.50	0.50	1998.6123-2012.9986	14.3863	3851
Managua, Nicaragua	MANA	12.149	273.751	68.683	8.0	0.5	2.0	8.3	6.9	0.4	2.0	4.9	-3.7	1.0	7.2	17.5	1.0	6.16	12.26	1.84	0.50	-5.36	0.40	-3.70	1.00	2000.3648-2013.4288	13.0640	4104
Guatemala City, Guatemala	GUAT	14.590	269.480	1517.611	3.2	0.4	2.0	5.2	5.2	0.5	2.0	6.8	-1.0	0.8	6.4	14.4	1.0	4.50	11.07	-1.30	0.40	-5.87	0.50	-1.00	0.80	2000.5751-2013.4288	12.8536	4192
Ilopango Airport, El Salvador	SSIA	13.697	270.883	624.313	8.0	0.8	2.0	13.2	6.7	0.5	2.0	6.8	2.0	0.8	6.8	13.2	1.0	5.05	11.50	2.95	0.80	-4.80	0.50	2.00	0.80	2001.1219-2013.4288	12.3068	2466
Teustepe, Nicaragua	TEUS	12.410	274.186	151.672	5.9	0.6	4.7	4.0	9.7	0.9	3.3	8.0	-2.5	1.4	7.1	12.0	1.0	6.33	12.15	-0.43	0.60	-2.45	0.90	-2.50	1.40	2000.5888-2012.5724	11.9836	23
El Porton, Nicaragua	PORT	12.573	274.633	452.966	7.1	0.6	4.2	4.0	9.4	0.9	4.7	8.0	-3.0	1.5	13.5	12.0	1.0	6.50	12.09	0.60	0.60	-2.69	0.90	-3.00	1.50	2000.6134-2012.5697	11.9563	22
Santa Elena, Guatemala	ELEN	16.916	270.132	115.966	1.2	0.4	1.9	5.0	-7.8	0.4	1.8	4.6	0.4	2.4	6.7	37.9	1.0	4.76	10.02	-3.56	0.40	-17.82	0.40	0.40	2.40	2001.9356-2013.4288	11.4932	2870
Dominica campaign site	FRSH	15.340	298.691	724.100	15.1	0.8	9.4	4.0	10.7	1.2	10.0	6.0	-2.4	1.7	13.6	12.0	1.0	14.88	12.07	0.22	0.80	-1.37	1.20	-2.40	1.70	2001.4452-2012.4358	10.9906	21
Dominica campaign site	CASS	15.241	298.709	-33.596	14.0	0.6	4.4	4.0	11.8	1.1	7.8	8.0	0.2	1.8	14.9	12.0	1.0	14.89	12.10	-0.89	0.60	-0.30	1.10	0.20	1.80	2001.4288-2012.4167	10.9879	20
Dominica campaign site	WOTT	15.317	298.661	229.847	14.8	0.7	6.1	4.0	11.5	1.1	8.1	8.0	-6.5	2.0	23.3	12.0	1.0	14.87	12.07	-0.07	0.70	-0.57	1.10	-6.50	2.00	2001.4452-2012.4331	10.9879	25
Dominica campaign site	BELV	15.294	298.751	161.098	17.2	0.7	4.5	4.0	13.5	1.1	5.0	8.0	3.7	2.4	20.7	12.0	1.0	14.90	12.09	2.30	0.70	1.41	1.10	3.70	2.40	2001.4425-2012.4276	10.9851	12
Dominica campaign site	NEWF	15.379	298.725	143.599	14.3	0.6	2.3	4.0	11.6	1.0	4.6	8.0	-3.5	1.6	12.2	12.0	1.0	14.89	12.05	-0.59	0.60	-0.45	1.00	-3.50	1.60	2001.4425-2012.4194	10.9769	23
UW-Madison site in Honduras	MNTO	14.917	273.619	654.437	6.7	0.6	1.1	4.0	11.0	1.1	2.0	8.0	-1.7	2.2	13.1	12.0	1.0	6.11	11.02	0.59	0.60	-0.02	1.10	-1.70	2.20	2000.1680-2010.4671	10.2991	9
UW-Madison site in Honduras	GLCO	15.030	273.930	659.995	7.1	0.9	7.9	4.0	10.8	1.8	16.1	8.0	-1.6	2.2	16.2	12.0	1.0	6.23	10.98	0.87	0.90	-0.18	1.80	-1.60	2.20	2000.1790-2010.4671	10.2882	13
Dominica campaign site	SCTT	15.214	298.627	21.765	13.7	0.7	4.5	4.0	12.2	1.1	5.7	8.0	-2.7	1.9	15.5	12.0	1.0	14.86	12.11	-1.16	0.70	0.09	1.10	-2.70	1.90	2001.4342-2011.5795	10.1452	19
Dominica campaign site	CABR	15.586	298.530	97.718	11.1	0.9	10.2	4.0	12.1	1.3	13.1	8.0	5.1	3.1	40.4	12.0	1.0	14.83	11.96	-3.73	0.90	0.14	1.30	5.10	3.10	2001.4342-2011.5767	10.1425	26
Dominica campaign site	GOMM	15.282	298.634	209.167	13.7	0.7	6.7	4.0	13.0	1.1	7.9	8.0	-1.3	2.2	24.8	12.0	1.0	14.86	12.08	-1.16	0.70	0.92	1.10	-1.30	2.20	2001.4397-2011.5575	10.1178	26
Dominica campaign site	CNCD	15.512	298.722	-24.548	14.2	0.7	6.2	4.0	11.8	1.1	6.0	8.0	5.6	2.5	29.9	12.0	1.0	14.89	12.00	-0.69	0.70	-0.20	1.10	5.60	2.50	2001.4534-2011.5411	10.0877	25
Montserrat	AIRS	16.741	297.786	82.208	13.5	1.0	3.3	12.5	12.3	1.0	6.1	11.9	-4.3	2.8	12.8	35.7	1.0	14.60	11.47	-1.10	1.00	0.83	1.00	-4.30	2.80	2004.2309-2013.4288	9.1979	2440
Montserrat	GERD	16.795	297.806	123.390	13.2	2.4	2.5	30.6	11.5	0.6	3.8	7.0	-2.6	2.5	9.3	32.0	1.0	14.61	11.45	-1.41	2.40	0.05	0.60	-2.60	2.50	2004.2309-2013.4288	9.1979	2383
Trants, Montserrat	TRNT	16.764	297.837	-25.557	14.0	1.7	2.1	20.8	11.5	0.5	2.8	4.8	-3.6	2.4	8.9	29.5	1.0	14.62	11.47	-0.62	1.70	0.03	0.50	-3.60	2.40	2004.2500-2013.4288	9.1760	2142
San Andres Isl., Colombia	SANA	12.524	278.271	3.330	7.2	0.7	2.5	4.0	13.1	1.1	3.8	8.0	10.5	9.9	121.7	12.0	1.0	7.88	12.21	-0.68	0.70	0.89	1.10	10.50	9.90	1994.1082-2003.2699	9.1616	22
Montserrat	OLVN	16.750	297.772	38.724	14.6	1.0	3.3	12.2	12.4	1.3	6.7	15.5	-3.9	2.1	13.4	26.1	1.0	14.60	11.47	0.00	1.00	0.93	1.30	-3.90	2.10	2004.1790-2013.3000	9.1210	2463
Barbados	BDOS	13.088	300.391	-40.859	15.2	0.5	2.0	4.0	14.2	0.8	2.1	9.3	-0.8	1.2	7.4	14.1	1.0	15.39	13.00	-0.19	0.50	1.20	0.80	-0.80	1.20	2004.4440-2013.3932	8.9492	2258
Dominica campaign site	SOIE	15.588	298.684	-34.642	17.6	1.2	10.9	4.0	9.4	1.7	11.6	8.0	0.2	2.1	10.4	12.0	1.0	14.88	11.97	2.72	1.20	-2.57	1.70	0.20	2.10	2003.4726-2011.5685	8.0959	20
Dominica campaign site	SPNG	15.347	298.631	306.878	14.7	0.9	9.7	4.0	16.1	1.9	23.2	8.0	-6.4	3.5	48.5	12.0	1.0	14.86	12.06	-0.16	0.90	4.04	1.90	-6.40	3.50	2003.4753-2011.5329	8.0575	47
Dominica campaign site	TETE	15.236	298.657	414.407	14.5	0.9	4.6	4.0	13.6	1.6	8.4	8.0	3.9	3.0	21.9	12.0	1.0	14.87	12.10	-0.37	0.90	1.50	1.60	3.90	3.00	2004.4658-2012.4495	7.9836	17
Dominica campaign site	SPAG	15.526	298.531	324.523	12.6	1.2	10.5	4.0	10.3	1.5	9.2	8.0	0.9	2.7	21.3	12.0	1.0	14.83	11.98	-2.23	1.20	-1.68	1.50	0.90	2.70	2004.4795-2012.4467	7.9672	21
Dominica campaign site	BRDX	15.234	298.681	244.109	13.7	0.9	5.0	4.0	9.9	1.8	11.3	8.0	9.9	4.9	39.9	12.0	1.0	14.88	12.10	-1.18	0.90	-2.20	1.80	9.90	4.90	2004.4768-2012.4249	7.9481	15
Cayman Brac, Cayman Islands	CBSB	19.712	280.167	-9.158	2.9	0.5	2.4	3.3	-8.3	0.7	2.7	6.1	-1.2	1.1	6.8	11.2	1.0	8.59	9.11	-5.69	0.50	-17.41	0.70	-1.20	1.10	2005.8836-2013.4288	7.5452	2052
Santo Domingo, Dom. Rep.	QSEC	9.840	274.643	15.030	26.8	0.7	2.2	5.7	14.0	0.9	2.1	8.1	-6.3	0.8	7.6	7.5	1.0	6.50	13.28	20.30	0.70	0.72	0.90	-6.30	0.80	2006.3219-2013.4288	7.1068	2155
Dominica campaign site	COHT	15.478	298.551	239.061	14.3	1.0	5.2	4.0	10.0	1.8	9.5	8.0	0.7	2.7	14.0	12.0	1.0	14.84	12.00	-0.54	1.00	-2.00	1.80	0.70	2.70	2004.4904-2011.5685	7.0781	17
Dominica campaign site	ATRU	15.616	298.597	-35.766	17.3	1.9	9.0	4.0	11.0	1.7	3.9	8.0	4.7	4.2	19.2	12.0	1.0	14.85	11.96	2.45	1.90	-0.96	1.70	4.70	4.20	2004.4850-2011.5411	7.0561	7
Dominica campaign site	GSAV	15.445	298.550	8.936	13.6	1.2	7.8	4.0	10.4	1.7	7.9	8.0	-7.7	4.5	32.8	12.0	1.0	14.84	12.02	-1.24	1.20	-1.62	1.70	-7.70	4.50	2004.4904-2011.5329	7.0424	16
St. Thomas, Virgin Islands	VITH	18.343	295.031	2.444	14.5	0.5	3.1	2.2	8.9	0.5	2.2	2.3	-1.1	0.9	7.6	8.4	1.0	13.74	10.64	0.76	0.50	-1.74	0.50	-1.10	0.90	2006.6288-2013.4918	6.8630	2266
St. Croix, Virgin Islands	VIKH	17.716	295.202	-8.357	13.6	0.6	3.5	4.0	10.8	0.4	2.3	2.0	-1.0	0.9	8.4	8.2	1.0	13.80	10.90	-0.20	0.60	-0.10	0.40	-1.00	0.90	2006.6425-2013.4068	6.7644	2170
Cabo Rojo, DR CANAPE site	ROJO	17.904	288.325	-20.336	9.1	0.9	3.5	4.0	9.1	1.6	4.7	8.0	6.0	7.1	52.7	12.0	1.0	11.51	10.36	-2.41	0.90	-1.26	1.60	6.00	7.10	1994.3959-2001.1466	6.7507	16
Roatan, Honduras	ROA0	16.318	273.473	7.893	8.7	0.6	2.0	3.9	13.6	0.9	1.9	6.5	-2.8	1.5	6.8	12.6	1.0	6.06	10.38	2.64	0.60	3.22	0.90	-2.80	1.50	2007.3575-2013.4534	6.0959	1832
Saint Marten, Netherlands Antilles	SMRT	18.042	296.891	-34.548	15.4	0.5	2.1	2.6	9.3	0.6	3.3	3.7	-1.2	1.2	8.1	9.6	1.0	14.33	10.90	1.07	0.50	-1.60	0.60	-1.20	1.20	2007.3904-2013.4288	6.0384	2181
Nassau, Bahamas	NAS0	25.053	282.538	-22.906	4.6	0.6	2.0	3.0	-9.3	0.5	1.8	2.4	-2.1	1.0	6.7	7.2	1.0	9.46	6.83	-4.86	0.60	-16.13	0.50	-2.10	1.00	2007.4808-2013.4288	5.9479	1707
Grand Turk	GTK0	21.433	288.855	-32.969	6.2	0.5	1.6	2.5	-8.1	0.5	1.6	2.4	-1.3	1.0	5.6	7.7	1.0	11.69	8.90	-5.49	0.50	-17.00	0.50	-1.30	1.00	2007.4863-2013.4288	5.9425	1654
Grenada	GRE0	12.222	298.360	14.363	15.2	0.5	2.1	2.5	13.6	0.5	3.4	2.9	-1.6	1.1	7.8	8.9	1.0	14.78	13.19	0.42	0.50	0.41	0.50	-1.60	1.10	2007.4863-2013.4260	5.9397	4214
Exuma Intl Airport, Bahamas	EXU0	23.564	284.127	-21.823	5.1	0.5	2.0	2.1	-9.4	0.5	1.9	2.2	-1.0	0.9	6.3	6.8	1.0	10.03	7.62	-4.93	0.50	-17.02	0.50	-1.00	0.90	2007.4918-2013.4288	5.9370	1826
Puerto Morelos, Mexico	UNPM	20.869	273.132	-2.366	0.3	0.5	1.6	2.3	-9.1	0.5	1.7	2.2	-0.8	1.2	5.6	9.0	1.0	5.92	8.27	-5.62	0.50	-17.37	0.50	-0.80	1.20	2007.6014-2013.4288	5.8274	1405
San Andres, Columbia	SAN0	12.580	278.284	7.762	6.9	0.6	1.8	3.4	12.5	0.6	1.9	3.5	-0.1	0.9	6.1	6.1	1.0	7.88	12.19	-0.98	0.60	0.31	0.60	-0.10	0.90	2007.9356-2013.4288	5.4932	1764
Martinique Volcano Observatory	FSD0	14.735	298.853	481.809	15.8	1.2	4.3	4.0	13.1	3.2	15.4	8.0	-7.0	13.9	80.8	12.0	1.0	14.93	12.30	0.97	1.30	-0.30	3.70	-6.90	13.70	1994.3986-1999.8671	5.4685	14
Martinique Volcano Observatory	FSD1	14.735	298.853	498.170	16.3	1.7	6.2	4.0	13.3	2.1	4.7	8.0	-0.4	4.2	14.7	12.0	1.0	14.93	12.30	1.17	1.70	2.50	2.70	0.30	3.80	1994.4096-1999.8671	5.4575	9
Cancun, Mexico	CNC0	21.175	273.179	-2.186	0.3	0.5	1.7	2.1	-9.0	0.6	1.6	3.1	-1.0	1.2	6.2	8.8	1.0	5.94	8.13	-5.64	0.50	-17.13	0.60	-1.00	1.20	2007.4233-1012.7719	5.3486	1752
UW-Madison site in Honduras	CMP1	14.509	274.285	389.225	5.4	1.7	4.6	4.0	11.7	2.4	4.2	8.0	-6.8	5.2	15.3	12.0	1.0	6.37	11.22	-0.97	1.70	0.48	2.40	-6.80	5.20	2000.1926-2005.4068	5.2142	6
Puerto Cabezas, Nicaragua	PUEC	14.042	276.618	21.070	6.1	1.1	1.4	4.0	11.0	2.0	2.1	8.0	-0.6	3.5	10.8	12.0	1.0	7.26	11.50	-1.16	1.10	-0.50	2.00	-0.60	3.50	2001.0397-2006.1630	5.1233	13
Dominica campaign site	CONN	15.635	298.542	57.543	17.2	1.3	6.0	4.0	10.5	2.4	10.1	8.0	-4.6	3.7	17.2	12.0	1.0	14.84	11.95	2.36	1.30	-1.45	2.40	-4.60	3.70	2006.4589-2011.5575	5.0986	22
Dominica campaign site	NVEN	15.456	298.658	293.570	15.1	1.3	3.8	4.0	11.3	2.1	3.7	8.0	-5.5	3.6	11.4	12.0	1.0	14.87	12.02	0.23	1.30	-0.72	2.10	-5.50	3.60	2006.4589-2011.5493	5.0904	13
Dominica campaign site	BOTG	15.299	298.618	-21.352	15.1	1.7	7.9	4.0	14.9	2.8	12.1	8.0	-0.9	9.1	52.1	12.0	1.0	14.86	12.08	0.24	1.70	2.82	2.80	-0.90	9.10	2006.4726-2011.5384	5.0658	17
Ponc, Puerto Rico	P780	18.075	293.421	151.990	13.4	0.5	2.4	2.2	8.9	0.6	3.3	3.1	-0.3	1.3	8.4	9.6	1.0	13.22	10.63	0.18	0.50	-1.73	0.60	-0.30	1.30	2008.4057-2013.4260	5.0203	3618
Caja de Muertos Island, PR	MIPR	17.866	293.473	-40.213	13.6	0.5	1.9	1.5	9.6	0.6	1.8	1.9	0.3	0.9	7.2	4.3	1.0	13.24	10.71	0.36	0.50	-1.11	0.60	0.30	0.90	2008.3566-2013.3055	4.9489	391
Dominica campaign site	MTNV	15.384	298.663	526.173	16.9	1.2	2.4	4.0	13.5	3.0	9.2	8.0	2.5	5.1	17.6	12.0	1.0	14.87	12.05	2.03	1.20	1.45	3.00	2.50	5.10	2007.4699-2012.4139	4.9441	9
Panama	ACP6	9.239	280.592	941.097	12.2	0.9	2.8	5.1	17.1	0.6	2.2	2.6	-0.5	1.1	6.7	6.8	1.0	8.74	13.60	3.46	0.90	3.50	0.60	-0.50	1.10	2008.7883-2013.4260	4.6378	1659
Sherman, Panama	ACP1	9.371	280.050	10.390	11.3	0.6	2.2	2.4	17.0	0.6	2.1	2.3	-0.7	1.1	7.0	6.3	1.0	8.54	13.59	2.76	0.60	3.41	0.60	-0.70	1.10	2008.8156-2013.4260	4.6105	1245
St. Thomas, Virgin Islands	STVI	18.340	295.030	-23.549	13.9	0.6	3.2	2.4	9.0	0.7	2.3	3.0	-0.9	1.4	8.1	7.8	1.0	13.74	10.64	0.16	0.60	-1.64	0.70	-0.90	1.40	2008.8210-2013.4096	4.5886	886
Culebra Island, PR	CUPR	18.307	294.717	-32.502	13.6	0.6	2.3	1.8	9.1	0.6	2.3	1.9	-1.2	1.3	7.1	7.1	1.0	13.64	10.63	-0.04	0.60	-1.53	0.60	-1.20	1.30	2008.8320-2013.4096	4.5776	674
UW-Madison site in Honduras	SFPD	14.966	273.755	1589.586	6.6	1.4	1.6	4.0	11.3	2.4	1.2	8.0	-6.5	4.0	5.4	12.0	1.0	6.16	11.00	0.44	1.40	0.30	2.40	-6.50	4.00	2000.1762-2004.5369	4.3607	6
Dominica campaign site	MHAM	15.346	298.652	616.336	15.9	1.6	3.0	4.0	11.1	3.0	6.0	8.0	-8.7	4.8	10.9	12.0	1.0	14.87	12.06	1.03	1.60	-0.96	3.00	-8.70	4.80	2007.4726-2011.5603	4.0877	9
Aves Island Venezuela	AVES	15.667	296.382	-38.928	14.2	1.3	3.0	4.0	11.3	2.3	2.4	8.0	-1.4	3.9	11.9	12.0	1.0	14.17	11.79	0.03	1.30	-0.49	2.30	-1.40	3.90	1994.3740-1998.2479	3.8740	28
Vera Cruz, Costa Rica	VERA	10.854	275.131	61.936	11.0	2.4	2.4	12.8	14.1	1.4	2.2	6.9	-1.3	1.7	7.1	9.0	1.0	6.69	12.85	4.31	2.40	1.25	1.40	-1.30	1.70	2009.5849-2013.4288	3.8438	1320
Mayaguez Pier PR	MAYZ	18.218	292.841	-40.706	14.0	0.9	2.5	2.9	9.2	0.7	2.4	1.9	0.4	1.5	8.4	6.0	1.0	13.03	10.53	0.97	0.90	-1.33	0.70	0.40	1.50	2010.1027-2013.4096	3.3068	567
Anegada, Virgin Islands	ABVI	18.730	295.668	-37.653	15.2	0.8	2.3	1.4	8.5	1.1	3.4	2.7	0.3	2.3	6.5	6.9	1.0	13.94	10.54	1.26	0.80	-2.04	1.10	0.30	2.30	2011.0973-2013.3822	2.9849	832
Voila, Haiti	VOIL	18.529	287.691	238.555	9.8	0.9	2.5	2.7	3.2	1.0	2.2	3.5	-1.8	1.9	8.2	7.1	1.0	11.29	10.06	-1.49	0.90	-6.86	1.00	-1.80	1.90	2010.1521-2013.0068	2.8548	1000
Aeroport Aime, LeLamentin	LMMF	14.595	299.004	-29.292	15.0	0.8	2.5	2.2	12.5	0.9	3.2	2.8	-2.4	2.5	9.7	9.9	1.0	14.98	12.36	0.02	0.80	0.14	0.90	-2.40	2.50	2010.6671-2013.5110	2.8438	1023
Les Abymes, Guadeloupe	ABMF	16.262	298.472	-27.688	14.4	0.8	2.3	2.2	12.0	0.9	2.4	2.7	2.5	2.3	8.2	8.9	1.0	14.81	11.70	-0.41	0.80	0.30	0.90	2.50	2.30	2010.6671-2013.511	2.8438	977
Mona Island, PR	MOPR	18.077	292.069	-41.688	11.4	0.7	2.1	0.8	8.9	0.7	2.1	1.3	-3.0	1.2	7.3	3.2	1.0	12.78	10.54	-1.38	0.70	-1.64	0.70	-3.00	1.20	2008.8210-2011.6452	2.8242	346
Observatorio Geodinamico, Cuba	SCUB	20.012	284.238	18.911	3.9	1.0	2.6	2.8	-6.5	1.0	2.5	3.0	0.5	2.3	8.9	8.6	1.0	10.07	9.20	-6.17	1.00	-15.70	1.00	0.50	2.30	2010.6671-2013.4288	2.7616	798
Nicaragua	RIOB	12.921	274.779	236.853	6.7	2.5	4.2	4.0	11.8	4.3	6.0	8.0	0.6	7.7	14.2	12.0	1.0	6.56	11.94	0.14	2.50	-0.14	4.30	0.60	7.70	2000.6025-2003.1521	2.5496	12
Les Cayes, Haiti	LCAY	18.188	286.246	-15.484	10.0	0.8	2.3	1.4	7.6	0.9	2.2	2.1	-20.7	1.6	7.5	4.7	1.0	10.78	10.12	-0.78	0.80	-2.52	0.90	-20.70	1.60	2010.2096-2012.7473	2.5377	497
San Pedro de Macoris, Dom. Rep.	SPED	18.461	290.694	-24.205	9.0	0.8	2.1	1.6	6.5	0.8	2.2	1.5	-1.5	2.3	8.0	7.5	1.0	12.32	18.46	-3.32	0.80	-11.96	0.80	-1.50	2.30	2011.0014-2013.4288	2.4274	850
La Vega, Dominican Republic	LVEG	19.222	289.469	76.586	7.3	0.7	2.2	1.2	0.5	0.8	2.1	1.8	-0.5	2.2	8.3	7.2	1.0	11.90	9.88	-4.60	0.70	-9.38	0.80	-0.50	2.20	2011.0014-2013.4288	2.4274	832
Barahona, DR CANAPE site	BARA	18.209	288.902	3.909	13.2	6.5	14.9	22.3	33.7	26.9	42.6	92.7	0.9	21.3	55.2	72.9	1.0	11.71	10.27	1.49	6.50	23.43	26.90	0.90	21.30	2011.0014-2013.4288	2.4274	824
Santiago Rodriguez, Dom. Rep.	SROD	19.475	288.659	96.752	5.0	0.7	2.1	1.1	-0.9	0.9	2.2	2.3	-0.6	1.6	7.3	5.1	1.0	11.62	9.72	-6.62	0.70	-10.62	0.90	-0.60	1.60	2011.0014-2013.4288	2.4274	774
Jacmel, Haiti	JMEL	18.235	287.464	4.655	9.7	0.8	2.3	1.4	6.1	0.9	2.2	2.1	-1.5	1.8	8.6	5.2	1.0	11.21	10.17	-1.51	0.80	-4.07	0.90	-1.50	1.80	2010.1986-2012.4932	2.2945	636
St. Mare, Haiti	MARC	19.052	287.242	405.123	4.1	1.6	2.2	4.0	0.3	3.0	2.5	8.0	-2.0	4.4	7.2	12.0	1.0	11.13	9.81	-7.03	1.60	-9.51	3.00	-2.00	4.40	2010.1959-2012.4522	2.2563	238
Volcan, Panama	VLCN	8.785	277.361	1440.118	15.4	1.5	3.2	3.6	23.2	1.3	3.0	3.0	0.2	4.2	11.0	11.9	1.0	7.54	13.78	7.86	1.50	9.42	1.30	0.20	4.20	2011.3767-2013.4288	2.0521	638
Cocos Island, Costa Rica	ISCO	5.544	272.944	7.915	75.4	1.2	3.0	2.9	50.1	1.1	3.2	2.3	-0.7	4.8	11.4	13.8	1.0	5.85	15.06	69.55	1.20	35.04	1.10	-0.70	4.80	2011.3822-2013.4288	2.0466	733
Bayamon Science Park, PR	BYSP	18.408	293.839	47.156	13.2	0.9	2.6	1.4	9.1	0.9	2.3	1.6	1.5	2.1	7.8	5.3	1.0	13.36	10.53	-0.16	0.90	-1.43	0.90	1.50	2.10	2011.3932-2013.4096	2.0164	621
Tegucigalpa, Honduras	TEG2	14.090	272.794	949.081	3.9	1.4	2.8	3.5	8.0	1.5	2.7	3.7	0.4	4.7	7.8	13.2	1.0	5.79	11.37	-1.89	1.40	-3.37	1.50	0.40	4.70	2011.3219-2013.3137	1.9918	707
Curacao	CN40	12.180	291.042	31.014	12.0	1.0	2.1	1.9	12.9	0.9	2.2	1.6	1.9	2.3	6.6	5.7	1.0	12.43	12.84	-0.43	1.00	0.06	0.90	1.90	2.30	2011.5521-2013.4260	1.8740	677
Pedro Cay, Jamaica	CN11	17.021	282.216	-12.814	6.5	0.9	2.1	1.2	9.2	1.1	2.1	2.0	-2.2	3.1	6.5	7.3	1.0	9.34	10.41	-2.84	0.90	-1.21	1.10	-2.20	3.10	2011.7219-2013.4288	1.7068	620
Leogane, Haiti	LGNE	18.508	287.369	0.437	6.1	2.4	1.9	4.0	2.6	4.5	1.5	8.0	-6.8	7.2	9.4	12.0	1.0	11.18	10.05	-5.08	2.40	-7.45	4.50	-6.80	7.20	2010.1932-2011.8781	1.6849	49
Petit Goave, Haiti	GOAV	18.428	287.135	-6.485	15.2	1.5	2.6	3.1	8.2	1.3	2.2	2.5	-8.7	3.1	9.3	6.7	1.0	11.10	10.07	4.10	1.50	-1.87	1.30	-8.70	3.10	2010.2041-2011.8781	1.6740	519
Barbados	BARB	13.008	300.391	-40.885	17.1	1.9	2.6	3.6	8.1	1.0	2.3	1.4	-4.3	3.8	9.0	7.7	1.0	15.39	13.00	1.71	1.90	-4.90	1.00	-4.30	3.80	1999.5000-2001.1164	1.6164	333
Perenome, Panama	CN33	8.487	279.673	74.384	10.8	2.1	3.4	4.3	20.0	1.9	2.7	3.7	-2.3	3.2	9.3	6.6	1.0	8.40	13.95	2.40	2.10	6.05	1.90	-2.30	3.20	2011.8616-2013.4288	1.5671	569
Morant Cay, Jamaica	CN10	17.415	284.029	-18.422	7.6	1.0	2.2	1.2	9.6	1.2	2.2	1.8	-0.7	2.9	6.6	5.8	1.0	10.00	10.33	-2.40	1.00	-0.73	1.20	-0.70	2.90	2011.7164-2013.2342	1.5178	552
Corozal, Columbia	CORO	9.328	284.712	153.367	11.2	1.2	2.1	1.5	10.0	1.2	2.3	1.7	4.0	3.8	7.7	7.2	1.0	10.24	13.73	0.96	1.20	-3.73	1.20	4.00	3.80	2011.9904-2013.4041	1.4137	510
Achotines, Panama	ACHO	7.415	279.827	33.074	10.7	1.2	2.4	1.6	32.8	1.6	2.4	2.7	-1.0	3.2	6.7	5.9	1.0	8.46	14.39	2.24	1.20	18.41	1.60	-1.00	3.20	2011.3849-2012.7582	1.3733	490
Grand Bahama, Bahamas	CN15	26.557	281.307	-29.072	4.4	1.3	2.7	1.6	-11.3	1.2	2.2	1.4	-5.7	3.9	8.4	6.9	1.0	9.01	6.05	-4.61	1.30	-17.35	1.20	-5.70	3.90	2011.4753-2012.8128	1.3375	414
Poneloya, Nicaragua	CN22	12.384	272.955	26.478	7.6	1.2	2.3	1.5	-1.5	1.5	2.4	2.3	6.6	4.8	7.1	8.8	1.0	5.86	12.13	1.74	1.20	-13.63	1.50	6.60	4.80	2012.1107-2013.4288	1.3181	439
Bluefield, Nicaragua	CN30	11.994	276.228	27.749	-0.3	1.2	2.7	1.5	8.3	1.4	2.8	1.9	-1.0	3.8	8.8	6.5	1.0	7.11	12.38	-7.41	1.20	-4.08	1.40	-1.00	3.80	2012.1189-2013.4288	1.3099	464
UWI, Jamaica	CN12	18.005	283.251	167.861	3.5	1.3	3.0	1.6	3.4	1.4	2.9	1.8	-24.8	2.6	10.9	3.7	1.0	9.72	10.03	-6.22	1.30	-6.63	1.40	-24.80	2.60	2012.1598-2013.4288	1.2689	460
Arecibo Observatory, PR	AOPR	18.347	293.246	317.458	13.6	1.3	2.3	1.6	8.7	1.2	2.4	1.4	0.1	2.3	8.0	3.1	1.0	13.16	10.51	0.44	1.30	-1.81	1.20	0.10	2.30	2012.1926-2013.4096	1.2170	443
Tegucigalpa, Honduras	TEG1	14.090	272.794	949.122	10.4	1.9	2.6	2.6	20.7	2.8	2.9	4.0	6.5	2.9	8.2	3.7	1.0	5.79	11.37	4.61	1.90	9.33	2.80	6.50	2.90	2000.6680-2001.8096	1.1416	294
Montserrat	RCHY	16.704	297.847	310.900	12.7	1.9	2.5	2.6	11.4	1.5	3.2	1.7	9.0	2.9	9.1	3.8	1.0	14.62	11.49	-1.92	1.90	-0.09	1.50	9.00	2.90	2012.3238-2013.4288	1.1050	401
Northwest Bluff, Montserrat	NWBL	16.820	297.797	144.493	23.8	1.5	2.5	1.8	10.9	1.5	3.2	1.7	16.4	3.0	8.5	3.9	1.0	14.61	11.44	9.19	1.50	-0.54	1.50	16.40	3.00	2012.3238-2013.4288	1.1050	372
Magangue, Columbia	VMAG	9.287	285.153	58.654	14.9	1.3	2.2	1.4	9.4	1.4	2.7	1.4	12.7	3.2	7.6	4.4	1.0	10.40	13.76	4.50	1.30	-4.36	1.40	12.70	3.20	2012.3320-2013.4288	1.0968	398
Puerto Rico, Dominican Republic	CN07	19.758	289.434	-34.216	9.4	1.3	2.6	1.2	-4.3	1.4	2.4	1.4	2.3	3.0	9.1	3.9	1.0	11.89	9.65	-2.49	1.30	-13.95	1.40	2.30	3.00	2012.3210-2013.4096	1.0886	394
Abaco, Bahamas	TCA0	26.741	282.617	-28.862	4.0	1.3	1.9	1.3	-10.5	1.2	1.9	1.1	-0.6	2.6	7.1	3.4	1.0	9.49	6.06	-5.49	1.30	-16.56	1.20	-0.60	2.60	2007.4863-2008.5669	1.0806	390
Redonda, Antigua	RDON	16.934	297.654	104.098	14.7	1.5	2.2	2.1	10.4	1.3	2.4	1.6	6.5	4.0	7.5	6.8	1.0	14.56	11.39	0.14	1.50	-0.99	1.30	6.50	4.00	2012.3975-2013.4288	1.0312	325
Cabo Rojo, Dominican Republic	CN08	17.903	288.326	-19.168	10.1	1.3	2.4	1.1	11.8	1.6	3.0	1.5	7.7	5.0	8.5	6.7	1.0	11.51	10.36	-1.41	1.30	1.44	1.60	7.70	5.00	2012.3320-2013.3411	1.0091	353
Santa Domingo, Dom. Rep.	RDSD	18.461	290.089	-11.232	7.8	1.4	2.4	1.1	11.5	1.2	2.2	0.8	19.5	3.2	8.3	3.6	1.0	12.11	10.24	-4.31	1.40	1.26	1.20	19.50	3.20	2012.4549-2013.4288	0.9738	338
Belmopan, Belize	CN23	17.261	271.221	53.228	-6.2	1.5	2.4	1.1	-5.9	1.8	2.5	1.6	19.6	3.6	7.5	3.6	1.0	5.18	9.89	-11.38	1.50	-15.79	1.80	19.60	3.60	2012.5669-2013.4288	0.8618	303
Cabo Frences Viejo, Dom. Rep.	CN27	19.667	290.060	-23.107	8.7	1.6	3.1	1.0	-3.9	1.6	2.9	1.1	38.4	4.2	9.5	3.7	1.0	12.10	9.74	-3.40	1.60	-13.64	1.60	38.40	4.20	2012.6298-2013.4260	0.7962	289
Galerazamba, Columbia	CN37	10.793	284.737	-0.923	22.7	4.0	2.5	4.0	8.8	7.6	2.4	8.0	15.5	11.5	7.2	12.0	1.0	10.25	13.14	12.45	4.00	-4.34	7.60	15.50	11.50	2012.6462-2013.4205	0.7744	205
Barbuda	CN00	17.669	298.214	-24.029	12.6	3.8	2.0	4.0	11.2	7.4	2.3	8.0	18.6	11.1	7.3	12.0	1.0	14.74	11.15	-2.14	3.80	0.05	7.40	18.60	11.10	2012.6407-2013.4096	0.7689	282
Cerrejon, Columbia	CN38	12.222	288.012	8.191	9.5	3.9	1.9	4.0	12.8	7.4	2.2	8.0	12.2	11.2	7.6	12.0	1.0	11.40	12.69	-1.90	3.90	0.11	7.40	12.20	11.20	2012.6626-2013.4288	0.7662	277
Old Town, Columbia	CN35	13.376	278.637	45.597	3.0	4.0	2.2	4.0	9.2	7.7	2.3	8.0	16.2	11.6	7.3	12.0	1.0	8.02	11.85	-5.02	4.00	-2.65	7.70	16.20	11.60	2012.6899-2013.4288	0.7389	268
Monteria, Columbia	CN36	8.820	284.179	12.923	7.7	4.1	2.4	4.0	8.8	7.9	2.6	8.0	-1.2	11.9	7.5	12.0	1.0	10.05	13.92	-2.35	4.10	-5.12	7.90	-1.20	11.90	2012.6325-2013.3493	0.7168	262
North Sound British Virgin Islands	CN03	18.491	295.598	286.355	25.3	12.5	2.1	4.0	23.8	24.1	2.6	8.0	21.3	37.4	7.2	12.0	1.0	13.92	10.63	11.38	12.50	13.17	24.10	21.30	37.40	2013.1466-2013.3822	0.2356	86
Contadora, Panama	CN28	8.625	280.966	23.426	4.8	28.7	2.3	4.0	-0.2	53.0	1.9	8.0	-12.1	-84.8	6.4	12.0	1.0	8.88	13.92	-4.08	28.70	-14.12	53.00	-12.10	-84.80	2013.1986-2013.3055	0.1068	40

4.2 The 1-plate model

The currently accepted definition for the motion of the Caribbean with respect to the ITRF, which serves as the foundation for this study, is presented by DeMets et al. (2007), and Figure 4-2 is a velocity map of the 15 sites from that study. The GPS processing software, methods and global reference frame have been updated since 2007, so it is necessary to reprocess all the data using the current software version and reference frame, so direct comparisons can be made. Figure 4-2 presents three sets of velocity vectors. The black arrows are the velocity vectors from Demets et al. (2007) with respect to ITRF2005. The first step was to update the original data to the current reference frame. The current global reference fame is ITRF2008, which outperforms ITRF2005 in terms of determining station positions and velocities (Altamimi et al., 2011). The improvement in the IGS solutions are a result of, among other things, new absolute phase center offsets and more advanced tropospheric modelling. The precise orbit and clock files, used by GIPSY-OASIS II for terrestrial positioning, have also been recalculated by JPL and the combination of the newest software and products will yield better results than those processed analyzed by DeMets et al. (2007). The red arrows represent the same data, for the same epochs, reprocessed with GOAII v. 6.2 in the ITRF2008 reference frame. Finally, any additional data collected between 2007 and 2013 were added and also processed in GOAII v. 6.2 in the IGS08 reference frame. The last revision to the site velocities is represented by the yellow vectors in Figure 4-2.

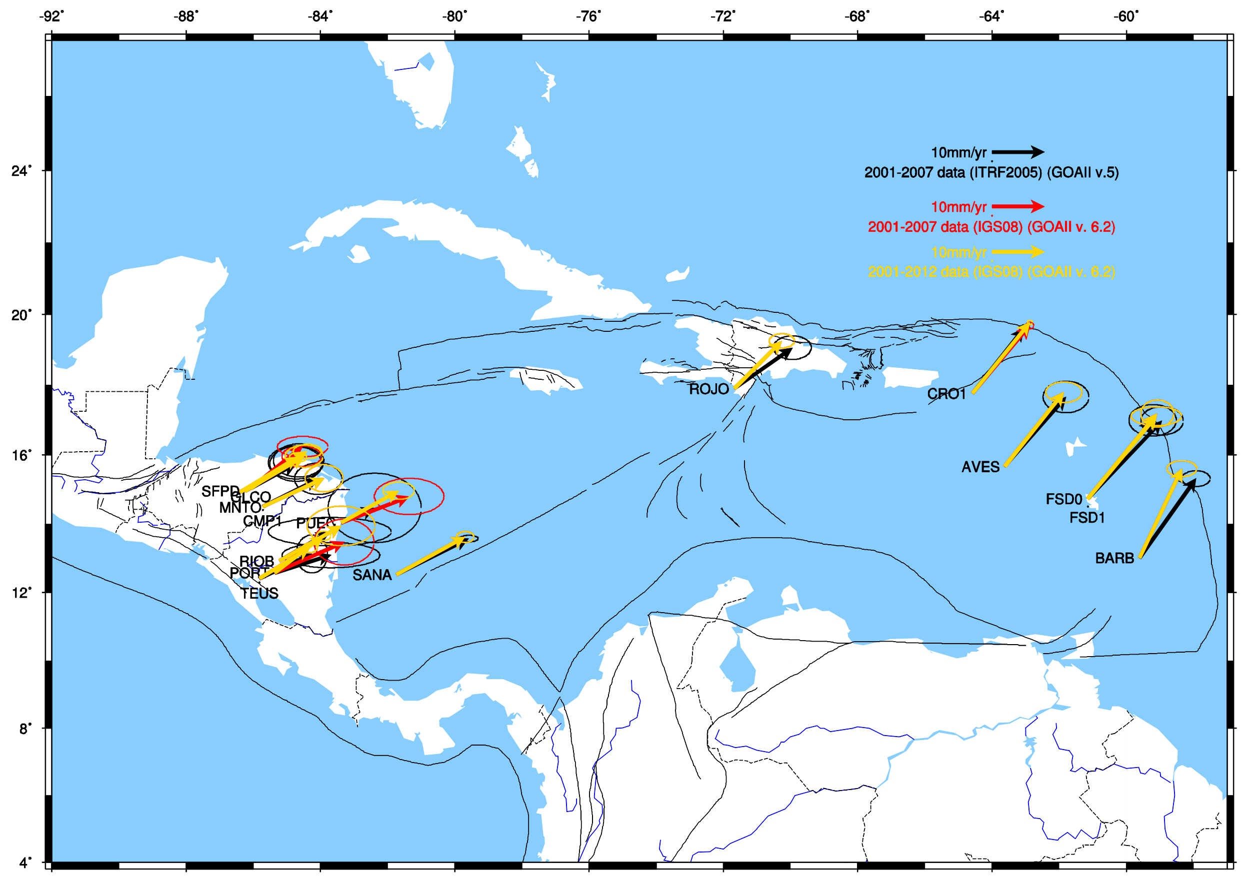


Figure 4-2 Demets et al. (2007) velocity vectors and updated values.
Black arrows are Demets, 2007 original values with respect to ITRF2005.
Red arrows are the 2007 sites and epochs, but processed with updated software and reference frame. Yellow arrows are the red arrows plus any additional data available from 2007 to the present.

The process of updating the reference frame (black arrows to red arrows), resulted in minor directional changes, but in a few cases, a notable change in the resulting rate. In general, the ITRF2008 results are rotated towards the north relative to the ITRF2005 results. For example, the ITRF2005 north and east velocities for PUEC (eastern Nicaragua) were 2.8 ± 4.4 and 6.4 ± 5.9 (DeMets et al., 2007), respectively, and when reprocessed with respect to ITRF2008, the north and east velocities are now 6.1 ± 1.1 and 11.0 ± 2.0. All of the sites, when reprocessed in ITRF2008 versus ITRF2005 yield an improvement in the velocity uncertainty. Between 2006 and 2013 additional data were collected at sites GLCO, MNTO, PORT, PUEC, TEUS, and CRO1. These data have been included in the yellow velocity vectors shown in Figure 4-2. Any site with updated data produces an additional reduction in error and some minor variations in direction are also apparent.

In order to define a best-fitting angular velocity vector for Caribbean plate motion relative to IGS08, the velocities of the 15 original sites will be inverted using an inversion algorithm written by DeMets (the code, called GCCM was provided to G. Mattioli). The north and east components for each site are weighted in the inversion by the reciprocal of their squared 1 sigma uncertainties, ensuring that velocities from sites with long continuous time series contribute more to the final solution than those occupied infrequently (DeMets et al., 2007). The inversion of the velocities generates an estimate of an Euler pole for the motion defined by the specified set of sites. An Euler pole is the fixed point around which a rigid body will rotate on a sphere (Fowler, 1990).

In order to test the validity of the current 1-plate model for the Caribbean, the inversion for: 1) the original sites with the original epochs, updated to the current reference frame and 2) the original sites with all data available through 2013. The results are listed in Table 4-3, and inversion input files and inversion results are available in Appendix E.

Table 4-3 Best-fitting Caribbean plate velocity vector information

Best-fitting Caribbean plate angular velocity vector information					
plate pair	no. of sites	angular velocity vector			reduced χ^2
		λ	φ	ω	
		(°N)	(°E)	$°m.y.^{-1}$	
CA-ITRF2000 published value by Demets et al., 2007	15	36.30	-98.50	0.2550	0.54
CA-IGS08 (original epochs - GOAII v. 6.2)	15	37.49	-102.62	0.2423	1.33
CA-IGS08 (all data available through 2013 - GOAII v. 6.2)	15	37.02	-103.18	0.2438	1.71

Small variations are seen in the latitude (λ), longitude (φ), and rotation (ω) of the estimated Euler pole, but the increase in the reduced χ^2 value is of concern here. χ^2 is the sum of the squared weighted residual values from the inversion output. The reduced χ^2 is the χ^2 divided by the degrees of freedom, and is a statistical measure of the goodness of fit (Bevington, 1969). The reduced χ^2 value should decrease as a model improves its fit to the data. The reduced χ^2 value of the inversion including only the original dataset was 1.33, while the reduced χ^2 for the inversion with the enhanced dataset was 1.71. In this case, adding additional GPS data (*i.e.* extending the time-series) to the existing model, changed the velocity estimates, and thus resulted in a worse fit. The degraded fit suggests that the 15 site, 1-plate model defined by Demets et al. (2007) may no longer be valid, and a new more complex model needs to be developed.

Perhaps the addition of more sites will improve the fit of the model. Figure 4-3 presents the 117 COCONet and campaign sites that were analyzed for consideration as part of the Caribbean plate. All sites were processed as described in Chapter 2 and the time series are located in Appendix B. Once the sites were processed, they were sorted by their deviation from the currently accepted plate motion. Any site outside of 2σ variation were not included and sites within 2σ variation underwent further scrutiny. Any site whose velocity is affected by a zone of plate boundary deformation, or has been established in the literature to be part of another plate also was excluded. Data from some sites in the highly concentrated GPS campaign region of Dominica were eliminated to reduce spatial redundancy. This process narrowed the list of 117 sites down to 24 that are considered "on plate" and these are designated by red arrows in Figure 4-3.

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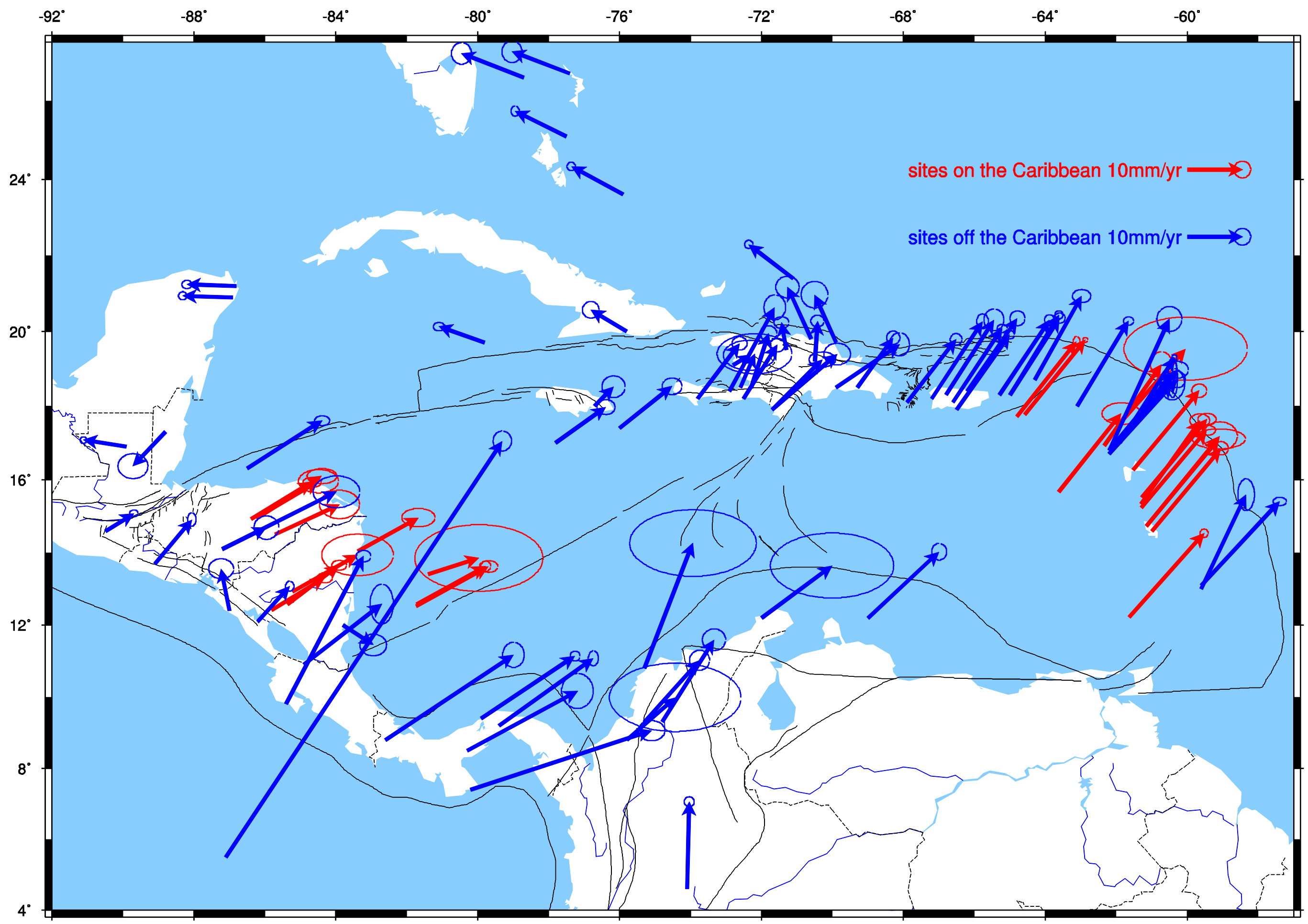


Figure 4-3 Caribbean horizontal site velocities
Red arrows are on-plate and blue arrows are off-plate.

Table 4-4 Occupation history and velocities

	country	site	lat	long	station days occupied per calendar year														site velocity mm yr^{-1} with respect to IGS08	
			(°N)	(°W)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	North	East
1	Honduras	CMP1	14.5090	85.7146	3					2									5.8 ±2.0	13.0 ±2.7
2	Honduras	GLCO	15.0300	86.0699	2				3	2					4				7.0 ±1.2	11.2 ±2.0
3	Honduras	MNTO	14.9170	86.3805	3				3						3				6.7 ±1.0	10.7 ±1.4
4	Honduras	SFDP	14.9660	86.2449	3				3										6.7 ±2.1	12.0 ±3.1
5	Nicaragua	PORT	12.5731	85.3671	3		4	4			4		4				4		7.4 ±0.8	9.8 ±1.2
6	Nicaragua	PUEC	14.0421	83.3820		4		4			4								6.5 ±1.7	10.6 ±2.5
7	Nicaragua	RIOB	12.9209	85.2206	4		4	4											6.2 ±3.3	11.2 ±6.8
8	Nicaragua	TEUS	12.4098	85.8136	5		5	5			4						4		5.9 ±0.6	9.7 ±0.9
9	Columbia	SANA	12.5238	81.7294	1994 (9), 1996 (3), 1998 (6), 2000 (6), 2003 (5)													44	7.2 ±0.7	13.1 ±1.1
10	Virgin Isl.	CRO1	17.7569	64.5843	1995-2002 (2285)			362	360	168	363	361	360	354	287	364	362	157	13.6 ±0.3	11.0 ±0.3
11	Venezuela	AVES	15.6670	63.6183	1994 (18), 1998 (10)														14.3 ±2.0	10.3 ±2.8
12	Matinique	FSD0	14.7348	61.1467	1994 (4), 1998 (6), 1999 (4)														15.9 ±1.7	12.0 ±3.9
13	Matinique	FSD1	14.7349	61.1465	1994 (5), 1998 (11), 1999 (4)														16.3 ±1.7	13.3 ±2.1
14	Ant./Barb.	RDON	16.9340	62.3460													217	85	15.2 ±1.9	11.2 ±2.2
15	Grenada	GRE0	12.2220	61.6400								188	360	354	326	365	363	103	15.2 ±0.5	13.5 ±0.7
	sites added																			
16	Guadeluope	ABMF	16.2623	61.5275											122	353	317	185	14.4 ±0.8	12.0 ±0.9
17	Martinique	LMMF	14.5948	60.9962											122	355	362	184	15.0 ±0.8	12.5 ±0.9
18	Columbia	SAN0	12.5800	81.7160								24	360	354	363	365	257	103	6.9 ±0.6	12.1 ±0.8
19	Virgin Isl.	VIKH	17.7160	64.7980							118	263	236	306	360	362	363	103	13.6 ±0.6	10.8 ±0.6
20	Barbuda	CN00	17.6685	61.7856													132	150	12.6 ±3.8	11.2 ±7.4
21	Columbia	CN35	13.3755	81.3629													114	154	3.0 ±4.0	9.2 ±7.7
22	Dominica	CASS	15.2409	61.2911		4		3	5		3	4					3		13.7 ±0.9	11.8 ±1.8
23	Dominica	CNCD	15.5118	61.2783		5		3	6		4	3				4			14.7 ±1.0	11.5 ±1.4
24	Dominica	FRSH	15.3402	61.3094		4		3	4		3	4					4		14.5 ±1.2	10.7 ±1.5
	sites removed																			
	Barbados	BARB	13.0879	59.6091	192	26	1999 (115)												17.1 ±1.9	8.1 ±1.0
	Dom. Rep.	ROJO	17.9040	71.6745		2	1994 (9), 1995 (2), 1998 (3)												9.1 ±0.9	9.1 ±1.6

4.3 The 2-plate model

The data from the 24 sites (Figure 4-3) that appear to move with the Caribbean plate are inverted to see how the result compares to the DeMets et al. (2007) 15 site, 1-plate model. BARB and ROJO have been removed from the original 15 sites, and 11 new sites have been added). I have chosen to remove BARB and ROJO because their velocities are inconsistent with the sites considered "on-plate". BARB, in Barbados is likely affected by active shortening of the accretionary wedge (Speed et al., 1982), and ROJO, in the Dominican Republic is very near the Enriquillo-Plaintain Garden fault which experiences slip on the order of ~20 mm/yr (Manaker et al., 2008). Visual inspection of the velocity map for these sites (Figure 4-3, red vectors) suggests that there are two distinct populations of horizontal velocity vectors. To better visualize the differences in azimuth between the two populations, the velocities are plotted on a compass diagram (Figure 4-4, inset), and it appears to verify that there are two distinct vector populations for the 24 sites considered "on plate": The eastern site velocities are represented by the blue arrows and the western site velocities by the red arrows in Figure 4-4. The western site velocities have a greater easterly component, while the eastern sites display stronger northerly motion.

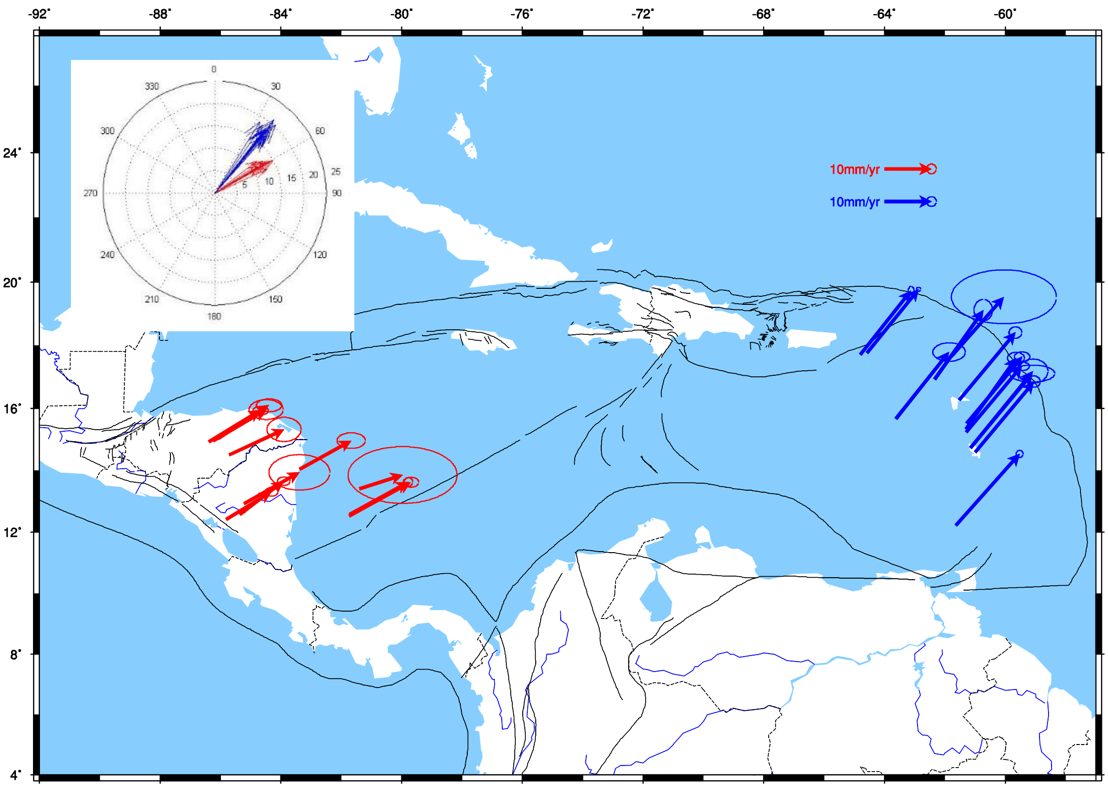


Figure 4-4 Horizontal velocities for sites on the Caribbean plate.
Arrows represent horizontal velocity vectors with respect to IGS08, blue arrows represent the eastern Caribbean sites and the red arrows represent the western Caribbean sites. Inset is a compass plot of Caribbean velocity vectors, azimuth and magnitude in mm/yr is shown.

Since it appears that the eastern and western sites have unique and independent motion, I will test whether a 2-plate model fits all the reprocessed data better by examining both options. First, the 24 sites are inverted, assuming all sites are on 1 plate, with respect to a fixed IGS08 reference frame and the reduced χ^2 is 0.75. When the inversion is run using 2 plates, with the sites split into an eastern group and a western group, the 2-plate model yields a reduced χ^2 of 0.60. Although the resulting reduced χ^2 value is improved, the F-ratio test must be employed to confirm that the improvement is not merely an artifact of adding three additional adjustable parameters (Stein and Gordon, 1984). There are 3 adjustable parameters for a 1-plate model, which are, latitude, longitude, and rotation rate of the pole. A 2-plate model doubles the adjustable parameters to 6, since a latitude, longitude and rotation rate must be defined for 2 poles. The equation for the F test for the validity of adding n^{th} term is shown below (Stein and Gordon, 1984):

$$F = \frac{\frac{\chi 2(r) - \chi 2(p)}{p - r}}{\frac{\chi 2(p)}{N - p}}$$

N = number of data
p = degrees of freedom for a 2-plate model
r = degrees of freedom for a 1-plate model

The F value calculated, F = 4.94, for $v_1 = 3$ and $v_2 = 42$, generates a 99.5% confidence that a 2-plate model is a statistically significant improvement over the 1-plate model.

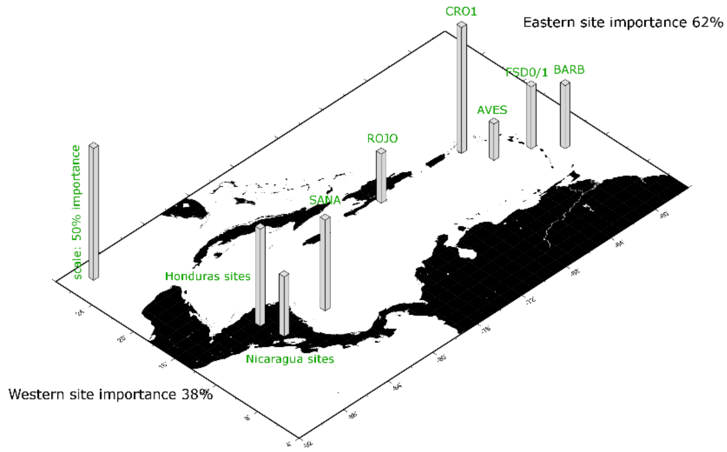
Figure 4-5 (A, B) shows and Table 4-5 Site data importance values by site, which is the percentage that each site contributes to the final solution. A continuous site with a long occupation history is weighted more in the inversion than the data from campaign sites that are intermittantly occupied. These data importance values are determined from the relative uncertainties of the individual site velocities and the site location with respect to other sites and the pole of rotation (Minster et al., 1974). The DeMets et al. (2007) values are also shown in Figure 4-5 (A) and Table 4-5. It is important to note that their solution relies heavily on site CRO1 (~41%), which was a concern stated by the authors at the time of publication. The heavy reliance of the model on CRO1 (St. Croix) forced DeMets et al. (2007) to consider the possibility that the assumption that CRO1 accurately records the motion of the undeforming Caribbean lithosphere may be incorrect. Enough data has been collected from the eastern Caribbean (Table 4-5 and Figure 4-5 B), since the DeMets et al. (2007) study, such that the plate motion model's dependence on CRO1 has been reduced to 17.7% (Table 4-5). The site data importances, in general, are more evenly distributed both numerically and spatially. The east versus west site data importance for DeMets et al. (2007) was 62% versus 38%, whereas the value for the 24-site 2-plate model is 49% versus 51%. The data are now nearly equally weighted, so neither region of the Caribbean plate has a dominating effect on the resulting kinematic model.

The spatial distribution of the site data importance is now adequate to support improved confidence in the inversion results. Figure 4-6 is a map showing the derived Euler poles for the Caribbean as determined by various authors. Although there are small variations seen in the pole of rotation based on the reference frame and the software version used, all of the poles for models that hold the Caribbean as a single rigid plate, plot in the similar vicinity. Note that if the Caribbean is considered as two plates, the pole for the east-Caribbean is farther east than all other results and the pole for west-Caribbean shows significant disparity, with its location north of 58°N. Another important feature is that the pole estimation determined by Altamimi et al. (2007) for the Caribbean is based on 3 sites: St. Croix, Puerto Rico, and Barbados. I have excluded data from Barbados and Puerto Rico from my inversions, because of their proximity to zones of active deformation and thus I would consider this pole location to be the least reliable.

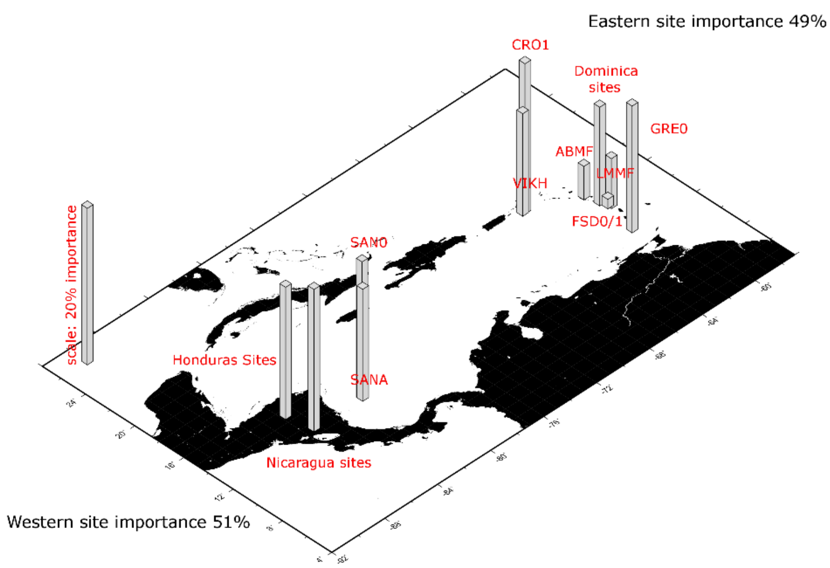
Table 4-5 Site data importance values

site importance (%)		
Miller, 2013	DeMets, 2007	site
17.7	41.7	CRO1
12.5	17.7	Honduras sites
8.5	14.8	SANA
1.2	6.3	FSD0/1
15.2	5.9	Nicaragua sites
0.5	2.9	AVES
14.2	new site	SAN0
11.3	new site	GRE0
7.1	new site	VIKH
6.6	new site	Dominica sites
2.6	new site	LMMF
1.9	new site	ABMF
0.7	new site	RDON
0.3	new site	CN35
0.1	new site	CN00
removed from inversion	6.5	BARB
removed from inversion	4.3	ROJO
100%	100%	total
east versus west importance		
49.0%	62.0%	eastern sites
51.0%	38.0%	western sites

Values for velocities of Caribbean GPS sites used to derive the best-fitting CA-ITRF2008 angular velocity vector. Values for DeMets et al. (2007) 15-sites.



(A)



(B)

Figure 4-5 Data importance
Data importance values for velocities of Caribbean and Central American GPS sites used to derive the best-fitting Caribbean-ITRF2008 angular velocity vector. Values plotted are those that contributed >1% to the solution. All importance values are listed in Table 4-5. (A) Values for DeMets et al. (2007) 15-site 1-plate model. (B) Values for 24-site 2-plate model. Note the different scales for (A) and (B).

Table 4-6 Best fitting Caribbean angular velocity vectors

Best-fitting Caribbean plate angular velocity vector information				
plate pair	no. of sites	angular velocity vector		
		λ	φ	ω
		(°N)	(°E)	°m.y.$^{-1}$
CA-ITRF2005 published value by Altamimi et al.	3	39.32	-104.28	0.2410
CA-ITRF2005 published value by Demets et al., 2007	15	36.30	-98.50	0.2550
CA-IGS08 data through 2007, reprocessed	15	37.49	-102.62	0.2423
CA-IGS08 data through 2013, reprocessed	15	37.02	-103.18	0.2438
CA-IGS08, 1-plate model result	24	37.19	-101.95	0.2545
CA(east)-IGS08, 2-plate model result	14	35.79	-97.18	0.2802
CA(west)-IGS08, 2-plate model result	10	58.51	-145.36	0.1321

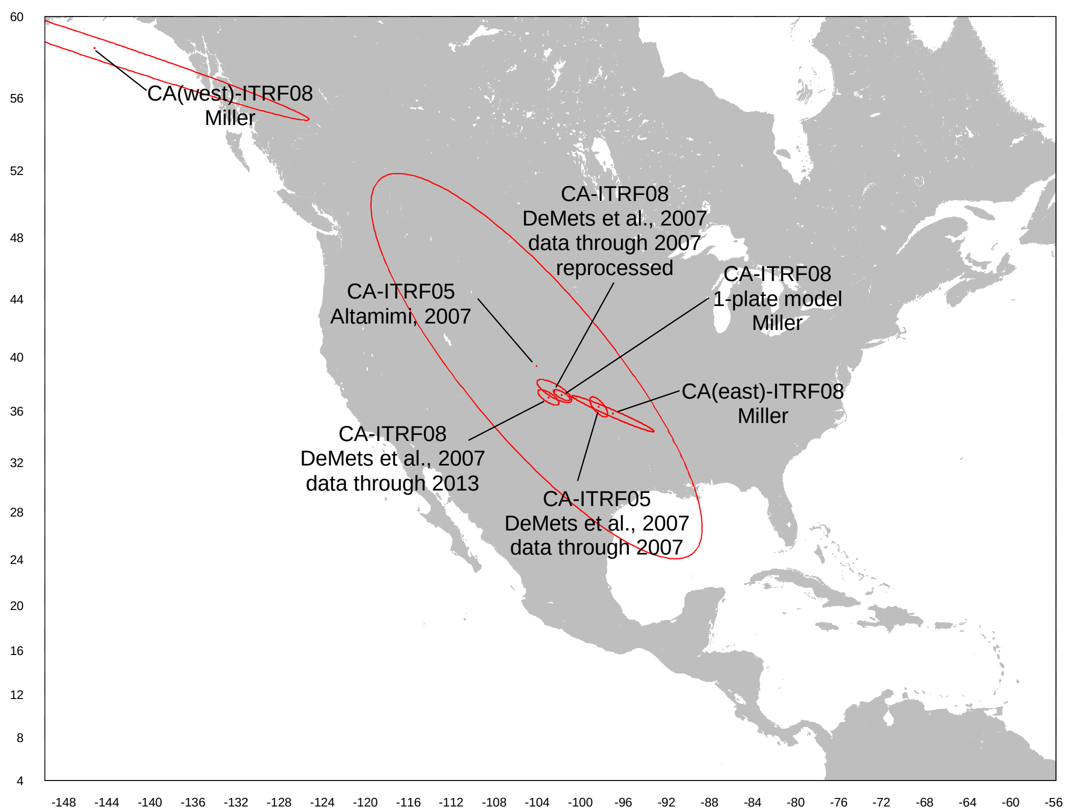


Figure 4-6 Euler pole locations.
Error ellipses are 1 σ.

4.4 The rigidity of the Caribbean plate

Based on the F-test, I can infer that the east and west Caribbean are moving at different rates and directions, and since we can see in Figure 4-7, that despite the fact that there is very little seismicity in the interior of the Caribbean, I conclude that there is ongoing internal deformation and therefore the Caribbean plate is non-rigid. To investigate possible structures that may serve as a boundary between east and west Caribbean blocks, and a location where such deformation might occur, I consider geomorphologically prominent features, the locations of known and putative faults, and observed earthquake hypocenters (Figure 4-7).

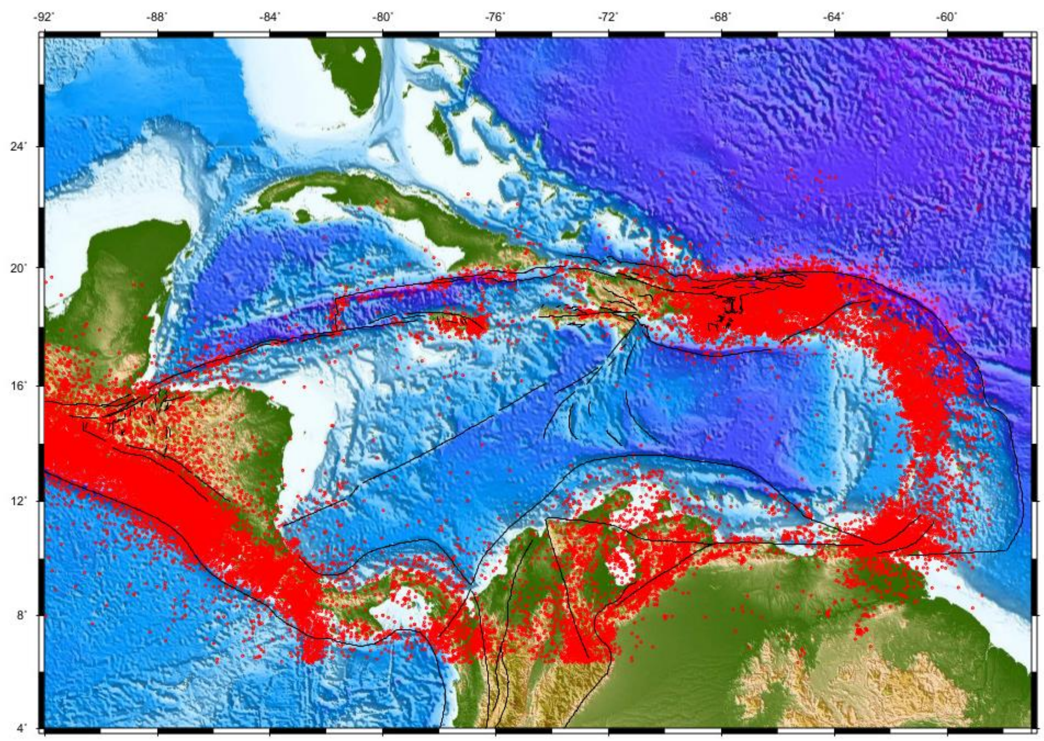


Figure 4-7 Faults and earthquakes of the Caribbean
Red circles are earthquake hypocenters (IRIS data, http://www.iris.edu). Black lines delineate putative faults.

Two features that appear to separate the Caribbean into east and west sections are the Lower Nicaraguan Rise and the Beata Ridge (Figure 1-5). Mauffret and Leroy (1999) conclude on the basis of marine seismic profiles, that the Beata Ridge shows clear evidence of compression and transpression. They estimate that the ridge has accommodated 9 ± 1.5 mm yr^{-1} of shortening since the early Miocene. To test this proposal, we use the 2-plate model, based on the inversion of the 24 sites (10 on the western block and 14 on the eastern block) and the derived poles to predict the relative motion of the east and west sections relative to each other along both the Beata Ridge and the Lower Nicaraguan Rise. The results for the predicted motion along the Lower Nicaraguan Rise are presented in Figure 4-8 and Figure 4-9. I calculate less than 1 mm of relative motion between the east and west sides of the Lower Nicaraguan Rise, which indicates that it is not a likely candidate for the location of any significant intraplate deformation. The 2-plate model, however, predicts an average velocity of 3 mm/yr along the Beata Ridge with the motion oblique to the boundary (Figure 4-10 and Figure 4-11). This prediction corroborates the transpessional environment described by Maufrett and Leroy (1999), which includes a pop-up structure, reverse faults, and an inverted basin, identified through interpretation of seismic reflection profiles.

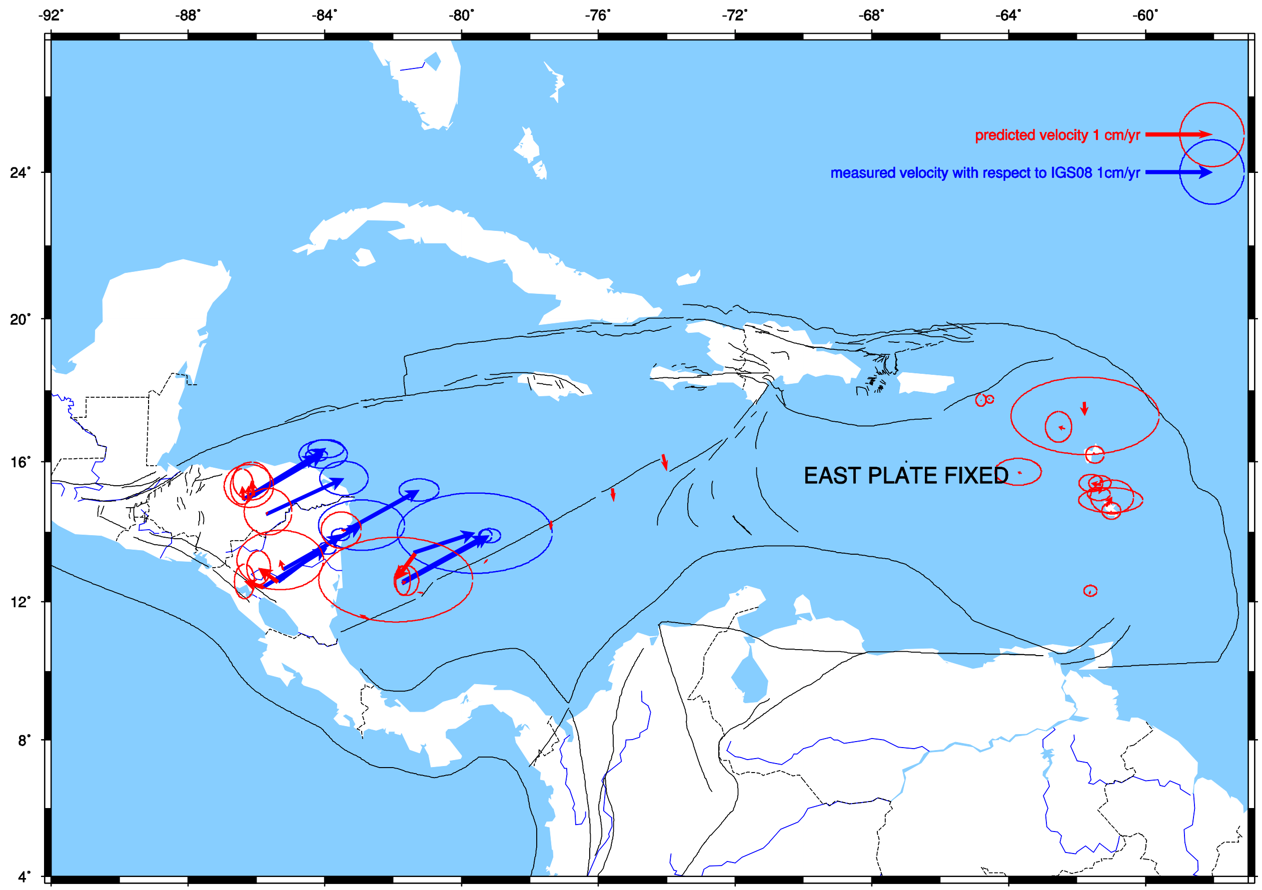


Figure 4-8 Motion along Lower Nicaraguan Rise with respect to a fixed east plate.
Red arrows are motion predicted by a 2-plate model with respect to a fixed east plate.
Blue arrows are velocities measured with respect to IGS08.Error ellipses are 1 σ.

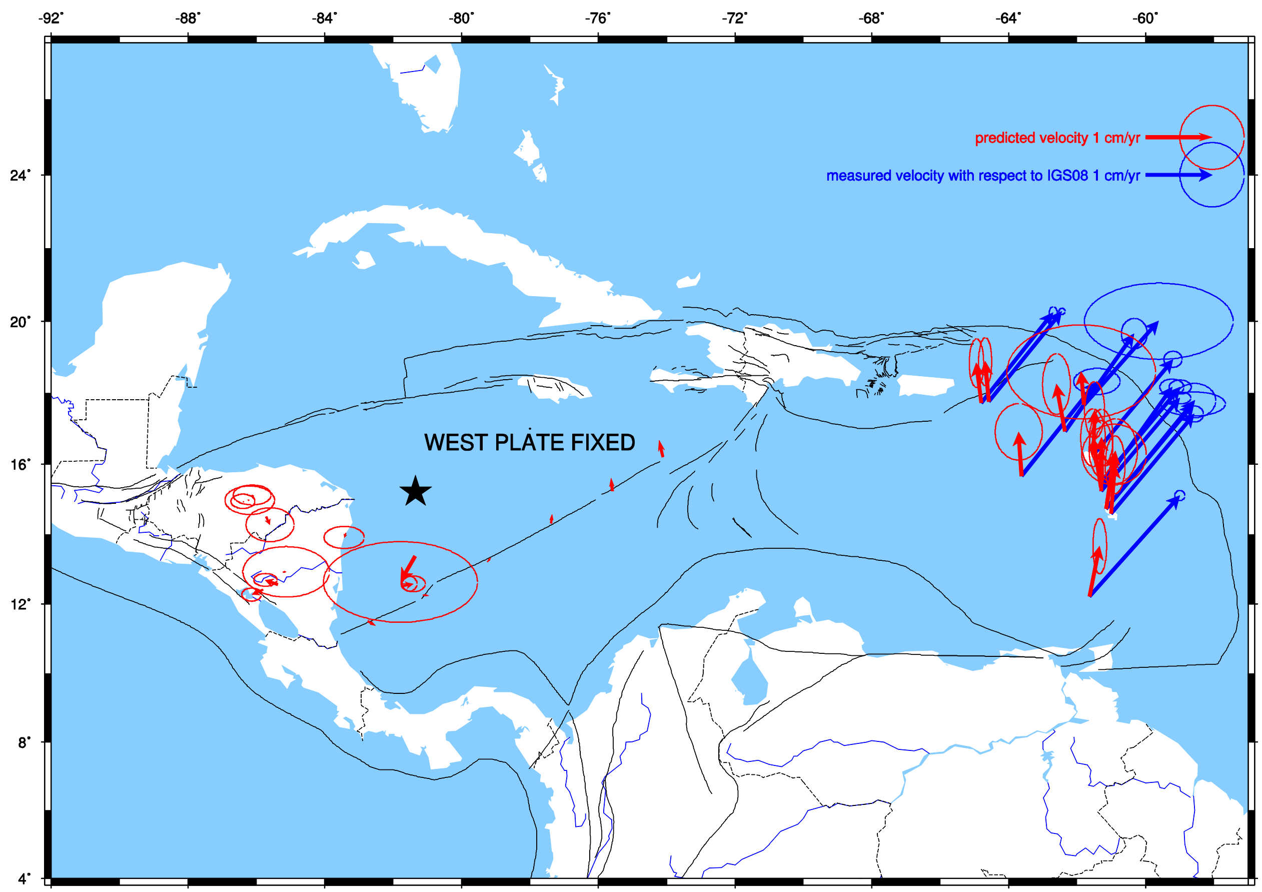


Figure 4-9 Motion along Lower Nicaraguan Rise with respect to a fixed west plate.
Red arrows are motion predicted by a 2-plate model with respect to a fixed east plate. Blue arrows are velocities measured with respect to IGS08. Black star is predicted Euler pole for the rotation of Caribbean-east with respect to a fixed Caribbean-west.. Error ellipses are 1 σ.

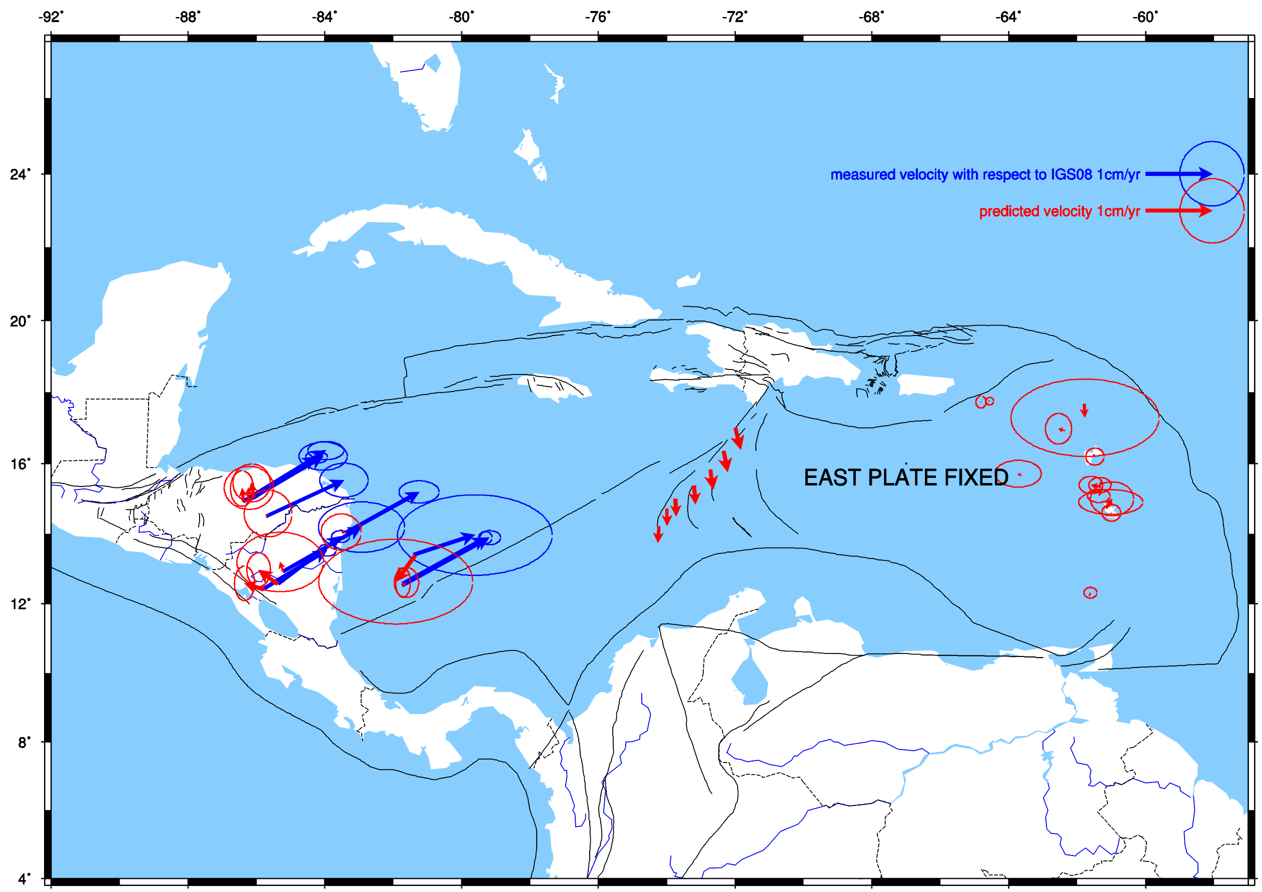


Figure 4-10 Motion along the Beata Ridge with respect to fixed east plate.
Red arrows are motion predicted by a 2-plate model with respect to a fixed east plate. Blue arrows are velocities measured with respect to IGS08. Error ellipses are 1 σ.

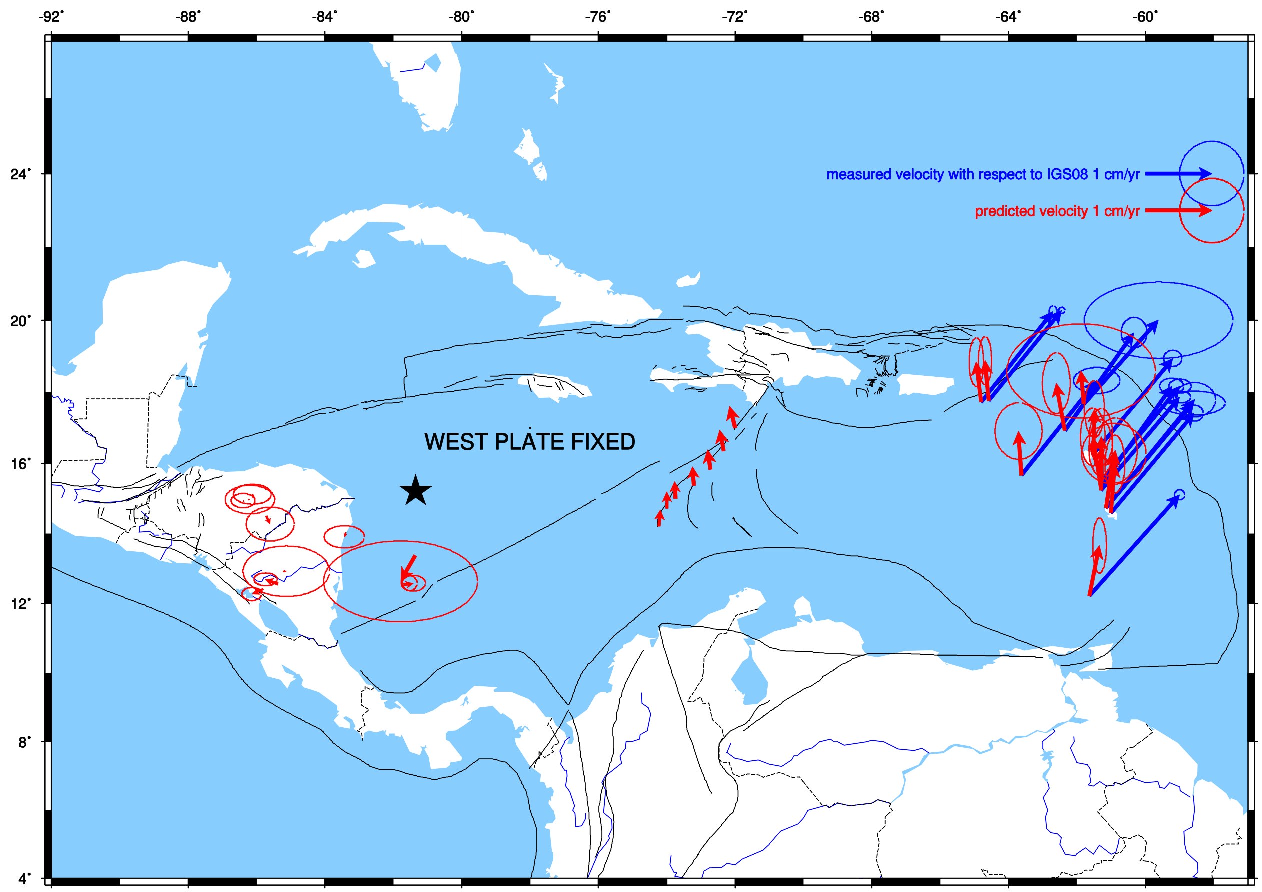


Figure 4-11 Motion along the Beata Ridge with respect to fixed west plate.
Red arrows are motion predicted by a 2-plate model with respect to a fixed east plate. Blue arrows are velocities measured with respect to IGS08. Black star is predicted Euler pole for the rotation of Caribbean-east with respect to a fixed Caribbean-west. Error ellipses are 1 σ.

Once new Caribbean poles for a 2-plate model are adopted, a re-plotting of the residual velocity maps is required, using the new Caribbean-east and Caribbean-west rates. Minimal change is expected for sites in the eastern block the previous model and the one that was used for the initial kinematic analysis (DeMets et al., 2007) was overly dependent on the eastern sites to define its pole. Figure 4-12 shows the Dominica residual velocity rates plotted in black for the 1-plate model and red for the 2-plate model. The red is superimposed on the black since the difference is virtually insignificant. The scale has been magnified in this image to make the vectors easier to see. The western sites show more variation in the residuals (Figure 4-13), due to the large disparity in the location of the Euler pole when the western sites are isolated.

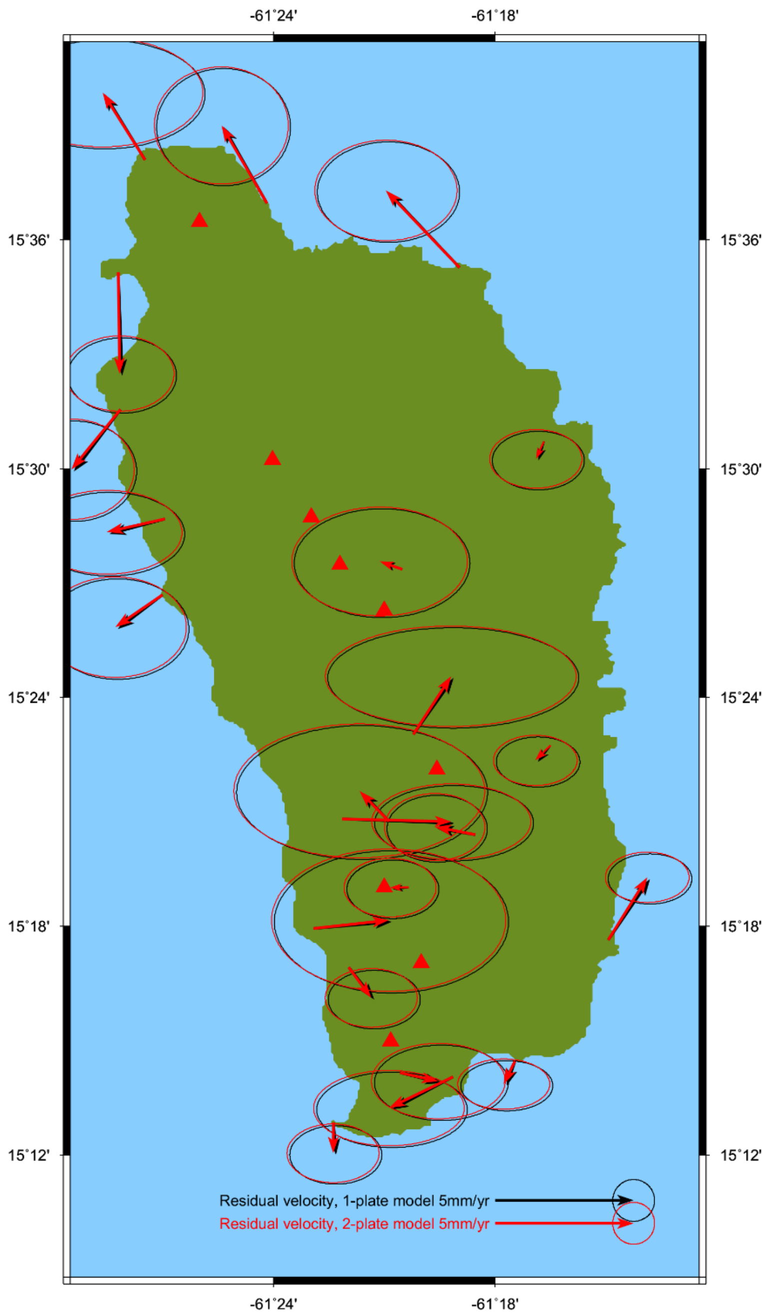


Figure 4-12 Dominica residual velocities, 1-plate model versus 2-plate model. Black arrows represent residual velocity with respect to a fixed 1-plate Caribbean. Red arrows represent residual velocity with respect to a fixed East Caribbean plate. Error ellipses are 1 σ. Note scale difference between this figure and figures 3-26 and 3-27.

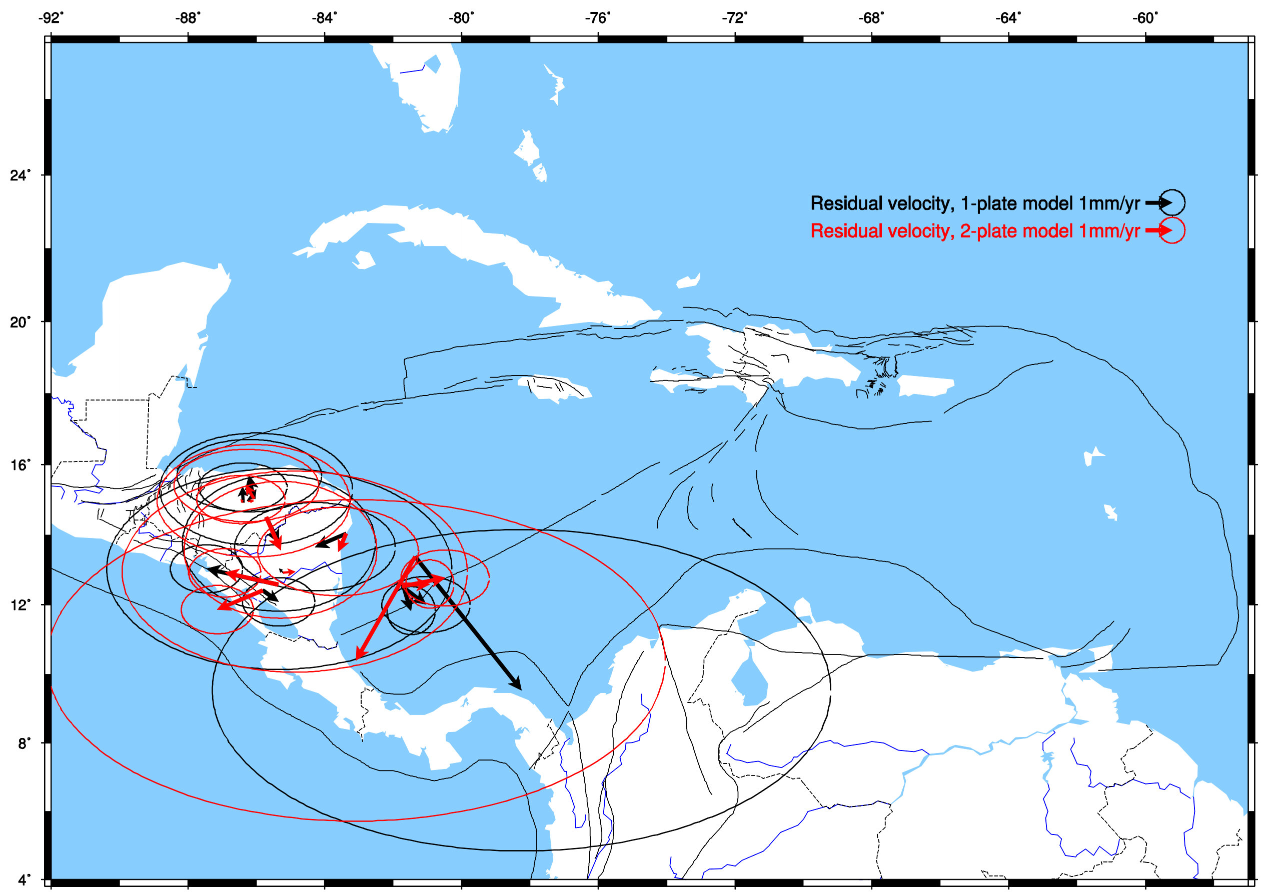


Figure 4-13 Western site residual velocities, 1-plate model versus 2-plate model.

Black arrows represent residual velocity with respect to a fixed 1-plate Caribbean. Red arrows represent residual velocity with respect to a fixed West Caribbean plate. Error ellipses are 1σ.

4-5 Kinematic versus dynamic model of the Caribbean

A dynamic model of the Caribbean is presented by van Benthem (2013), which supports the kinematic 2-plate model I have proposed. He identifies the forces contributing to the dynamics of the Caribbean plate as: (1) pull by the Maracaibo slab, which is largely counteracted by slab resistive forces, (2) frictional forces with the surrounding plates, perhaps combined with (3) trench suction at the southern Lesser Antilles (van Benthem, 2013). Figure 4-14 presents van Benthem's map of principle stresses for the Caribbean. Note that in the area of Beata Ridge (marked with a red oval), where we suspect a transpessional environment, the primary stress direction is compressional and oriented approximately E-W.

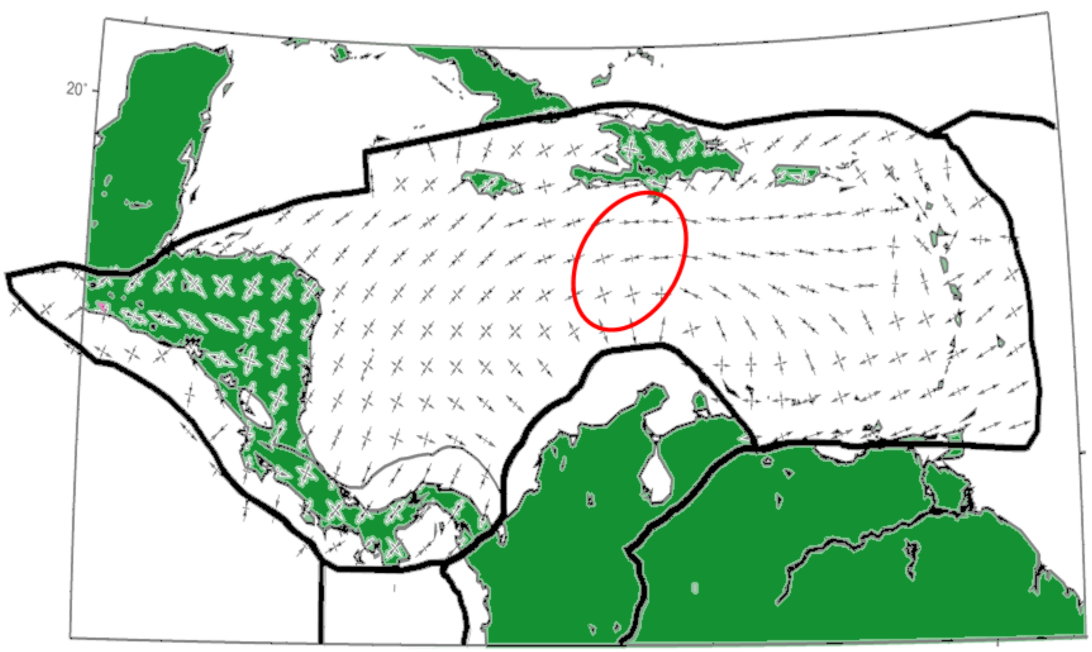


Figure 4-14 Caribbean principle stress directions (van Benthem, 2013)
Red oval marks the area of the Beata Ridge.

Van Benthem (2013) also identifies mechanisms for plate boundary deformation in the NE Caribbean as "Bahamas collision" and "slab edge push". His "slab edge push" model predicts uplift for the interior of the Caribbean plate, roughly at the location of the Beata Ridge (Figure 4-15) (van Benthem, 2013). In both models, predicted strain rates are higher for eastern versus western Caribbean, with a demarcation that lies along the Beata Ridge.

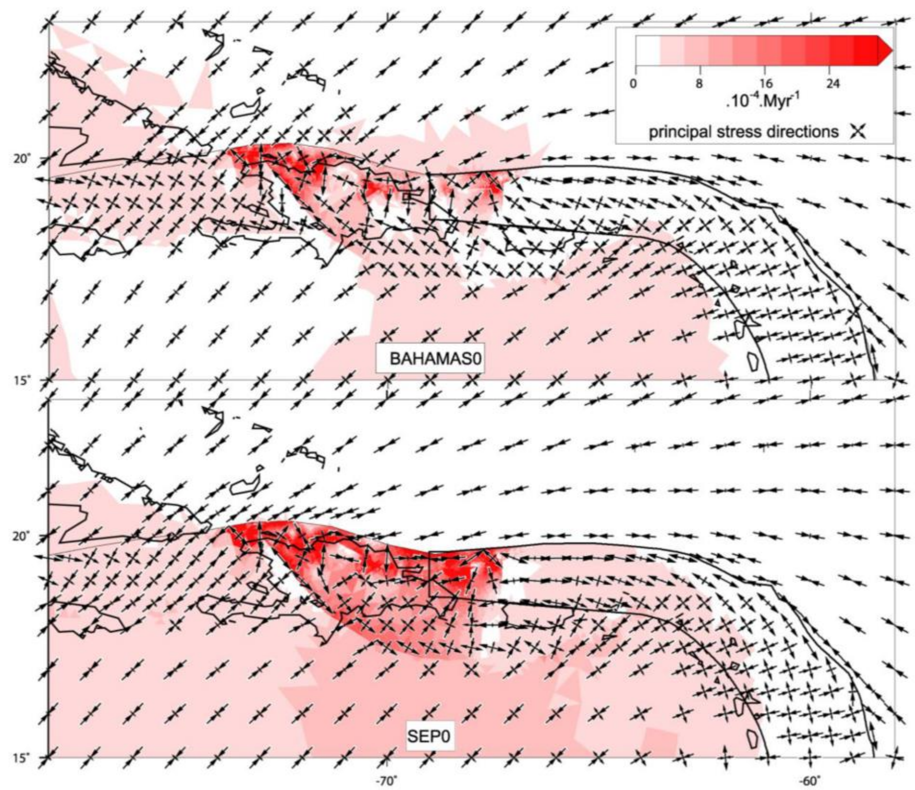


Figure 4-15 Caribbean effective strain rate (van Benthem, 2013)
Strain rate is Myr^{-1}. Black crosses denote the principle strain rate directions. The top panel is the Bahamas collision model for present day and the bottom panel is the slab edge push (SEP) model for present day.

4-6 Conclusion

It is with confidence that I conclude that the east and west sides of the Caribbean display unique motion and that the Caribbean is not a single rigid plate. E-W shortening is likely occurring in the area of the Beata Ridge, a theory supported by seismic data, kinematic and dynamic modeling. The adoption of a 2-plate model would have implications in various areas of Caribbean studies, including geodesy and neotectonics. Poles associated with a 2-plate model highlight the inconsistencies with the Euler pole for the Caribbean plate as defined by ITRF2008. Any models used to assess regional hazards associated with plate motion would need to be reevaluated, especially for the Western Caribbean.

Appendix A

Dominica Campaign Site Descriptions

Modified from James, 2008

ATRU

Site is located at Atru Bay on the coast near the north end of Dominica (fig. A-1). The end of the journey to this site requires a descent down a steep switch backed driveway to a plot of land that was for sale in 2011. At the end of the driveway, there is a relatively flat open field (fig. A-1) to the Atlantic Ocean. Once parked at the end of the driveway, you will be facing east to the Atlantic. Park here and head out on foot south/southeast across the field approximately 100 yards to a grove of palms. There is a subtle opening in the trees, which may once have been a "trail". Enter the trees and follow the "trail" towards the ocean. As you emerge from the trees, it is necessary to scale down a small (3-5 m) drop to the rocks on the shore. Once at the bottom, you are very near the site. The pin is located in a boulder approximately 2 m from the base of the ~5 m cliff you just scaled down. The cliff may be a source of multipath interference and certainly limits the sky view available to the west of this site. Antenna should be elevated as much as possible to reduce the influence of this cliff. The site is not secure, however there is relatively low traffic and as such, security is not a major concern.

Installation: June 2004, stainless steel Bevis pin set with epoxy in a 0.5” hole in andesitic bedrock.

(A) (B)

Figure A-1 Dominica campaign site (A) ATRU, 2012 looking back across the field from the palm grove towards the parking area (B) ATRU, 2012

BELV

Site is located in an andesite boulder on a hillside at Belvedere Estates on the east coast of Dominica. There is a road (two strips of concrete) that will take you this location. The road has some precarious spots so proceed with caution. The landowner is Edward Joseph, he is very friendly and if present, can show you where the pin is located. When you get close using GPS, look for a shed (fig. A-2). Park near the shed, cross the road and cut through the trees. The boulder is located in the field just north of the shed. The field is no longer used for grazing cows as it had been in the past so the vegetation was chest high. You will need a machete for this site. Edward cut a path for us and cleared around the boulder.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5" hole. Site requires either a tripod or tetrapod for setup due to a small mounting area on the surface of the boulder.

Figure A-2 Dominica campaign site (A) BELV, 2012 Edward Joseph's shed, place to park and cross through trees (B) BELV, 2012 (C) BELV, 2006 (D) BELV, 2006

BOIL

This site is on the shore of boiling lake and is a 16 mile round trip on foot.

Installation: 2007

BOTG

Site is located in a mostly buried boulder at the Botanical Gardens in Roseau (fig. A-3). The boulder is located inside a fence with a locked gate that contains the parrot house. Access is very limited so coordination with the Forestry Division is required. Permissions were required from not only the Forestry Division, but from the person in charge of the Aviary. A new addition to the site in 2011 was an RV (fig. A-3) that is parked very near the pin and will not be removed. Proximity to the Parrot House as well as the height of the surrounding fence means that tripod or tetrapod antennae mount is preferred.

Installation: June 2006, stainless steel Bevis pin set with epoxy in a 0.5” hole.

(A) (B)

Figure A-3 Dominica campaign site (A) BOTG, 2011 (B) BOTG, 2011

BRDX

Site located in andesite boulder in a small orchard above a farm just east of TETE (fig. A-4). Take the roads most of the way up to the site and park near the cell tower. Take the path that leads away from the cell tower through the trees to an open field. The site has been overgrown with trees that may require trimming. The landowner was in the process of planting something in the open field so site may be obscured in future visits.

Installation: June 2004, stainless steel Bevis pin set with epoxy in a 0.5” hole. Any type of antenna mount may be used.

(A) (B)

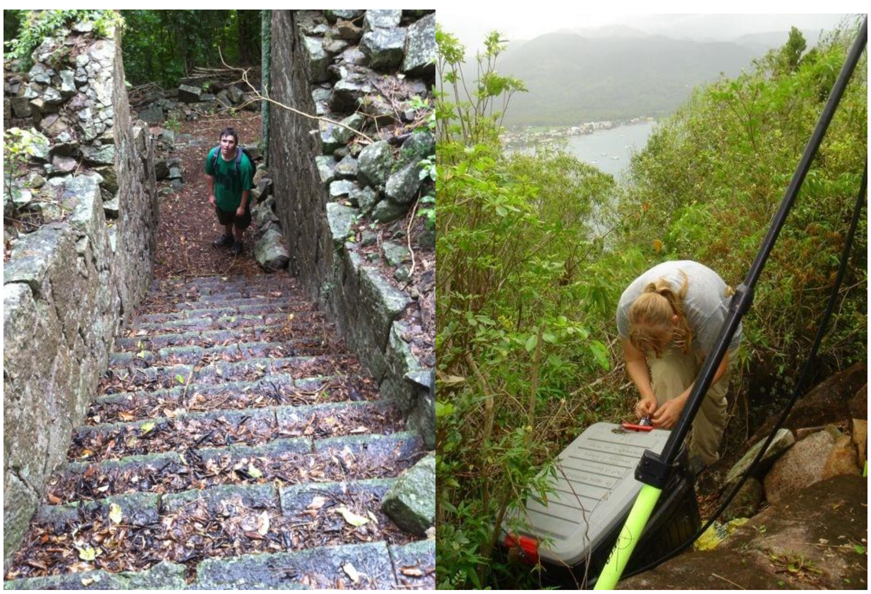
Figure A-4 Dominica campaign site (A) BRDX, 2011 (B) BRDX, 2011

CABR

Government permission from the Forestry Division is needed in order to work at this location. In 2011 and 2012 permission was granted by Jacqueline Andre. In 2012, the department instituted a lengthy application process for working in the parks. An exception was granted for us since we were working with the Office of Disaster Management. It was necessary however, to first get permission from the Office of Disaster Management before requesting the permission from the Forestry Division.

Site is located in Cabrits National Park at the North end of the Island (fig. A-5). As you enter the park (which may require finding someone to lift the gate) you will pass a building on the left associated with the ship docks. After passing the docks, you should be able to see a four sided archway. You need to drive through the archway (even though it looks like it is for foot traffic) and head uphill. Before heading through the arch, find a park representative to show the permission letter to and confirm that it is ok to set up equipment. The road up the hill is narrow and cobblestone as you pass through the outer wall of Fort Shirley. Pass the restored portion of the fort and look for a newer concrete road and follow it uphill a little bit further. There is an old dirt road (4 wheel drive required) that leads over to the parade grounds (fig. A-5) just north of the fort, take this road or park and walk from here. Cross the parade grounds (which may require clearing a path), enter the forest on the other side and look for the ruins of the commandants quarters (fig. A-5). Follow the trail that leads up the hill from here, cross through the ruins of the Douglas Bay Battery (fig. A-5) and keep going. Near the end of the trail, you should find some small cannons. If you are looking along the firing trajectory of the cannons, the site is behind you. Bushwhack to the highest point you can find, the pin is located in an andesite boulder (fig. A-5) most likely overgrown with trees. Depending on where you park, the hike to the site will be a 1-2 mile roundtrip so plan accordingly.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5" hole. Any type of antenna mount may be used, but a tetrapod is the best choice.



(A) (B)

(C) (D)

Figure A-5 Dominica campaign site (A) CABR, 2011 Ruins of the Douglas Bay Battery must be passed through to reach the site (B) CABR, 2006 (C) CABR, 2011,ruins of the commandants quarters (D) CABR, 2011, parade grounds overgrown, follow the signs to Douglas Bay Battery

CASS

Site is located in bedrock on the southern coast, at Zandoli Inn (fig. A-6). Permission may be gained from Jen (the owner) who may be reached by email through the Zandoli Inn website (http://www.zandoli.com). The groundskeeper's name is Daison, he knows the location of the site and is most helpful. The site is located on the cliffs above the ocean just off of one of the hotel's walking paths. Park in the hotel parking and head towards the hotel. Take a left at the hotel and head down the stairs to the trails.

Cross the creek and continue to choose the "high road" trails. After walking 100 yards or so, parallel to the coastline, start looking for a place to cut through the trees and emerge onto rocky cliffs. The pin is located in a rock near the tree line. A spike mount is preferred for antennae setup at this site.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5” hole

(A) (B)

Figure A-6 Dominica campaign site (A) CASS, 2012 (B) CASS, 2006

CNCD

Site is located on the road that leads from the airport to Ponde Casse (fig. A-7), approximately 3.5 km after the road turns away from the ocean (this road was closed in 2011 and 2012 so 4 wheel drive was required). The site is located on a large boulder (requires scrambling up) on private property on the south side of the road. The nearest most notable landmark is the pink modern style house just to the north of the property.

The property owners were not present, but the caretakers of the property were able to grant permission for access, and showed us to and cleared the site which was quite overgrown.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5” hole. A spike mount is preferable for this site.

(A) (B)

Figure A-7 Dominica campaign site (A) CNCD, 2006 (B) CNCD, 2006

COHT

Site is located just off the main road near Colihaut (fig. A-8). The pin is located on the top of a large andesite outcrop on the south side of road which will most likely be obscured by foliage. There is a spot to pull off the road just uphill from the site. The landowner's name is Emmanuel, he lives up the mountain. The working surface around the pin is very small which makes it unsuitable for a tetrapod. A carefully placed tripod or a spike mount will work at this location.

Installation: June 2006, stainless steel Bevis pin set with epoxy in a 0.5” hole

(A) (B)

Figure A-8 Dominica campaign site (A) COHT, 2012 Place to park, site is located at the top of the peak shown (B) COHT, 2012

CONN

Site is located in large andesite boulder on top of a hill in a clearing at Connor Estates (fig. A-9). The owner of the property is Andre and in 2011, the property was for sale. His nephew was in the process of building the next house to the north. There is a driveway up to the property, but I do not recommend driving on it. We parked at the base and walked up towards the house. Before you get to the house, cut left through the grove of fruit trees. The boulder is located on the slope between the trees and the road. Andre is very friendly and says researchers are always welcome. A spike mount is best for this location.

Installation: June 2006, stainless steel Bevis pin set with epoxy in a 0.5” hole

(A) (B)

Figure A-9 Dominica campaign site (A) CONN, 2011 (B) CONN, 2011, path up to house with new concrete

ELOI

Site is located in bedrock on the floor of an abandoned quarry (fig. A-10). Any type of antenna mount could be implemented at this site. This site was not occupied due to time and logistical constraints.

Installation: June 2003, stainless steel Bevis pin set with epoxy in a 0.5” hole.

(A) (B)

Figure A-10 Dominica campaign site (A) ELOI, 2006 (B) ELOI, 2006

FRSH

Site is located near the shore of Freshwater Lake in the National Park at the base of Morne Microtrin (fig. A-11). Government permissions are required in order to work on this site. The road to this location is well paved. Take the road all the way to the park, drive past the park buildings and through a green metal gate where you may park. The pin is located in a buried boulder at ground level and very difficult to find. In 2012, it was completely covered with soil and chest high foliage. A tripod or tetrapod is needed for this site.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5” hole.


(A)


(B)

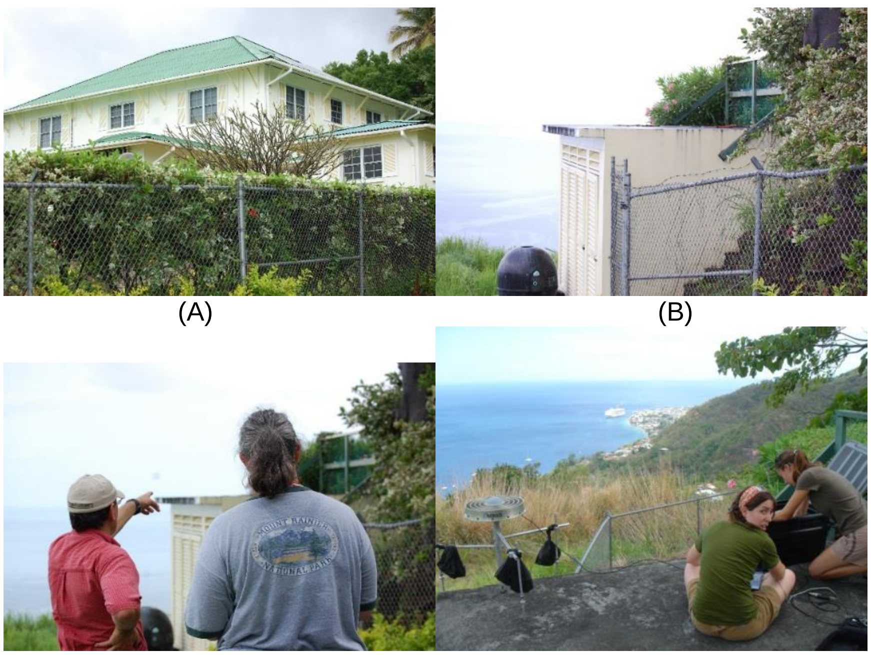

(C)

Figure A-11 Dominica campaign site (A) FRSH, 2012, looking at park entrance with lake to right and site to rear (B) FRSH, 2012, view of site from parking area (C) FRSH, 2012

GOMM

Site is located in a small concrete roof of the pool equipment building adjacent to the pool at Gommier Estates (fig. A-12). The house belongs to the Scotia Bank, and the main office must be contacted for permission to access the site. It is easiest to make an appointment with the bank manager and visit the bank in person for permission. Once at the site, the caretakers can unlock the gate next to the pool equipment house. A spike mount is the ideal for this location.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5" hole.



(A) (B) (C) (D)

Figure A-12 Dominica campaign site (A) GOMM, 2011, the estate where the site is located (B) GOMM, 2011, view of the pool equipment building (C) GOMM, 2011,pin located very near the end of Glen Mattioli's pointed finger (D) GOMM, 2006

GSAV

Site is on top of a large andesitic outcrop on the property of the Stonehedge Safari Hotel (fig. A-13). The road to the hotel is through a grassy field that leads to an oceanside cliff. A spike mount is required, the area around the site is very limited. A black plastic water tank has recently been installed very near the site which creates an obstruction that may cause interference. Owner is very friendly and helpful, his presence insures the security of this location.

Installation: June 2004, stainless steel Bevis pin set with epoxy in a 0.5”hole.

(A) (B)

Figure A-13 Dominica campaign site (A) GSAV, 2011 Harrison Miller pointing to site (B) GSAV, 2011 site installed

GUIG

Site is located in a small concrete foundation atop a hill at Point Guignard on the west coast of the island (fig. A-14). The land has changed hands twice since the site was installed. Wayne Abraham attempted unsuccessfully to find the current owner for permission. There is a fence with a locked gate and "no trespassing" signs posted so permission is required. There are stairs that lead to the site.

Installation: June 2006, stainless steel Bevis pin set with epoxy in a 0.5” hole.

(A) (B)

Figure A-14 Dominica campaign site (A) GUIG, 2006 (B) GUIG, 2006

MHAM

Site is located in a boulder in a field near Middleham Falls (fig. A-15). Follow GPS along the road to Middleham and park near the house shown in figure A-15. Cross through an orchard and head downhill from the road. The ground is very soft so a tripod/tetrapod is best. In 2011, the site was overgrown with ground cover.

Installation: June 2007, stainless steel Bevis pin set with epoxy in a 0.5” hole.

Figure A-15 Dominica campaign site (A) MHAM, 2011

MNTV

The site is located in a boulder on a slope behind a green bar/restaurant facility that is only open sporadically. The owner does not live in the country, the next door neighbor's name is Alan and he knows the location of the pin. This location is pretty close to the road and easy to get to. Park at the green guard hut shown in figure A-16, cross the courtyard and head uphill. A tripod/tetrapod is best for this location.

Installation: June 2007, stainless steel Bevis pin set with epoxy in a 0.5" hole.

(A) (B) (C) (D)

Figure A-16 Dominica campaign site (A) MTNV, 2011 (B) MTNV, 2012 (C) MTNV, 2011, parking location (D) MTNV, 2006

NEWF

Site is located on an andesite boulder in a field (fig. A-17). Landowner approval is required. The owner's name is Joseph (767-617-2333) and he will demand payment for land use. In 2012, he was paid $400 (Caribbean) for 4 occupation days. Although at first meeting, he may seem confrontational, he is very helpful. If you arrange a time with him, he will clear a path to and around the site, and will assist with the transport of gear. He knows the location of the site, which will be difficult to find without him due to the overgrowth. In 2012, the boulder in figure A-17 was surrounded by head-height foliage.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5” hole.


(A)


(B)


(C)


(D)

Figure A-17 Dominica campaign site (A) NEWF, 2012, location to park (B) NEWF, 2012, looking north, site is approximately 100m into the field, entirely obscured by vegetation (C) NEWF, 2006 (D) NEWF, 2006

NVEN

Site is located in a concrete foundation at the edge of a field (fig. A-18). The road to this location is in very poor condition, four-wheel drive required. Following GPS, you will be able to drive most of the way to this site. You will walk approximately 75 yards along a dasheen field to its back edge where the slab is located. In 2011, the concrete slab was completely overgrown and not visible (fig. A-18). Any type of standard antenna mount will work for this location. The landowner is Mathew Bernard (277-6063) and he is very friendly. Notify him or a neighbor before setting up equipment.

Installation: June 2004, stainless steel Bevis pin set with epoxy in a 0.5” hole

(A) (B)

(C) (D)

Figure A-18 Dominica campaign site (A) NVEN, 2011 before cleared (B) NVEN, 2011 cleared (C) NVEN, 2006 (D) NVEN, 2006

SCTT

Site is located in a boulder on top of Scott's Head at the southern tip of the Island (fig. A-19). In 2011 it had been completely covered with soil and vegetation. A narrow land bridge (rocky beach) is crossed before heading up the hill. The dirt road that leads up to the tower was drivable in 2011 and you can park and turn around at the tower. The short walk up to the peak from here begins with concrete stairs and ends with a scramble.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5" hole

(A) (B)

Figure A-19 Dominica campaign site (A) SCTT, 2011 view of land bridge and tower to park near (B) SCTT, 2011 installed

SOIE

Site is located at Point La Soie on the north coast of the island (fig. A-20). Park on the shoulder and walk about 300m along a path through the orchard towards the coast. The path to take used to be a dirt road but trees have been cut down to block passage. Any mount may be used, the area surrounding the site is flat and rocky adjacent to the coast.

Installation: June 2003, stainless steel Bevis pin set with epoxy in a 0.5” hole

Figure A-20 Dominica campaign site (A) SOIE, 2011

SPAG

Site is located in an andesite boulder at the base of cellular towers atop Morne Espagnole (fig. A-21). The road to the top is very steep with tight switchbacks (even by Dominica standards), it is not advisable to drive the entire way to the top. A spike mount is required for this site. The site is near the cable and wireless long-range transmission antennae.

Installation: June 2004, stainless steel Bevis pin set with epoxy in a 0.5” hole.

(A) (B)

Figure A-21 Dominica campaign site (A) SPAG, 2012 (B) SPAG, 2012

SPNG

Site sits in andesite boulder on the grounds of Springfield Estates. Take the steps that lead down to the river from the main porch and make an immediate right once at the base of the rock wall that provides support for the porch. The pin is in a boulder next to the wall that will probably be covered with foliage. A tetrapod works best at this location. AC power is available with use of extension cords from the main facility.

Installation: June 2004, stainless steel Bevis pin set with epoxy in a 0.5” hole

TETE

Site located in andesite boulder near the top of Tete Morne (fig. A-22). It is in a clearing located behind a large cylindrically shaped concrete structure (fig. A-22) just before the end of the 4x4 road leading to the mountain top. Any type of antennae mount is suitable for this location. In 2012 we encountered the landowner, who was friendly, tending crops on this property.

Installation: June 2004, stainless steel Bevis pin set with epoxy in a 0.5” hole

(A) (B)

Figure A-22 Dominica campaign site (A) TETE, 2012 (B) TETE, 2012, park at this location and take a path to the left of this concrete structure

WOTT

Site located on the roof of the primary schoolhouse in Wotten Waven (fig. A-23). Either a tall ladder or a ladder placed in the bed of a truck will be required to access the site. The pin is set into the roof just behind the basketball goal. We stayed at Archbold Tropical Research Center (Springfield Guesthouse), and were able to borrow a ladder from the caretaker Desmond.

Installation: June 2001, stainless steel Bevis pin set with epoxy in a 0.5” hole

(A) (B)

Figure A-23 Dominica campaign site (A) WOTT, 2012 (B) WOTT, 2012

WQ95

Site located on the roof of what used to be WQ95 radio station (fig. A-24). In 2011/2012, the building was owned by Dragon Windows (www.dragonwindows.com), but no one was ever present. Numerous unsuccessful attempts in 2011/2012 were made to gain permission to install. A spike mount is required for this location.

Installation: June 2006, stainless steel Bevis pin set with epoxy in a 0.5" hole

(A) (B)

Figure A-24 Dominica campaign site (A) WQ95, 2006 (B) WQ95, 2006

Appendix B

COCONet Time Series

For all time series in this Appendix:

Red dots are the daily position estimates (16 – 24 hr occupations).

Blue lines are the predicted plate rates in IGS08 held fixed (horizontal).

Green lines are the least squares best-fit site rates in IGS08 with respect to the Caribbean plate rate (CA).

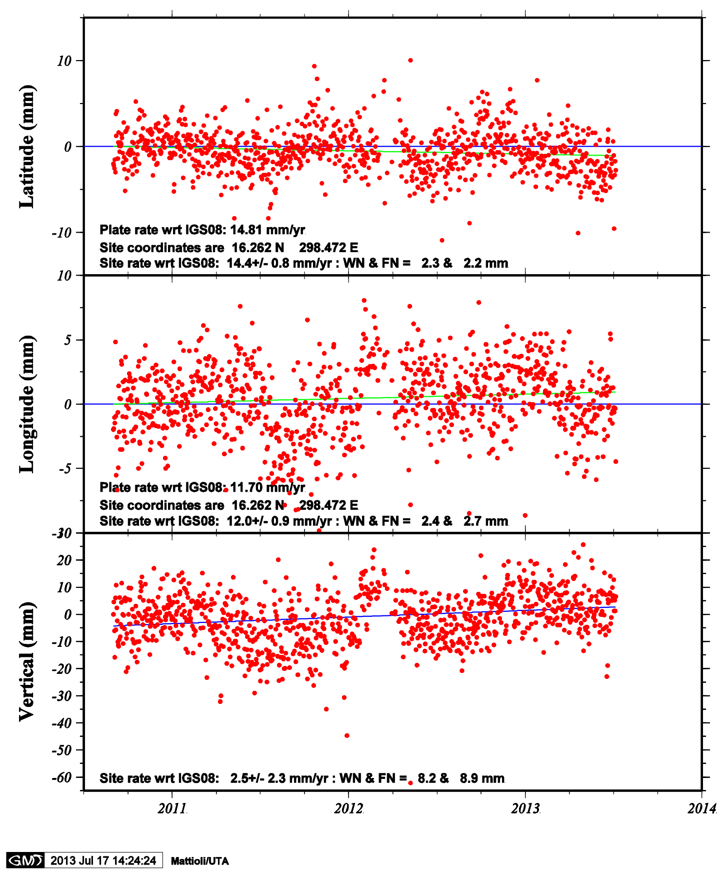
WN = white noise estimates

FN = flicker noise estimates

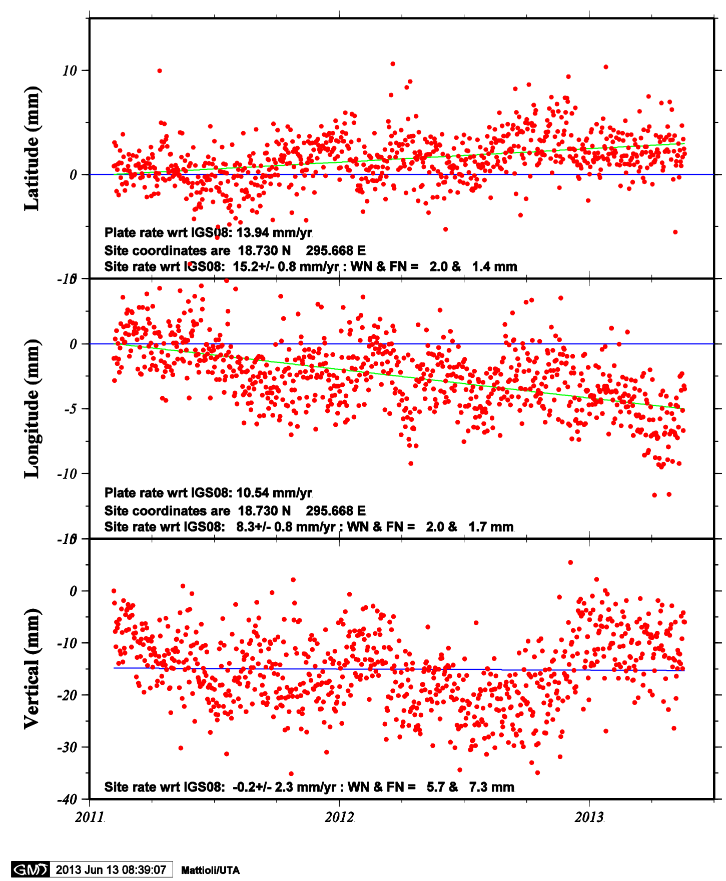
Black vertical dotted lines indicate when a correction has been made for an offset created either by a seismic event or an antenna change.

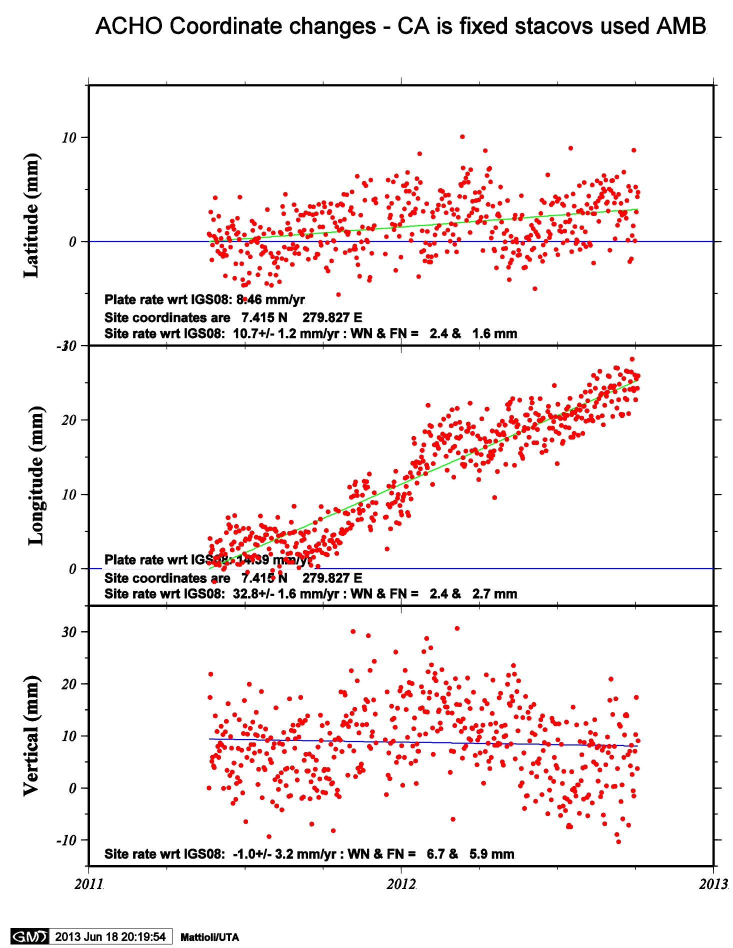
These data have been processed using GIPSY-OASIS II version 6.2, with ambiguity resolution on, using VMF1GRID for tropospheric corrections, and using absolute antenna phase center information.

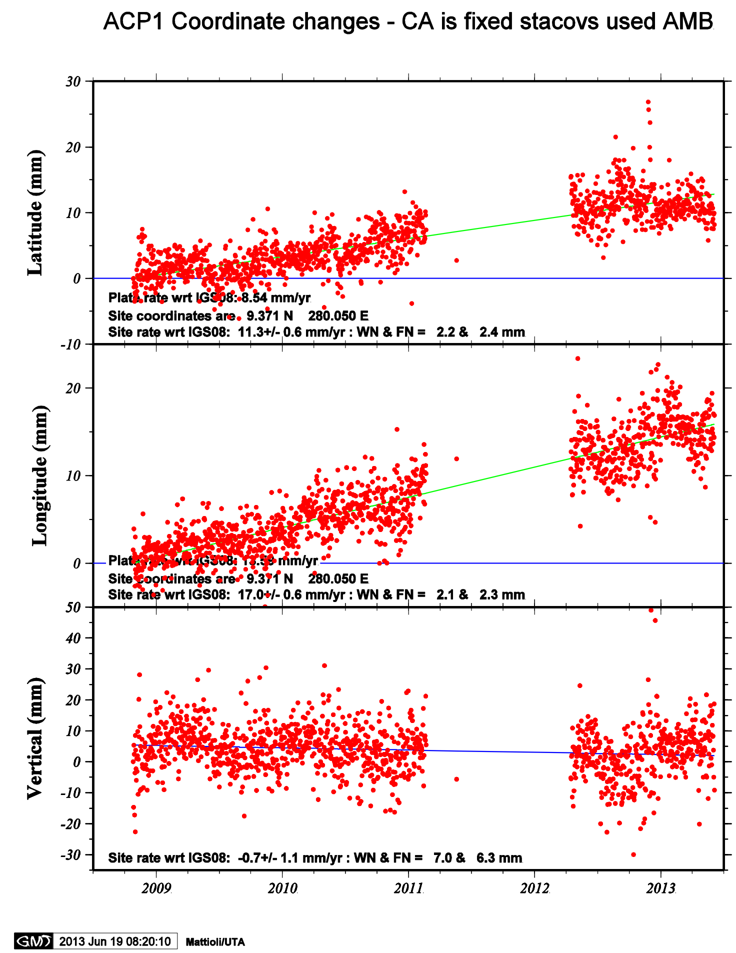
ABMF Coordinate changes - CA is fixed stacovs used AMB



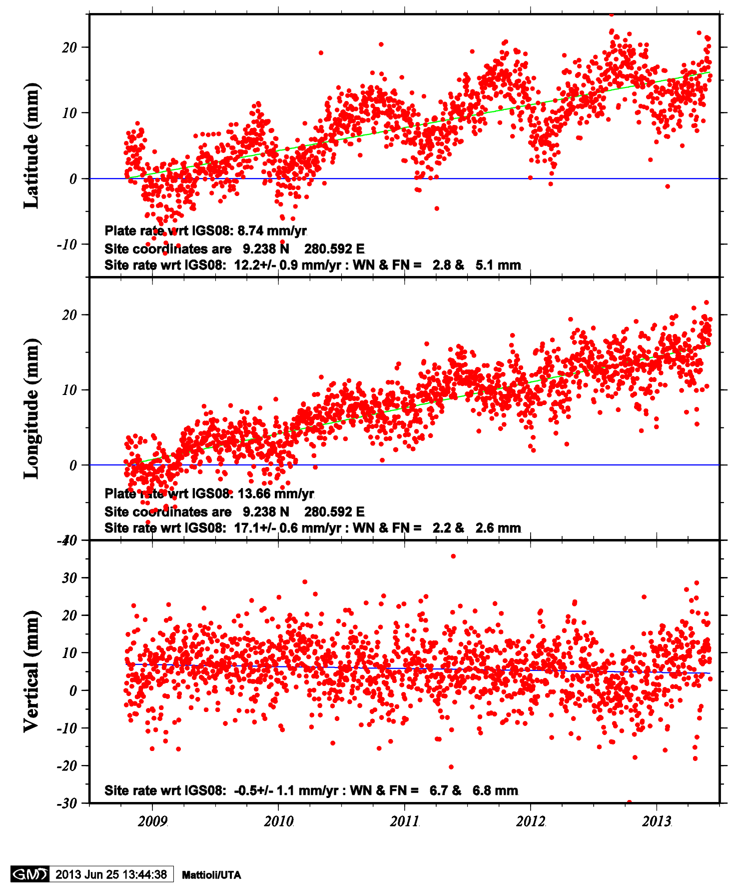
ABVI Coordinate changes - CA is fixed stacovs used AMB



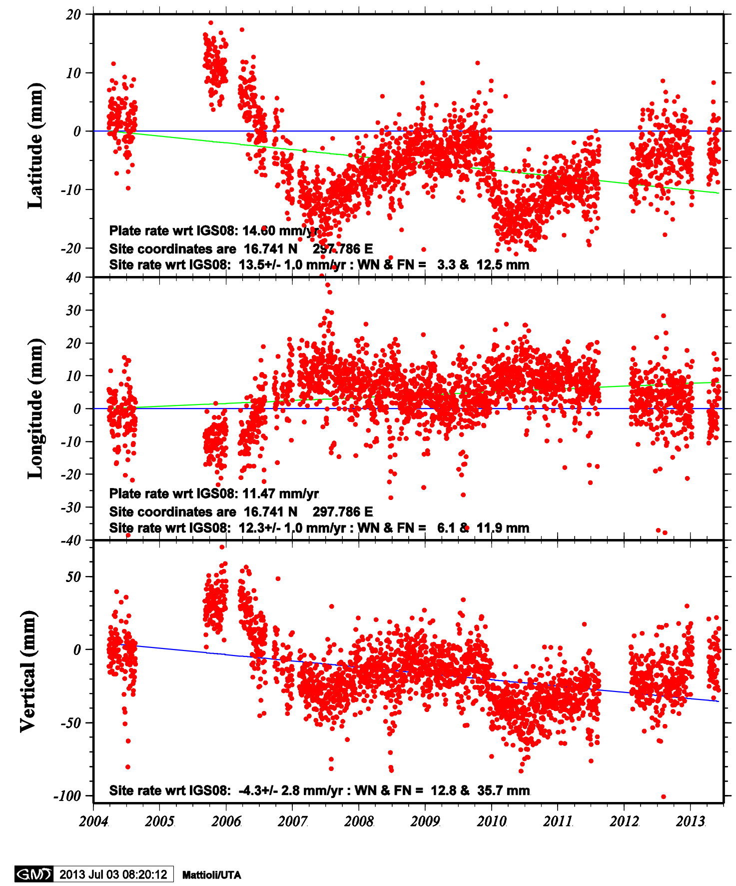

ACHO Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 8.46 mm/yr
Site coordinates are 7.415 N 279.827 E
Site rate wrt IGS08: 10.7+/- 1.2 mm/yr : WN & FN = 2.4 & 1.6 mm
Longitude (mm)
Site coordinates are 7.415 N 279.827 E
Site rate wrt IGS08: 32.8+/- 1.6 mm/yr : WN & FN = 2.4 & 2.7 mm
Vertical (mm)
Site rate wrt IGS08: -1.0+/- 3.2 mm/yr : WN & FN = 6.7 & 5.9 mm
2011
2012
2013
2013 Jun 18 20:19:54
Mattioli/UTA

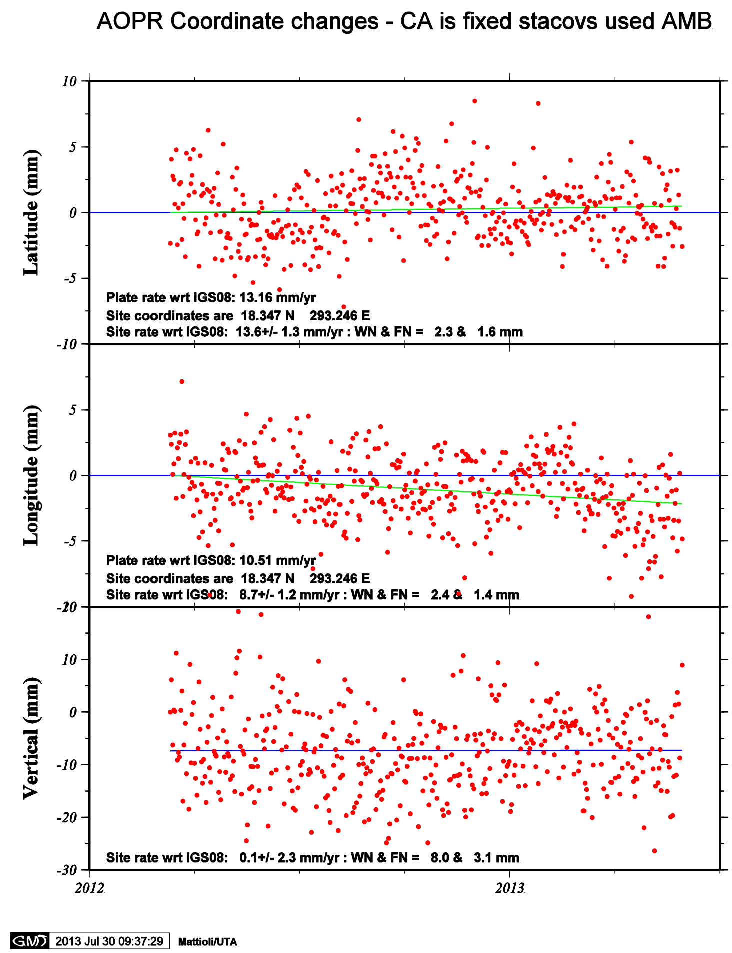

ACP1 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Site coordinates are 9.371 N 280.050 E
Site rate wrt IGS08: 11.3+/- 0.6 mm/yr : WN & FN = 2.2 & 2.4 mm
Longitude (mm)
Site rate wrt IGS08: 17.0+/- 0.6 mm/yr : WN & FN = 2.1 & 2.3 mm
Vertical (mm)
Site rate wrt IGS08: -0.7+/- 1.1 mm/yr : WN & FN = 7.0 & 6.3 mm
2009
2010
2011
2012
2013
2013 Jun 19 08:20:10
Mattioli/UTA

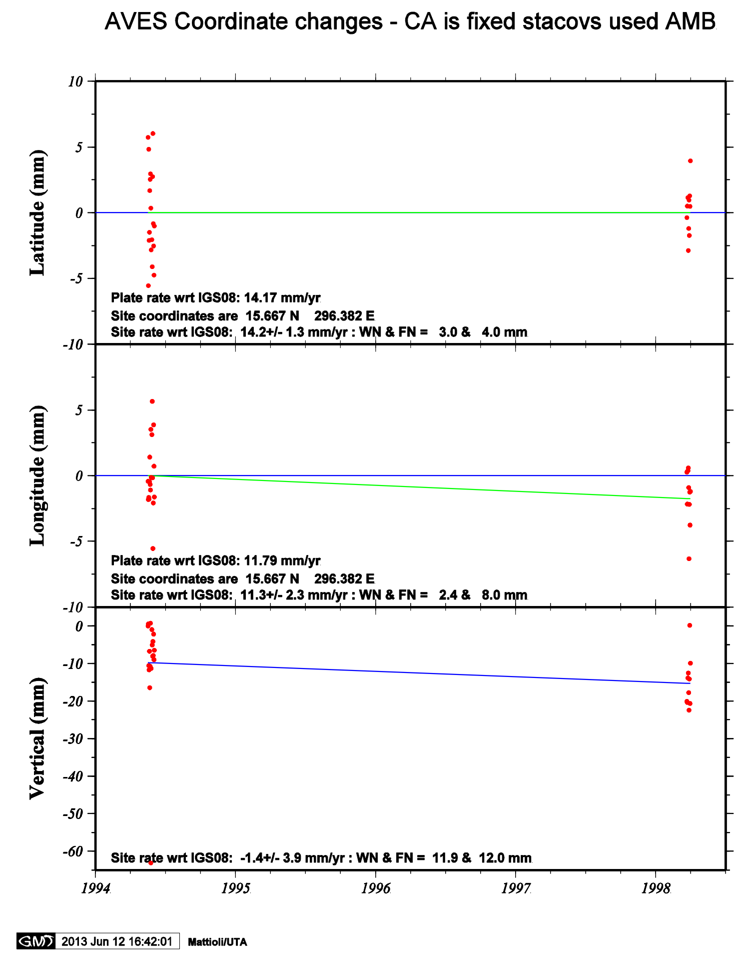
ACP6 Coordinate changes - CA is fixed stacovs used AMB

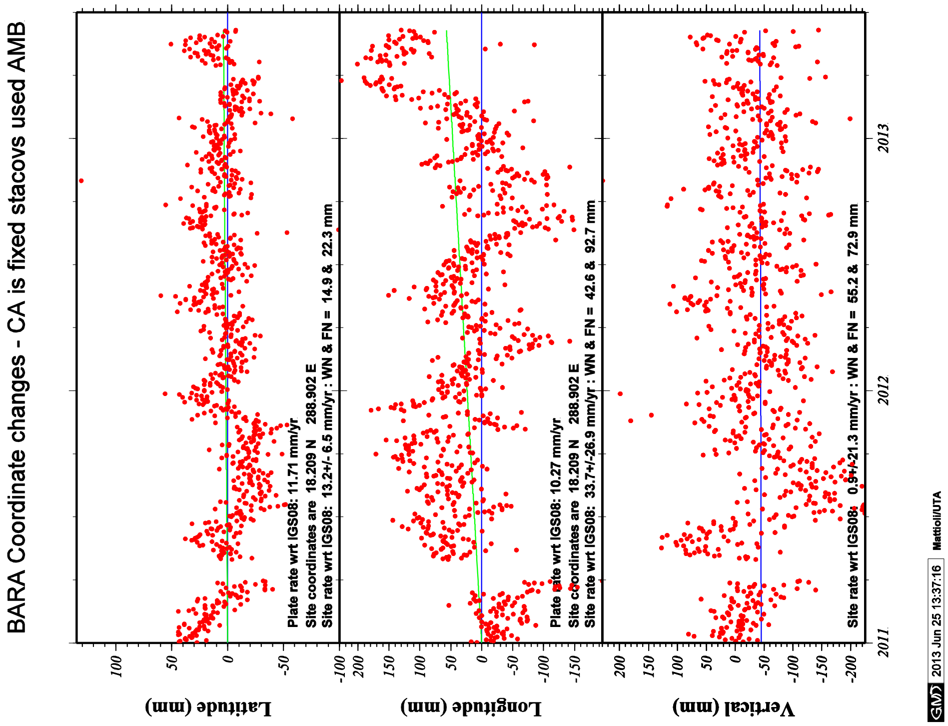


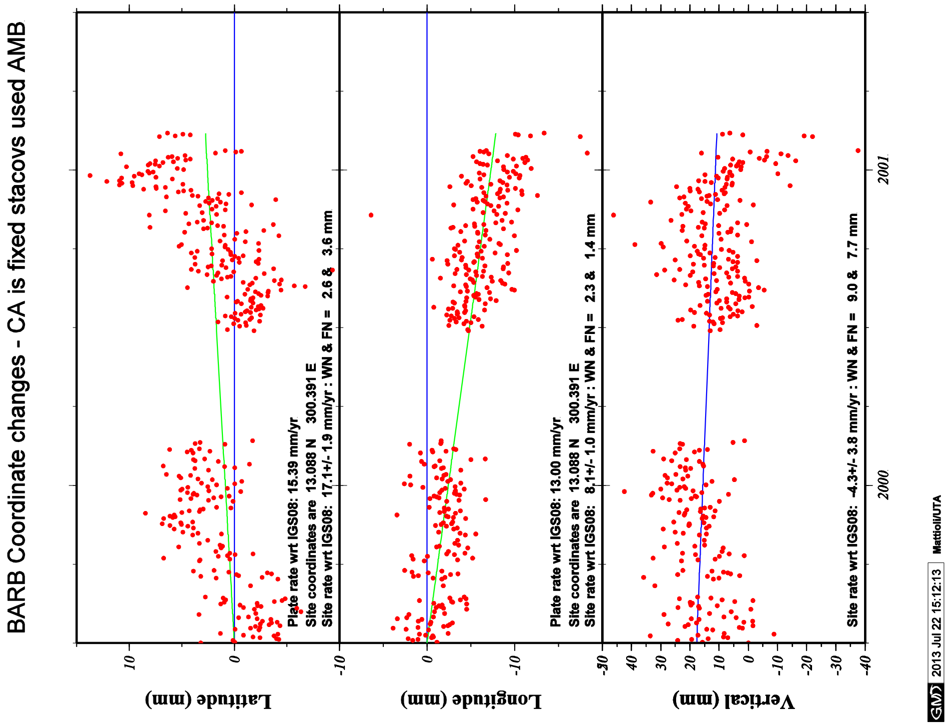
AIRS Coordinate changes - CA is fixed stacovs used AMB

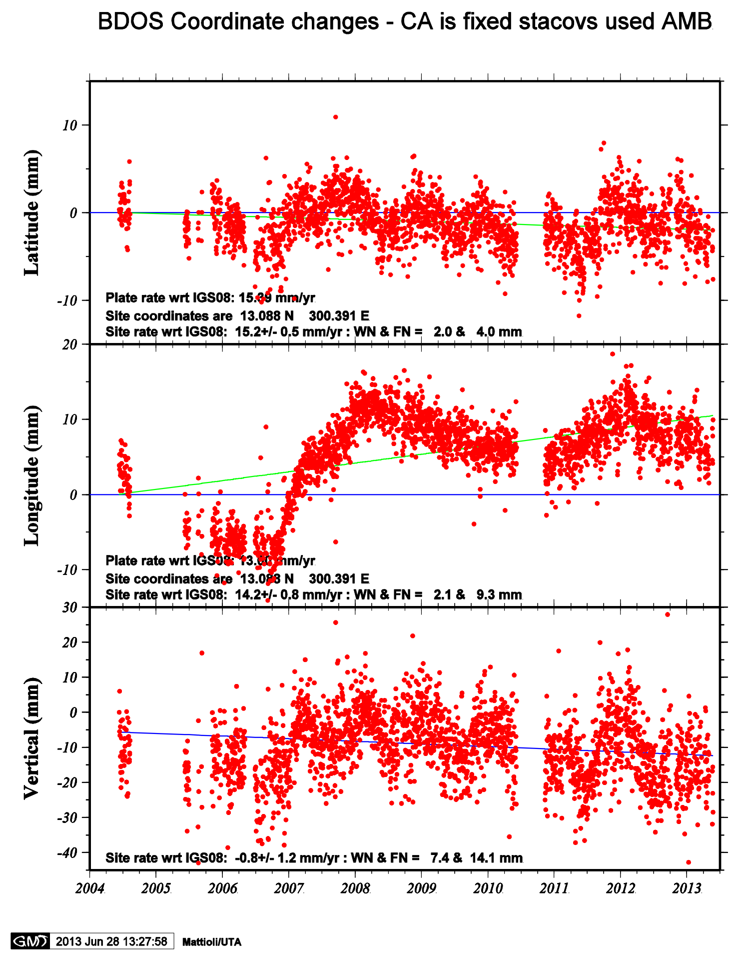


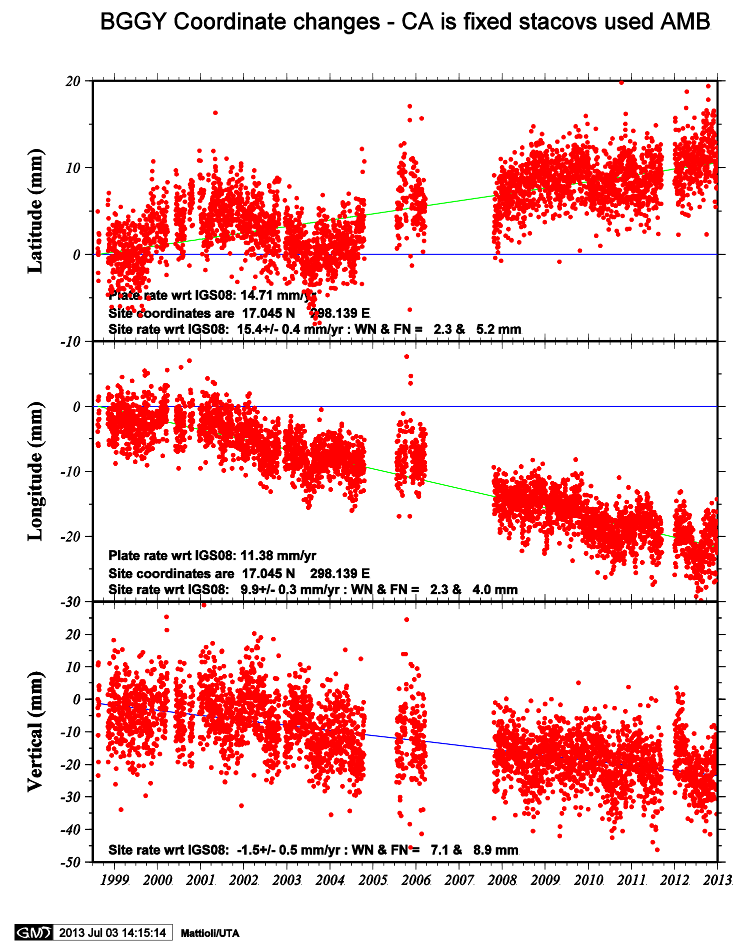

AOPR Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 13.16 mm/yr
Site coordinates are 18.347 N 293.246 E
Site rate wrt IGS08: 13.6+/- 1.3 mm/yr : WN & FN = 2.3 & 1.6 mm
Plate rate wrt IGS08: 10.51 mm/yr
Site coordinates are 18.347 N 293.246 E
Site rate wrt IGS08: 8.7+/- 1.2 mm/yr : WN & FN = 2.4 & 1.4 mm
Site rate wrt IGS08: 0.1+/- 2.3 mm/yr : WN & FN = 8.0 & 3.1 mm
2012
2013
GMT 2013 Jul 30 09:37:29 Mattioli/UTA


AVES Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 14.17 mm/yr
Site coordinates are 15.667 N 296.382 E
Site rate wrt IGS08: 14.2+/- 1.3 mm/yr : WN & FN = 3.0 & 4.0 mm
Plate rate wrt IGS08: 11.79 mm/yr
Site coordinates are 15.667 N 296.382 E
Site rate wrt IGS08: 11.3+/- 2.3 mm/yr : WN & FN = 2.4 & 8.0 mm
Site rate wrt IGS08: -1.4+/- 3.9 mm/yr : WN & FN = 11.9 & 12.0 mm
1994
1995
1996
1997
1998
GMT 2013 Jun 12 16:42:01 Mattioli/UTA

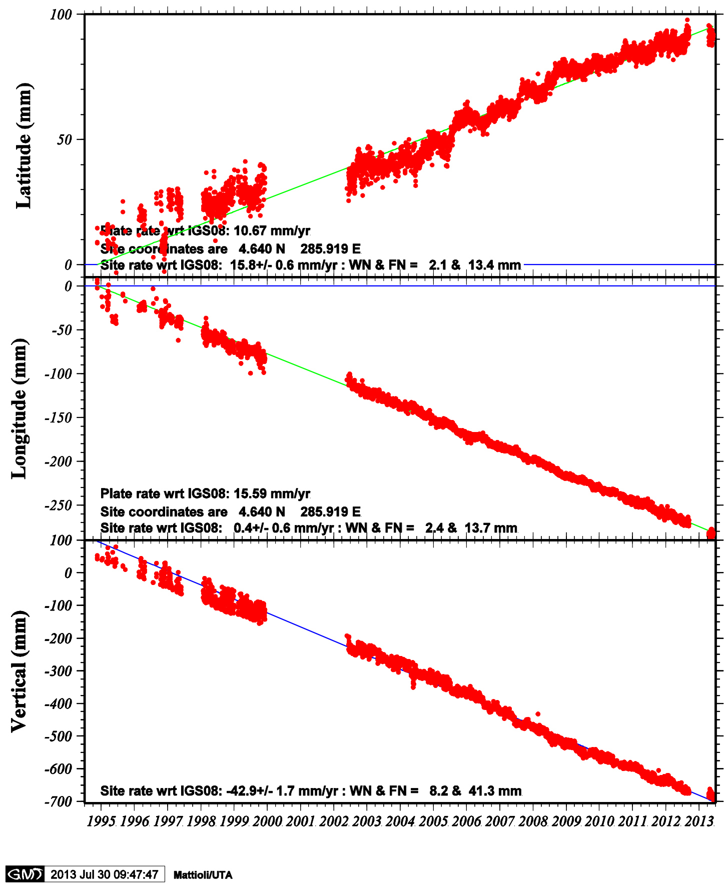

BARA Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 11.71 mm/yr
Site coordinates are 18.209 N 288.902 E
Site rate wrt IGS08: 13.2+/- 6.5 mm/yr : WN & FN = 14.9 & 22.3 mm
Plate rate wrt IGS08: 10.27 mm/yr
Site coordinates are 18.209 N 288.902 E
Site rate wrt IGS08: 33.7+/-26.9 mm/yr : WN & FN = 42.6 & 92.7 mm
Site rate wrt IGS08: 0.9+/-21.3 mm/yr : WN & FN = 55.2 & 72.9 mm
2011
2012
2013
2013 Jun 25 13:37:16
Mattioli/UTA


BARB Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 15.39 mm/yr
Site coordinates are 13.088 N 300.391 E
Site rate wrt IGS08: 17.1+/- 1.9 mm/yr : WN & FN = 2.6 & 3.6 mm
Plate rate wrt IGS08: 13.00 mm/yr
Site coordinates are 13.088 N 300.391 E
Site rate wrt IGS08: 8.1+/- 1.0 mm/yr : WN & FN = 2.3 & 1.4 mm
Site rate wrt IGS08: -4.3+/- 3.8 mm/yr : WN & FN = 9.0 & 7.7 mm
2000
2001
2013 Jul 22 15:12:13
Mattioli/UTA

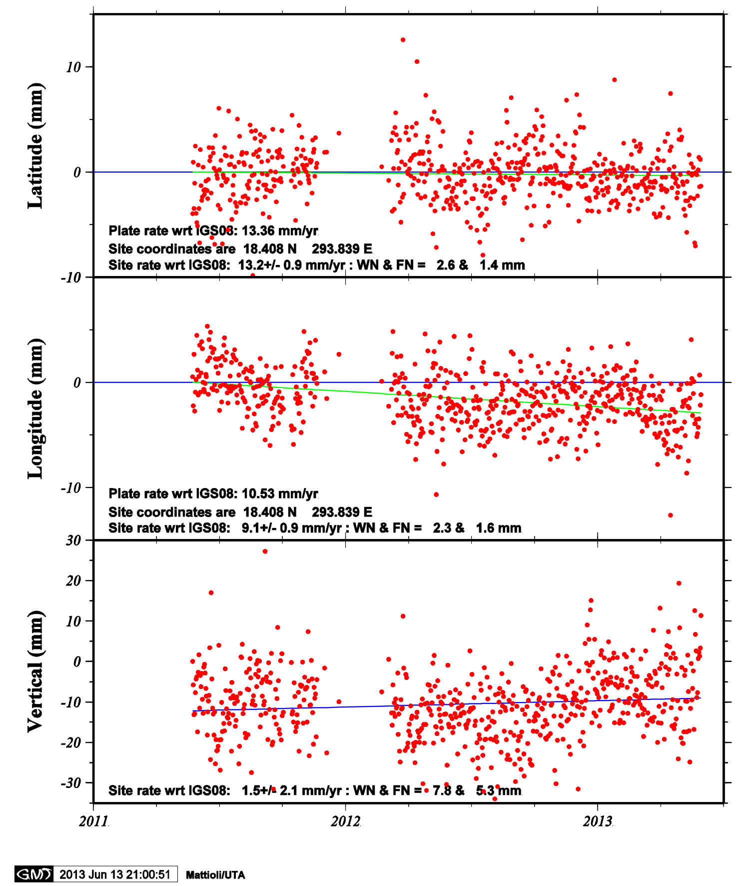

BDOS Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Site coordinates are 13.088 N 300.391 E
Site rate wrt IGS08: 15.2+/- 0.5 mm/yr : WN & FN = 2.0 & 4.0 mm
Longitude (mm)
Site rate wrt IGS08: 14.2+/- 0.8 mm/yr : WN & FN = 2.1 & 9.3 mm
Vertical (mm)
Site rate wrt IGS08: -0.8+/- 1.2 mm/yr : WN & FN = 7.4 & 14.1 mm
2013 Jun 28 13:27:58
Mattioli/UTA


BGGY Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Site coordinates are 17.045 N 298.139 E
Site rate wrt IGS08: 15.4+/- 0.4 mm/yr : WN & FN = 2.3 & 5.2 mm
Longitude (mm)
Plate rate wrt IGS08: 11.38 mm/yr
Site coordinates are 17.045 N 298.139 E
Site rate wrt IGS08: 9.9+/- 0.3 mm/yr : WN & FN = 2.3 & 4.0 mm
Vertical (mm)
Site rate wrt IGS08: -1.5+/- 0.5 mm/yr : WN & FN = 7.1 & 8.9 mm
2013 Jul 03 14:15:14
Mattioli/UTA

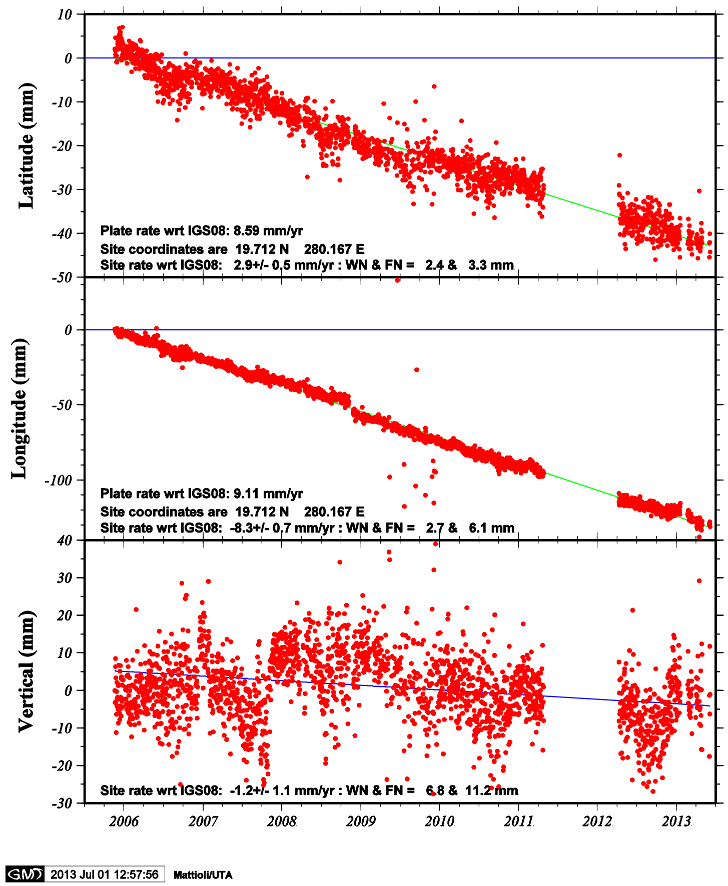
BOGT Coordinate changes - CA is fixed stacovs used AMB



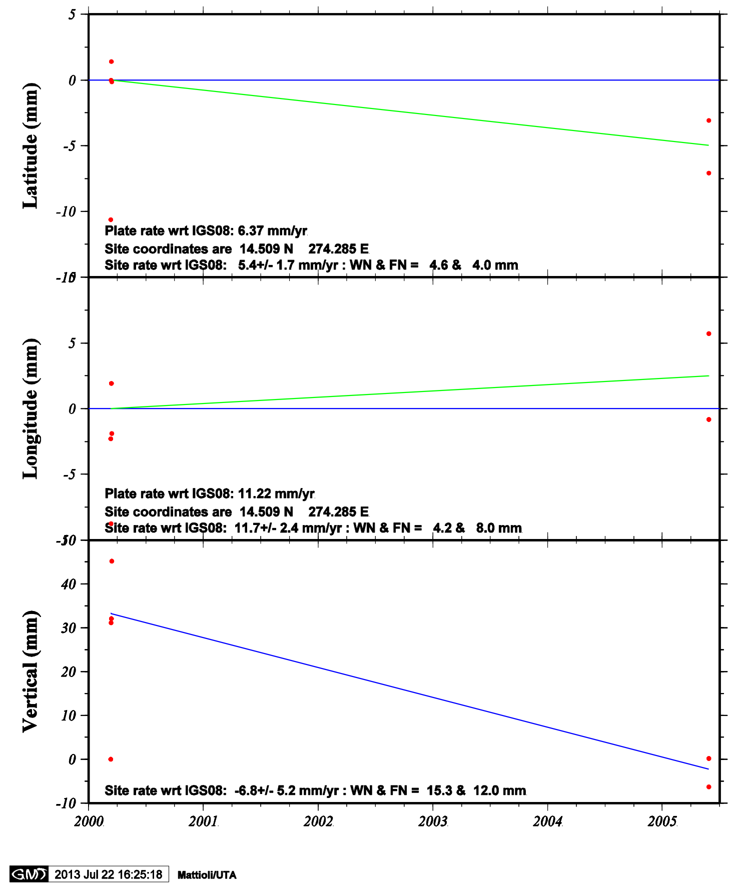
BYSP Coordinate changes - CA is fixed stacovs used AMB



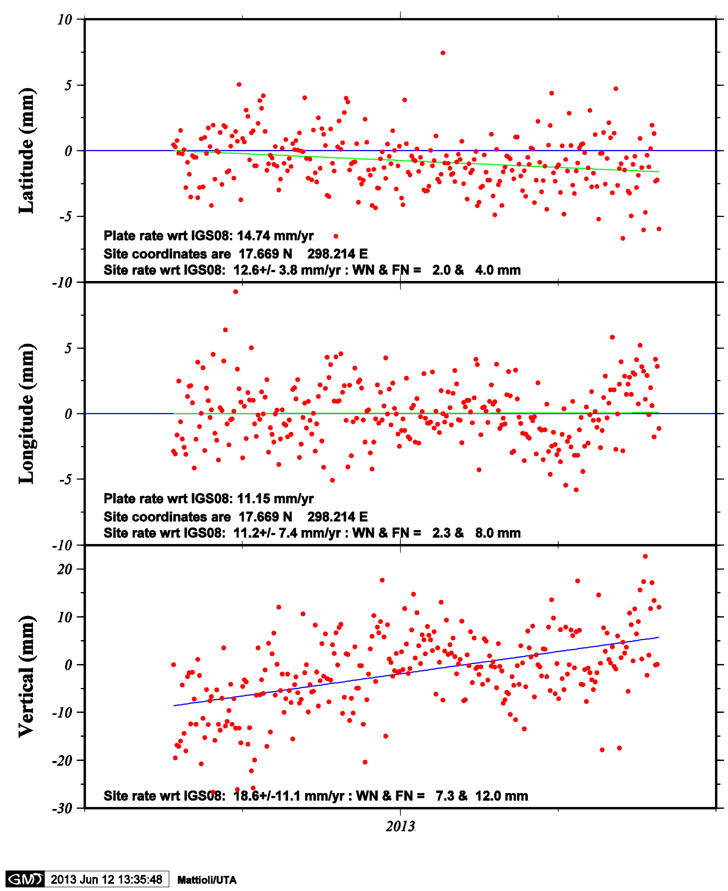
CBSB Coordinate changes - CA is fixed stacovs used AMB



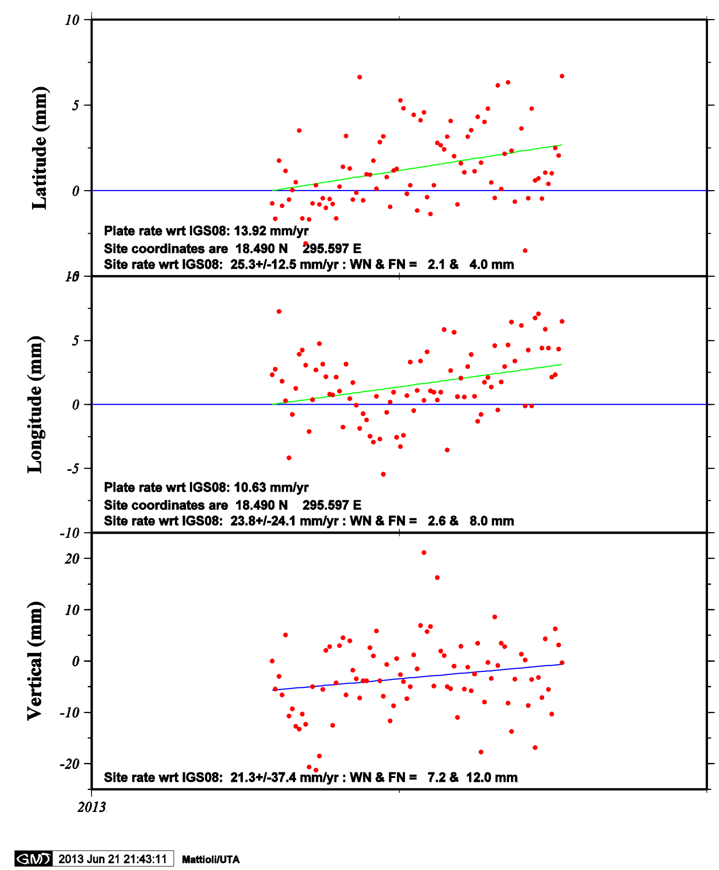
CMP1 Coordinate changes - CA is fixed stacovs used AMB

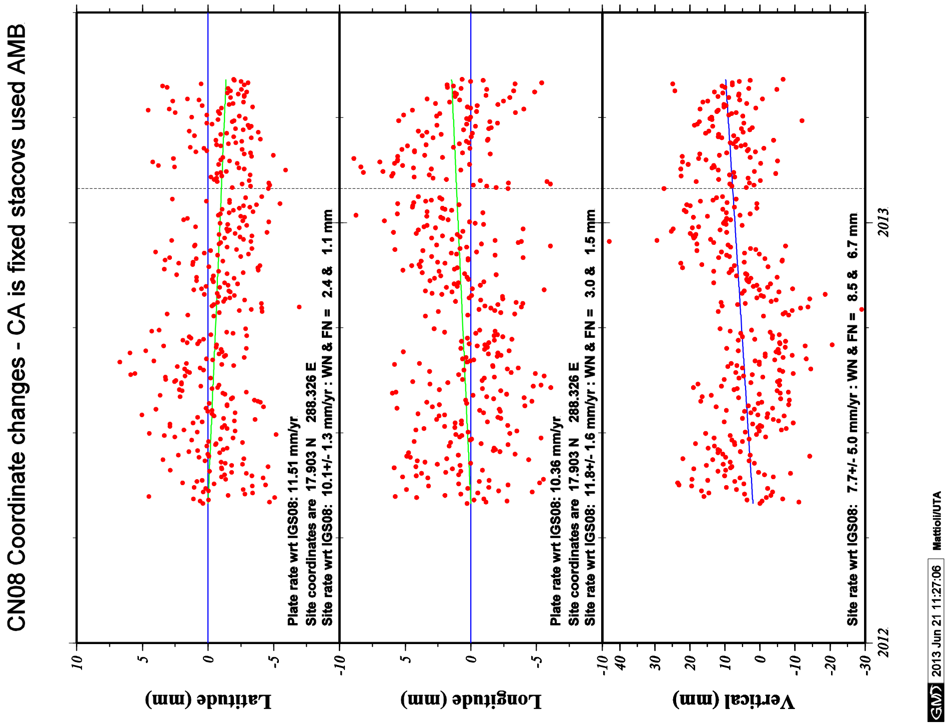


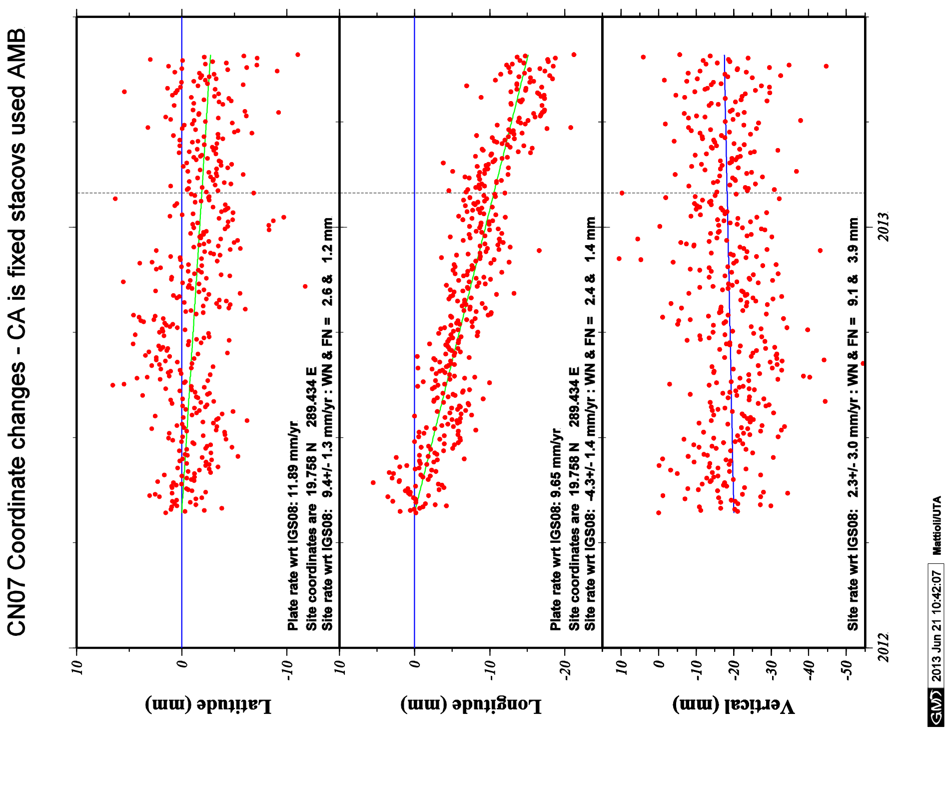
CN00 Coordinate changes - CA is fixed stacovs used AMB

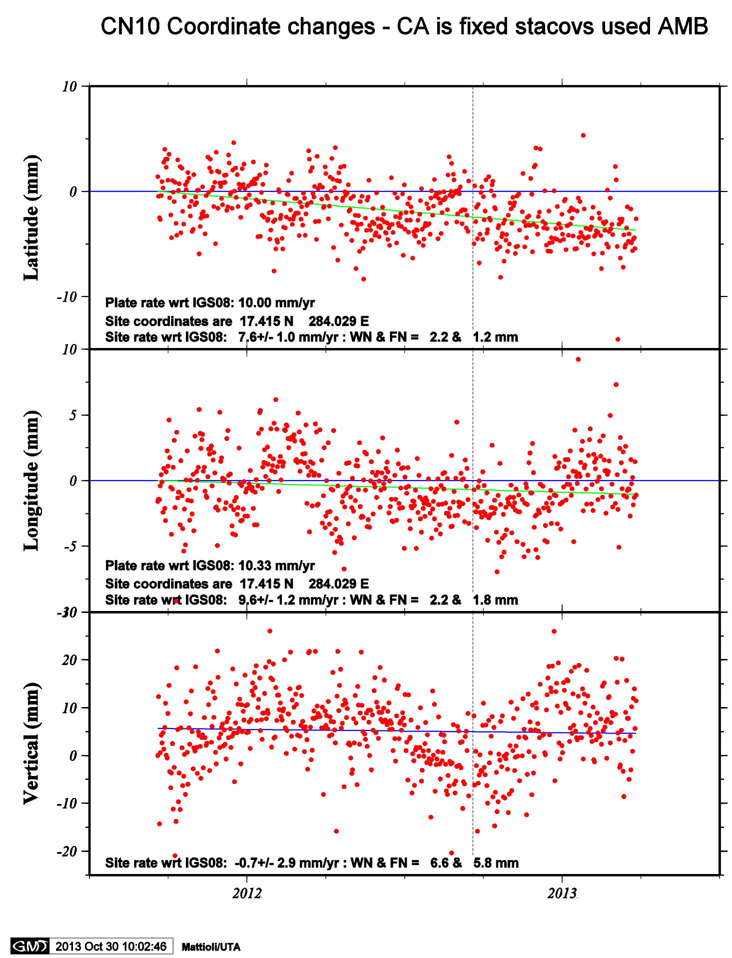


CN03 Coordinate changes - CA is fixed stacovs used AMB

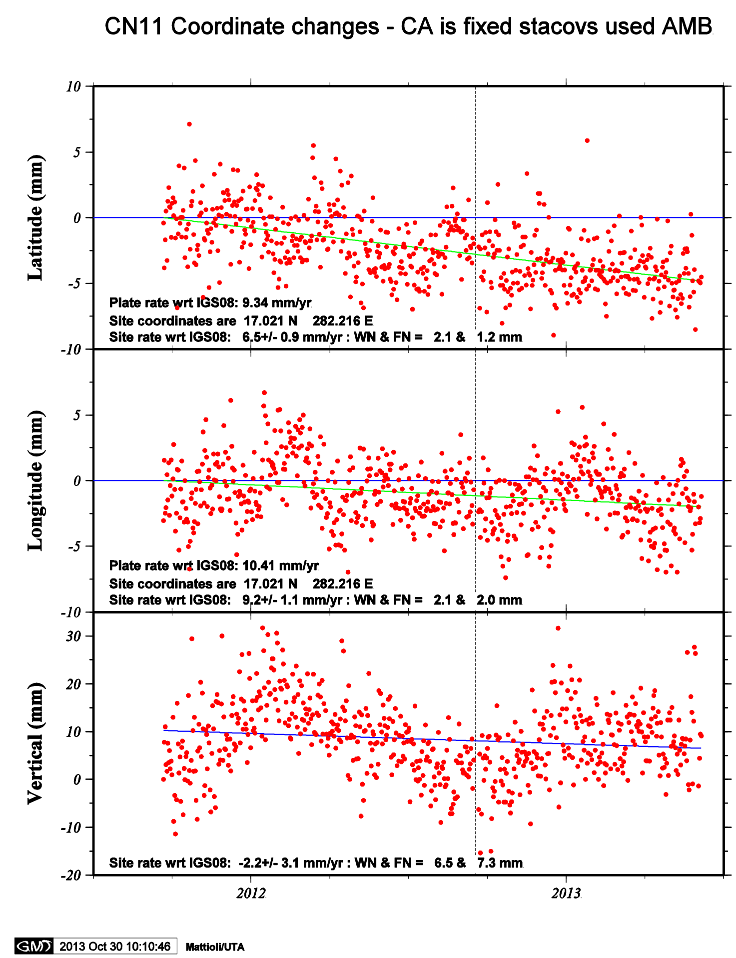



CN08 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.51 mm/yr
Site coordinates are 17.903 N 288.326 E
Site rate wrt IGS08: 10.1+/- 1.3 mm/yr : WN & FN = 2.4 & 1.1 mm
Longitude (mm)
Plate rate wrt IGS08: 10.36 mm/yr
Site coordinates are 17.903 N 288.326 E
Site rate wrt IGS08: 11.8+/- 1.6 mm/yr : WN & FN = 3.0 & 1.5 mm
Vertical (mm)
Site rate wrt IGS08: 7.7+/- 5.0 mm/yr : WN & FN = 8.5 & 6.7 mm
2012
2013
2013 Jun 21 11:27:06
Mattioli/UTA

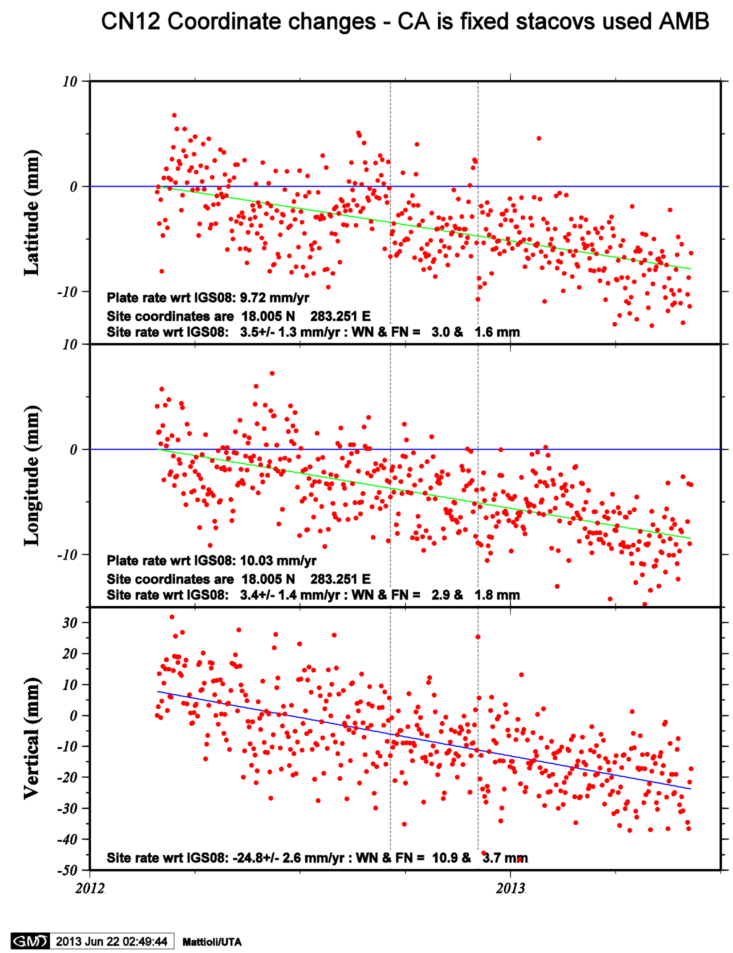

CN07 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.89 mm/yr
Site coordinates are 19.758 N 289.434 E
Site rate wrt IGS08: 9.4+/- 1.3 mm/yr : WN & FN = 2.6 & 1.2 mm
Longitude (mm)
Plate rate wrt IGS08: 9.65 mm/yr
Site coordinates are 19.758 N 289.434 E
Site rate wrt IGS08: -4.3+/- 1.4 mm/yr : WN & FN = 2.4 & 1.4 mm
Vertical (mm)
Site rate wrt IGS08: 2.3+/- 3.0 mm/yr : WN & FN = 9.1 & 3.9 mm
2012
2013
2013 Jun 21 10:42:07
Mattioli/UTA

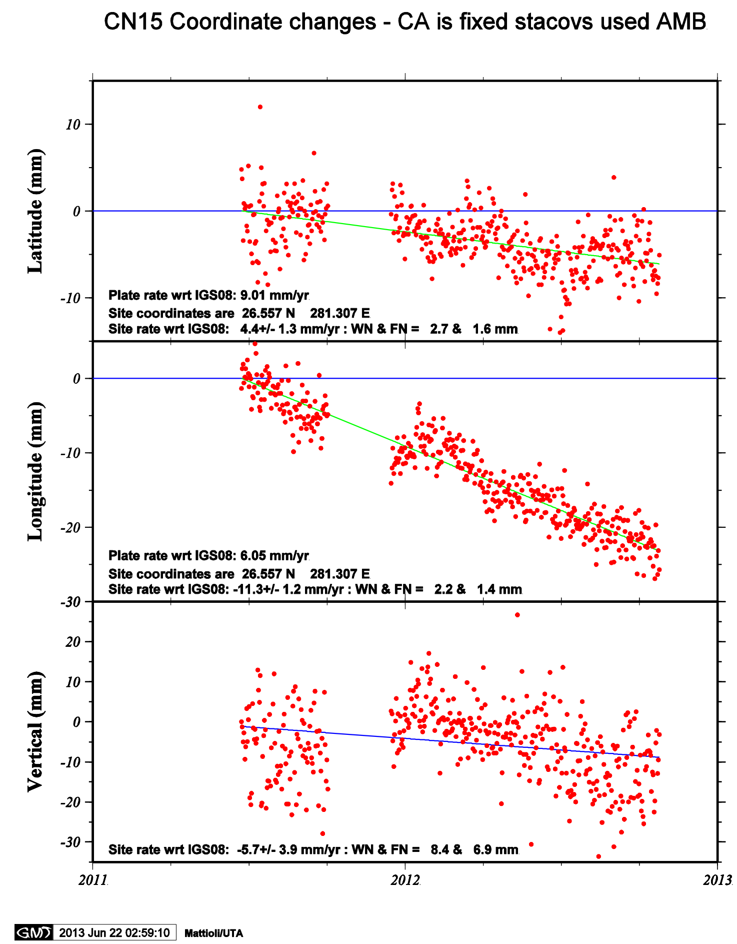


CN10 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 10.00 mm/yr
Site coordinates are 17.415 N 284.029 E
Site rate wrt IGS08: 7.6+/- 1.0 mm/yr : WN & FN = 2.2 & 1.2 mm
Plate rate wrt IGS08: 10.33 mm/yr
Site coordinates are 17.415 N 284.029 E
Site rate wrt IGS08: 9.6+/- 1.2 mm/yr : WN & FN = 2.2 & 1.8 mm
Site rate wrt IGS08: -0.7+/- 2.9 mm/yr : WN & FN = 6.6 & 5.8 mm
2012
2013
2013 Oct 30 10:02:46
Mattioli/UTA

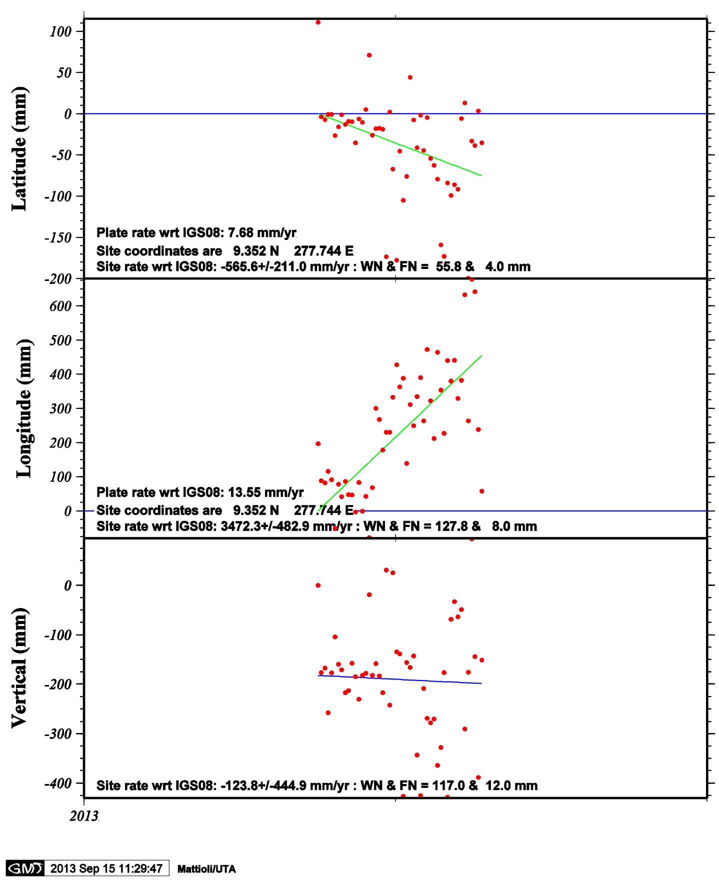


CN11 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 9.34 mm/yr
Site coordinates are 17.021 N 282.216 E
Site rate wrt IGS08: 6.5+/- 0.9 mm/yr : WN & FN = 2.1 & 1.2 mm
Plate rate wrt IGS08: 10.41 mm/yr
Site coordinates are 17.021 N 282.216 E
Site rate wrt IGS08: 9.2+/- 1.1 mm/yr : WN & FN = 2.1 & 2.0 mm
Site rate wrt IGS08: -2.2+/- 3.1 mm/yr : WN & FN = 6.5 & 7.3 mm
2012
2013
2013 Oct 30 10:10:46
Mattioli/UTA

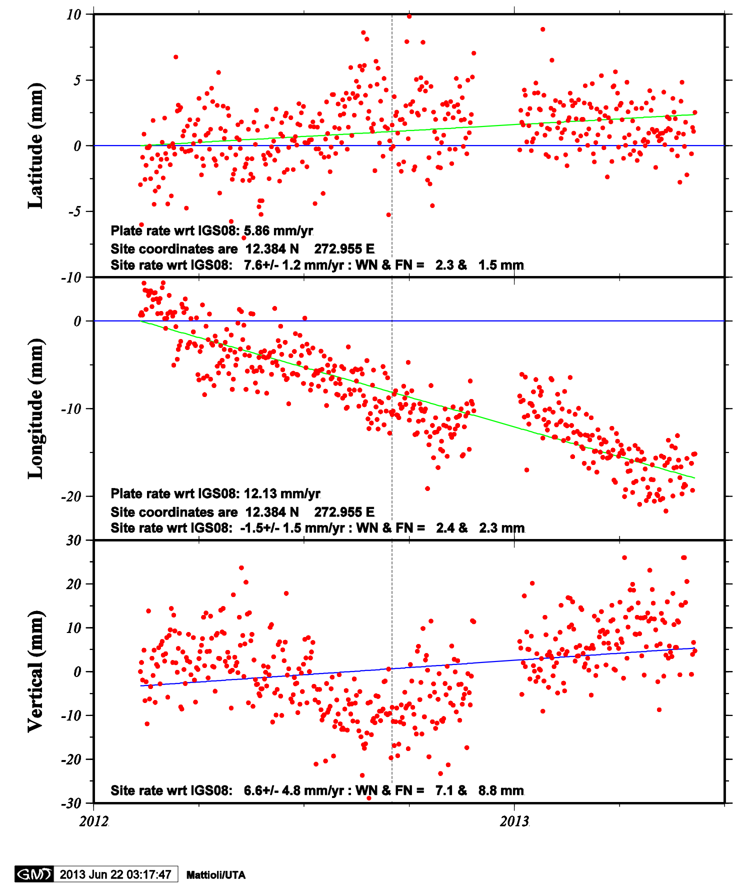

CN12 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 9.72 mm/yr
Site coordinates are 18.005 N 283.251 E
Site rate wrt IGS08: 3.5+/- 1.3 mm/yr : WN & FN = 3.0 & 1.6 mm
Plate rate wrt IGS08: 10.03 mm/yr
Site coordinates are 18.005 N 283.251 E
Site rate wrt IGS08: 3.4+/- 1.4 mm/yr : WN & FN = 2.9 & 1.8 mm
Site rate wrt IGS08: -24.8+/- 2.6 mm/yr : WN & FN = 10.9 & 3.7 mm
2012
2013
GMT 2013 Jun 22 02:49:44 Mattioli/UTA


CN15 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 9.01 mm/yr
Site coordinates are 26.557 N 281.307 E
Site rate wrt IGS08: 4.4+/- 1.3 mm/yr : WN & FN = 2.7 & 1.6 mm
Plate rate wrt IGS08: 6.05 mm/yr
Site coordinates are 26.557 N 281.307 E
Site rate wrt IGS08: -11.3+/- 1.2 mm/yr : WN & FN = 2.2 & 1.4 mm
Site rate wrt IGS08: -5.7+/- 3.9 mm/yr : WN & FN = 8.4 & 6.9 mm
2011
2012
2013
GMT 2013 Jun 22 02:59:10 Mattioli/UTA

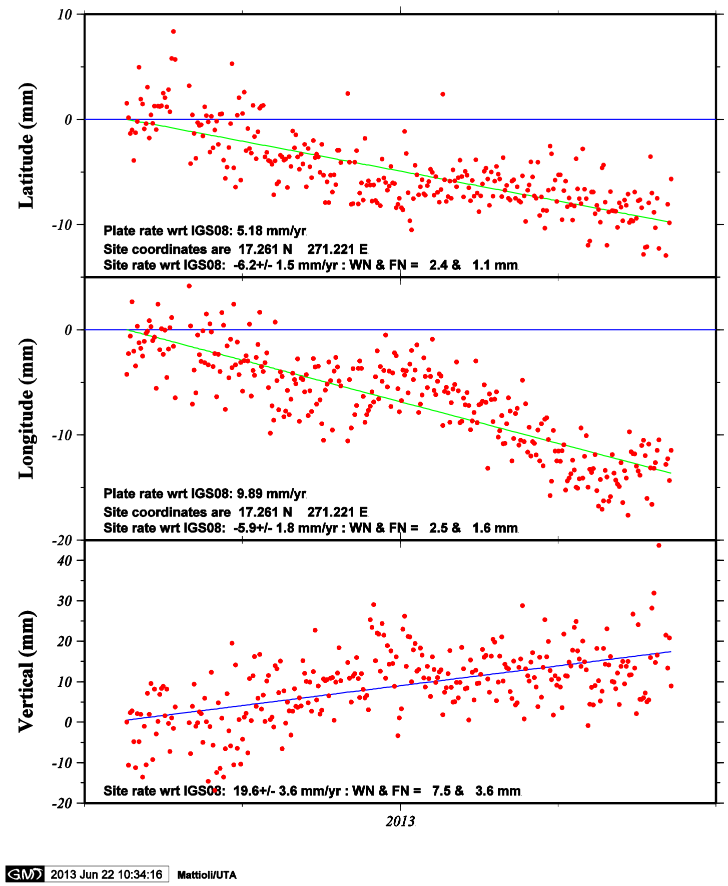
CN20 Coordinate changes - CA is fixed stacovs used AMB



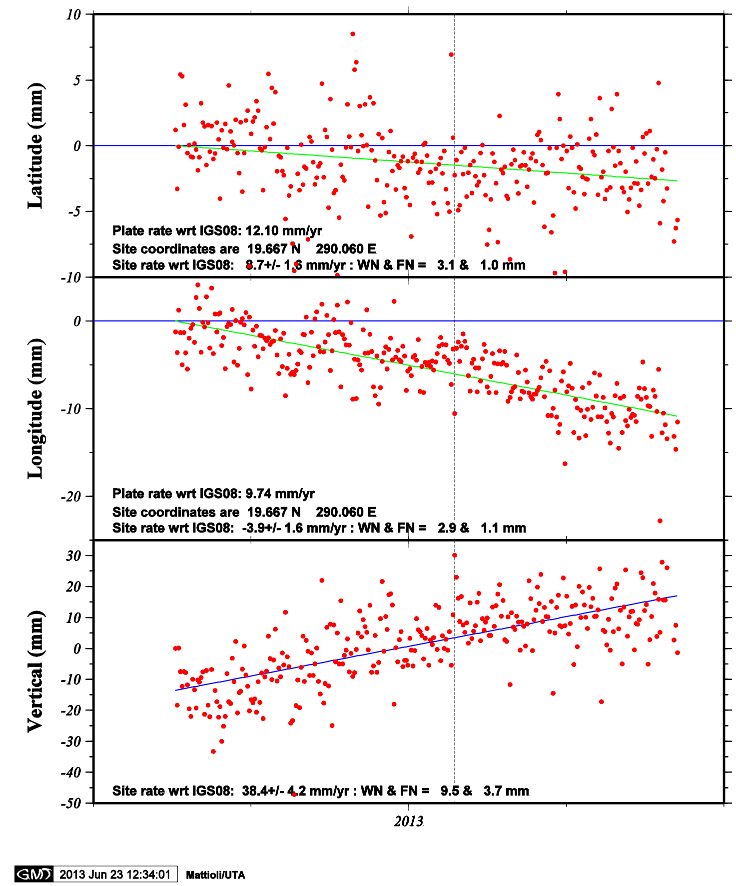
CN22 Coordinate changes - CA is fixed stacovs used AMB

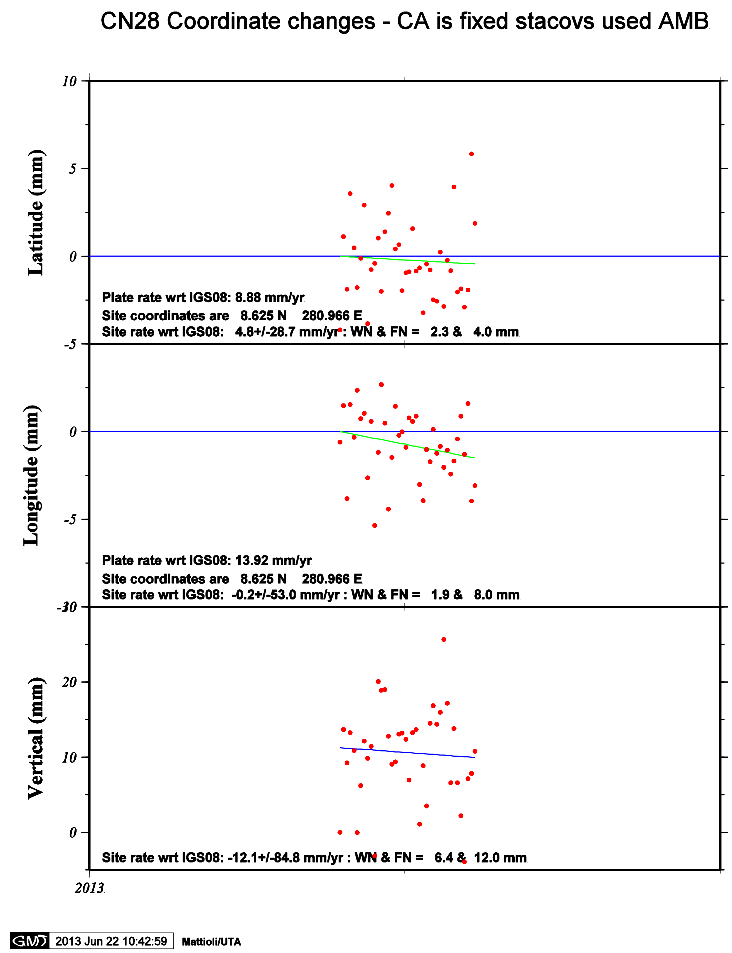


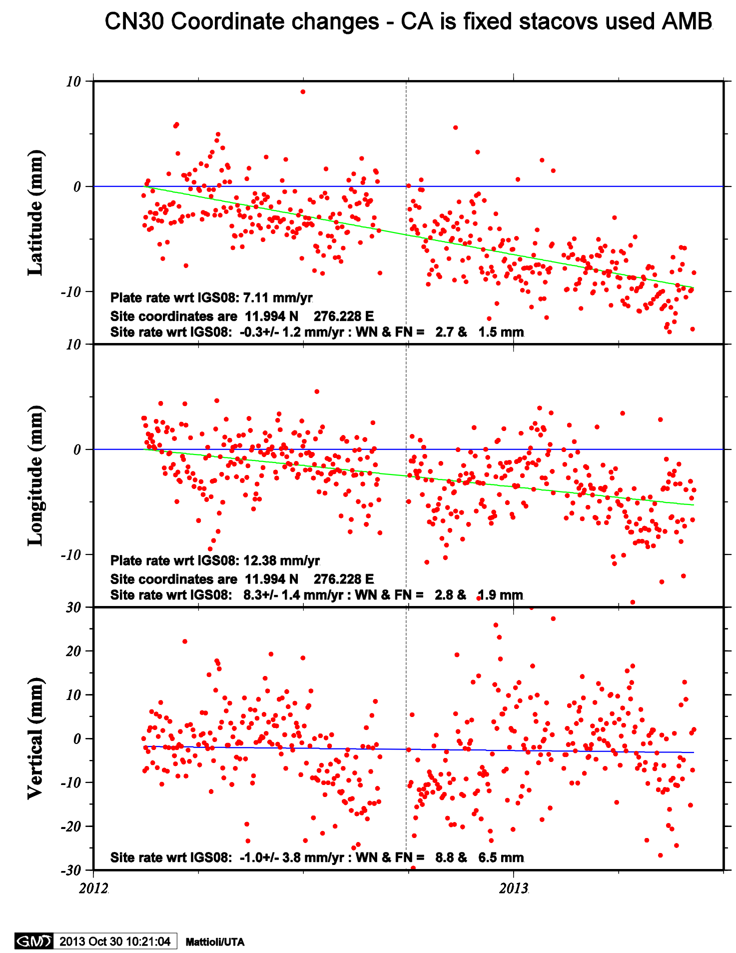
CN23 Coordinate changes - CA is fixed stacovs used AMB

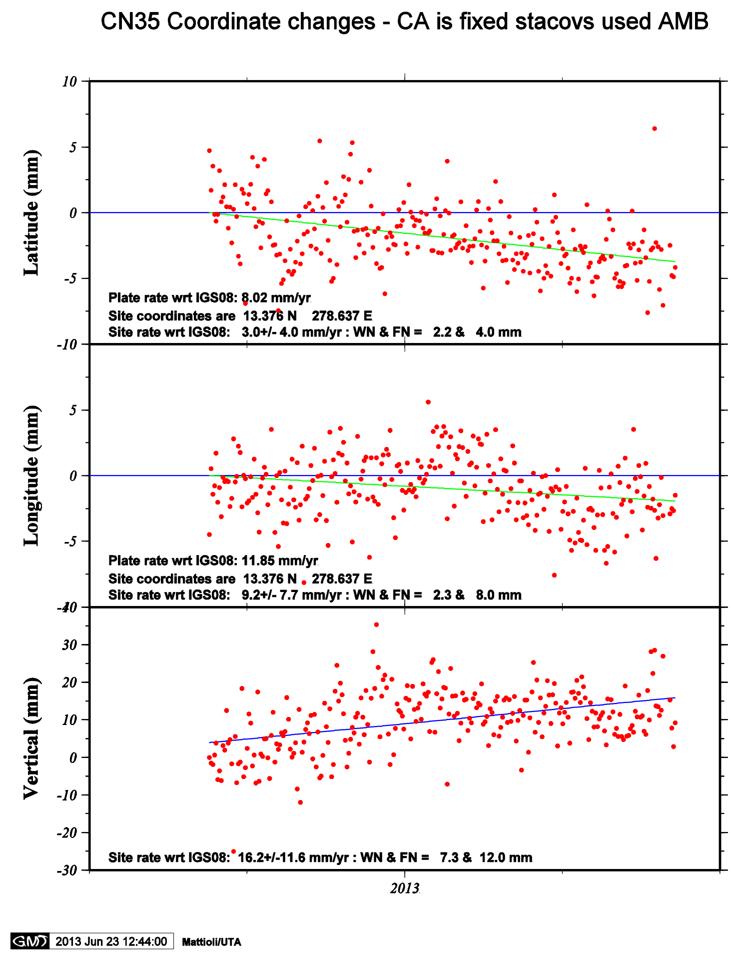


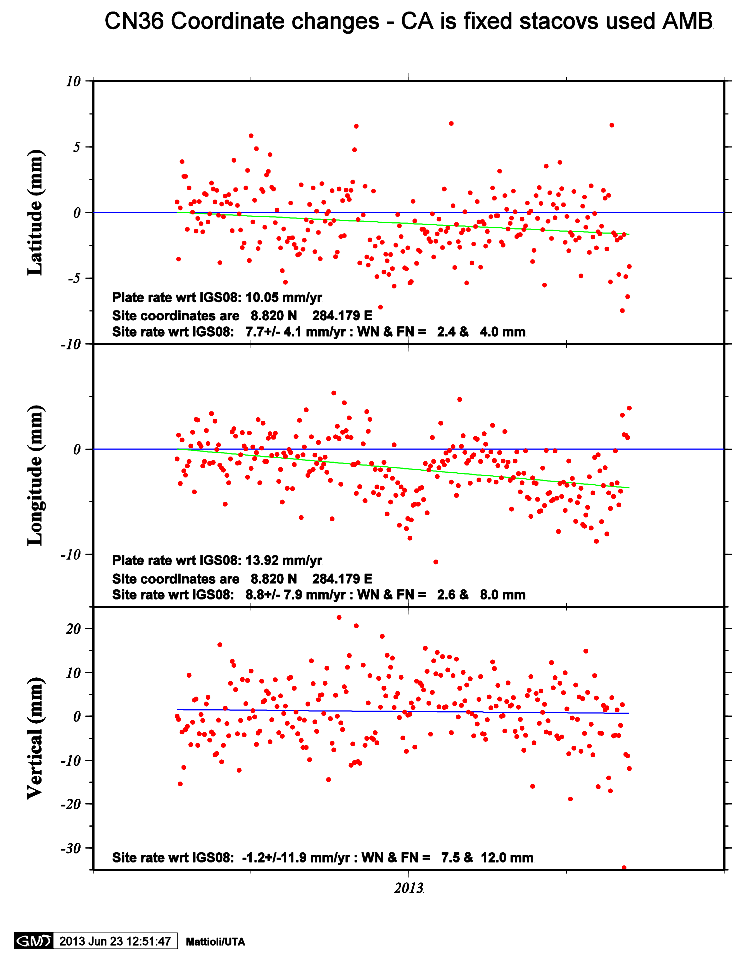
CN27 Coordinate changes - CA is fixed stacovs used AMB

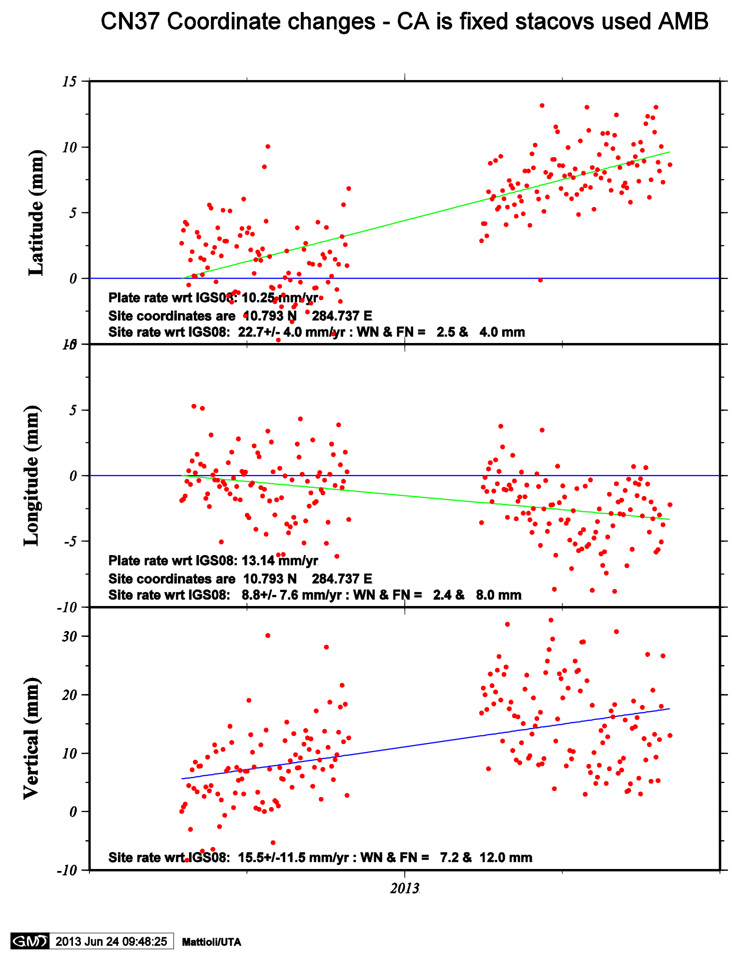


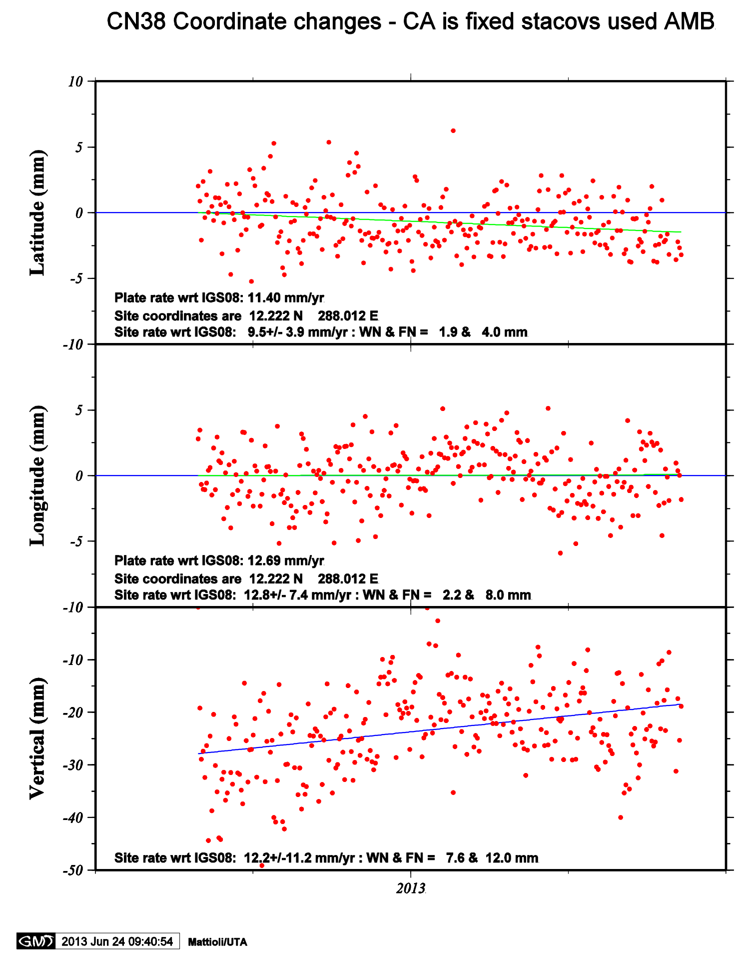

CN28 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 8.88 mm/yr
Site coordinates are 8.625 N 280.966 E
Site rate wrt IGS08: 4.8+/-28.7 mm/yr : WN & FN = 2.3 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 13.92 mm/yr
Site coordinates are 8.625 N 280.966 E
Site rate wrt IGS08: -0.2+/-53.0 mm/yr : WN & FN = 1.9 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -12.1+/-84.8 mm/yr : WN & FN = 6.4 & 12.0 mm
2013
GMT 2013 Jun 22 10:42:59 Mattioli/UTA

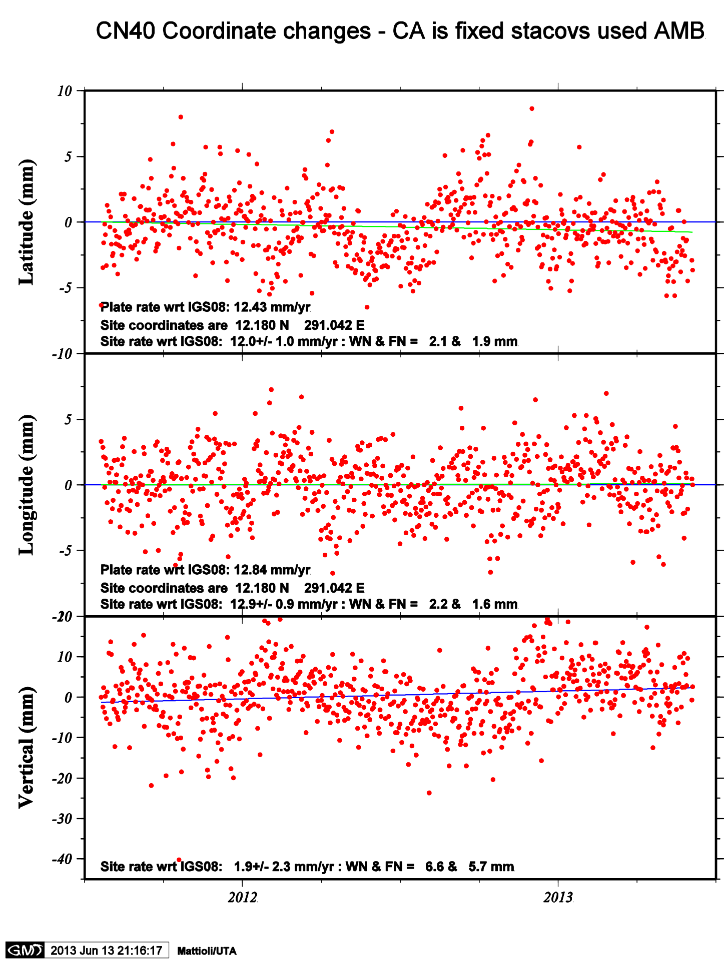

CN30 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 7.11 mm/yr
Site coordinates are 11.994 N 276.228 E
Site rate wrt IGS08: -0.3+/- 1.2 mm/yr : WN & FN = 2.7 & 1.5 mm
Longitude (mm)
Plate rate wrt IGS08: 12.38 mm/yr
Site coordinates are 11.994 N 276.228 E
Site rate wrt IGS08: 8.3+/- 1.4 mm/yr : WN & FN = 2.8 & 1.9 mm
Vertical (mm)
Site rate wrt IGS08: -1.0+/- 3.8 mm/yr : WN & FN = 8.8 & 6.5 mm
2012
2013
GMT 2013 Oct 30 10:21:04 Mattioli/UTA

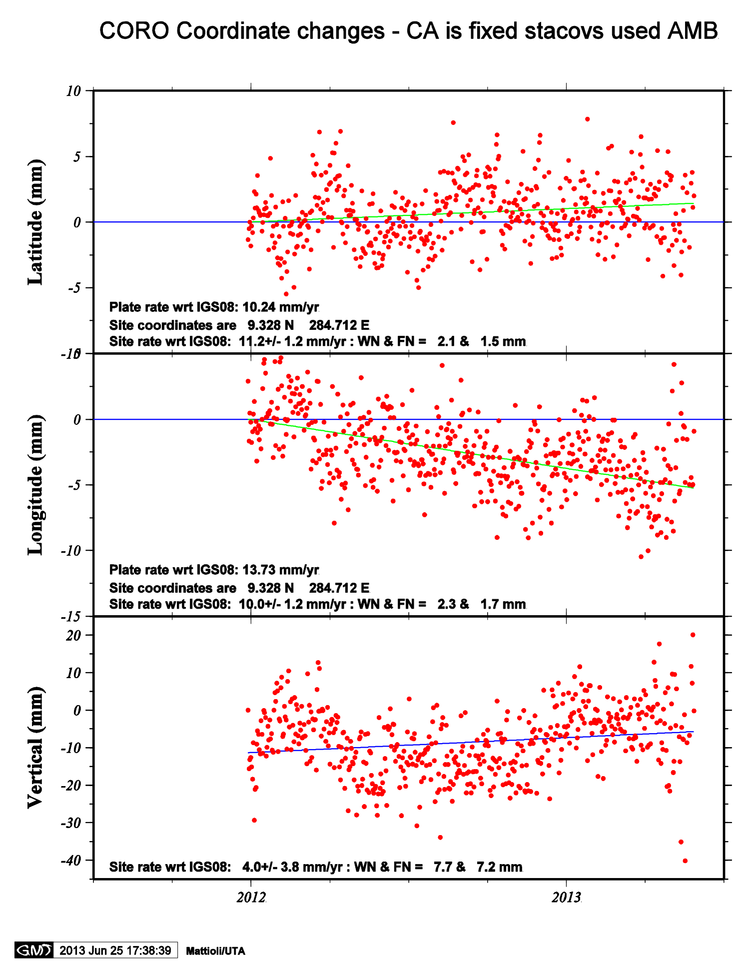

CN35 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 8.02 mm/yr
Site coordinates are 13.376 N 278.637 E
Site rate wrt IGS08: 3.0+/- 4.0 mm/yr : WN & FN = 2.2 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 11.85 mm/yr
Site coordinates are 13.376 N 278.637 E
Site rate wrt IGS08: 9.2+/- 7.7 mm/yr : WN & FN = 2.3 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: 16.2+/-11.6 mm/yr : WN & FN = 7.3 & 12.0 mm
2013
2013 Jun 23 12:44:00
Mattioli/UTA

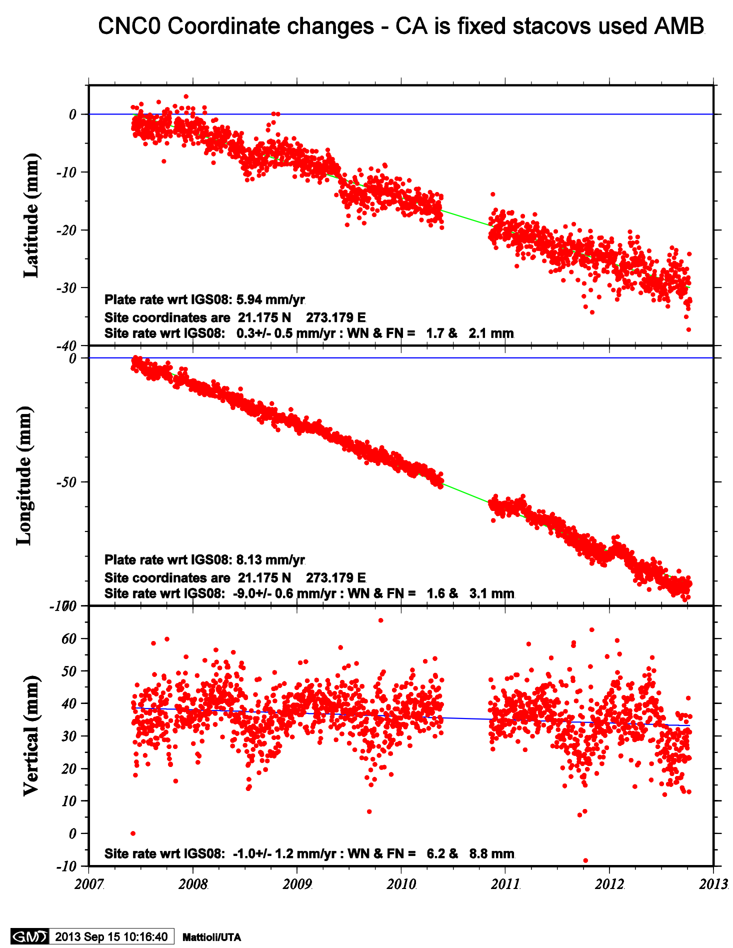

CN36 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 10.05 mm/yr
Site coordinates are 8.820 N 284.179 E
Site rate wrt IGS08: 7.7+/- 4.1 mm/yr : WN & FN = 2.4 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 13.92 mm/yr
Site coordinates are 8.820 N 284.179 E
Site rate wrt IGS08: 8.8+/- 7.9 mm/yr : WN & FN = 2.6 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -1.2+/-11.9 mm/yr : WN & FN = 7.5 & 12.0 mm
2013
2013 Jun 23 12:51:47
Mattioli/UTA

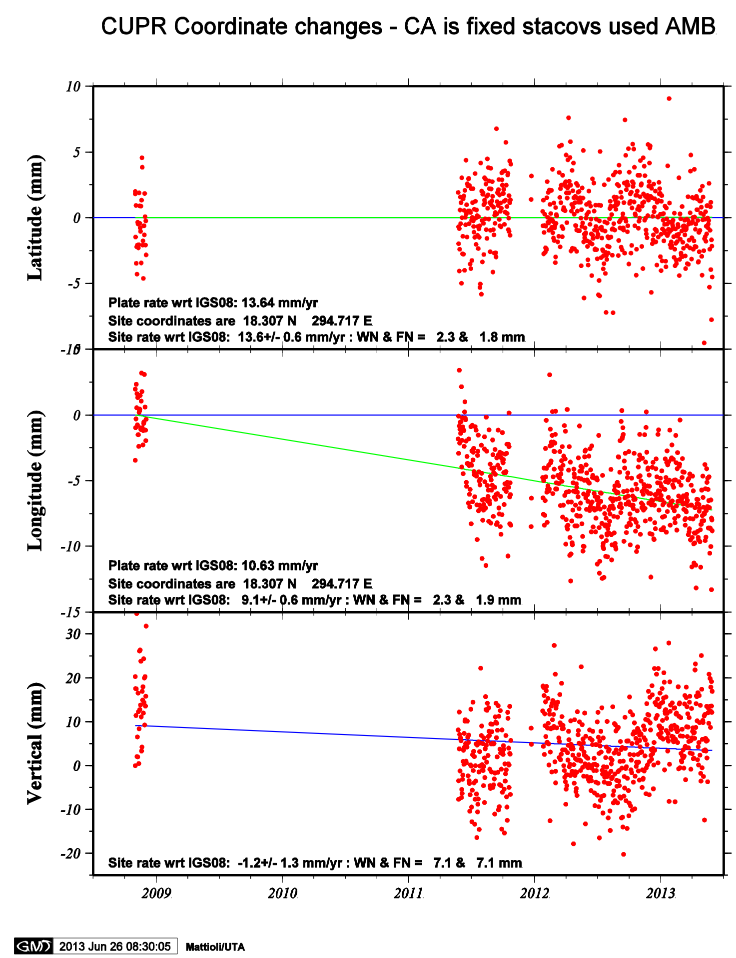

CN37 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 10.25 mm/yr
Site coordinates are 10.793 N 284.737 E
Site rate wrt IGS08: 22.7+/- 4.0 mm/yr : WN & FN = 2.5 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 13.14 mm/yr
Site coordinates are 10.793 N 284.737 E
Site rate wrt IGS08: 8.8+/- 7.6 mm/yr : WN & FN = 2.4 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: 15.5+/-11.5 mm/yr : WN & FN = 7.2 & 12.0 mm
2013
2013 Jun 24 09:48:25
Mattioli/UTA

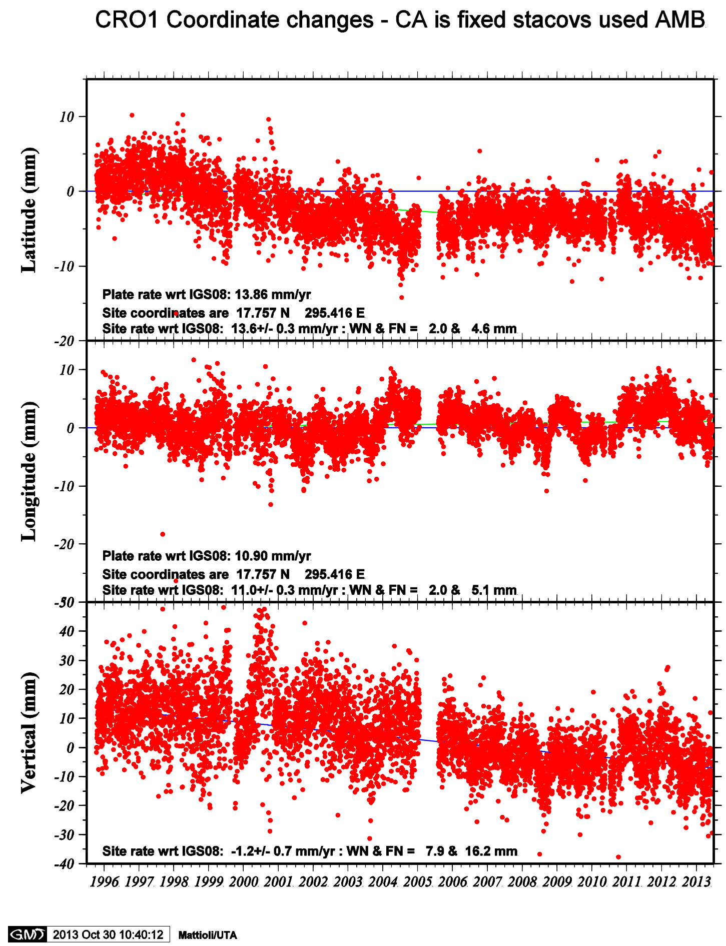

CN38 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.40 mm/yr
Site coordinates are 12.222 N 288.012 E
Site rate wrt IGS08: 9.5+/- 3.9 mm/yr : WN & FN = 1.9 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 12.69 mm/yr
Site coordinates are 12.222 N 288.012 E
Site rate wrt IGS08: 12.8+/- 7.4 mm/yr : WN & FN = 2.2 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: 12.2+/-11.2 mm/yr : WN & FN = 7.6 & 12.0 mm
2013
2013 Jun 24 09:40:54
Mattioli/UTA

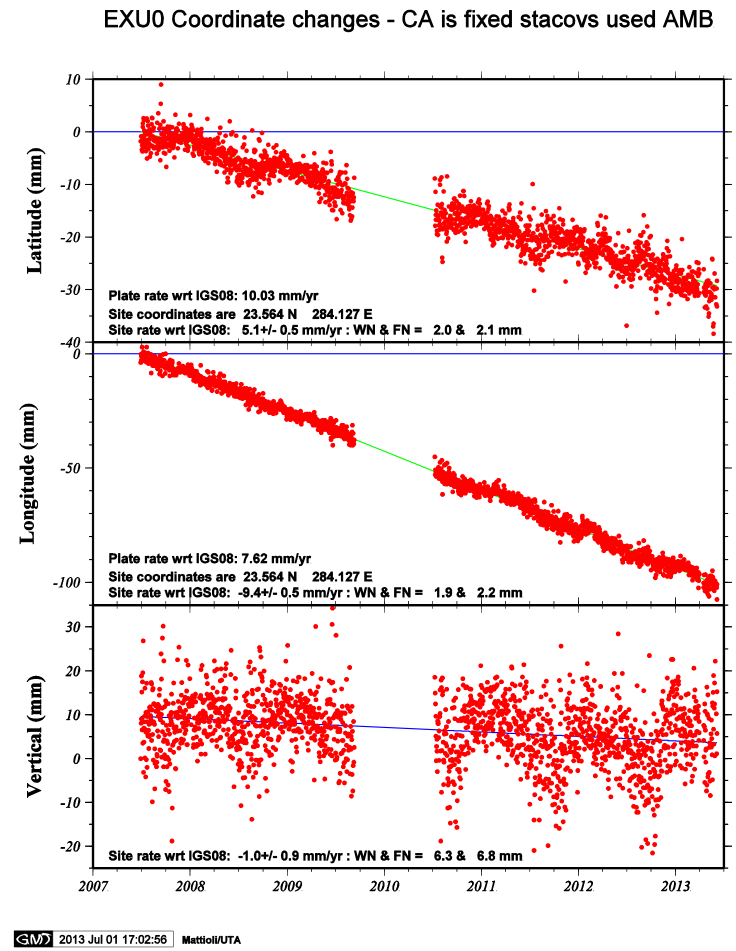

CN40 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 12.43 mm/yr
Site coordinates are 12.180 N 291.042 E
Site rate wrt IGS08: 12.0+/- 1.0 mm/yr : WN & FN = 2.1 & 1.9 mm
Longitude (mm)
Plate rate wrt IGS08: 12.84 mm/yr
Site coordinates are 12.180 N 291.042 E
Site rate wrt IGS08: 12.9+/- 0.9 mm/yr : WN & FN = 2.2 & 1.6 mm
Vertical (mm)
Site rate wrt IGS08: 1.9+/- 2.3 mm/yr : WN & FN = 6.6 & 5.7 mm
2012
2013
2013 Jun 13 21:16:17
Mattioli/UTA

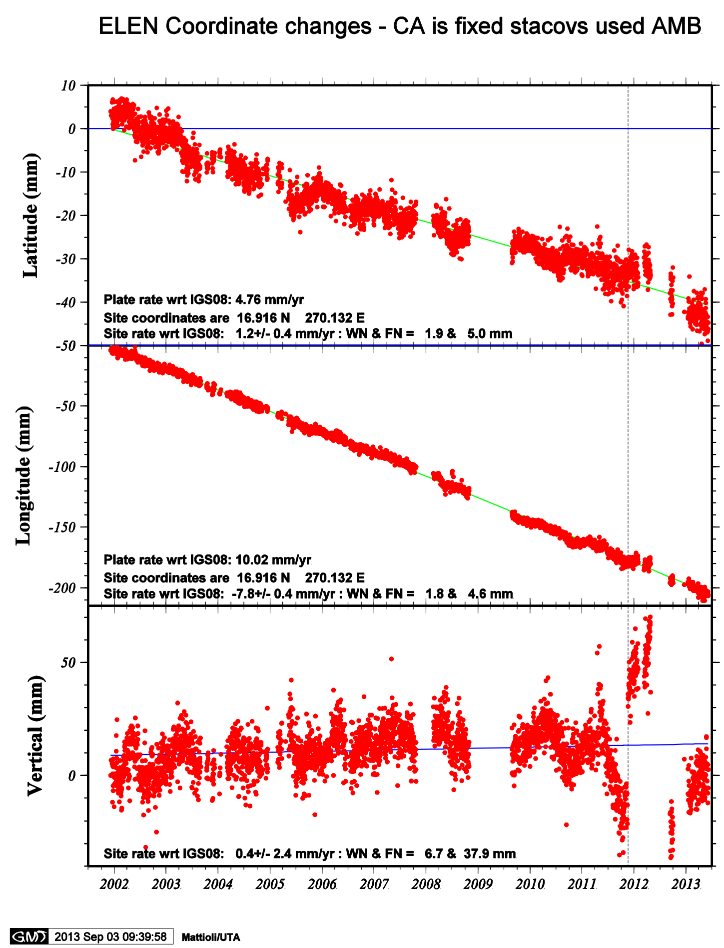

CORO Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 10.24 mm/yr
Site coordinates are 9.328 N 284.712 E
Site rate wrt IGS08: 11.2+/- 1.2 mm/yr : WN & FN = 2.1 & 1.5 mm
Longitude (mm)
Plate rate wrt IGS08: 13.73 mm/yr
Site coordinates are 9.328 N 284.712 E
Site rate wrt IGS08: 10.0+/- 1.2 mm/yr : WN & FN = 2.3 & 1.7 mm
Vertical (mm)
Site rate wrt IGS08: 4.0+/- 3.8 mm/yr : WN & FN = 7.7 & 7.2 mm
2012
2013
2013 Jun 25 17:38:39
Mattioli/UTA

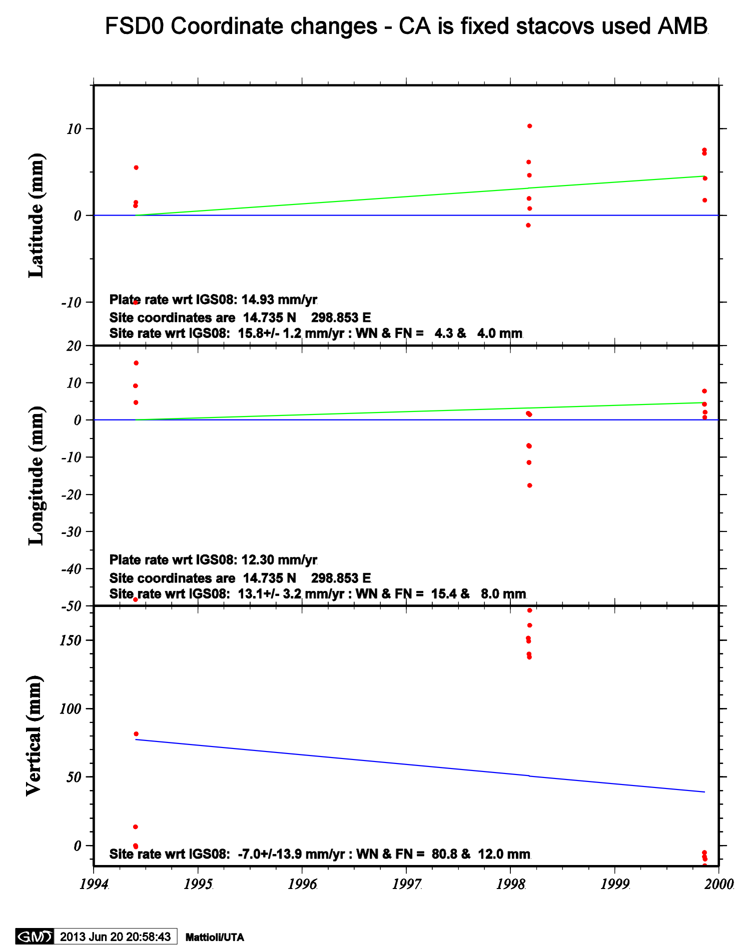

CNC0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 5.94 mm/yr
Site coordinates are 21.175 N 273.179 E
Site rate wrt IGS08: 0.3+/- 0.5 mm/yr : WN & FN = 1.7 & 2.1 mm
Plate rate wrt IGS08: 8.13 mm/yr
Site coordinates are 21.175 N 273.179 E
Site rate wrt IGS08: -9.0+/- 0.6 mm/yr : WN & FN = 1.6 & 3.1 mm
Site rate wrt IGS08: -1.0+/- 1.2 mm/yr : WN & FN = 6.2 & 8.8 mm
2007
2008
2009
2010
2011
2012
2013
GMT 2013 Sep 15 10:16:40
Mattioli/UTA

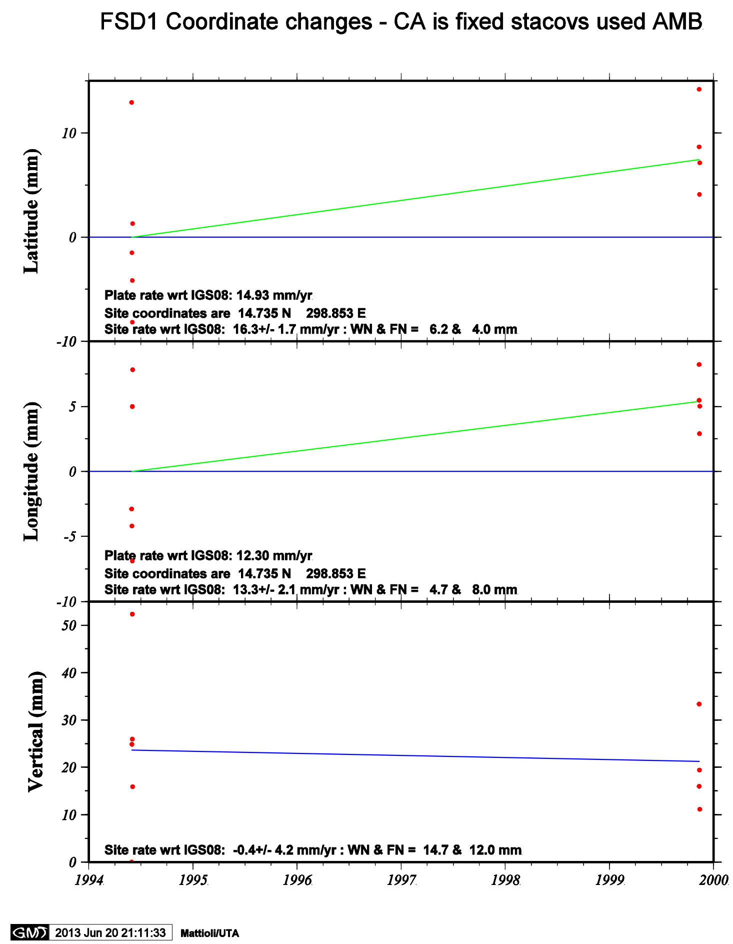

CUPR Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 13.64 mm/yr
Site coordinates are 18.307 N 294.717 E
Site rate wrt IGS08: 13.6+/- 0.6 mm/yr : WN & FN = 2.3 & 1.8 mm
Plate rate wrt IGS08: 10.63 mm/yr
Site coordinates are 18.307 N 294.717 E
Site rate wrt IGS08: 9.1+/- 0.6 mm/yr : WN & FN = 2.3 & 1.9 mm
Site rate wrt IGS08: -1.2+/- 1.3 mm/yr : WN & FN = 7.1 & 7.1 mm
2009
2010
2011
2012
2013
GMT 2013 Jun 26 08:30:05
Mattioli/UTA

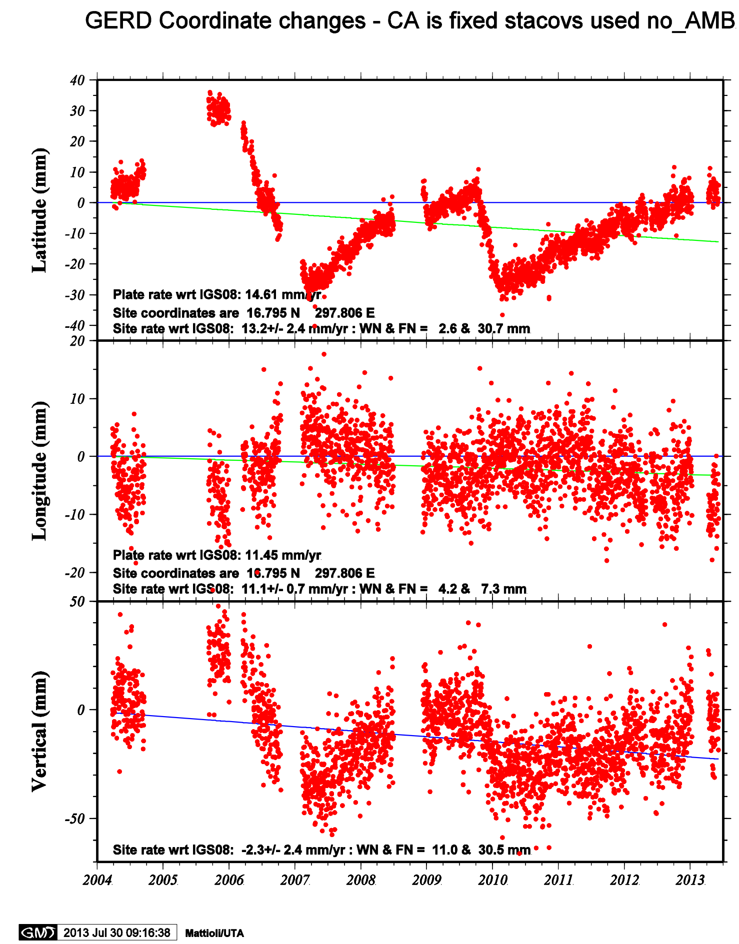

CRO1 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 13.86 mm/yr
Site coordinates are 17.757 N 295.416 E
Site rate wrt IGS08: 13.6+/- 0.3 mm/yr : WN & FN = 2.0 & 4.6 mm
Longitude (mm)
Plate rate wrt IGS08: 10.90 mm/yr
Site coordinates are 17.757 N 295.416 E
Site rate wrt IGS08: 11.0+/- 0.3 mm/yr : WN & FN = 2.0 & 5.1 mm
Vertical (mm)
Site rate wrt IGS08: -1.2+/- 0.7 mm/yr : WN & FN = 7.9 & 16.2 mm
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
GMT 2013 Oct 30 10:40:12 Mattioli/UTA

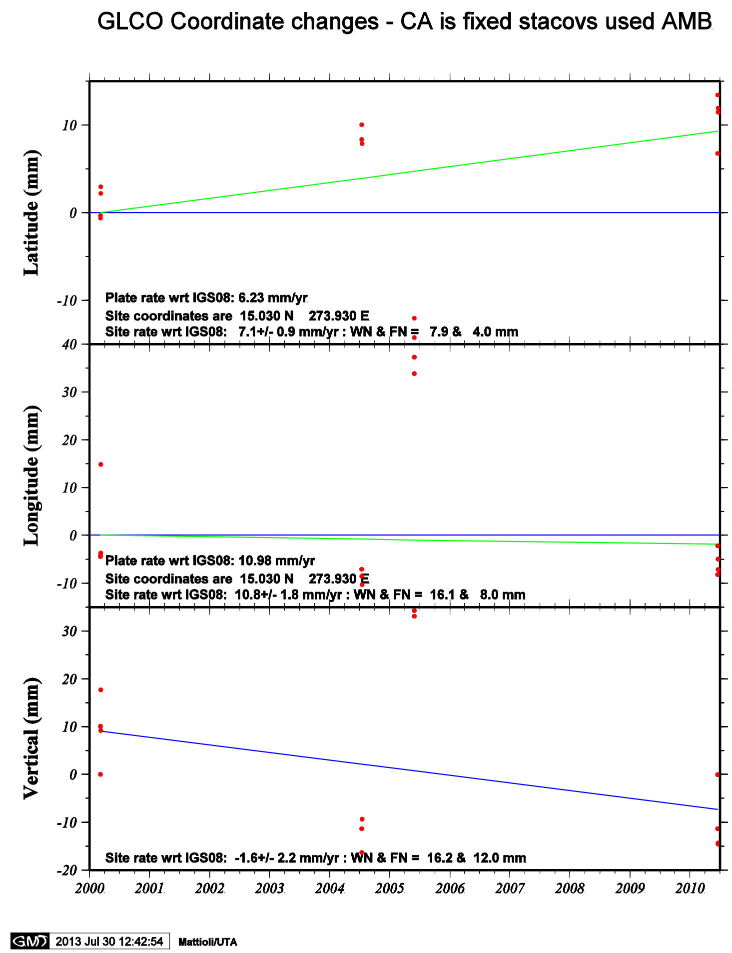

EXU0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 10.03 mm/yr
Site coordinates are 23.564 N 284.127 E
Site rate wrt IGS08: 5.1+/- 0.5 mm/yr : WN & FN = 2.0 & 2.1 mm
Longitude (mm)
Plate rate wrt IGS08: 7.62 mm/yr
Site coordinates are 23.564 N 284.127 E
Site rate wrt IGS08: -9.4+/- 0.5 mm/yr : WN & FN = 1.9 & 2.2 mm
Vertical (mm)
Site rate wrt IGS08: -1.0+/- 0.9 mm/yr : WN & FN = 6.3 & 6.8 mm
2007 2008 2009 2010 2011 2012 2013
GMT 2013 Jul 01 17:02:56 Mattioli/UTA

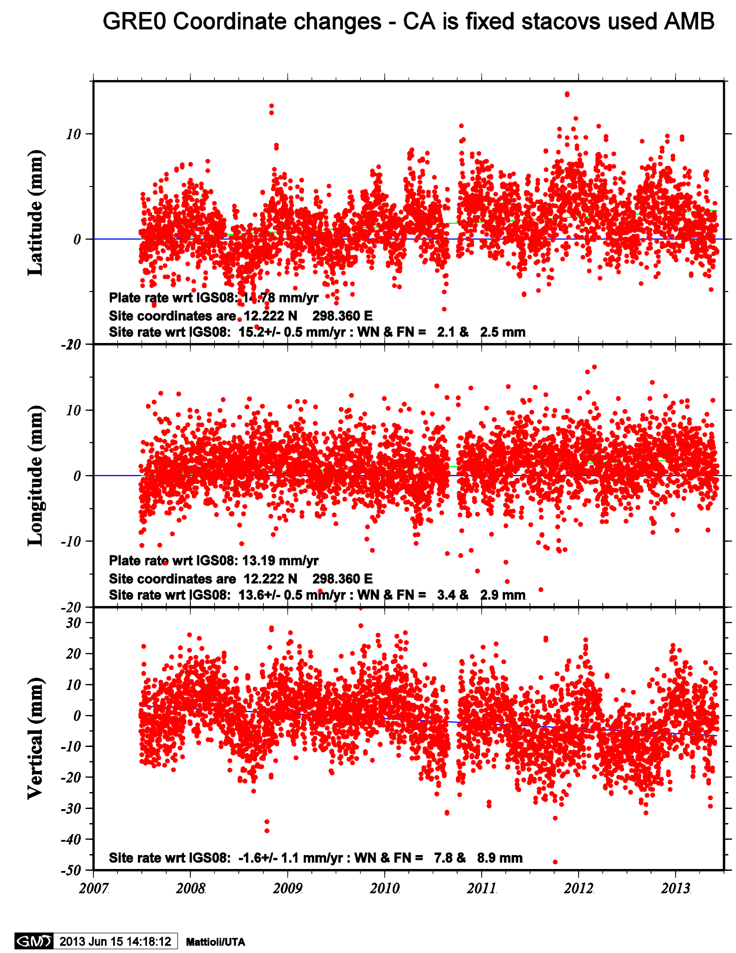

ELEN Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 4.76 mm/yr
Site coordinates are 16.916 N 270.132 E
Site rate wrt IGS08: 1.2+/- 0.4 mm/yr : WN & FN = 1.9 & 5.0 mm
Longitude (mm)
Plate rate wrt IGS08: 10.02 mm/yr
Site coordinates are 16.916 N 270.132 E
Site rate wrt IGS08: -7.8+/- 0.4 mm/yr : WN & FN = 1.8 & 4.6 mm
Vertical (mm)
Site rate wrt IGS08: 0.4+/- 2.4 mm/yr : WN & FN = 6.7 & 37.9 mm
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
2013 Sep 03 09:39:58
Mattioli/UTA

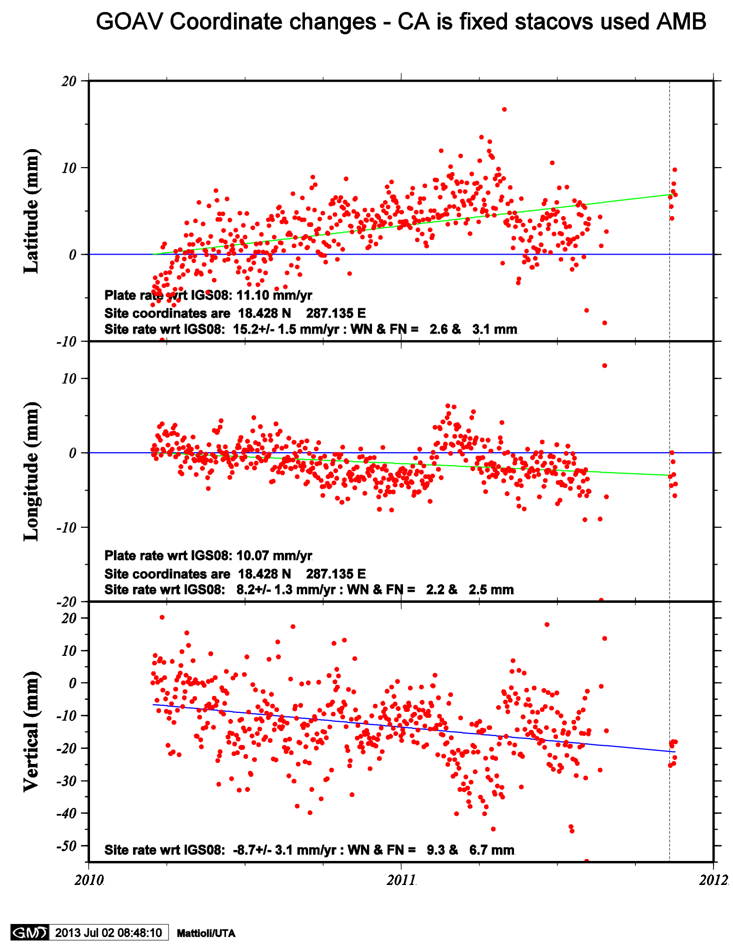

FSD0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.93 mm/yr
Site coordinates are 14.735 N 298.853 E
Site rate wrt IGS08: 15.8+/- 1.2 mm/yr : WN & FN = 4.3 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 12.30 mm/yr
Site coordinates are 14.735 N 298.853 E
Site rate wrt IGS08: 13.1+/- 3.2 mm/yr : WN & FN = 15.4 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -7.0+/-13.9 mm/yr : WN & FN = 80.8 & 12.0 mm
1994 1995 1996 1997 1998 1999 2000
2013 Jun 20 20:58:43
Mattioli/UTA

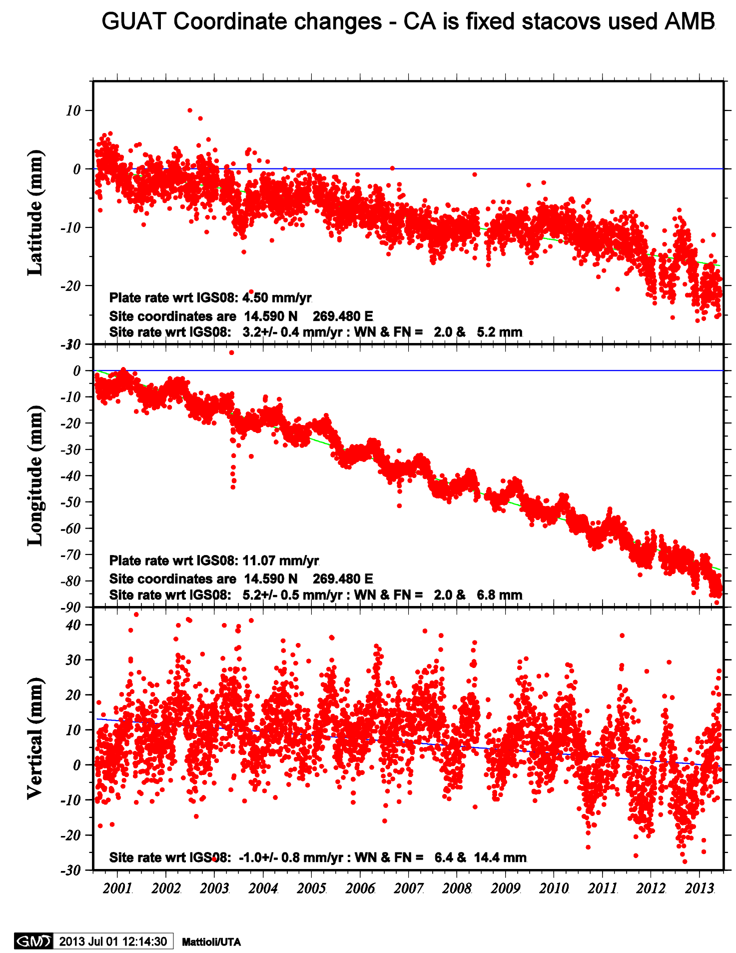

FSD1 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.93 mm/yr
Site coordinates are 14.735 N 298.853 E
Site rate wrt IGS08: 16.3+/- 1.7 mm/yr : WN & FN = 6.2 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 12.30 mm/yr
Site coordinates are 14.735 N 298.853 E
Site rate wrt IGS08: 13.3+/- 2.1 mm/yr : WN & FN = 4.7 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -0.4+/- 4.2 mm/yr : WN & FN = 14.7 & 12.0 mm
1994
1995
1996
1997
1998
1999
2000
2013 Jun 20 21:11:33
Mattioli/UTA

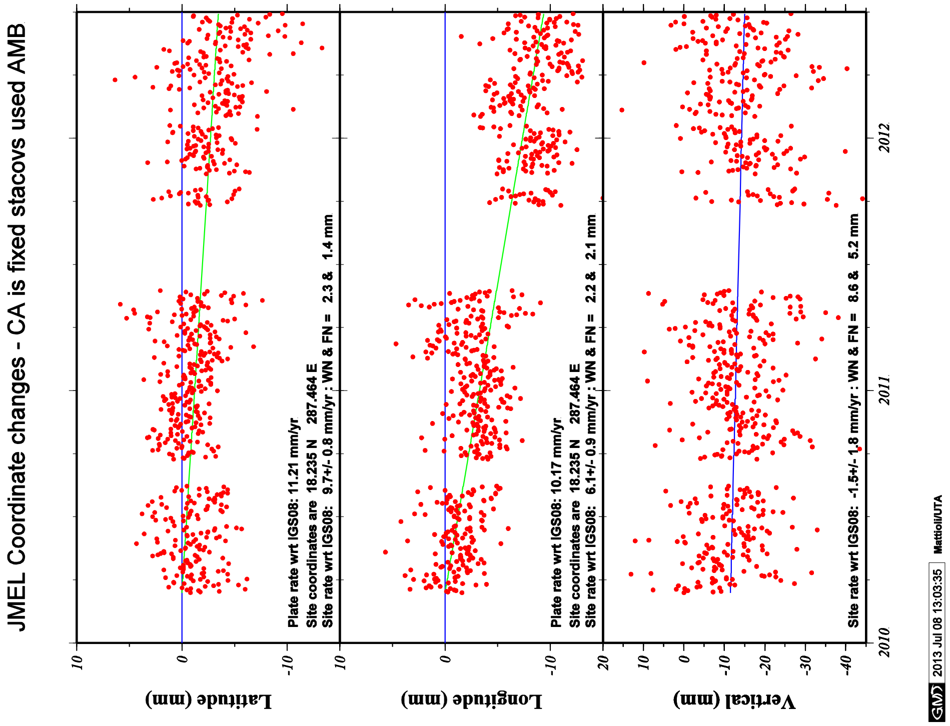

GERD Coordinate changes - CA is fixed stacovs used no_AMB
Latitude (mm)
Plate rate wrt IGS08: 14.61 mm/yr
Site coordinates are 16.795 N 297.806 E
Site rate wrt IGS08: 13.2+/- 2.4 mm/yr : WN & FN = 2.6 & 30.7 mm
Longitude (mm)
Plate rate wrt IGS08: 11.45 mm/yr
Site coordinates are 16.795 N 297.806 E
Site rate wrt IGS08: 11.1+/- 0.7 mm/yr : WN & FN = 4.2 & 7.3 mm
Vertical (mm)
Site rate wrt IGS08: -2.3+/- 2.4 mm/yr : WN & FN = 11.0 & 30.5 mm
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2013 Jul 30 09:16:38
Mattioli/UTA

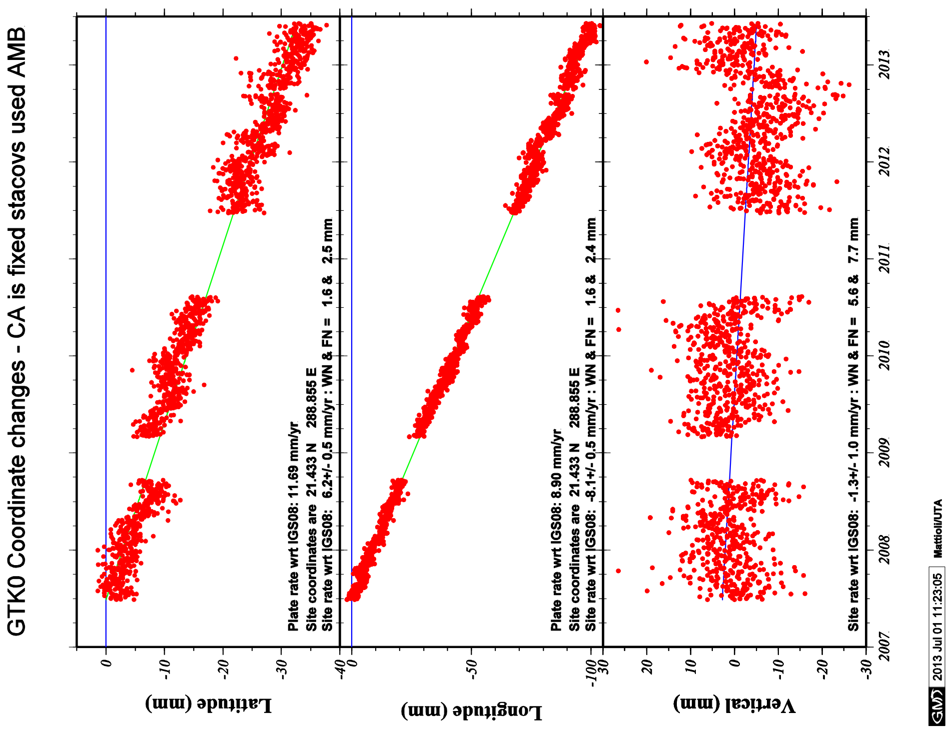

GLCO Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 6.23 mm/yr
Site coordinates are 15.030 N 273.930 E
Site rate wrt IGS08: 7.1+/- 0.9 mm/yr : WN & FN = 7.9 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 10.98 mm/yr
Site coordinates are 15.030 N 273.930 E
Site rate wrt IGS08: 10.8+/- 1.8 mm/yr : WN & FN = 16.1 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -1.6+/- 2.2 mm/yr : WN & FN = 16.2 & 12.0 mm
2013 Jul 30 12:42:54
Mattioli/UTA

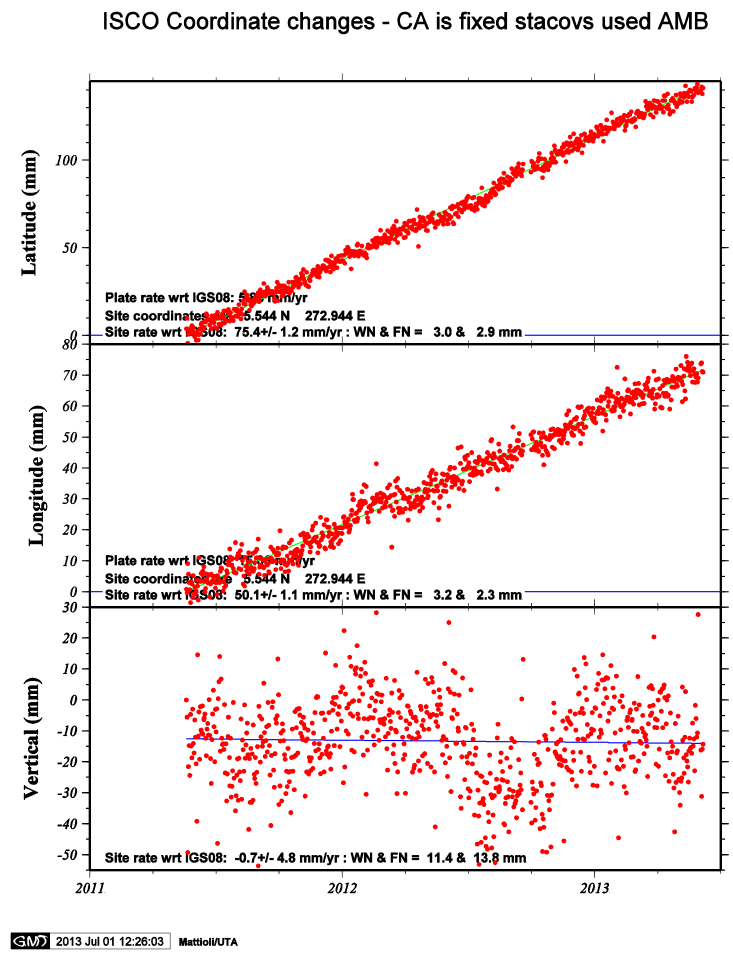

GRE0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.78 mm/yr
Site coordinates are 12.222 N 298.360 E
Site rate wrt IGS08: 15.2+/- 0.5 mm/yr : WN & FN = 2.1 & 2.5 mm
Longitude (mm)
Plate rate wrt IGS08: 13.19 mm/yr
Site coordinates are 12.222 N 298.360 E
Site rate wrt IGS08: 13.6+/- 0.5 mm/yr : WN & FN = 3.4 & 2.9 mm
Vertical (mm)
Site rate wrt IGS08: -1.6+/- 1.1 mm/yr : WN & FN = 7.8 & 8.9 mm
2013 Jun 15 14:18:12
Mattioli/UTA

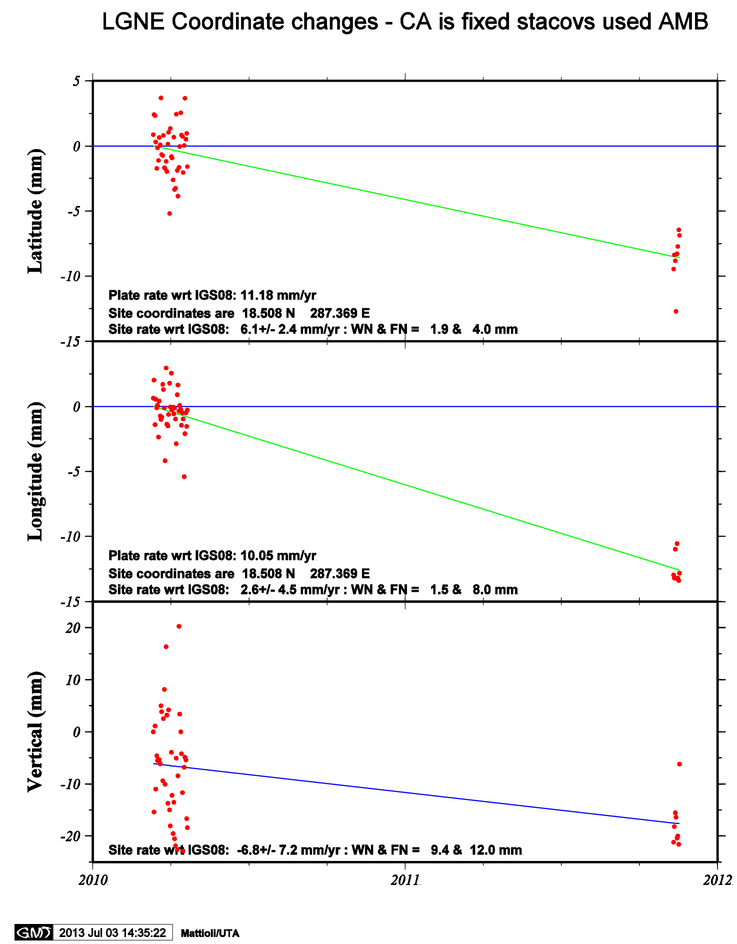

GOAV Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.10 mm/yr
Site coordinates are 18.428 N 287.135 E
Site rate wrt IGS08: 15.2+/- 1.5 mm/yr : WN & FN = 2.6 & 3.1 mm
Longitude (mm)
Plate rate wrt IGS08: 10.07 mm/yr
Site coordinates are 18.428 N 287.135 E
Site rate wrt IGS08: 8.2+/- 1.3 mm/yr : WN & FN = 2.2 & 2.5 mm
Vertical (mm)
Site rate wrt IGS08: -8.7+/- 3.1 mm/yr : WN & FN = 9.3 & 6.7 mm
2010
2011
2012
2013 Jul 02 08:48:10
Mattioli/UTA

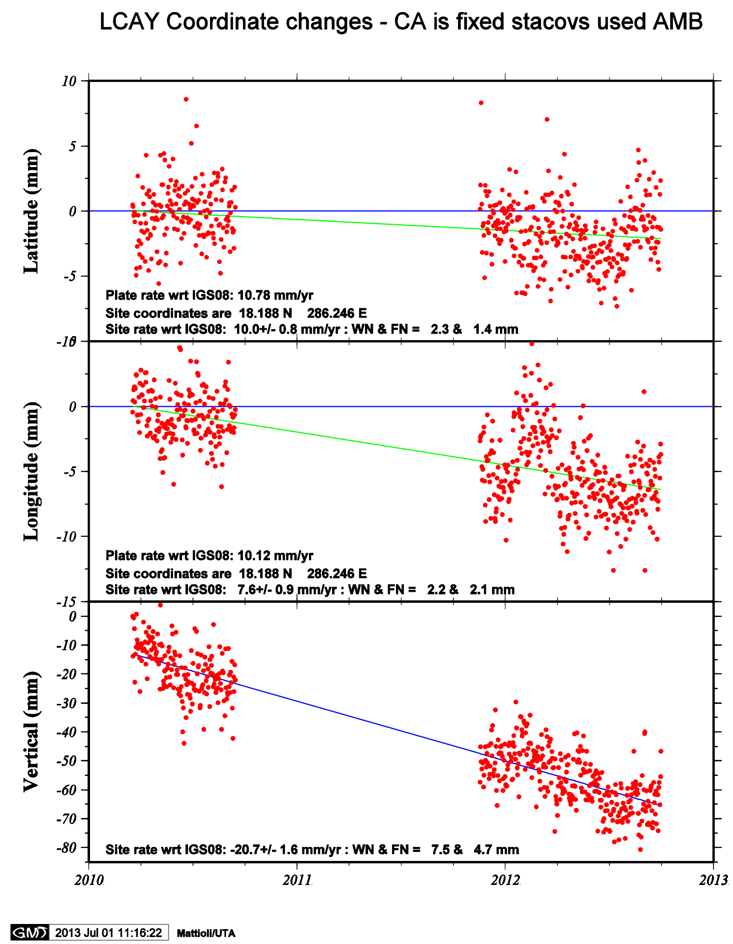

GUAT Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 4.50 mm/yr
Site coordinates are 14.590 N 269.480 E
Site rate wrt IGS08: 3.2+/- 0.4 mm/yr : WN & FN = 2.0 & 5.2 mm
Longitude (mm)
Plate rate wrt IGS08: 11.07 mm/yr
Site coordinates are 14.590 N 269.480 E
Site rate wrt IGS08: 5.2+/- 0.5 mm/yr : WN & FN = 2.0 & 6.8 mm
Vertical (mm)
Site rate wrt IGS08: -1.0+/- 0.8 mm/yr : WN & FN = 6.4 & 14.4 mm
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2013 Jul 01 12:14:30
Mattioli/UTA

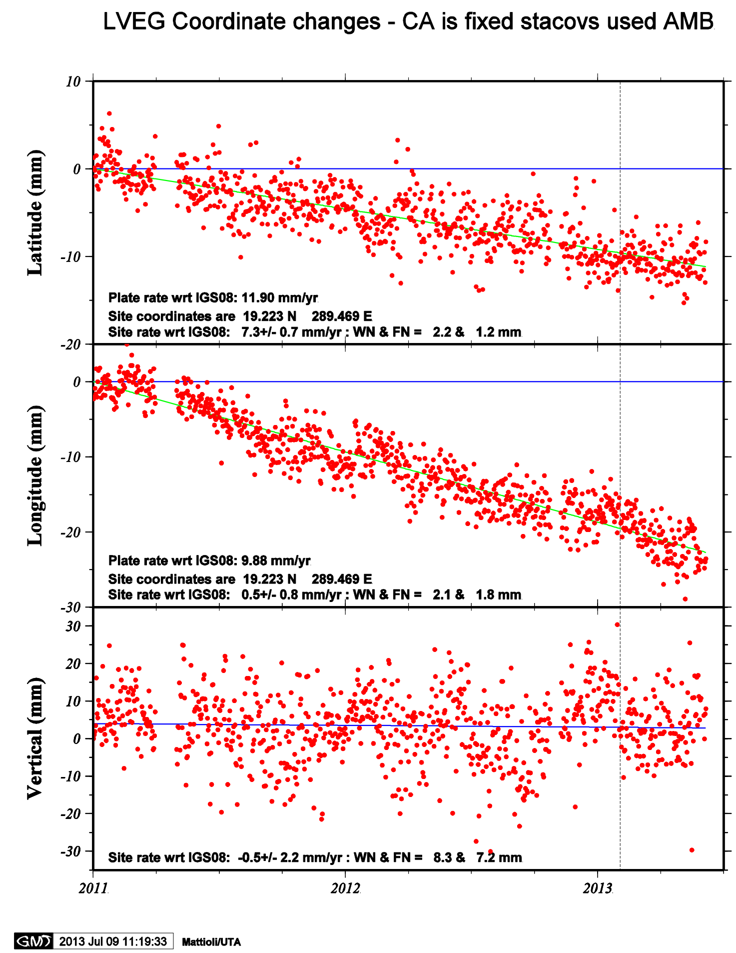

JMEL Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 11.21 mm/yr
Site coordinates are 18.235 N 287.464 E
Site rate wrt IGS08: 9.7+/- 0.8 mm/yr ; WN & FN = 2.3 & 1.4 mm
Plate rate wrt IGS08: 10.17 mm/yr
Site coordinates are 18.235 N 287.464 E
Site rate wrt IGS08: 6.1+/- 0.9 mm/yr ; WN & FN = 2.2 & 2.1 mm
Site rate wrt IGS08: -1.5+/- 1.8 mm/yr ; WN & FN = 8.6 & 5.2 mm
2010
2011
2012
GMT 2013 Jul 08 13:03:35
Mattioli/UTA

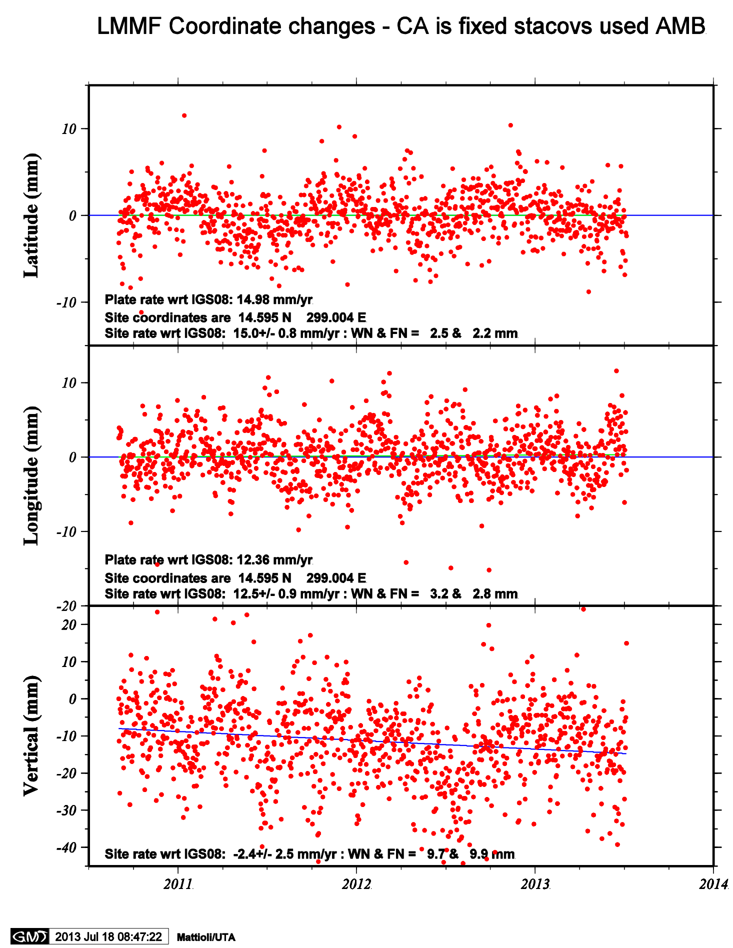

GTK0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 11.69 mm/yr
Site coordinates are 21.433 N 288.855 E
Site rate wrt IGS08: 6.2+/- 0.5 mm/yr ; WN & FN = 1.6 & 2.5 mm
Plate rate wrt IGS08: 8.90 mm/yr
Site coordinates are 21.433 N 288.855 E
Site rate wrt IGS08: -8.1+/- 0.5 mm/yr ; WN & FN = 1.6 & 2.4 mm
Site rate wrt IGS08: -1.3+/- 1.0 mm/yr ; WN & FN = 5.6 & 7.7 mm
2007
2008
2009
2010
2011
2012
2013
GMT 2013 Jul 01 11:23:05
Mattioli/UTA

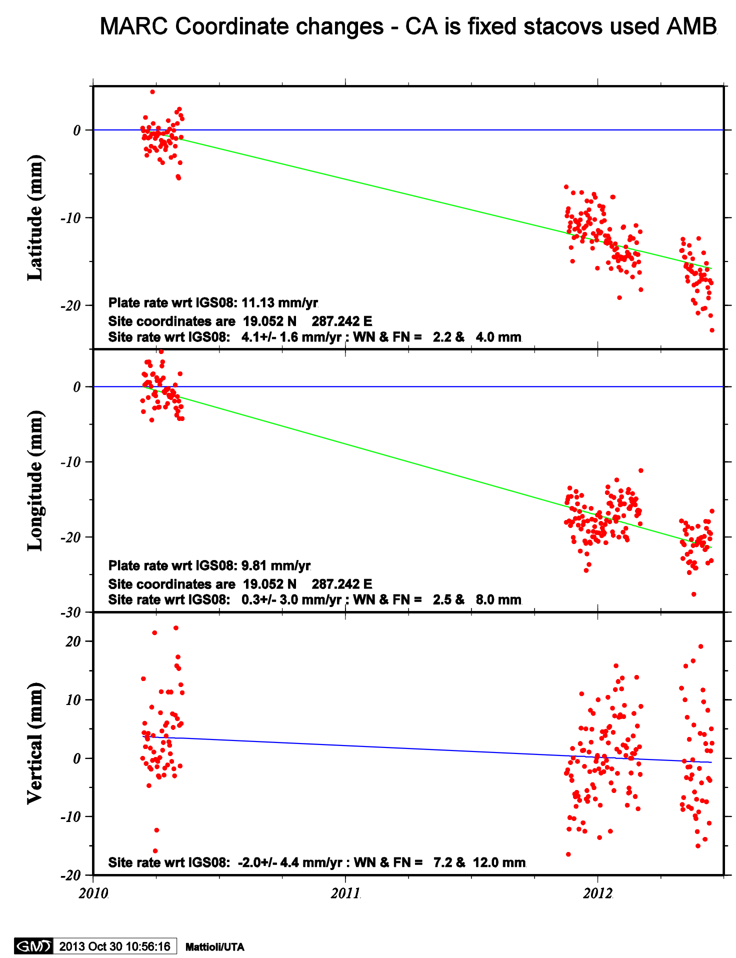

ISCO Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Site coordinates are 15.544 N 272.944 E
Site rate wrt IGS08: 75.4+/- 1.2 mm/yr : WN & FN = 3.0 & 2.9 mm
Site rate wrt IGS08: 50.1+/- 1.1 mm/yr : WN & FN = 3.2 & 2.3 mm
Site rate wrt IGS08: -0.7+/- 4.8 mm/yr : WN & FN = 11.4 & 13.8 mm
2011
2012
2013
2013 Jul 01 12:26:03
Mattioli/UTA

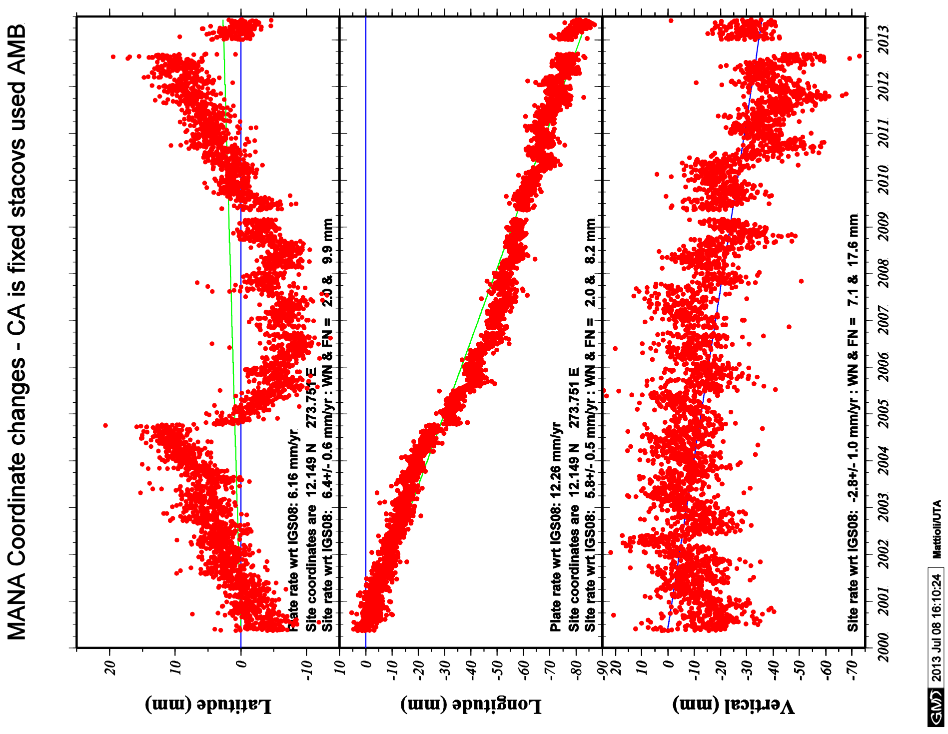

LGNE Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 11.18 mm/yr
Site coordinates are 18.508 N 287.369 E
Site rate wrt IGS08: 6.1+/- 2.4 mm/yr : WN & FN = 1.9 & 4.0 mm
Plate rate wrt IGS08: 10.05 mm/yr
Site coordinates are 18.508 N 287.369 E
Site rate wrt IGS08: 2.6+/- 4.5 mm/yr : WN & FN = 1.5 & 8.0 mm
Site rate wrt IGS08: -6.8+/- 7.2 mm/yr : WN & FN = 9.4 & 12.0 mm
2010
2011
2012
2013 Jul 03 14:35:22
Mattioli/UTA

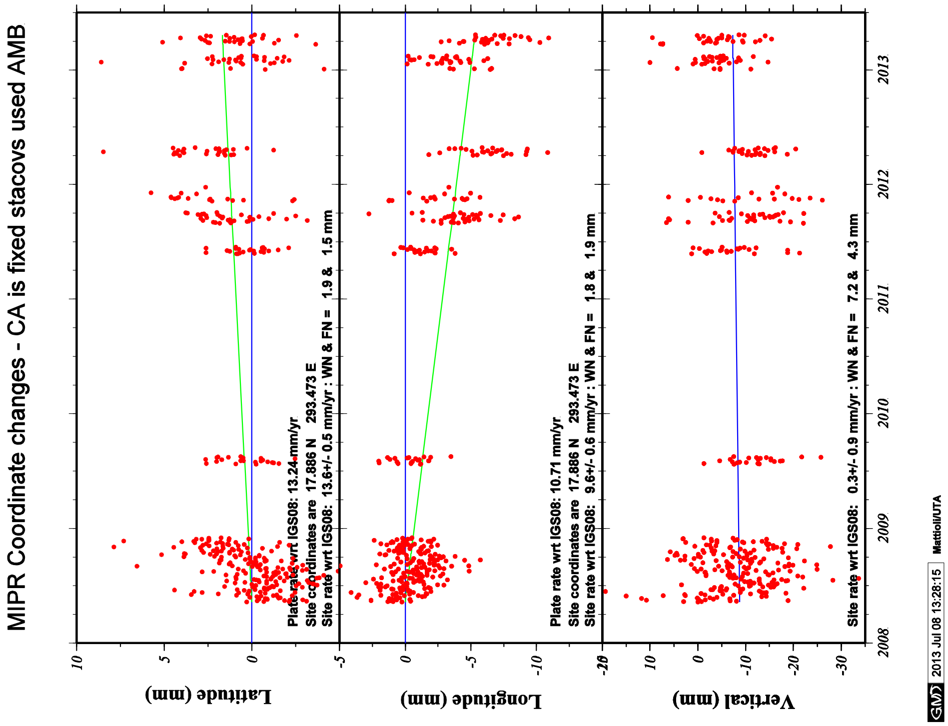

LCAY Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 10.78 mm/yr
Site coordinates are 18.188 N 286.246 E
Site rate wrt IGS08: 10.0+/- 0.8 mm/yr : WN & FN = 2.3 & 1.4 mm
Plate rate wrt IGS08: 10.12 mm/yr
Site coordinates are 18.188 N 286.246 E
Site rate wrt IGS08: 7.6+/- 0.9 mm/yr : WN & FN = 2.2 & 2.1 mm
Site rate wrt IGS08: -20.7+/- 1.6 mm/yr : WN & FN = 7.5 & 4.7 mm
2010
2011
2012
2013
2013 Jul 01 11:16:22
Mattioli/UTA

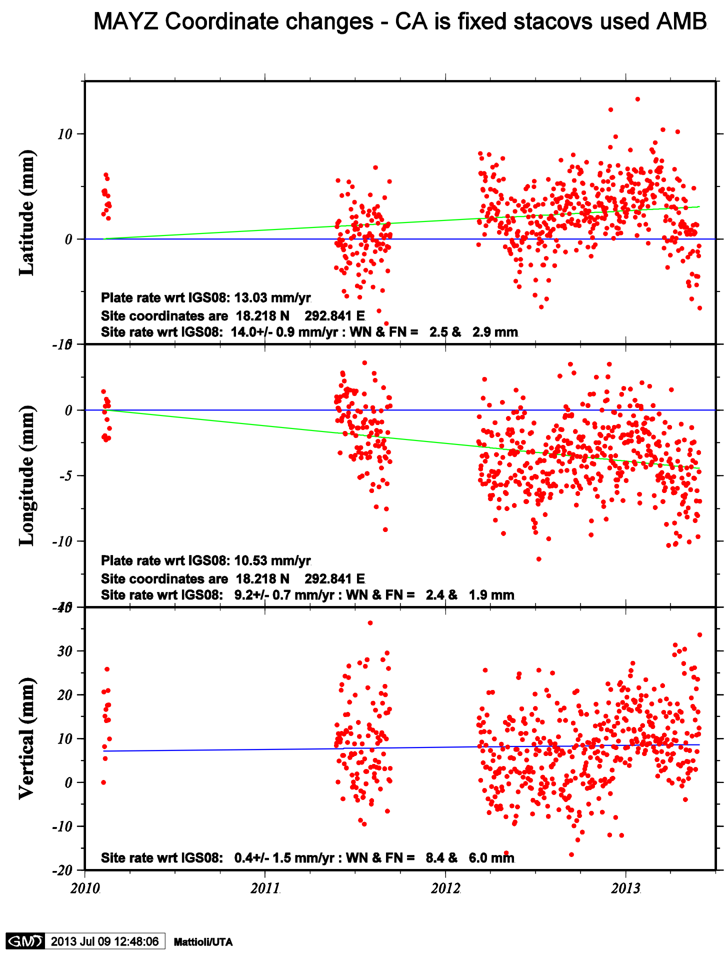

LVEG Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 11.90 mm/yr
Site coordinates are 19.223 N 289.469 E
Site rate wrt IGS08: 7.3+/- 0.7 mm/yr : WN & FN = 2.2 & 1.2 mm
Plate rate wrt IGS08: 9.88 mm/yr
Site coordinates are 19.223 N 289.469 E
Site rate wrt IGS08: 0.5+/- 0.8 mm/yr : WN & FN = 2.1 & 1.8 mm
Site rate wrt IGS08: -0.5+/- 2.2 mm/yr : WN & FN = 8.3 & 7.2 mm
2011
2012
2013
2013 Jul 09 11:19:33
Mattioli/UTA

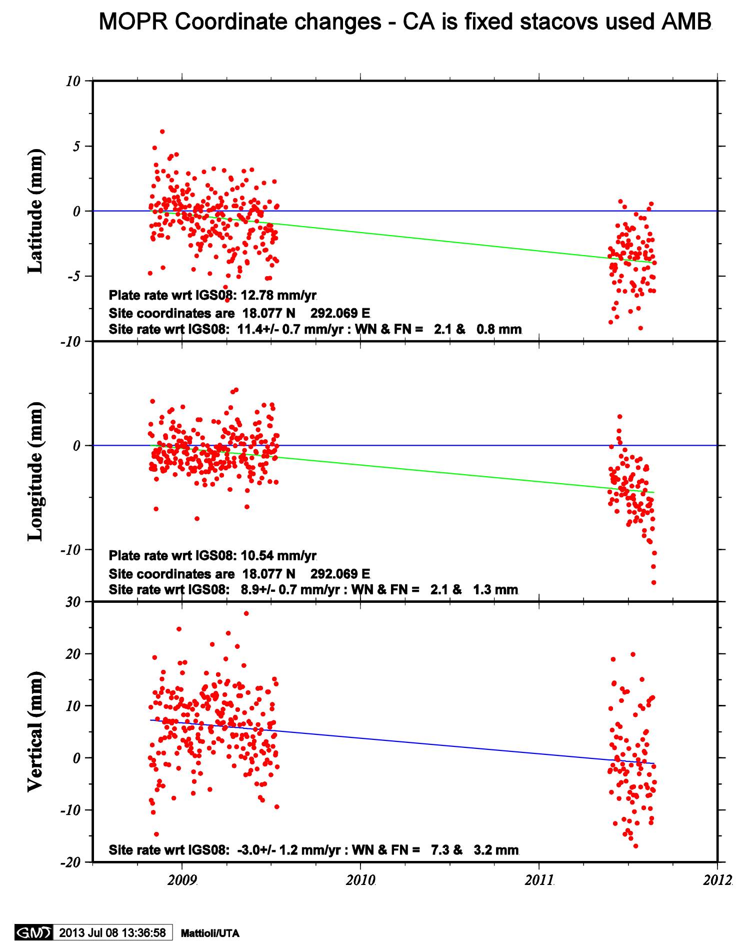

LMMF Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.98 mm/yr
Site coordinates are 14.595 N 299.004 E
Site rate wrt IGS08: 15.0+/- 0.8 mm/yr : WN & FN = 2.5 & 2.2 mm
Longitude (mm)
Plate rate wrt IGS08: 12.36 mm/yr
Site coordinates are 14.595 N 299.004 E
Site rate wrt IGS08: 12.5+/- 0.9 mm/yr : WN & FN = 3.2 & 2.8 mm
Vertical (mm)
Site rate wrt IGS08: -2.4+/- 2.5 mm/yr : WN & FN = 9.7 & 9.9 mm
2011
2012
2013
2014
2013 Jul 18 08:47:22
Mattioli/UTA

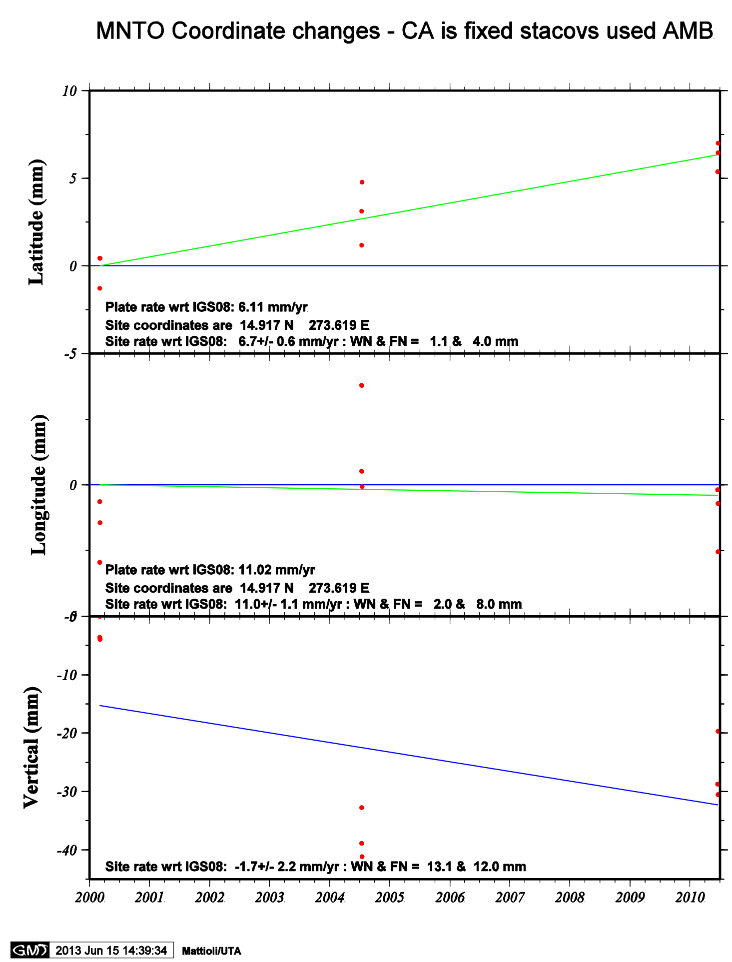

MARC Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.13 mm/yr
Site coordinates are 19.052 N 287.242 E
Site rate wrt IGS08: 4.1+/- 1.6 mm/yr : WN & FN = 2.2 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 9.81 mm/yr
Site coordinates are 19.052 N 287.242 E
Site rate wrt IGS08: 0.3+/- 3.0 mm/yr : WN & FN = 2.5 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -2.0+/- 4.4 mm/yr : WN & FN = 7.2 & 12.0 mm
2010
2011
2012
2013 Oct 30 10:56:16
Mattioli/UTA

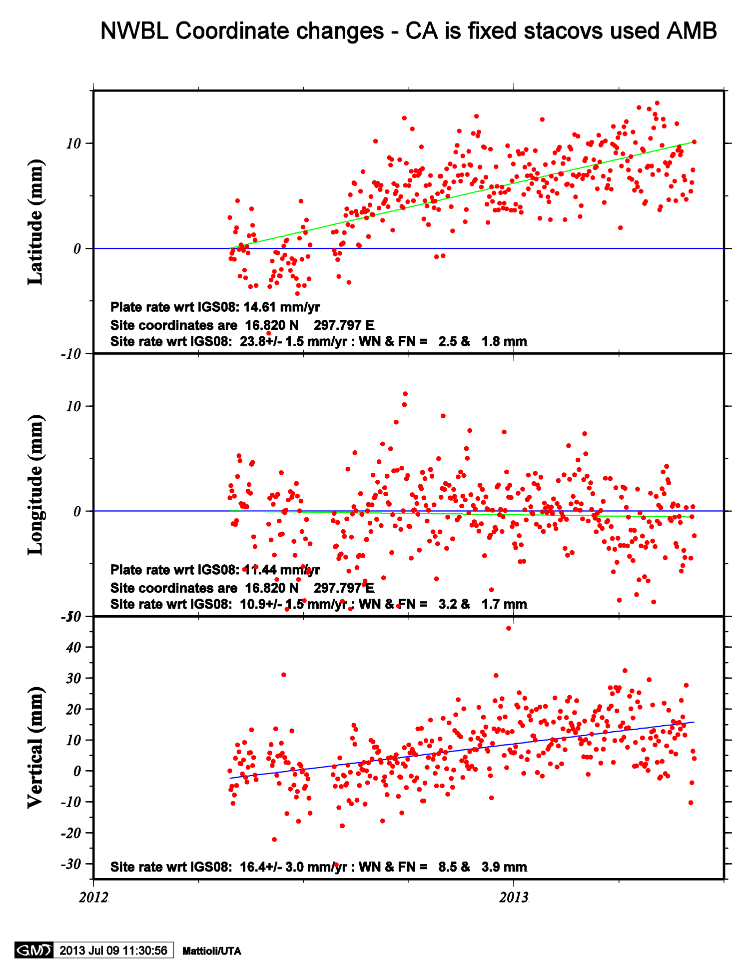

MANA Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 6.16 mm/yr
Site coordinates are 12.149 N 273.751 E
Site rate wrt IGS08: 6.4+/- 0.6 mm/yr : WN & FN = 2.0 & 9.9 mm
Plate rate wrt IGS08: 12.26 mm/yr
Site coordinates are 12.149 N 273.751 E
Site rate wrt IGS08: 5.8+/- 0.5 mm/yr : WN & FN = 2.0 & 8.2 mm
Site rate wrt IGS08: -2.8+/- 1.0 mm/yr : WN & FN = 7.1 & 17.6 mm
2013 Jul 08 16:10:24
Mattioli/UTA

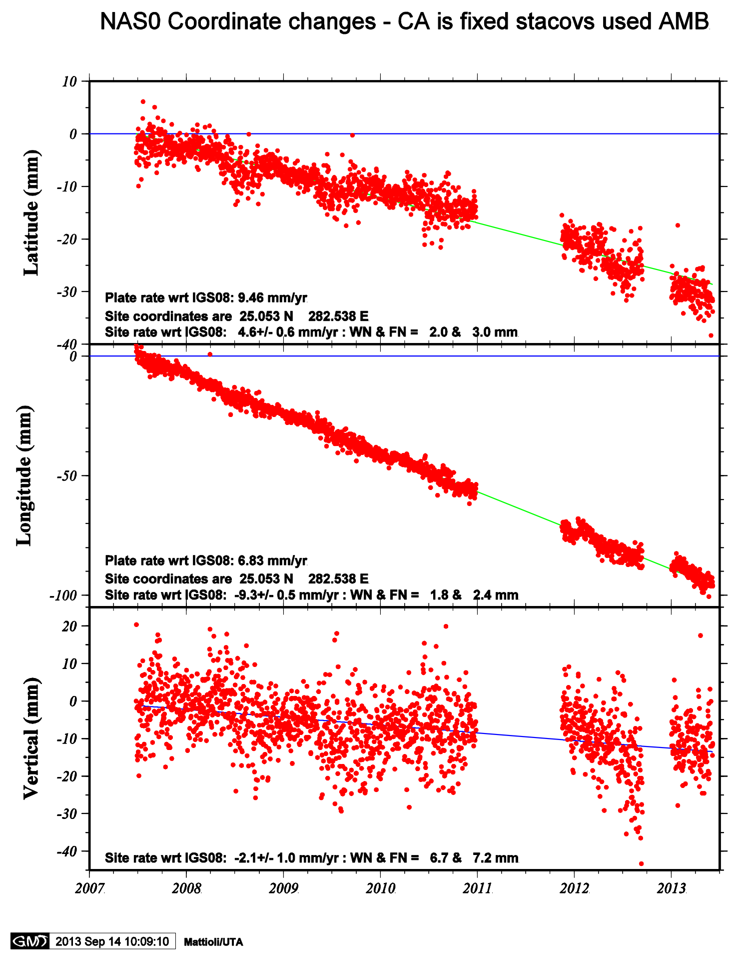

MIPR Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 13.24 mm/yr
Site coordinates are 17.886 N 293.473 E
Site rate wrt IGS08: 13.6+/- 0.5 mm/yr : WN & FN = 1.9 & 1.5 mm
Plate rate wrt IGS08: 10.71 mm/yr
Site coordinates are 17.886 N 293.473 E
Site rate wrt IGS08: 9.6+/- 0.5 mm/yr : WN & FN = 1.8 & 1.9 mm
Site rate wrt IGS08: 0.3+/- 0.9 mm/yr : WN & FN = 7.2 & 4.3 mm
2013 Jul 08 13:28:15
Mattioli/UTA

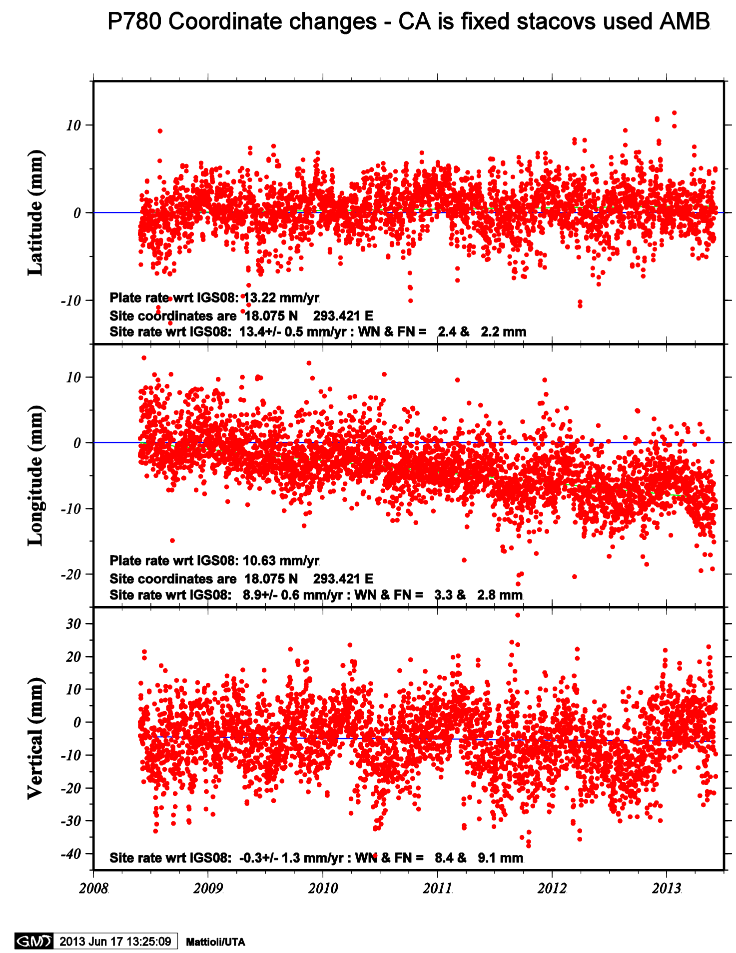

MAYZ Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 13.03 mm/yr
Site coordinates are 18.218 N 292.841 E
Site rate wrt IGS08: 14.0+/- 0.9 mm/yr : WN & FN = 2.5 & 2.9 mm
Plate rate wrt IGS08: 10.53 mm/yr
Site coordinates are 18.218 N 292.841 E
Site rate wrt IGS08: 9.2+/- 0.7 mm/yr : WN & FN = 2.4 & 1.9 mm
Site rate wrt IGS08: 0.4+/- 1.5 mm/yr : WN & FN = 8.4 & 6.0 mm
2010
2011
2012
2013
2013 Jul 09 12:48:06
Mattioli/UTA

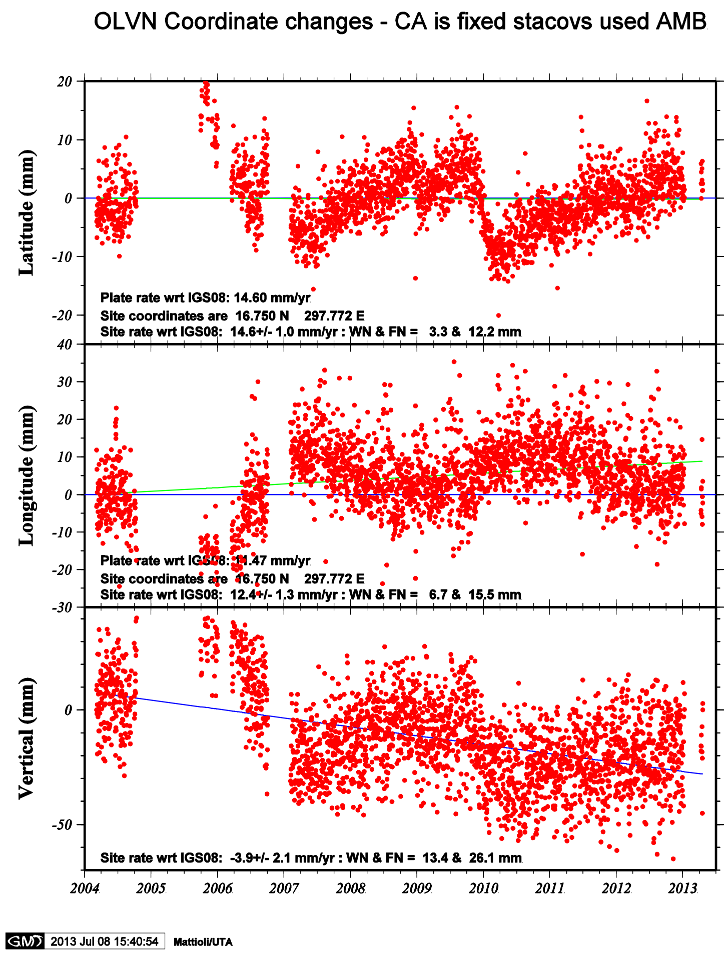

MOPR Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 12.78 mm/yr
Site coordinates are 18.077 N 292.069 E
Site rate wrt IGS08: 11.4+/- 0.7 mm/yr : WN & FN = 2.1 & 0.8 mm
Plate rate wrt IGS08: 10.54 mm/yr
Site coordinates are 18.077 N 292.069 E
Site rate wrt IGS08: 8.9+/- 0.7 mm/yr : WN & FN = 2.1 & 1.3 mm
Site rate wrt IGS08: -3.0+/- 1.2 mm/yr : WN & FN = 7.3 & 3.2 mm
2009
2010
2011
2012
2013 Jul 08 13:36:58
Mattioli/UTA


MNTO Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 6.11 mm/yr
Site coordinates are 14.917 N 273.619 E
Site rate wrt IGS08: 6.7+/- 0.6 mm/yr : WN & FN = 1.1 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 11.02 mm/yr
Site coordinates are 14.917 N 273.619 E
Site rate wrt IGS08: 11.0+/- 1.1 mm/yr : WN & FN = 2.0 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -1.7+/- 2.2 mm/yr : WN & FN = 13.1 & 12.0 mm
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
2013 Jun 15 14:39:34
Mattioli/UTA

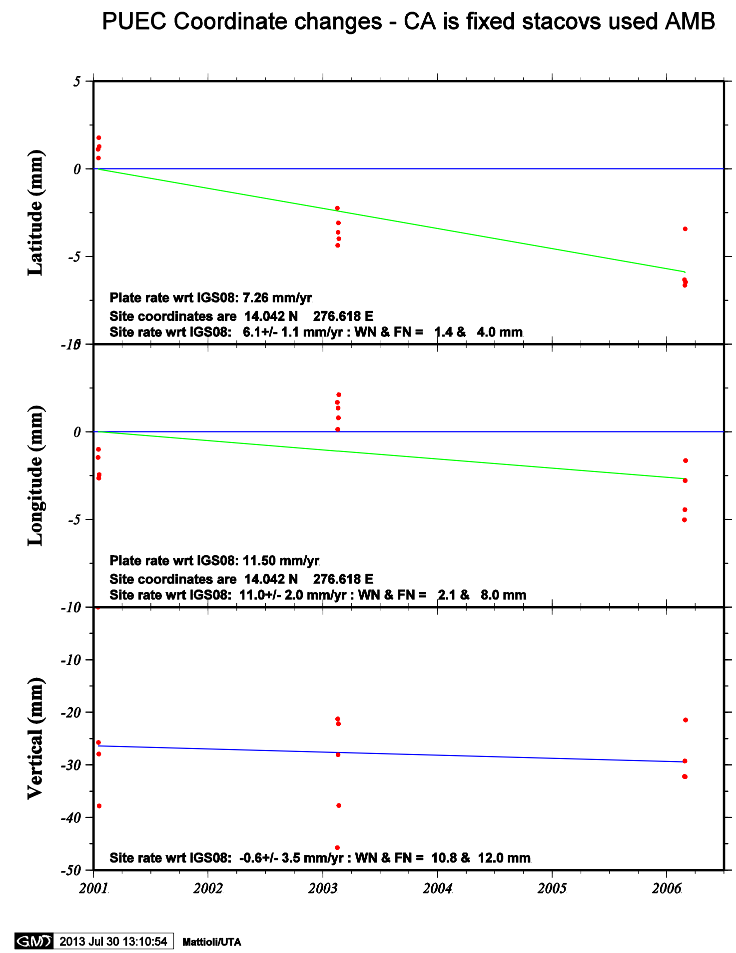

NWBL Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.61 mm/yr
Site coordinates are 16.820 N 297.797 E
Site rate wrt IGS08: 23.8+/- 1.5 mm/yr : WN & FN = 2.5 & 1.8 mm
Longitude (mm)
Plate rate wrt IGS08: 11.44 mm/yr
Site coordinates are 16.820 N 297.797 E
Site rate wrt IGS08: 10.9+/- 1.5 mm/yr : WN & FN = 3.2 & 1.7 mm
Vertical (mm)
Site rate wrt IGS08: 16.4+/- 3.0 mm/yr : WN & FN = 8.5 & 3.9 mm
2012 2013
2013 Jul 09 11:30:56
Mattioli/UTA


NAS0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 9.46 mm/yr
Site coordinates are 25.053 N 282.538 E
Site rate wrt IGS08: 4.6+/- 0.6 mm/yr : WN & FN = 2.0 & 3.0 mm
Longitude (mm)
Plate rate wrt IGS08: 6.83 mm/yr
Site coordinates are 25.053 N 282.538 E
Site rate wrt IGS08: -9.3+/- 0.5 mm/yr : WN & FN = 1.8 & 2.4 mm
Vertical (mm)
Site rate wrt IGS08: -2.1+/- 1.0 mm/yr : WN & FN = 6.7 & 7.2 mm
2007
2008
2009
2010
2011
2012
2013
GMT 2013 Sep 14 10:09:10
Mattioli/UTA

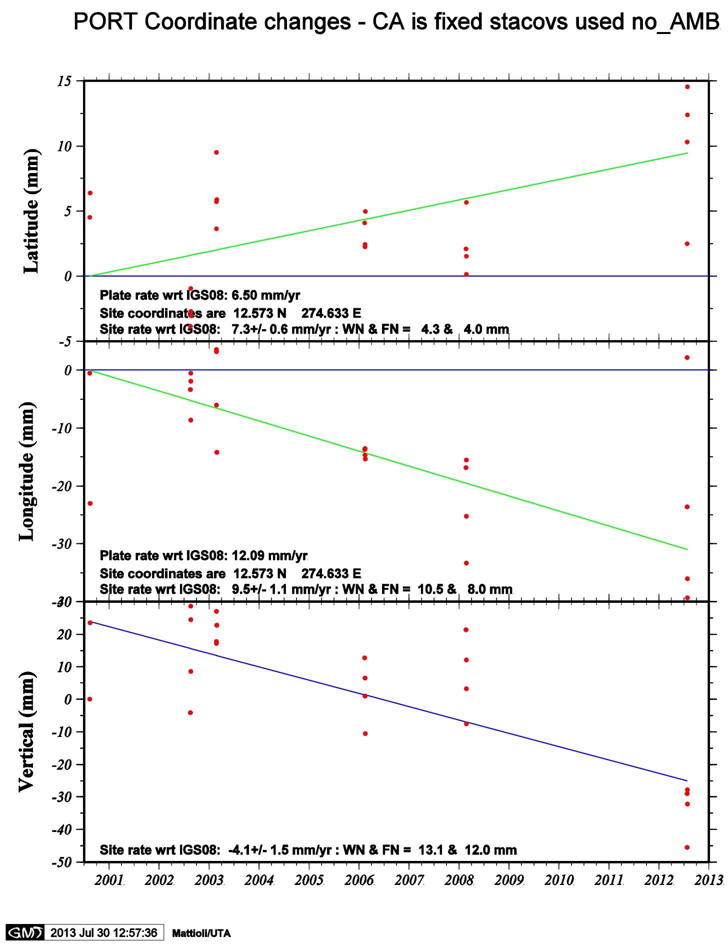

P780 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 13.22 mm/yr
Site coordinates are 18.075 N 293.421 E
Site rate wrt IGS08: 13.4+/- 0.5 mm/yr : WN & FN = 2.4 & 2.2 mm
Longitude (mm)
Plate rate wrt IGS08: 10.63 mm/yr
Site coordinates are 18.075 N 293.421 E
Site rate wrt IGS08: 8.9+/- 0.6 mm/yr : WN & FN = 3.3 & 2.8 mm
Vertical (mm)
Site rate wrt IGS08: -0.3+/- 1.3 mm/yr : WN & FN = 8.4 & 9.1 mm
2008
2009
2010
2011
2012
2013
GMT 2013 Jun 17 13:25:09
Mattioli/UTA

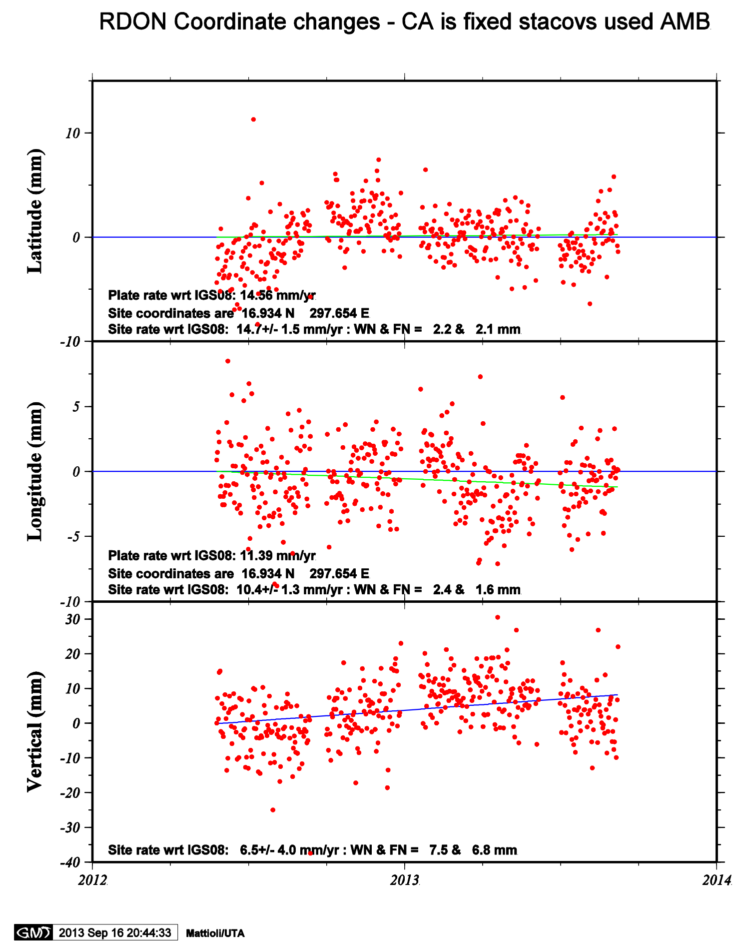


OLVN Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 14.60 mm/yr
Site coordinates are 16.750 N 297.772 E
Site rate wrt IGS08: 14.6+/- 1.0 mm/yr : WN & FN = 3.3 & 12.2 mm
Plate rate wrt IGS08: 11.47 mm/yr
Site coordinates are 16.750 N 297.772 E
Site rate wrt IGS08: 12.4+/- 1.3 mm/yr : WN & FN = 6.7 & 15.5 mm
Site rate wrt IGS08: -3.9+/- 2.1 mm/yr : WN & FN = 13.4 & 26.1 mm
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
GMT 2013 Jul 08 15:40:54
Mattioli/UTA

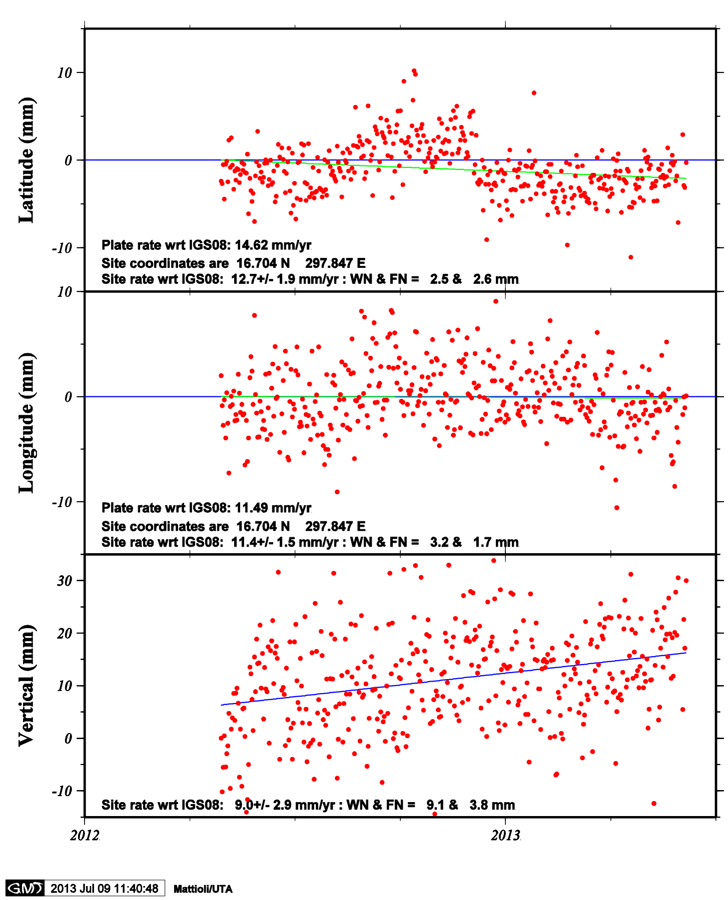


PUEC Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 7.26 mm/yr
Site coordinates are 14.042 N 276.618 E
Site rate wrt IGS08: 6.1+/- 1.1 mm/yr : WN & FN = 1.4 & 4.0 mm
Plate rate wrt IGS08: 11.50 mm/yr
Site coordinates are 14.042 N 276.618 E
Site rate wrt IGS08: 11.0+/- 2.0 mm/yr : WN & FN = 2.1 & 8.0 mm
Site rate wrt IGS08: -0.6+/- 3.5 mm/yr : WN & FN = 10.8 & 12.0 mm
2001 2002 2003 2004 2005 2006
GMT 2013 Jul 30 13:10:54
Mattioli/UTA

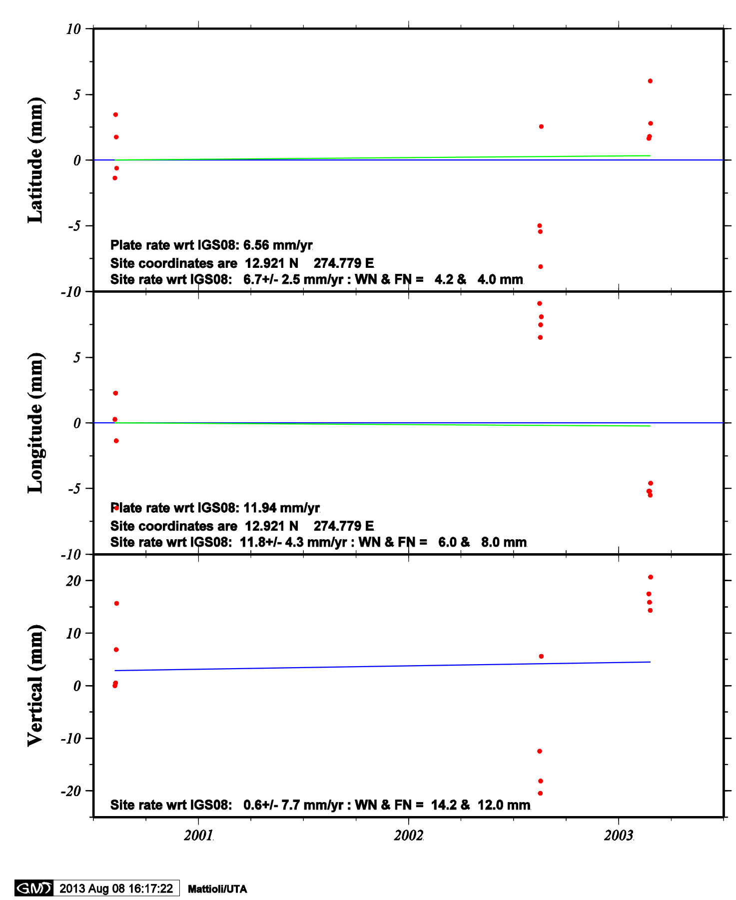

PORT Coordinate changes - CA is fixed stacovs used no_AMB
Latitude (mm)
Plate rate wrt IGS08: 6.50 mm/yr
Site coordinates are 12.573 N 274.633 E
Site rate wrt IGS08: 7.3+/- 0.6 mm/yr : WN & FN = 4.3 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 12.09 mm/yr
Site coordinates are 12.573 N 274.633 E
Site rate wrt IGS08: 9.5+/- 1.1 mm/yr : WN & FN = 10.5 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -4.1+/- 1.5 mm/yr : WN & FN = 13.1 & 12.0 mm
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
GMT 2013 Jul 30 12:57:36 Mattioli/UTA

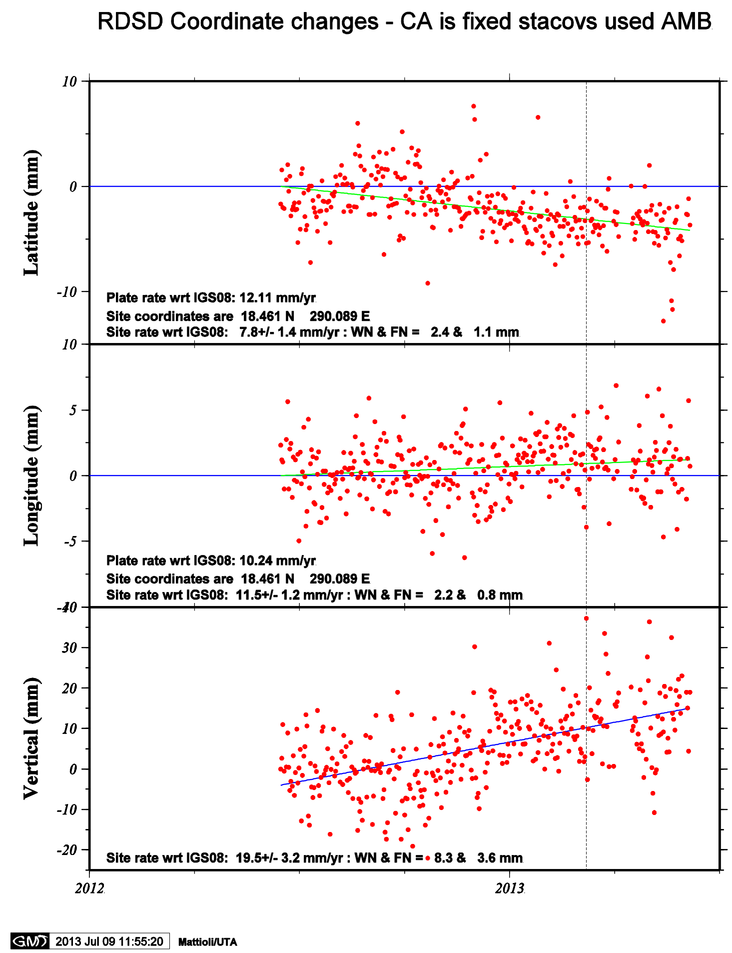

RDON Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.56 mm/yr
Site coordinates are 16.934 N 297.654 E
Site rate wrt IGS08: 14.7+/- 1.5 mm/yr : WN & FN = 2.2 & 2.1 mm
Longitude (mm)
Plate rate wrt IGS08: 11.39 mm/yr
Site coordinates are 16.934 N 297.654 E
Site rate wrt IGS08: 10.4+/- 1.3 mm/yr : WN & FN = 2.4 & 1.6 mm
Vertical (mm)
Site rate wrt IGS08: 6.5+/- 4.0 mm/yr : WN & FN = 7.5 & 6.8 mm
2012 2013 2014
GMT 2013 Sep 16 20:44:33 Mattioli/UTA

RCHY Coordinate changes - CA is fixed stacovs used AMB

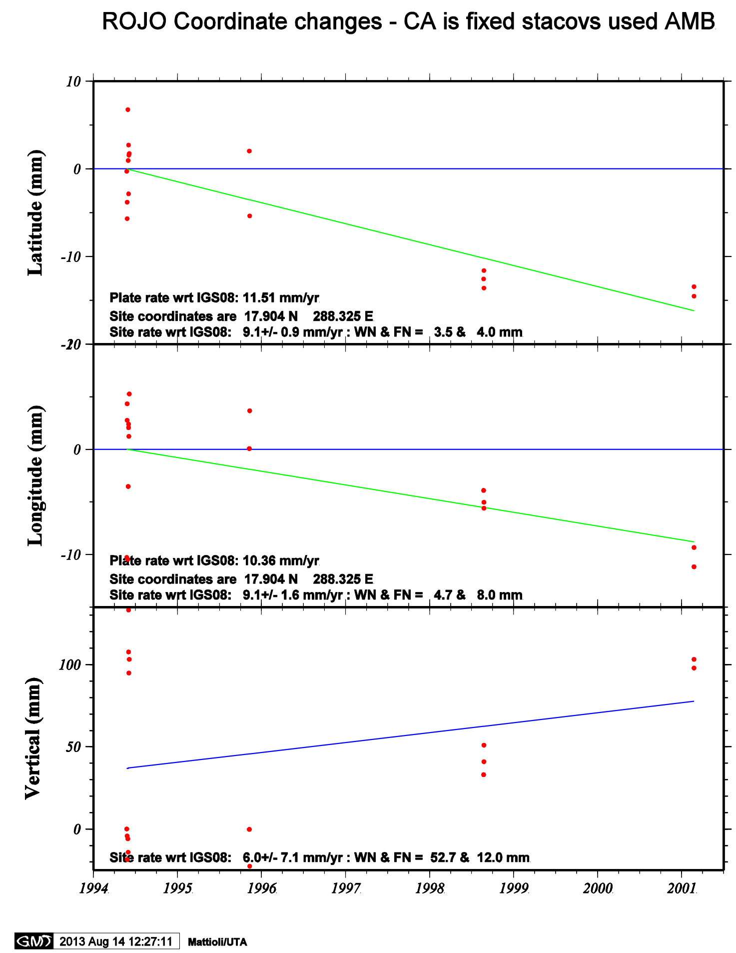


RIOB Coordinate changes - CA is fixed stacovs used AMB

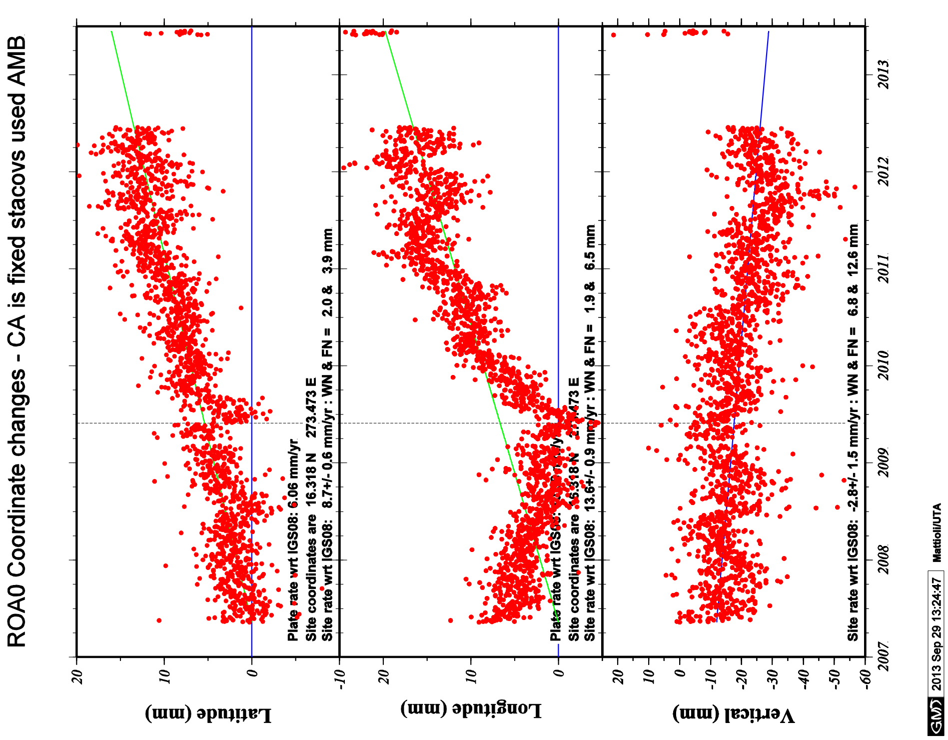


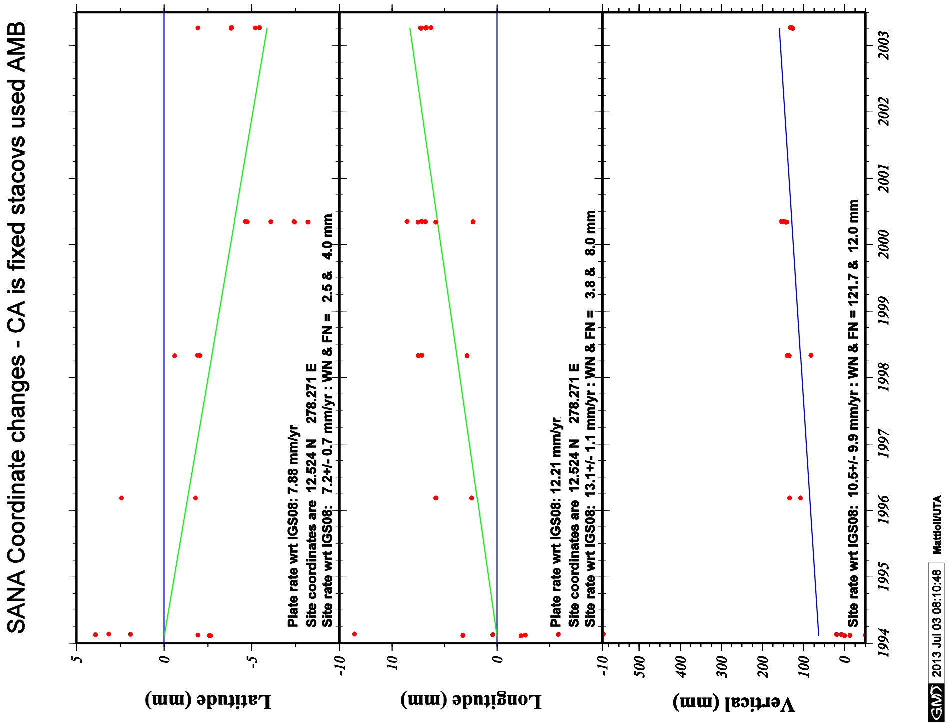


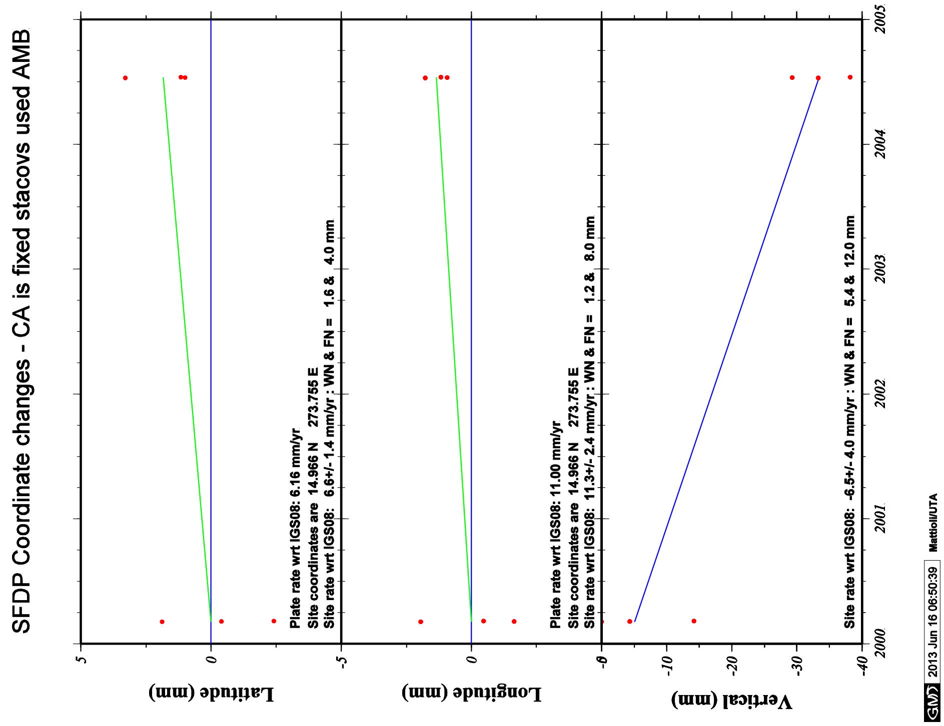
RDSD Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 12.11 mm/yr
Site coordinates are 18.461 N 290.089 E
Site rate wrt IGS08: 7.8+/- 1.4 mm/yr : WN & FN = 2.4 & 1.1 mm
Longitude (mm)
Plate rate wrt IGS08: 10.24 mm/yr
Site coordinates are 18.461 N 290.089 E
Site rate wrt IGS08: 11.5+/- 1.2 mm/yr : WN & FN = 2.2 & 0.8 mm
Vertical (mm)
Site rate wrt IGS08: 19.5+/- 3.2 mm/yr : WN & FN = 8.3 & 3.6 mm
2012
2013
2013 Jul 09 11:55:20
Mattioli/UTA

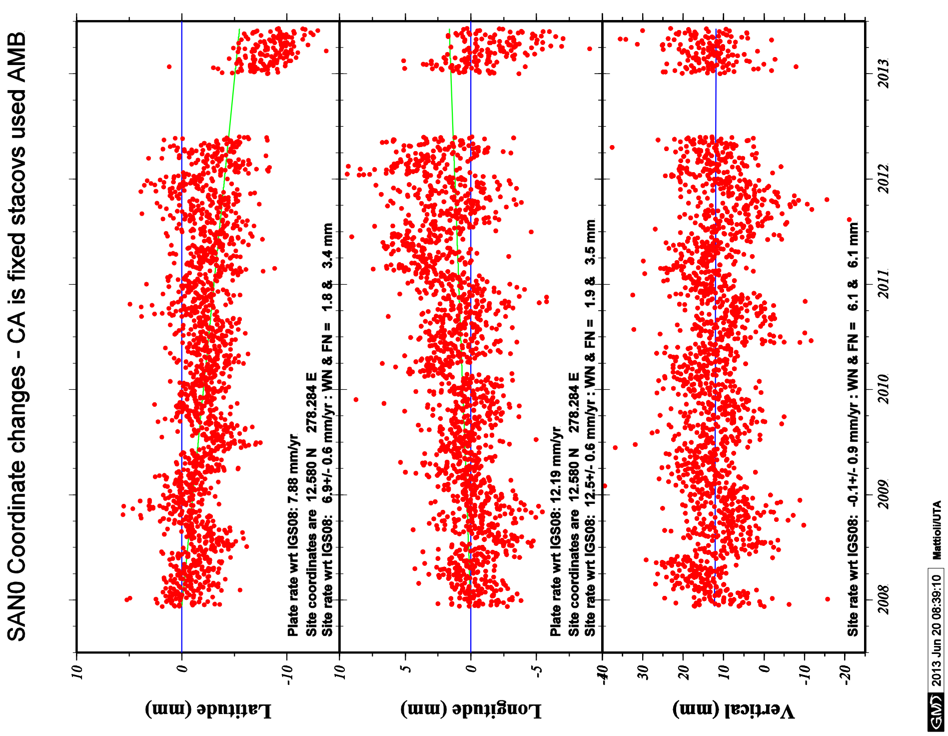


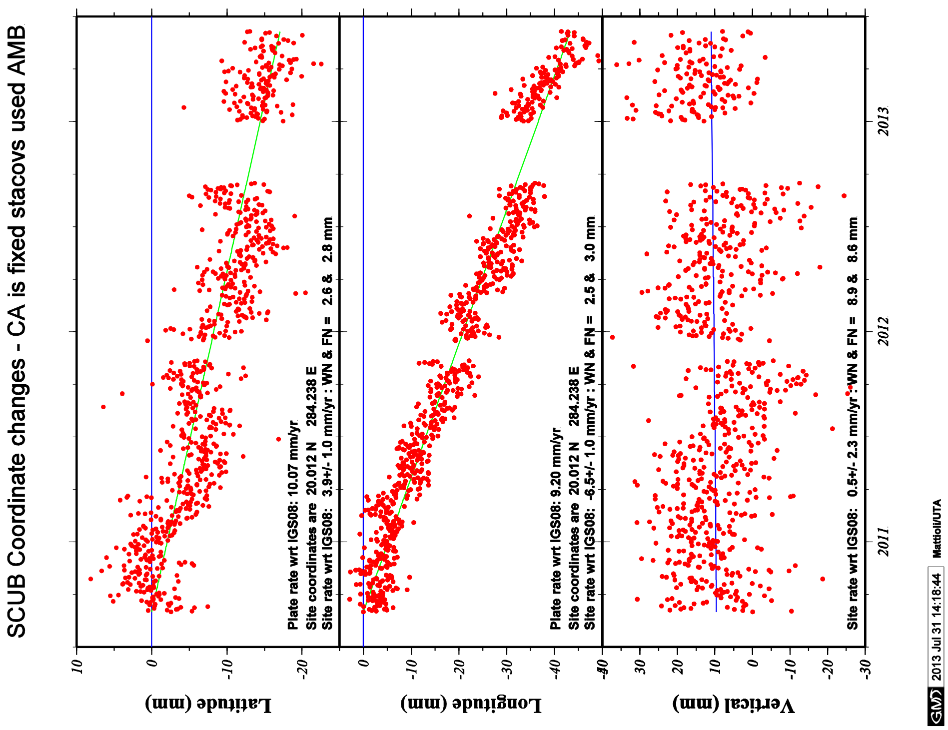
ROJO Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.51 mm/yr
Site coordinates are 17.904 N 288.325 E
Site rate wrt IGS08: 9.1+/- 0.9 mm/yr : WN & FN = 3.5 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 10.36 mm/yr
Site coordinates are 17.904 N 288.325 E
Site rate wrt IGS08: 9.1+/- 1.6 mm/yr : WN & FN = 4.7 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: 6.0+/- 7.1 mm/yr : WN & FN = 52.7 & 12.0 mm
1994
1995
1996
1997
1998
1999
2000
2001
2013 Aug 14 12:27:11
Mattioli/UTA


ROA0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 6.06 mm/yr
Site coordinates are 16.318 N 273.473 E
Site rate wrt IGS08: 8.7+/- 0.6 mm/yr : WN & FN = 2.0 & 3.9 mm
Site rate wrt IGS08: 13.6+/- 0.9 mm/yr : WN & FN = 1.9 & 6.5 mm
Site rate wrt IGS08: -2.8+/- 1.5 mm/yr : WN & FN = 6.8 & 12.6 mm
2007 2008 2009 2010 2011 2012 2013
2013 Sep 29 13:24:47
Mattioli/UTA

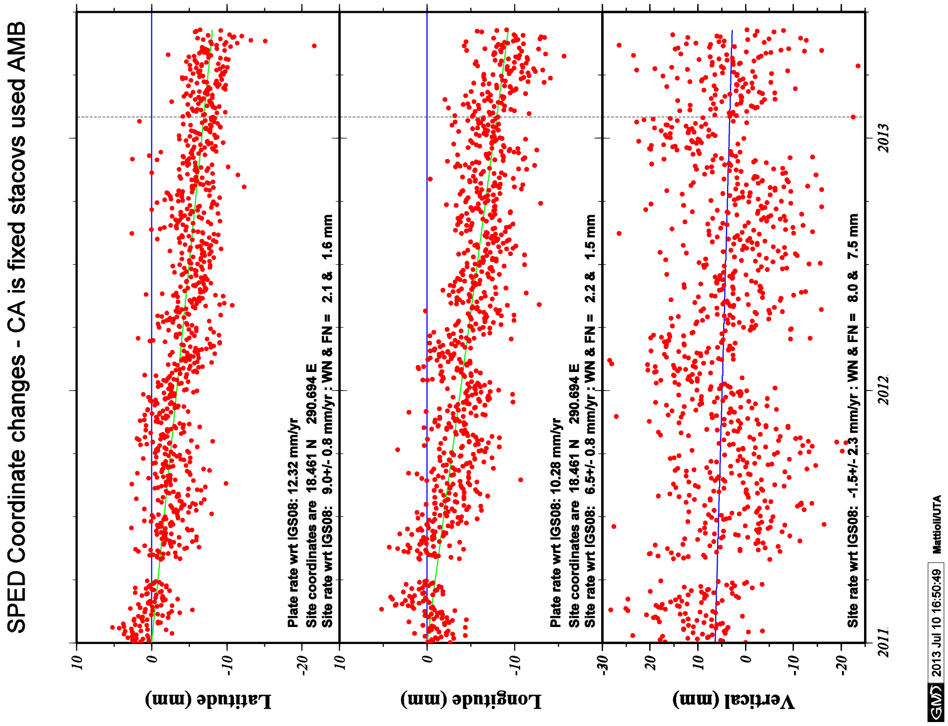

SANA Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 7.88 mm/yr
Site coordinates are 12.524 N 278.271 E
Site rate wrt IGS08: 7.2+/- 0.7 mm/yr : WN & FN = 2.5 & 4.0 mm
Plate rate wrt IGS08: 12.21 mm/yr
Site coordinates are 12.524 N 278.271 E
Site rate wrt IGS08: 13.1+/- 1.1 mm/yr : WN & FN = 3.8 & 8.0 mm
Site rate wrt IGS08: 10.5+/- 9.9 mm/yr : WN & FN = 121.7 & 12.0 mm
1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
2013 Jul 03 08:10:48
Mattioli/UTA


SFDP Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 6.16 mm/yr
Site coordinates are 14.966 N 273.755 E
Site rate wrt IGS08: 6.6+/- 1.4 mm/yr : WN & FN = 1.6 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 11.00 mm/yr
Site coordinates are 14.966 N 273.755 E
Site rate wrt IGS08: 11.3+/- 2.4 mm/yr : WN & FN = 1.2 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -6.5+/- 4.0 mm/yr : WN & FN = 5.4 & 12.0 mm
2000
2001
2002
2003
2004
2005
2013 Jun 16 06:50:39
Mattioli/UTA

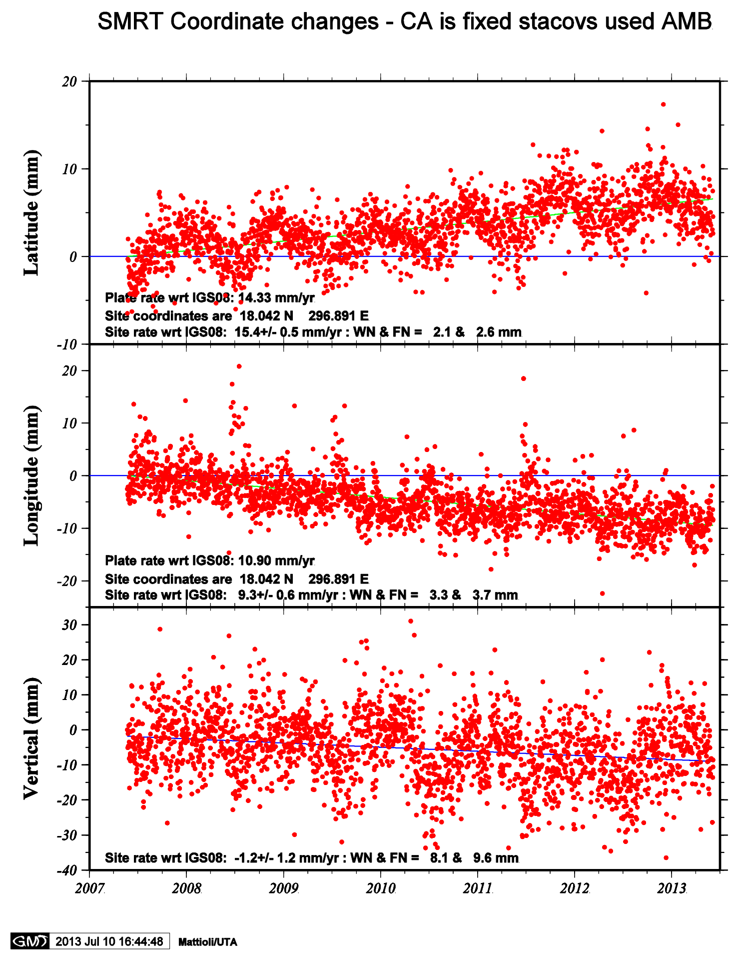

SAN0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 7.88 mm/yr
Site coordinates are 12.580 N 278.284 E
Site rate wrt IGS08: 6.9+/- 0.6 mm/yr : WN & FN = 1.8 & 3.4 mm
Longitude (mm)
Plate rate wrt IGS08: 12.19 mm/yr
Site coordinates are 12.580 N 278.284 E
Site rate wrt IGS08: 12.5+/- 0.6 mm/yr : WN & FN = 1.9 & 3.5 mm
Vertical (mm)
Site rate wrt IGS08: -0.1+/- 0.9 mm/yr : WN & FN = 6.1 & 6.1 mm
2008
2009
2010
2011
2012
2013
2013 Jun 20 08:39:10
Mattioli/UTA

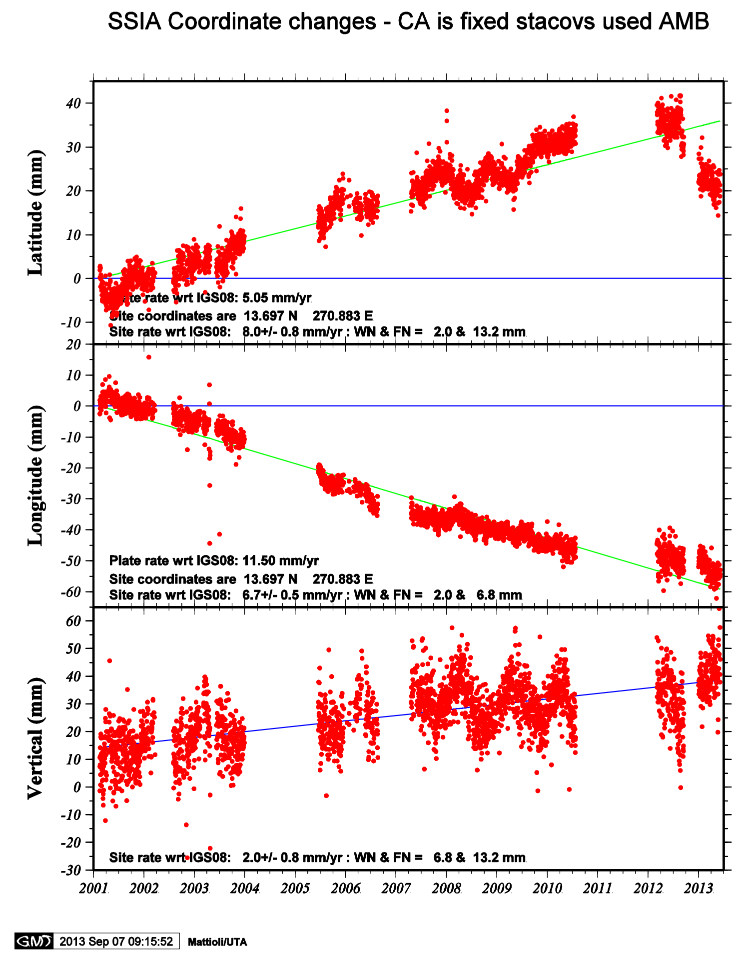


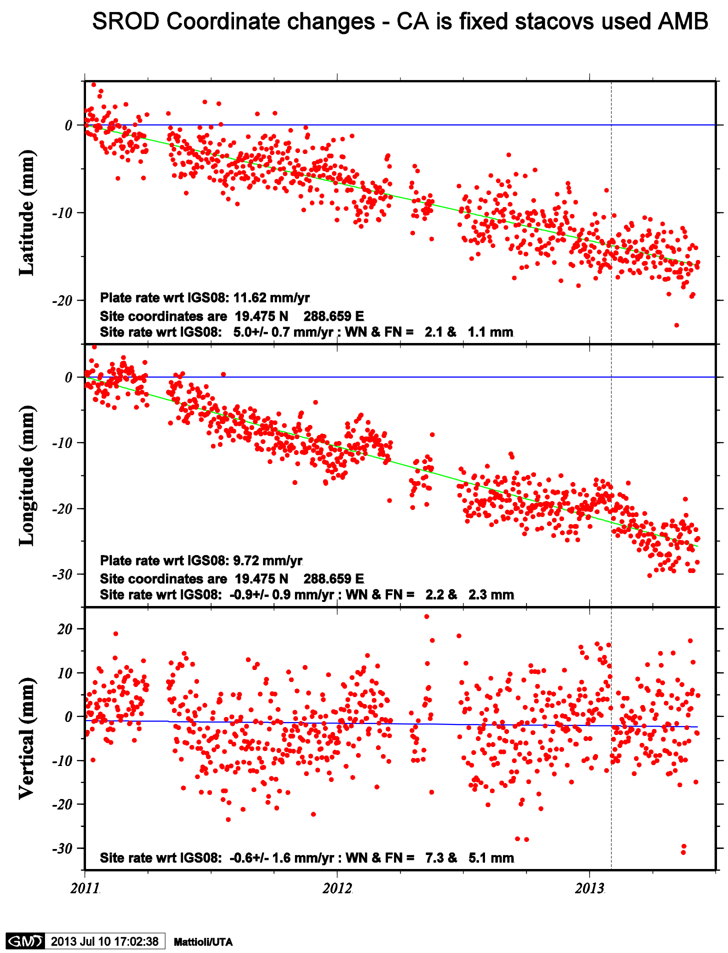
SCUB Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 10.07 mm/yr
Site coordinates are 20.012 N 284.238 E
Site rate wrt IGS08: 3.9+/- 1.0 mm/yr ; WN & FN = 2.6 & 2.8 mm
Plate rate wrt IGS08: 9.20 mm/yr
Site coordinates are 20.012 N 284.238 E
Site rate wrt IGS08: -6.5+/- 1.0 mm/yr ; WN & FN = 2.5 & 3.0 mm
Site rate wrt IGS08: 0.5+/- 2.3 mm/yr ; WN & FN = 8.9 & 8.6 mm
2011
2012
2013
2013 Jul 31 14:18:44
Mattioli/UTA

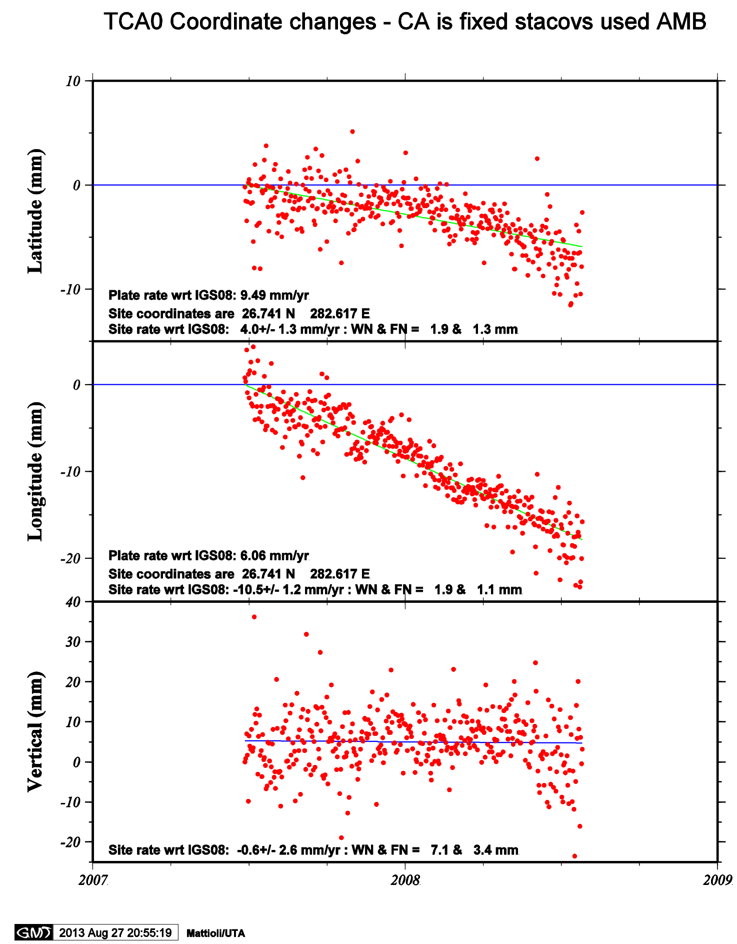


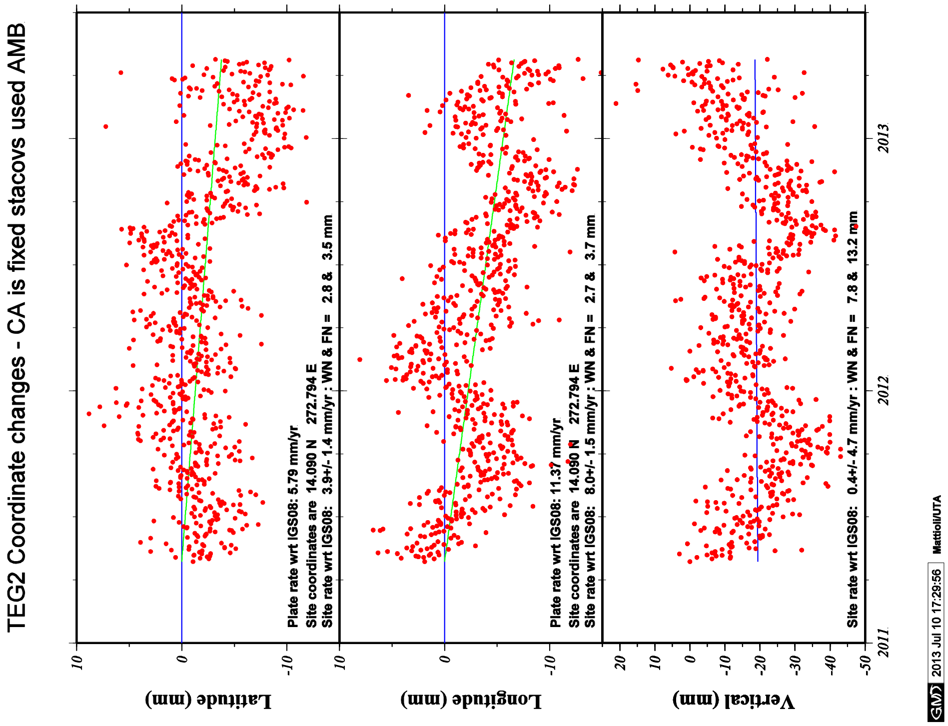
SPED Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 12.32 mm/yr
Site coordinates are 18.461 N 290.694 E
Site rate wrt IGS08: 9.0+/- 0.8 mm/yr ; WN & FN = 2.1 & 1.6 mm
Plate rate wrt IGS08: 10.28 mm/yr
Site coordinates are 18.461 N 290.694 E
Site rate wrt IGS08: 6.5+/- 0.8 mm/yr ; WN & FN = 2.2 & 1.5 mm
Site rate wrt IGS08: -1.5+/- 2.3 mm/yr ; WN & FN = 8.0 & 7.5 mm
2011
2012
2013
2013 Jul 10 16:50:49
Mattioli/UTA

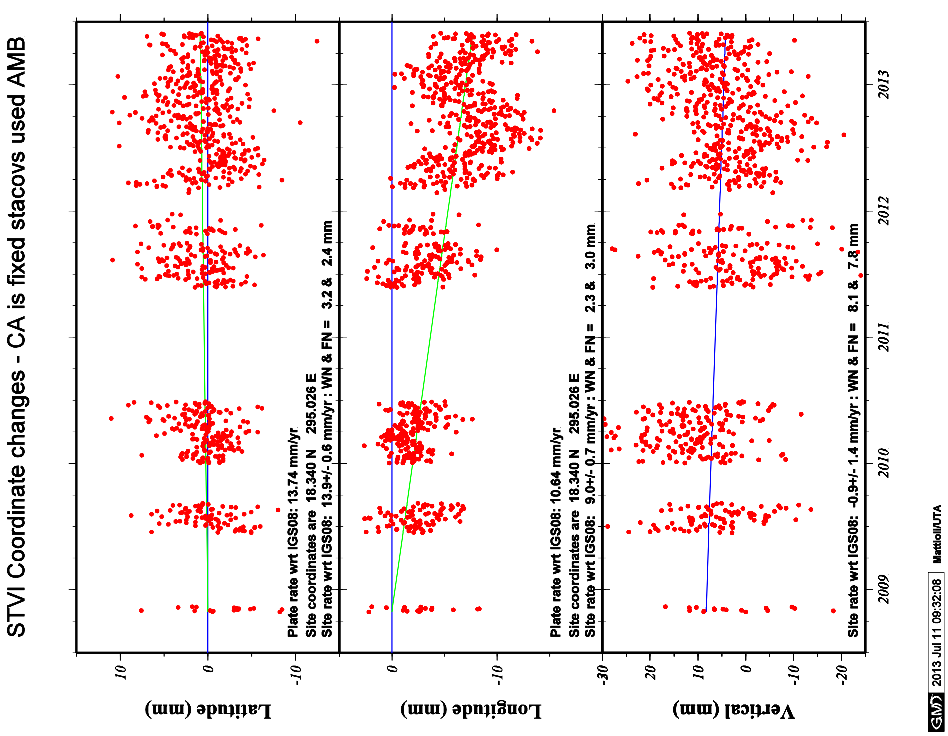

SMRT Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.33 mm/yr
Site coordinates are 18.042 N 296.891 E
Site rate wrt IGS08: 15.4+/- 0.5 mm/yr : WN & FN = 2.1 & 2.6 mm
Longitude (mm)
Plate rate wrt IGS08: 10.90 mm/yr
Site coordinates are 18.042 N 296.891 E
Site rate wrt IGS08: 9.3+/- 0.6 mm/yr : WN & FN = 3.3 & 3.7 mm
Vertical (mm)
Site rate wrt IGS08: -1.2+/- 1.2 mm/yr : WN & FN = 8.1 & 9.6 mm
2007 2008 2009 2010 2011 2012 2013
GMT 2013 Jul 10 16:44:48 Mattioli/UTA

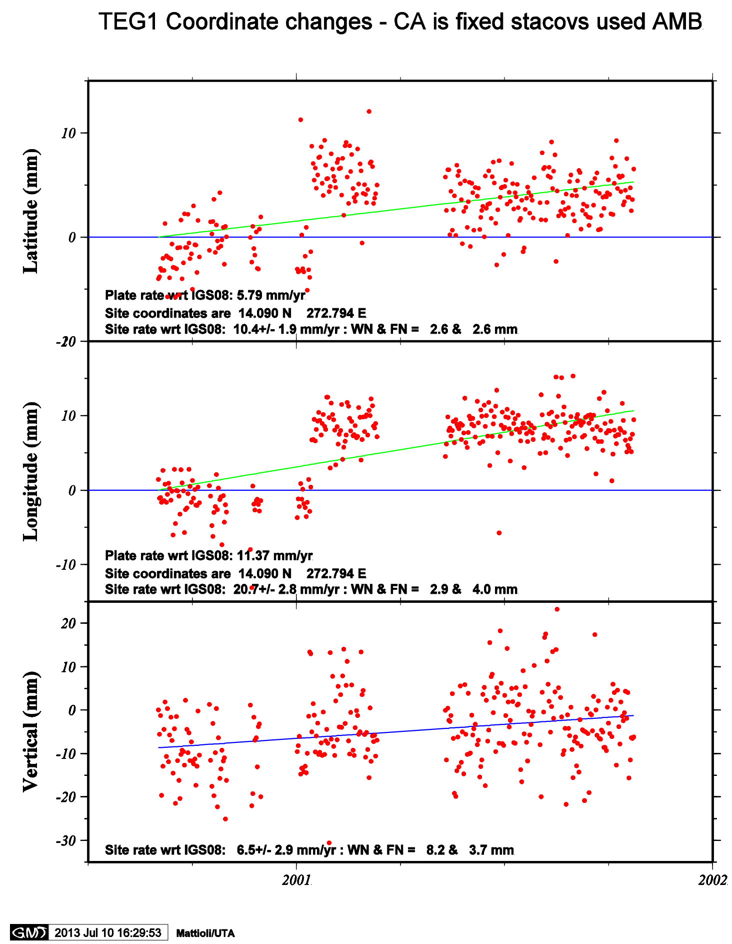

SSIA Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 5.05 mm/yr
Site coordinates are 13.697 N 270.883 E
Site rate wrt IGS08: 8.0+/- 0.8 mm/yr : WN & FN = 2.0 & 13.2 mm
Longitude (mm)
Plate rate wrt IGS08: 11.50 mm/yr
Site coordinates are 13.697 N 270.883 E
Site rate wrt IGS08: 6.7+/- 0.5 mm/yr : WN & FN = 2.0 & 6.8 mm
Vertical (mm)
Site rate wrt IGS08: 2.0+/- 0.8 mm/yr : WN & FN = 6.8 & 13.2 mm
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
GMT 2013 Sep 07 09:15:52 Mattioli/UTA

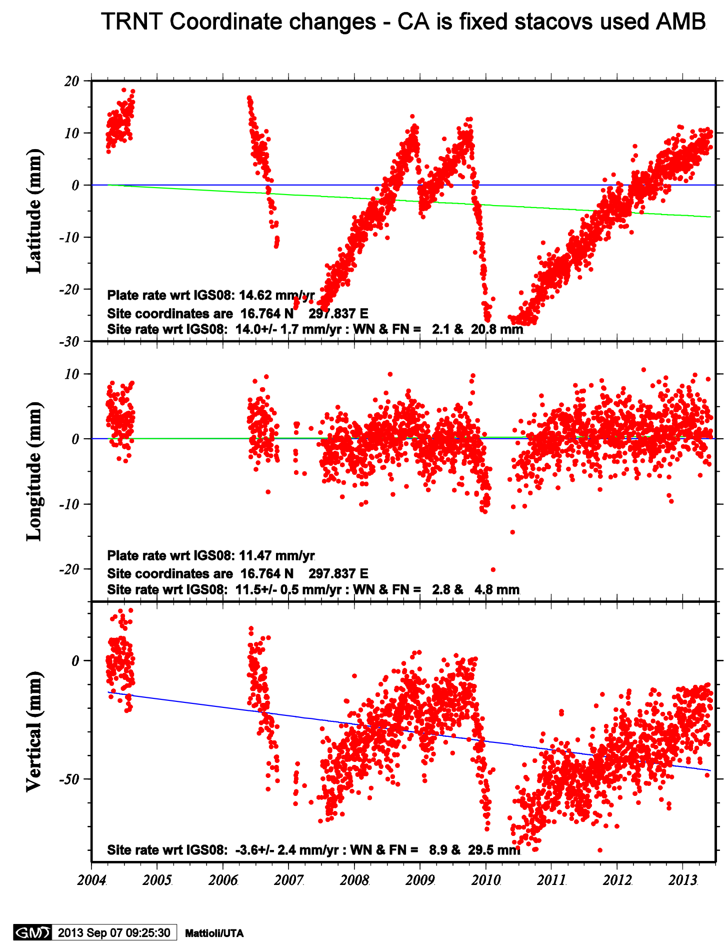

SROD Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.62 mm/yr
Site coordinates are 19.475 N 288.659 E
Site rate wrt IGS08: 5.0+/- 0.7 mm/yr : WN & FN = 2.1 & 1.1 mm
Longitude (mm)
Plate rate wrt IGS08: 9.72 mm/yr
Site coordinates are 19.475 N 288.659 E
Site rate wrt IGS08: -0.9+/- 0.9 mm/yr : WN & FN = 2.2 & 2.3 mm
Vertical (mm)
Site rate wrt IGS08: -0.6+/- 1.6 mm/yr : WN & FN = 7.3 & 5.1 mm
2011
2012
2013
2013 Jul 10 17:02:38
Mattioli/UTA

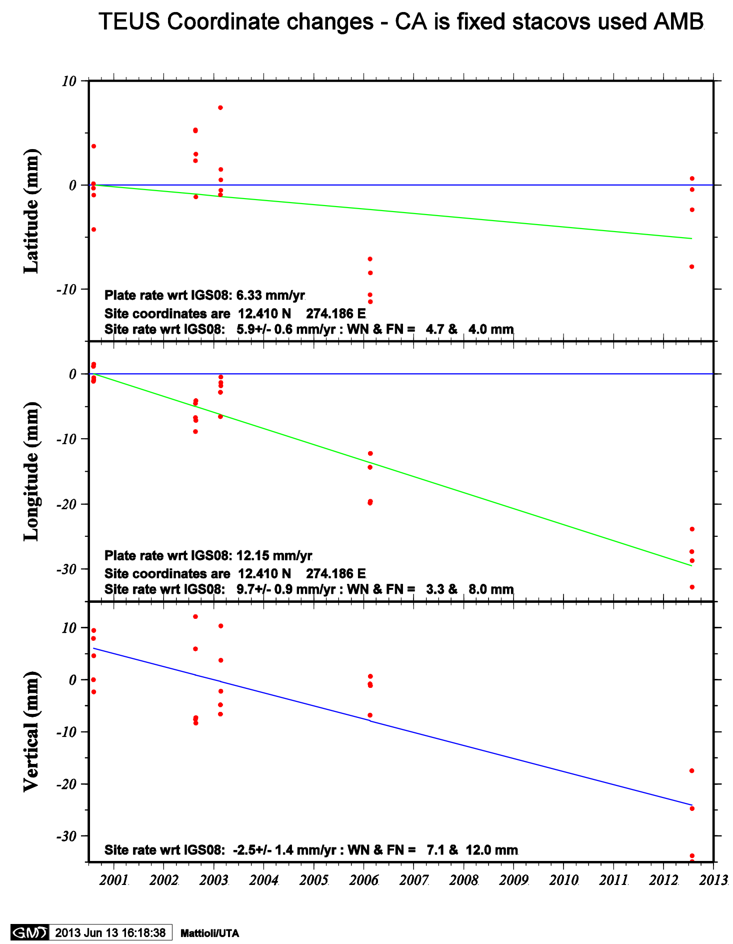

TCA0 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 9.49 mm/yr
Site coordinates are 26.741 N 282.617 E
Site rate wrt IGS08: 4.0+/- 1.3 mm/yr : WN & FN = 1.9 & 1.3 mm
Longitude (mm)
Plate rate wrt IGS08: 6.06 mm/yr
Site coordinates are 26.741 N 282.617 E
Site rate wrt IGS08: -10.5+/- 1.2 mm/yr : WN & FN = 1.9 & 1.1 mm
Vertical (mm)
Site rate wrt IGS08: -0.6+/- 2.6 mm/yr : WN & FN = 7.1 & 3.4 mm
2007
2008
2009
2013 Aug 27 20:55:19
Mattioli/UTA

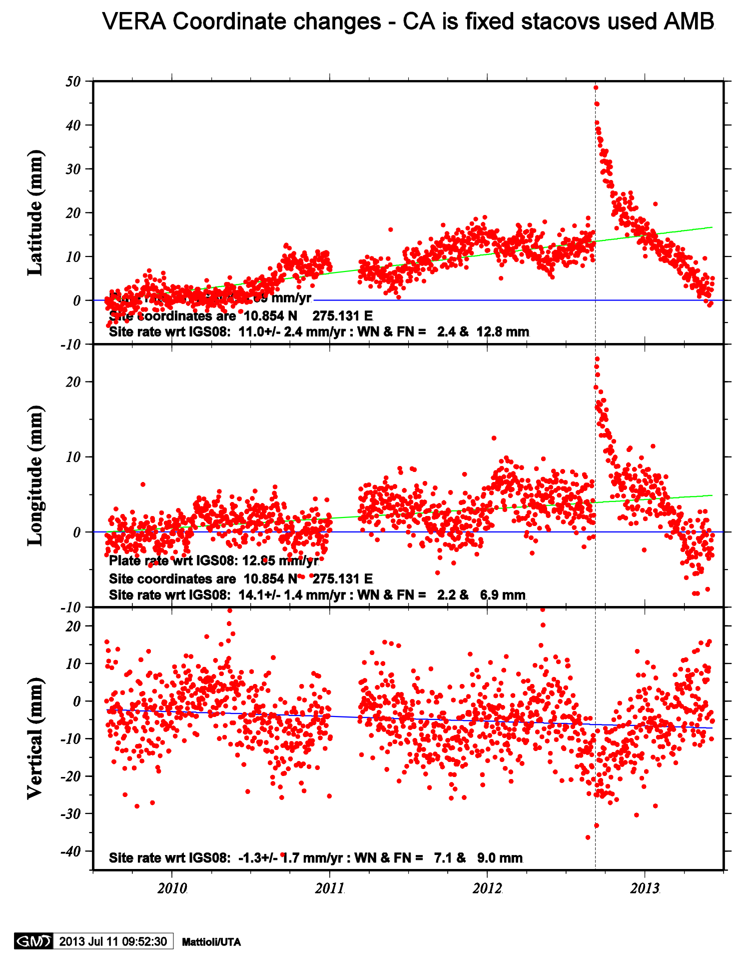

TEG2 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 5.79 mm/yr
Site coordinates are 14.090 N 272.794 E
Site rate wrt IGS08: 3.9+/- 1.4 mm/yr ; WN & FN = 2.8 & 3.5 mm
Plate rate wrt IGS08: 11.37 mm/yr
Site coordinates are 14.090 N 272.794 E
Site rate wrt IGS08: 8.0+/- 1.5 mm/yr ; WN & FN = 2.7 & 3.7 mm
Site rate wrt IGS08: 0.4+/- 4.7 mm/yr ; WN & FN = 7.8 & 13.2 mm
2011
2012
2013
2013 Jul 10 17:29:56
Mattioli/UTA

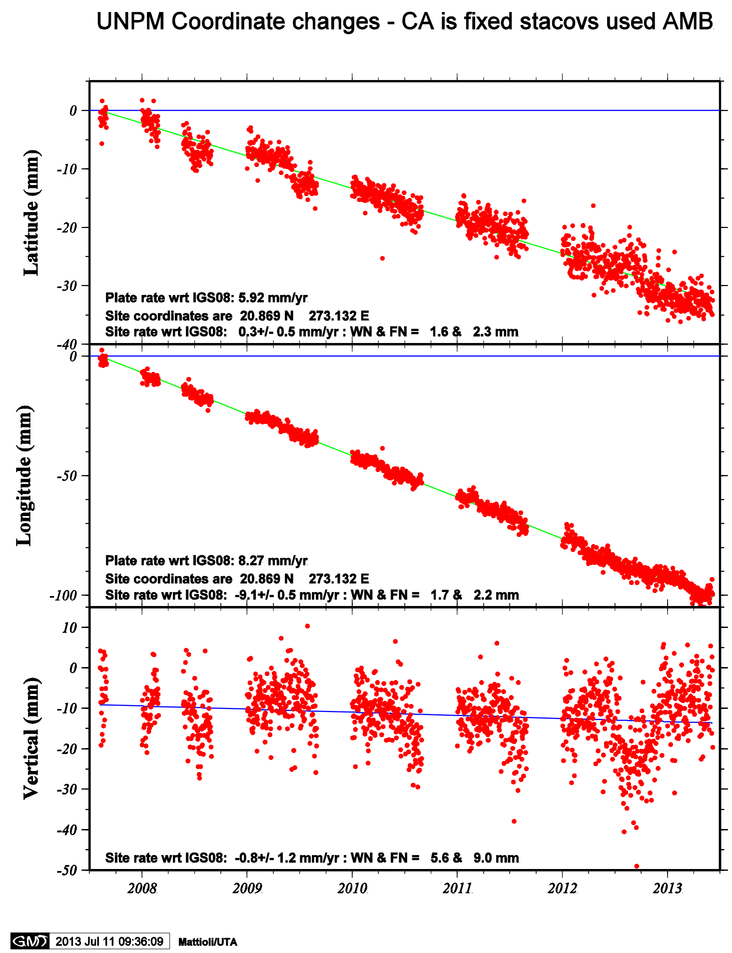

STVI Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Longitude (mm)
Vertical (mm)
Plate rate wrt IGS08: 13.74 mm/yr
Site coordinates are 18.340 N 295.026 E
Site rate wrt IGS08: 13.9+/- 0.6 mm/yr ; WN & FN = 3.2 & 2.4 mm
Plate rate wrt IGS08: 10.64 mm/yr
Site coordinates are 18.340 N 295.026 E
Site rate wrt IGS08: 9.0+/- 0.7 mm/yr ; WN & FN = 2.3 & 3.0 mm
Site rate wrt IGS08: -0.9+/- 1.4 mm/yr ; WN & FN = 8.1 & 7.8 mm
2009
2010
2011
2012
2013
2013 Jul 11 09:32:08
Mattioli/UTA

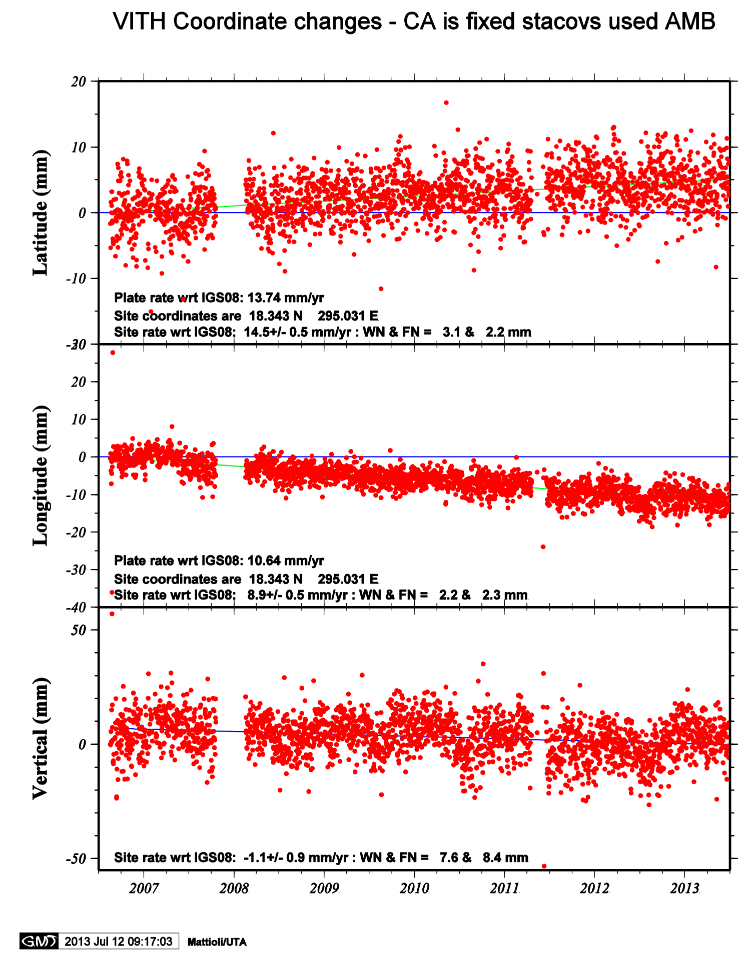

TEG1 Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 5.79 mm/yr
Site coordinates are 14.090 N 272.794 E
Site rate wrt IGS08: 10.4+/- 1.9 mm/yr : WN & FN = 2.6 & 2.6 mm
Longitude (mm)
Plate rate wrt IGS08: 11.37 mm/yr
Site coordinates are 14.090 N 272.794 E
Site rate wrt IGS08: 20.7+/- 2.8 mm/yr : WN & FN = 2.9 & 4.0 mm
Vertical (mm)
Site rate wrt IGS08: 6.5+/- 2.9 mm/yr : WN & FN = 8.2 & 3.7 mm
2001
2002
2013 Jul 10 16:29:53
Mattioli/UTA


TRNT Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 14.62 mm/yr
Site coordinates are 16.764 N 297.837 E
Site rate wrt IGS08: 14.0+/- 1.7 mm/yr : WN & FN = 2.1 & 20.8 mm
Longitude (mm)
Plate rate wrt IGS08: 11.47 mm/yr
Site coordinates are 16.764 N 297.837 E
Site rate wrt IGS08: 11.5+/- 0.5 mm/yr : WN & FN = 2.8 & 4.8 mm
Vertical (mm)
Site rate wrt IGS08: -3.6+/- 2.4 mm/yr : WN & FN = 8.9 & 29.5 mm
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2013 Sep 07 09:25:30
Mattioli/UTA

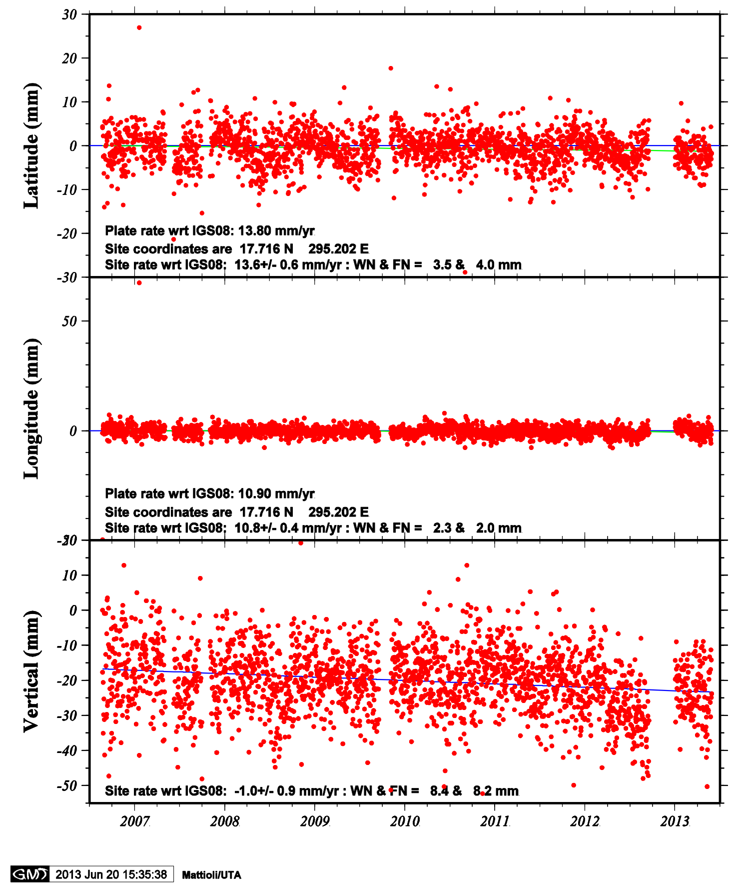

TEUS Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 6.33 mm/yr
Site coordinates are 12.410 N 274.186 E
Site rate wrt IGS08: 5.9+/- 0.6 mm/yr : WN & FN = 4.7 & 4.0 mm
Longitude (mm)
Plate rate wrt IGS08: 12.15 mm/yr
Site coordinates are 12.410 N 274.186 E
Site rate wrt IGS08: 9.7+/- 0.9 mm/yr : WN & FN = 3.3 & 8.0 mm
Vertical (mm)
Site rate wrt IGS08: -2.5+/- 1.4 mm/yr : WN & FN = 7.1 & 12.0 mm
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
2013 Jun 13 16:18:38
Mattioli/UTA


VERA Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Site coordinates are 10.854 N 275.131 E
Site rate wrt IGS08: 11.0+/- 2.4 mm/yr : WN & FN = 2.4 & 12.8 mm
Longitude (mm)
Plate rate wrt IGS08: 12.85 mm/yr
Site coordinates are 10.854 N 275.131 E
Site rate wrt IGS08: 14.1+/- 1.4 mm/yr : WN & FN = 2.2 & 6.9 mm
Vertical (mm)
Site rate wrt IGS08: -1.3+/- 1.7 mm/yr : WN & FN = 7.1 & 9.0 mm
2010 2011 2012 2013
2013 Jul 11 09:52:30
Mattioli/UTA

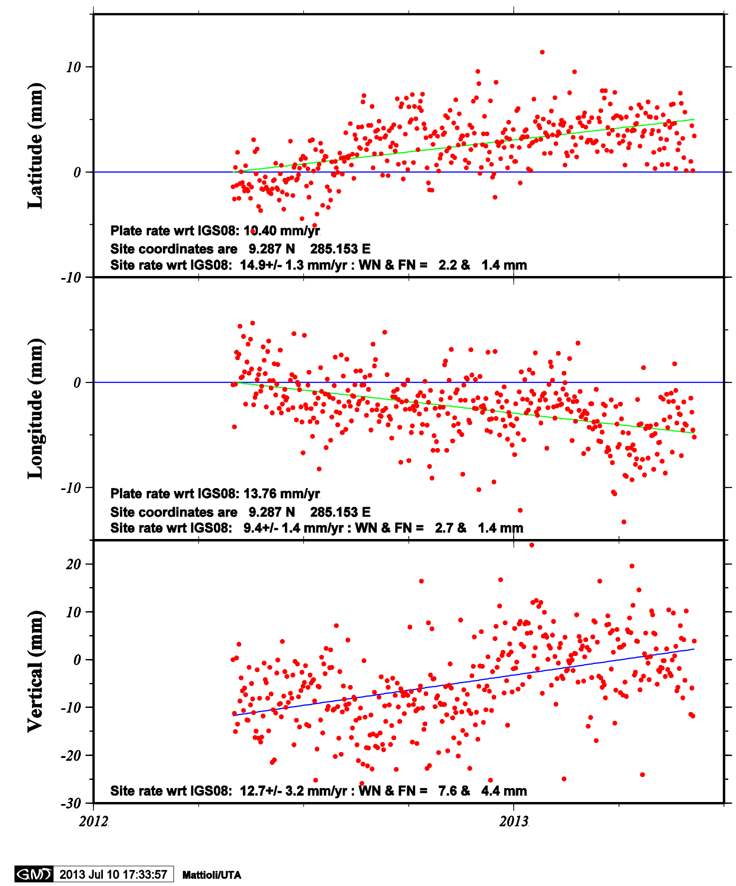

UNPM Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 5.92 mm/yr
Site coordinates are 20.869 N 273.132 E
Site rate wrt IGS08: 0.3+/- 0.5 mm/yr : WN & FN = 1.6 & 2.3 mm
Longitude (mm)
Plate rate wrt IGS08: 8.27 mm/yr
Site coordinates are 20.869 N 273.132 E
Site rate wrt IGS08: -9.1+/- 0.5 mm/yr : WN & FN = 1.7 & 2.2 mm
Vertical (mm)
Site rate wrt IGS08: -0.8+/- 1.2 mm/yr : WN & FN = 5.6 & 9.0 mm
2008 2009 2010 2011 2012 2013
2013 Jul 11 09:36:09 Mattioli/UTA

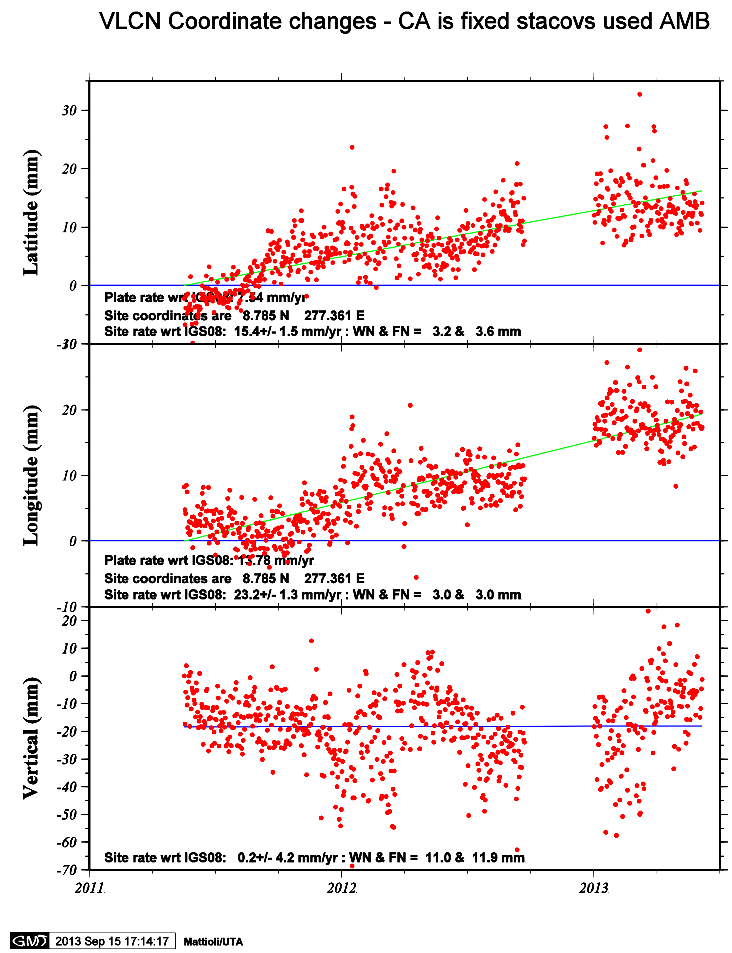

VITH Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 13.74 mm/yr
Site coordinates are 18.343 N 295.031 E
Site rate wrt IGS08: 14.5+/- 0.5 mm/yr : WN & FN = 3.1 & 2.2 mm
Longitude (mm)
Plate rate wrt IGS08: 10.64 mm/yr
Site coordinates are 18.343 N 295.031 E
Site rate wrt IGS08: 8.9+/- 0.5 mm/yr : WN & FN = 2.2 & 2.3 mm
Vertical (mm)
Site rate wrt IGS08: -1.1+/- 0.9 mm/yr : WN & FN = 7.6 & 8.4 mm
2007 2008 2009 2010 2011 2012 2013
2013 Jul 12 09:17:03 Mattioli/UTA

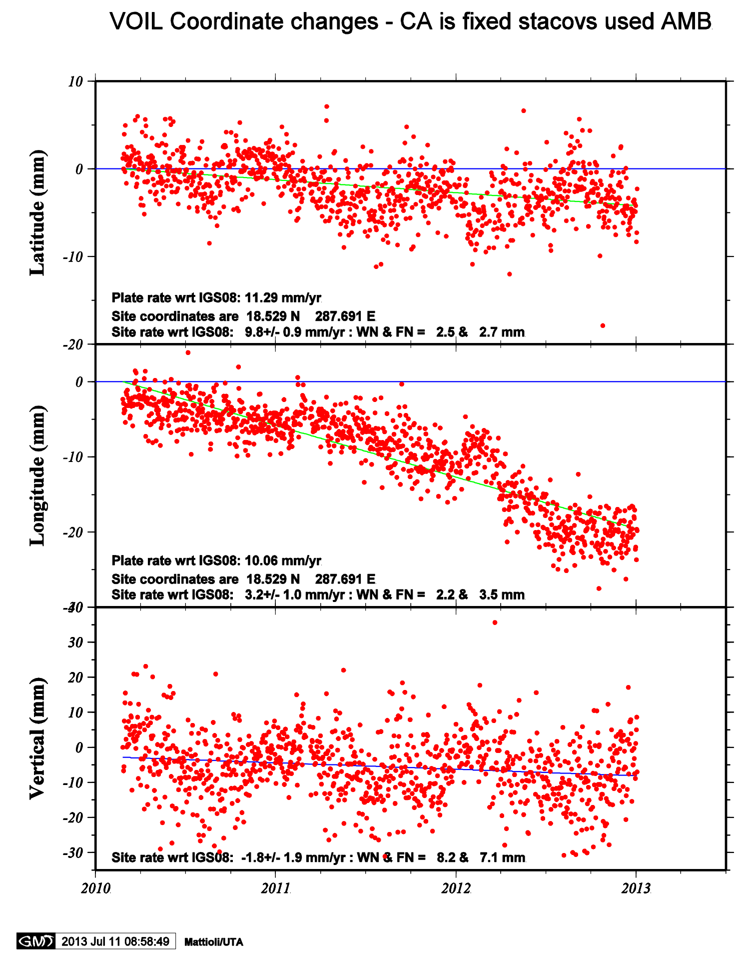
VIKH Coordinate changes - CA is fixed stacovs used AMB

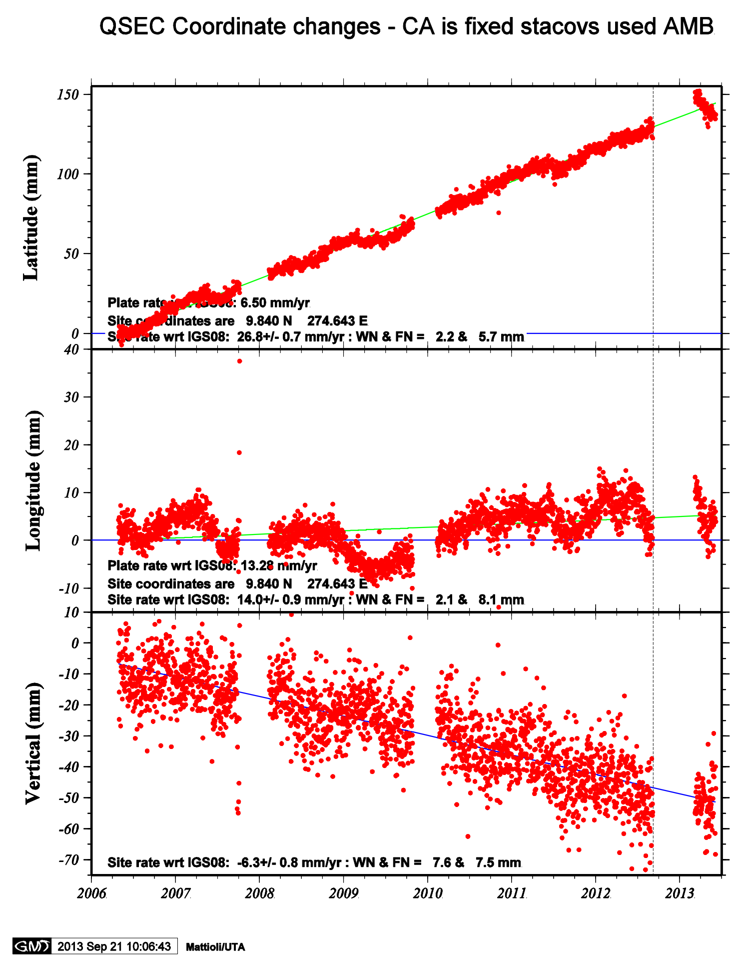


VMAG Coordinate changes - CA is fixed stacovs used AMB




VLCN Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 7.84 mm/yr
Site coordinates are 8.785 N 277.361 E
Site rate wrt IGS08: 15.4+/- 1.5 mm/yr : WN & FN = 3.2 & 3.6 mm
Longitude (mm)
Plate rate wrt IGS08: 13.78 mm/yr
Site coordinates are 8.785 N 277.361 E
Site rate wrt IGS08: 23.2+/- 1.3 mm/yr : WN & FN = 3.0 & 3.0 mm
Vertical (mm)
Site rate wrt IGS08: 0.2+/- 4.2 mm/yr : WN & FN = 11.0 & 11.9 mm
2011
2012
2013
GMT 2013 Sep 15 17:14:17 Mattioli/UTA


VOIL Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 11.29 mm/yr
Site coordinates are 18.529 N 287.691 E
Site rate wrt IGS08: 9.8+/- 0.9 mm/yr : WN & FN = 2.5 & 2.7 mm
Longitude (mm)
Plate rate wrt IGS08: 10.06 mm/yr
Site coordinates are 18.529 N 287.691 E
Site rate wrt IGS08: 3.2+/- 1.0 mm/yr : WN & FN = 2.2 & 3.5 mm
Vertical (mm)
Site rate wrt IGS08: -1.8+/- 1.9 mm/yr : WN & FN = 8.2 & 7.1 mm
2010
2011
2012
2013
GMT 2013 Jul 11 08:58:49 Mattioli/UTA


QSEC Coordinate changes - CA is fixed stacovs used AMB
Latitude (mm)
Plate rate wrt IGS08: 6.50 mm/yr
Site coordinates are 9.840 N 274.643 E
Site rate wrt IGS08: 26.8+/- 0.7 mm/yr : WN & FN = 2.2 & 5.7 mm
Longitude (mm)
Plate rate wrt IGS08: 13.28 mm/yr
Site coordinates are 9.840 N 274.643 E
Site rate wrt IGS08: 14.0+/- 0.9 mm/yr : WN & FN = 2.1 & 8.1 mm
Vertical (mm)
Site rate wrt IGS08: -6.3+/- 0.8 mm/yr : WN & FN = 7.6 & 7.5 mm
2006
2007
2008
2009
2010
2011
2012
2013
GMT 2013 Sep 21 10:06:43
Mattioli/UTA

Appendix C

Dominica site equipment history

Dominica campaign site equipment occupation history

	2001			2003			2004			2006			2007			2011/2012		
SITE	mount	antenna	receiver	mount	antenna	receiver	mount	antenna	receiver	mount	antenna	receiver	mount	antenna	receiver	mount	antenna	receiver
atru		not occupied			not occupied		tetrapod	choke ring	Ashtech Z12	tripod	choke ring	Trimble 4000SSI	tripod	choke ring	Ashtech Z12	tetrapod	choke ring	Ashtech μ-Z
belv	0.5 m spike	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	0.5 m spike	choke ring	Ashtech Z12	tetrapod	choke ring	Ashtech Z12	tetrapod	choke ring	Trimble R7	tripod	zephyr	Trimble R7
botg		not occupied			not occupied		not occupied			tetrapod	choke ring	Ashtech Z12	tetrapod	choke ring	Ashtech Z12	tripod	choke ring	Ashtech μ-Z
brdx		not occupied			not occupied		0.5 m spike	choke ring	Ashtech Z12	0.5 m spike	choke ring	Ashtech Z12	0.5 m spike	choke ring	Ashtech Z12	0.2 m spike	choke ring	Ashtech μ-Z
cabr	tripod	choke ring	Trimble 4000SSI	tripod	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	tetrapod	zephyr	Trimble R7	tripod	choke ring	Ashtech μ-Z
cass	0.5 m spike	choke ring	Trimble 4000SSI	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Trimble 4000SSI	0.5 m spike	choke ring	Ashtech Z12	0.5 spike	zephyr	Trimble R7
cncd	0.5 m spike	choke ring	Trimble 4000SSI	0.5 m spike	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	tripod	choke ring	Trimble 4000SSI	0.5 m spike	choke ring	Ashtech Z12	0.5 spike	choke ring	Ashtech μ-Z
coht		not occupied			not occupied		tetrapod	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	tripod	choke ring	Aschtech Z12	tripod	choke ring	Ashtech μ-Z
conn		not occupied			not occupied		not occupied			0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Ashtech μ-Z
frsh	0.5 m spike	choke ring	Trimble 4000SSI	tetrapod	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	tripod	choke ring	Aschtech Z12	tetrapod	zephyr	Trimble R7	tetrapod	zephyr	Trimble R7
gomm	0.5 spike	choke ring	Trimble 4000SSI	0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Ashtech μ-Z	0.5 spike	choke ring	Ashtech μ-Z
gsav		not occupied			not occupied		0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Aschtech Z12	0.5 spike	choke ring	Ashtech μ-Z
mham		not occupied			not occupied			not occupied			not occupied		tetrapod	zephyr	Trimble R7	tetrapod	choke ring	Ashtech μ-Z
mtnv		not occupied			not occupied			not occupied			not occupied		0.5 m spike	choke ring	Aschtech Z12	tirpod	choke ring	Ashtech μ-Z
newf	0.5 m spike	choke ring	Trimble 4000SSI	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Ashtech μ-Z
nven		not occupied			not occupied			not occupied		0.5 m spike	choke ring	Aschtech Z12	tripod	choke ring	Aschtech Z12	0.5 m spike	choke ring	Ashtech μ-Z
sctt	0.5 m spike	choke ring	Trimble 4000SSI	0.5 m spike	choke ring	Aschtech Z12	tri/tetrapod	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Ashtech μ-Z
soie	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Trimble 4000SSI	tetrapod	zephyr	Trimble R7	0.5 m spike	choke ring	Ashtech μ-Z
spag		not occupied			not occupied		0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Ashtech μ-Z
spng		not occupied		tripod	choke ring	Aschtech Z12	tri/tetrapod	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	tetrapod	choke ring	Aschtech Z12	tetrapod	choke ring	Ashtech μ-Z
tete		not occupied			not occupied		0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.2 m spike	zephyr	Trimble R7
wott	0.5 m spike	choke ring	Trimble 4000SSI	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	choke ring	Aschtech Z12	0.5 m spike	zephyr	Trimble R7	0.5 m spike	choke ring	Ashtech μ-Z

Appendix D

Inversion Input Files

DeMets, 2007 values, 1-plate, 15 sites, ITRF fixed

```
caribbean gps site velocities - IGS08
  0  0  0  0  0  0  0  0      0  0
it                              # Fixed plate
ca   0.0     0.0    0.5         # Starting est of IGS08-CAR ca ang vel lat/long/omega
zz                              # End of plate list
       ca it vn  15.67  296.38   1.42  0.132    AVES ITRF08  3.8740 yrs  #=   28
       ca it ve  15.67  296.38   1.13  0.231    AVES Start/stop times:1994.3740-1998.2479
       ca it cv  15.67  296.38   0.00000   Corr. coeff. for AVES
       ca it vn  13.09  300.39   1.71  0.186    BARB ITRF08  1.6164 yrs  #=  333
       ca it ve  13.09  300.39   0.81  0.104    BARB Start/stop times:1999.5000-2001.1164
       ca it cv  13.09  300.39  -0.07188   Corr. coeff. for BARB
       ca it vn  14.51  274.29   0.54  0.167    CMP1 ITRF08  5.2142 yrs  #=    6
       ca it ve  14.51  274.29   1.17  0.236    CMP1 Start/stop times:2000.1926-2005.4068
       ca it cv  14.51  274.29   0.00000   Corr. coeff. for CMP1
       ca it vn  17.76  295.42   1.30  0.039    CRO1 ITRF08 10.2164 yrs  #= 3410
       ca it ve  17.76  295.42   1.10  0.047    CRO1 Start/stop times:1995.7822-2005.9986
       ca it cv  17.76  295.42  -0.09560   Corr. coeff. for CRO1
       ca it vn  14.73  298.85   1.58  0.122    FSD0 ITRF08  5.4685 yrs  #=   14
       ca it ve  14.73  298.85   1.31  0.318    FSD0 Start/stop times:1994.3986-1999.8671
       ca it cv  14.73  298.85   0.00000   Corr. coeff. for FSD0
       ca it vn  14.73  298.85   1.63  0.167    FSD1 ITRF08  5.4575 yrs  #=    9
       ca it ve  14.73  298.85   1.33  0.214    FSD1 Start/stop times:1994.4096-1999.8671
       ca it cv  14.73  298.85   0.00000   Corr. coeff. for FSD1
       ca it vn  15.03  273.93   0.80  0.133    GLCO ITRF08  4.3579 yrs  #=    7
       ca it ve  15.03  273.93   0.99  0.321    GLCO Start/stop times:2000.1790-2004.5369
       ca it cv  15.03  273.93   0.00000   Corr. coeff. for GLCO
       ca it vn  14.92  273.62   0.69  0.134    MNTO ITRF08  4.3689 yrs  #=    6
       ca it ve  14.92  273.62   1.17  0.246    MNTO Start/stop times:2000.1680-2004.5369
       ca it cv  14.92  273.62   0.00000   Corr. coeff. for MNTO
       ca it vn  12.57  274.63   0.59  0.289    PORT ITRF08  2.5387 yrs  #=   10
       ca it ve  12.57  274.63   1.33  0.380    PORT Start/stop times:2000.6134-2003.1521
       ca it cv  12.57  274.63   0.00000   Corr. coeff. for PORT
       ca it vn  14.04  276.62   0.50  0.230    PUEC ITRF08  2.0986 yrs  #=    9
       ca it ve  14.04  276.62   1.30  0.441    PUEC Start/stop times:2001.0397-2003.1384
       ca it cv  14.04  276.62   0.00000   Corr. coeff. for PUEC
       ca it vn  12.92  274.78   0.67  0.250    RIOB ITRF08  2.5496 yrs  #=   12
       ca it ve  12.92  274.78   1.18  0.429    RIOB Start/stop times:2000.6025-2003.1521
       ca it cv  12.92  274.78   0.00000   Corr. coeff. for RIOB
       ca it vn  17.90  288.33   0.91  0.093    ROJO ITRF08  6.7507 yrs  #=   16
       ca it ve  17.90  288.33   0.91  0.161    ROJO Start/stop times:1994.3959-2001.1466
       ca it cv  17.90  288.33   0.00000   Corr. coeff. for ROJO
       ca it vn  12.52  278.27   0.72  0.066    SANA ITRF08  9.1616 yrs  #=   22
       ca it ve  12.52  278.27   1.31  0.115    SANA Start/stop times:1994.1082-2003.2699
       ca it cv  12.52  278.27   0.00000   Corr. coeff. for SANA
       ca it vn  14.97  273.76   0.66  0.138    SFDP ITRF08  4.3607 yrs  #=    6
       ca it ve  14.97  273.76   1.13  0.244    SFDP Start/stop times:2000.1762-2004.5369
       ca it cv  14.97  273.76   0.00000   Corr. coeff. for SFDP
       ca it vn  12.41  274.19   0.75  0.209    TEUS ITRF08  2.5523 yrs  #=   15
       ca it ve  12.41  274.19   1.04  0.362    TEUS Start/stop times:2000.5888-2003.1411
       ca it cv  12.41  274.19   0.00000   Corr. coeff. for TEUS
```

DeMets et al., 2007 values-updated, 1-plate, 15 sites, ITRF fixed

```
caribbean gps site velocities - IGS08
  0  0  0  0  0  0  0  0      0  0
it                                  # Fixed plate
ca   0.0     0.0    0.5             # Starting est of IGS08-CAR ca ang vel
lat/long/omega
zz                                  # End of plate list
      ca it vn  15.67  296.38   1.42  0.132    AVES ITRF08  3.8740 yrs  #=   28
      ca it ve  15.67  296.38   1.13  0.231    AVES Start/stop times:1994.3740-1998.2479
      ca it cv  15.67  296.38   0.00000   Corr. coeff. for AVES
      ca it vn  13.09  300.39   1.71  0.186    BARB ITRF08  1.6164 yrs  #=  333
      ca it ve  13.09  300.39   0.81  0.104    BARB Start/stop times:1999.5000-2001.1164
      ca it cv  13.09  300.39  -0.07188   Corr. coeff. for BARB
      ca it vn  14.51  274.29   0.54  0.167    CMP1 ITRF08  5.2142 yrs  #=    6
      ca it ve  14.51  274.29   1.17  0.236    CMP1 Start/stop times:2000.1926-2005.4068
      ca it cv  14.51  274.29   0.00000   Corr. coeff. for CMP1
      ca it vn  17.76  295.42   1.36  0.029    CRO1 ITRF08 17.6438 yrs  #=12070
      ca it ve  17.76  295.42   1.10  0.033    CRO1 Start/stop times:1995.7822-2013.4260
      ca it cv  17.76  295.42   0.00160   Corr. coeff. for CRO1
      ca it vn  14.73  298.85   1.58  0.122    FSD0 ITRF08  5.4685 yrs  #=   14
      ca it ve  14.73  298.85   1.31  0.318    FSD0 Start/stop times:1994.3986-1999.8671
      ca it cv  14.73  298.85   0.00000   Corr. coeff. for FSD0
      ca it vn  14.73  298.85   1.63  0.167    FSD1 ITRF08  5.4575 yrs  #=    9
      ca it ve  14.73  298.85   1.33  0.214    FSD1 Start/stop times:1994.4096-1999.8671
      ca it cv  14.73  298.85   0.00000   Corr. coeff. for FSD1
      ca it vn  15.03  273.93   0.71  0.095    GLCO ITRF08 10.2882 yrs  #=   13
      ca it ve  15.03  273.93   1.08  0.184    GLCO Start/stop times:2000.1790-2010.4671
      ca it cv  15.03  273.93   0.00000   Corr. coeff. for GLCO
      ca it vn  14.92  273.62   0.67  0.062    MNTO ITRF08 10.2991 yrs  #=    9
      ca it ve  14.92  273.62   1.10  0.112    MNTO Start/stop times:2000.1680-2010.4671
      ca it cv  14.92  273.62   0.00000   Corr. coeff. for MNTO
      ca it vn  12.57  274.63   0.73  0.057    PORT ITRF08 11.9563 yrs  #=   22
      ca it ve  12.57  274.63   0.95  0.110    PORT Start/stop times:2000.6134-2012.5697
      ca it cv  12.57  274.63   0.00000   Corr. coeff. for PORT
      ca it vn  14.04  276.62   0.61  0.107    PUEC ITRF08  5.1233 yrs  #=   13
      ca it ve  14.04  276.62   1.10  0.197    PUEC Start/stop times:2001.0397-2006.1630
      ca it cv  14.04  276.62   0.00000   Corr. coeff. for PUEC
      ca it vn  12.92  274.78   0.67  0.250    RIOB ITRF08  2.5496 yrs  #=   12
      ca it ve  12.92  274.78   1.18  0.429    RIOB Start/stop times:2000.6025-2003.1521
      ca it cv  12.92  274.78   0.00000   Corr. coeff. for RIOB
      ca it vn  17.90  288.33   0.91  0.093    ROJO ITRF08  6.7507 yrs  #=   16
      ca it ve  17.90  288.33   0.91  0.161    ROJO Start/stop times:1994.3959-2001.1466
      ca it cv  17.90  288.33   0.00000   Corr. coeff. for ROJO
      ca it vn  12.52  278.27   0.72  0.066    SANA ITRF08  9.1616 yrs  #=   22
      ca it ve  12.52  278.27   1.31  0.115    SANA Start/stop times:1994.1082-2003.2699
      ca it cv  12.52  278.27   0.00000   Corr. coeff. for SANA
      ca it vn  14.97  273.76   0.66  0.138    SFDP ITRF08  4.3607 yrs  #=    6
      ca it ve  14.97  273.76   1.13  0.244    SFDP Start/stop times:2000.1762-2004.5369
      ca it cv  14.97  273.76   0.00000   Corr. coeff. for SFDP
      ca it vn  12.41  274.19   0.59  0.058    TEUS ITRF08 11.9836 yrs  #=   23
      ca it ve  12.41  274.19   0.97  0.090    TEUS Start/stop times:2000.5888-2012.5724
      ca it cv  12.41  274.19   0.00000   Corr. coeff. for TEUS
```

2 plates, 24 sites, Caribbean (east) fixed

```
caribbean gps site velocities - IGS08
  0  0  0  0  0  0  0  0      0  0
ce                                  # Fixed plate
it   0.0     0.0    0.5             # Starting est of IGS08-CAR ca ang vel lat/long/omega
cw   0.0     0.0    0.5             #
zz                                  # End of plate list
       ce it vn  16.26  298.47   1.44  0.082    ABMF ITRF08  2.8438 yrs  #=  977
       ce it ve  16.26  298.47   1.20  0.089    ABMF Start/stop times:2010.6671-2013.5110
       ce it cv  16.26  298.47  -0.03874  Corr. coeff. for ABMF
       ce it vn  12.22  298.36   1.52  0.049    GRE0 ITRF08  5.9397 yrs  #= 4214
       ce it ve  12.22  298.36   1.36  0.052    GRE0 Start/stop times:2007.4863-2013.4260
       ce it cv  12.22  298.36  -0.11443  Corr. coeff. for GRE0
       ce it vn  14.59  299.00   1.50  0.080    LMMF ITRF08  2.8438 yrs  #= 1023
       ce it ve  14.59  299.00   1.25  0.091    LMMF Start/stop times:2010.6671-2013.5110
       ce it cv  14.59  299.00   0.01081  Corr. coeff. for LMMF
       ce it vn  14.73  298.85   1.58  0.122    FSD0 ITRF08  5.4685 yrs  #=   14
       ce it ve  14.73  298.85   1.31  0.318    FSD0 Start/stop times:1994.3986-1999.8671
       ce it cv  14.73  298.85   0.00000  Corr. coeff. for FSD0
       ce it vn  14.73  298.85   1.63  0.167    FSD1 ITRF08  5.4575 yrs  #=    9
       ce it ve  14.73  298.85   1.33  0.214    FSD1 Start/stop times:1994.4096-1999.8671
       ce it cv  14.73  298.85   0.00000  Corr. coeff. for FSD1
       ce it vn  15.24  298.71   1.40  0.063    CASS ITRF08 10.9879 yrs  #=   20
       ce it ve  15.24  298.71   1.18  0.111    CASS Start/stop times:2001.4288-2012.4167
       ce it cv  15.24  298.71   0.00000  Corr. coeff. for ceSS
       ce it vn  15.34  298.69   1.51  0.084    FRSH ITRF08 10.9906 yrs  #=   21
       ce it ve  15.34  298.69   1.07  0.117    FRSH Start/stop times:2001.4452-2012.4358
       ce it cv  15.34  298.69   0.00000  Corr. coeff. for FRSH
       ce it vn  15.51  298.72   1.42  0.071    CNCD ITRF08 10.0877 yrs  #=   25
       ce it ve  15.51  298.72   1.18  0.109    CNCD Start/stop times:2001.4534-2011.5411
       ce it cv  15.51  298.72   0.00000  Corr. coeff. for CNCD
       ce it vn  15.67  296.38   1.42  0.132    AVES ITRF08  3.8740 yrs  #=   28
       ce it ve  15.67  296.38   1.13  0.231    AVES Start/stop times:1994.3740-1998.2479
       ce it cv  15.67  296.38   0.00000  Corr. coeff. for AVES
       ce it vn  17.67  298.21   1.26  0.384    CN00 ITRF08  0.7689 yrs  #=  282
       ce it ve  17.67  298.21   1.12  0.737    CN00 Start/stop times:2012.6407-2013.4096
       ce it cv  17.67  298.21  -0.00308  Corr. coeff. for CN00
       ce it vn  17.72  295.20   1.36  0.057    VIKH ITRF08  6.7644 yrs  #= 2170
       ce it ve  17.72  295.20   1.08  0.044    VIKH Start/stop times:2006.6425-2013.4068
       ce it cv  17.72  295.20  -0.00329  Corr. coeff. for VIKH
       cw it vn  15.03  273.93   0.71  0.095    GLCO ITRF08 10.2882 yrs  #=   13
       cw it ve  15.03  273.93   1.08  0.184    GLCO Start/stop times:2000.1790-2010.4671
       cw it cv  15.03  273.93   0.00000  Corr. coeff. for GLCO
       cw it vn  14.97  273.76   0.66  0.138    SFDP ITRF08  4.3607 yrs  #=    6
       cw it ve  14.97  273.76   1.13  0.244    SFDP Start/stop times:2000.1762-2004.5369
       cw it cv  14.97  273.76   0.00000  Corr. coeff. for SFDP
       cw it vn  14.92  273.62   0.67  0.062    MNTO ITRF08 10.2991 yrs  #=    9
       cw it ve  14.92  273.62   1.10  0.112    MNTO Start/stop times:2000.1680-2010.4671
       cw it cv  14.92  273.62   0.00000  Corr. coeff. for MNTO
       cw it vn  14.51  274.29   0.54  0.167    CMP1 ITRF08  5.2142 yrs  #=    6
       cw it ve  14.51  274.29   1.17  0.236    CMP1 Start/stop times:2000.1926-2005.4068
       cw it cv  14.51  274.29   0.00000  Corr. coeff. for CMP1
       cw it vn  14.04  276.62   0.61  0.107    PUEC ITRF08  5.1233 yrs  #=   13
       cw it ve  14.04  276.62   1.10  0.197    PUEC Start/stop times:2001.0397-2006.1630
       cw it cv  14.04  276.62   0.00000  Corr. coeff. for PUEC
       cw it vn  12.58  278.28   0.69  0.061    SAN0 ITRF08  5.4932 yrs  #= 1764
       cw it ve  12.58  278.28   1.25  0.063    SAN0 Start/stop times:2007.9356-2013.4288
       cw it cv  12.58  278.28   0.11575  Corr. coeff. for SAN0
       cw it vn  12.57  274.63   0.73  0.057    PORT ITRF08 11.9563 yrs  #=   22
       cw it ve  12.57  274.63   0.95  0.110    PORT Start/stop times:2000.6134-2012.5697
       cw it cv  12.57  274.63   0.00000  Corr. coeff. for PORT
       cw it vn  12.52  278.27   0.72  0.066    SANA ITRF08  9.1616 yrs  #=   22
       cw it ve  12.52  278.27   1.31  0.115    SANA Start/stop times:1994.1082-2003.2699
       cw it cv  12.52  278.27   0.00000  Corr. coeff. for SANA
       cw it vn  12.41  274.19   0.59  0.058    TEUS ITRF08 11.9836 yrs  #=   23
       cw it ve  12.41  274.19   0.97  0.090    TEUS Start/stop times:2000.5888-2012.5724
       cw it cv  12.41  274.19   0.00000  Corr. coeff. for TEUS
       cw it vn  12.92  274.78   0.67  0.250    RIOB ITRF08  2.5496 yrs  #=   12
```

```
      cw it ve  12.92  274.78   1.18  0.429    RIOB Start/stop times:2000.6025-2003.1521
      cw it cv  12.92  274.78   0.00000   Corr. coeff. for RIOB
      ce it vn  17.76  295.42   1.36  0.030    CRO1 ITRF08 17.6740 yrs  #= 6018
      ce it ve  17.76  295.42   1.10  0.031    CRO1 Start/stop times:1995.7822-2013.4562
      ce it cv  17.76  295.42  -0.01438   Corr. coeff. for CRO1
      ce it vn  16.93  297.65   1.47  0.151    RDON ITRF08  1.2860 yrs  #=  403
      ce it ve  16.93  297.65   1.04  0.129    RDON Start/stop times:2012.3975-2013.6836
      ce it cv  16.93  297.65   0.02801   Corr. coeff. for RDON
      cw it vn  13.38  278.64   0.30  0.400    CN35 ITRF08  0.7389 yrs  #=  268
      cw it ve  13.38  278.64   0.92  0.767    CN35 Start/stop times:2012.6899-2013.4288
      cw it cv  13.38  278.64  -0.01010   Corr. coeff. for CN35
site  it it vn  16.26  298.47   1.44  0.082    ABMF ITRF08  2.8438 yrs  #=  977
site  it it ve  16.26  298.47   1.20  0.089    ABMF Start/stop times:2010.6671-2013.5110
site  it it cv  16.26  298.47  -0.03874   Corr. coeff. for ABMF
site  it it vn  12.22  298.36   1.52  0.049    GRE0 ITRF08  5.9397 yrs  #= 4214
site  it it ve  12.22  298.36   1.36  0.052    GRE0 Start/stop times:2007.4863-2013.4260
site  it it cv  12.22  298.36  -0.11443   Corr. coeff. for GRE0
site  it it vn  14.59  299.00   1.50  0.080    LMMF ITRF08  2.8438 yrs  #= 1023
site  it it ve  14.59  299.00   1.25  0.091    LMMF Start/stop times:2010.6671-2013.5110
site  it it cv  14.59  299.00   0.01081   Corr. coeff. for LMMF
site  it it vn  14.73  298.85   1.58  0.122    FSD0 ITRF08  5.4685 yrs  #=   14
site  it it ve  14.73  298.85   1.31  0.318    FSD0 Start/stop times:1994.3986-1999.8671
site  it it cv  14.73  298.85   0.00000   Corr. coeff. for FSD0
site  it it vn  14.73  298.85   1.63  0.167    FSD1 ITRF08  5.4575 yrs  #=    9
site  it it ve  14.73  298.85   1.33  0.214    FSD1 Start/stop times:1994.4096-1999.8671
site  it it cv  14.73  298.85   0.00000   Corr. coeff. for FSD1
site  it it vn  15.24  298.71   1.40  0.063    CASS ITRF08 10.9879 yrs  #=   20
site  it it ve  15.24  298.71   1.18  0.111    CASS Start/stop times:2001.4288-2012.4167
site  it it cv  15.24  298.71   0.00000   Corr. coeff. for ceSS
site  it it vn  15.34  298.69   1.51  0.084    FRSH ITRF08 10.9906 yrs  #=   21
site  it it ve  15.34  298.69   1.07  0.117    FRSH Start/stop times:2001.4452-2012.4358
site  it it cv  15.34  298.69   0.00000   Corr. coeff. for FRSH
site  it it vn  15.51  298.72   1.42  0.071    CNCD ITRF08 10.0877 yrs  #=   25
site  it it ve  15.51  298.72   1.18  0.109    CNCD Start/stop times:2001.4534-2011.5411
site  it it cv  15.51  298.72   0.00000   Corr. coeff. for CNCD
site  it it vn  15.67  296.38   1.42  0.132    AVES ITRF08  3.8740 yrs  #=   28
site  it it ve  15.67  296.38   1.13  0.231    AVES Start/stop times:1994.3740-1998.2479
site  it it cv  15.67  296.38   0.00000   Corr. coeff. for AVES
site  it it vn  17.67  298.21   1.26  0.384    CN00 ITRF08  0.7689 yrs  #=  282
site  it it ve  17.67  298.21   1.12  0.737    CN00 Start/stop times:2012.6407-2013.4096
site  it it cv  17.67  298.21  -0.00308   Corr. coeff. for CN00
site  it it vn  17.72  295.20   1.36  0.057    VIKH ITRF08  6.7644 yrs  #= 2170
site  it it ve  17.72  295.20   1.08  0.044    VIKH Start/stop times:2006.6425-2013.4068
site  it it cv  17.72  295.20  -0.00329   Corr. coeff. for VIKH
site  it it vn  15.03  273.93   0.71  0.095    GLCO ITRF08 10.2882 yrs  #=   13
site  it it ve  15.03  273.93   1.08  0.184    GLCO Start/stop times:2000.1790-2010.4671
site  it it cv  15.03  273.93   0.00000   Corr. coeff. for GLCO
site  it it vn  14.97  273.76   0.66  0.138    SFDP ITRF08  4.3607 yrs  #=    6
site  it it ve  14.97  273.76   1.13  0.244    SFDP Start/stop times:2000.1762-2004.5369
site  it it cv  14.97  273.76   0.00000   Corr. coeff. for SFDP
site  it it vn  14.92  273.62   0.67  0.062    MNTO ITRF08 10.2991 yrs  #=    9
site  it it ve  14.92  273.62   1.10  0.112    MNTO Start/stop times:2000.1680-2010.4671
site  it it cv  14.92  273.62   0.00000   Corr. coeff. for MNTO
site  it it vn  14.51  274.29   0.54  0.167    CMP1 ITRF08  5.2142 yrs  #=    6
site  it it ve  14.51  274.29   1.17  0.236    CMP1 Start/stop times:2000.1926-2005.4068
site  it it cv  14.51  274.29   0.00000   Corr. coeff. for CMP1
site  it it vn  14.04  276.62   0.61  0.107    PUEC ITRF08  5.1233 yrs  #=   13
site  it it ve  14.04  276.62   1.10  0.197    PUEC Start/stop times:2001.0397-2006.1630
site  it it cv  14.04  276.62   0.00000   Corr. coeff. for PUEC
site  it it vn  12.58  278.28   0.69  0.061    SAN0 ITRF08  5.4932 yrs  #= 1764
site  it it ve  12.58  278.28   1.25  0.063    SAN0 Start/stop times:2007.9356-2013.4288
site  it it cv  12.58  278.28   0.11575   Corr. coeff. for SAN0
site  it it vn  12.57  274.63   0.73  0.057    PORT ITRF08 11.9563 yrs  #=   22
site  it it ve  12.57  274.63   0.95  0.110    PORT Start/stop times:2000.6134-2012.5697
site  it it cv  12.57  274.63   0.00000   Corr. coeff. for PORT
site  it it vn  12.52  278.27   0.72  0.066    SANA ITRF08  9.1616 yrs  #=   22
site  it it ve  12.52  278.27   1.31  0.115    SANA Start/stop times:1994.1082-2003.2699
site  it it cv  12.52  278.27   0.00000   Corr. coeff. for SANA
site  it it vn  12.41  274.19   0.59  0.058    TEUS ITRF08 11.9836 yrs  #=   23
site  it it ve  12.41  274.19   0.97  0.090    TEUS Start/stop times:2000.5888-2012.5724
site  it it cv  12.41  274.19   0.00000   Corr. coeff. for TEUS
site  it it vn  12.92  274.78   0.67  0.250    RIOB ITRF08  2.5496 yrs  #=   12
```

```
site  it it ve  12.92  274.78   1.18  0.429    RIOB Start/stop times:2000.6025-2003.1521
site  it it cv  12.92  274.78   0.00000   Corr. coeff. for RIOB
site  it it vn  17.76  295.42   1.36  0.030    CRO1 ITRF08 17.6740 yrs  #= 6018
site  it it ve  17.76  295.42   1.10  0.031    CRO1 Start/stop times:1995.7822-2013.4562
site  it it cv  17.76  295.42  -0.01438   Corr. coeff. for CRO1
site  it it vn  16.93  297.65   1.47  0.151    RDON ITRF08  1.2860 yrs  #=  403
site  it it ve  16.93  297.65   1.04  0.129    RDON Start/stop times:2012.3975-2013.6836
site  it it cv  16.93  297.65   0.02801   Corr. coeff. for RDON
site  it it vn  13.38  278.64   0.30  0.400    CN35 ITRF08  0.7389 yrs  #=  268
site  it it ve  13.38  278.64   0.92  0.767    CN35 Start/stop times:2012.6899-2013.4288
site  it it cv  13.38  278.64  -0.01010   Corr. coeff. for CN35
```

1 plate, 24 sites, ITRF2008 fixed

```
caribbean gps site velocities - IGS08
  0  0  0  0  0  0  0  0      0  0
it                                # Fixed plate
ca   0.0     0.0    0.5           # Starting est of IGS08-CAR ca ang vel lat/long/omega
zz   0.0     0.0    0.5           # end of plate list
       ca it vn  16.26  298.47   1.44  0.082    ABMF ITRF08  2.8438 yrs  #=  977
       ca it ve  16.26  298.47   1.20  0.089    ABMF Start/stop times:2010.6671-2013.5110
       ca it cv  16.26  298.47  -0.03874  Corr. coeff. for ABMF
       ca it vn  12.22  298.36   1.52  0.049    GRE0 ITRF08  5.9397 yrs  #= 4214
       ca it ve  12.22  298.36   1.36  0.052    GRE0 Start/stop times:2007.4863-2013.4260
       ca it cv  12.22  298.36  -0.11443  Corr. coeff. for GRE0
       ca it vn  14.59  299.00   1.50  0.080    LMMF ITRF08  2.8438 yrs  #= 1023
       ca it ve  14.59  299.00   1.25  0.091    LMMF Start/stop times:2010.6671-2013.5110
       ca it cv  14.59  299.00   0.01081  Corr. coeff. for LMMF
       ca it vn  14.73  298.85   1.58  0.122    FSD0 ITRF08  5.4685 yrs  #=   14
       ca it ve  14.73  298.85   1.31  0.318    FSD0 Start/stop times:1994.3986-1999.8671
       ca it cv  14.73  298.85   0.00000  Corr. coeff. for FSD0
       ca it vn  14.73  298.85   1.63  0.167    FSD1 ITRF08  5.4575 yrs  #=    9
       ca it ve  14.73  298.85   1.33  0.214    FSD1 Start/stop times:1994.4096-1999.8671
       ca it cv  14.73  298.85   0.00000  Corr. coeff. for FSD1
       ca it vn  15.24  298.71   1.40  0.063    CASS ITRF08 10.9879 yrs  #=   20
       ca it ve  15.24  298.71   1.18  0.111    CASS Start/stop times:2001.4288-2012.4167
       ca it cv  15.24  298.71   0.00000  Corr. coeff. for caSS
       ca it vn  15.34  298.69   1.51  0.084    FRSH ITRF08 10.9906 yrs  #=   21
       ca it ve  15.34  298.69   1.07  0.117    FRSH Start/stop times:2001.4452-2012.4358
       ca it cv  15.34  298.69   0.00000  Corr. coeff. for FRSH
       ca it vn  15.51  298.72   1.42  0.071    CNCD ITRF08 10.0877 yrs  #=   25
       ca it ve  15.51  298.72   1.18  0.109    CNCD Start/stop times:2001.4534-2011.5411
       ca it cv  15.51  298.72   0.00000  Corr. coeff. for CNCD
       ca it vn  15.67  296.38   1.42  0.132    AVES ITRF08  3.8740 yrs  #=   28
       ca it ve  15.67  296.38   1.13  0.231    AVES Start/stop times:1994.3740-1998.2479
       ca it cv  15.67  296.38   0.00000  Corr. coeff. for AVES
       ca it vn  17.67  298.21   1.26  0.384    CN00 ITRF08  0.7689 yrs  #=  282
       ca it ve  17.67  298.21   1.12  0.737    CN00 Start/stop times:2012.6407-2013.4096
       ca it cv  17.67  298.21  -0.00308  Corr. coeff. for CN00
       ca it vn  17.72  295.20   1.36  0.057    VIKH ITRF08  6.7644 yrs  #= 2170
       ca it ve  17.72  295.20   1.08  0.044    VIKH Start/stop times:2006.6425-2013.4068
       ca it cv  17.72  295.20  -0.00329  Corr. coeff. for VIKH
       ca it vn  15.03  273.93   0.71  0.095    GLCO ITRF08 10.2882 yrs  #=   13
       ca it ve  15.03  273.93   1.08  0.184    GLCO Start/stop times:2000.1790-2010.4671
       ca it cv  15.03  273.93   0.00000  Corr. coeff. for GLCO
       ca it vn  14.97  273.76   0.66  0.138    SFDP ITRF08  4.3607 yrs  #=    6
       ca it ve  14.97  273.76   1.13  0.244    SFDP Start/stop times:2000.1762-2004.5369
       ca it cv  14.97  273.76   0.00000  Corr. coeff. for SFDP
       ca it vn  14.92  273.62   0.67  0.062    MNTO ITRF08 10.2991 yrs  #=    9
       ca it ve  14.92  273.62   1.10  0.112    MNTO Start/stop times:2000.1680-2010.4671
       ca it cv  14.92  273.62   0.00000  Corr. coeff. for MNTO
       ca it vn  14.51  274.29   0.54  0.167    CMP1 ITRF08  5.2142 yrs  #=    6
       ca it ve  14.51  274.29   1.17  0.236    CMP1 Start/stop times:2000.1926-2005.4068
       ca it cv  14.51  274.29   0.00000  Corr. coeff. for CMP1
       ca it vn  14.04  276.62   0.61  0.107    PUEC ITRF08  5.1233 yrs  #=   13
       ca it ve  14.04  276.62   1.10  0.197    PUEC Start/stop times:2001.0397-2006.1630
       ca it cv  14.04  276.62   0.00000  Corr. coeff. for PUEC
       ca it vn  12.58  278.28   0.69  0.061    SAN0 ITRF08  5.4932 yrs  #= 1764
       ca it ve  12.58  278.28   1.25  0.063    SAN0 Start/stop times:2007.9356-2013.4288
       ca it cv  12.58  278.28   0.11575  Corr. coeff. for SAN0
       ca it vn  12.57  274.63   0.73  0.057    PORT ITRF08 11.9563 yrs  #=   22
       ca it ve  12.57  274.63   0.95  0.110    PORT Start/stop times:2000.6134-2012.5697
       ca it cv  12.57  274.63   0.00000  Corr. coeff. for PORT
       ca it vn  12.52  278.27   0.72  0.066    SANA ITRF08  9.1616 yrs  #=   22
       ca it ve  12.52  278.27   1.31  0.115    SANA Start/stop times:1994.1082-2003.2699
       ca it cv  12.52  278.27   0.00000  Corr. coeff. for SANA
       ca it vn  12.41  274.19   0.59  0.058    TEUS ITRF08 11.9836 yrs  #=   23
       ca it ve  12.41  274.19   0.97  0.090    TEUS Start/stop times:2000.5888-2012.5724
       ca it cv  12.41  274.19   0.00000  Corr. coeff. for TEUS
       ca it vn  12.92  274.78   0.67  0.250    RIOB ITRF08  2.5496 yrs  #=   12
       ca it ve  12.92  274.78   1.18  0.429    RIOB Start/stop times:2000.6025-2003.1521
```

```
ca it cv  12.92  274.78   0.00000   Corr. coeff. for RIOB
ca it vn  17.76  295.42   1.36  0.030    CRO1 ITRF08 17.6740 yrs  #= 6018
ca it ve  17.76  295.42   1.10  0.031    CRO1 Start/stop times:1995.7822-2013.4562
ca it cv  17.76  295.42  -0.01438   Corr. coeff. for CRO1
ca it vn  16.93  297.65   1.47  0.151    RDON ITRF08  1.2860 yrs  #=  403
ca it ve  16.93  297.65   1.04  0.129    RDON Start/stop times:2012.3975-2013.6836
ca it cv  16.93  297.65   0.02801   Corr. coeff. for RDON
ca it vn  13.38  278.64   0.30  0.400    CN35 ITRF08  0.7389 yrs  #=  268
ca it ve  13.38  278.64   0.92  0.767    CN35 Start/stop times:2012.6899-2013.4288
ca it cv  13.38  278.64  -0.01010   Corr. coeff. for CN35
```

2 plates, 24 sites, Caribbean (west) fixed

```
caribbean gps site velocities - IGS08
 0  0  0  0  0  0  0  0      0  0
cw                                   # Fixed plate
it   0.0     0.0    0.5              # Starting est of IGS08-CAR ca ang vel lat/long/omega
ce   0.0     0.0    0.5              #
zz                                   # End of plate list
       ce it vn  16.26  298.47   1.44  0.082    ABMF ITRF08  2.8438 yrs  #=  977
       ce it ve  16.26  298.47   1.20  0.089    ABMF Start/stop times:2010.6671-2013.5110
       ce it cv  16.26  298.47  -0.03874   Corr. coeff. for ABMF
       ce it vn  12.22  298.36   1.52  0.049    GRE0 ITRF08  5.9397 yrs  #= 4214
       ce it ve  12.22  298.36   1.36  0.052    GRE0 Start/stop times:2007.4863-2013.4260
       ce it cv  12.22  298.36  -0.11443   Corr. coeff. for GRE0
       ce it vn  14.59  299.00   1.50  0.080    LMMF ITRF08  2.8438 yrs  #= 1023
       ce it ve  14.59  299.00   1.25  0.091    LMMF Start/stop times:2010.6671-2013.5110
       ce it cv  14.59  299.00   0.01081   Corr. coeff. for LMMF
       ce it vn  14.73  298.85   1.58  0.122    FSD0 ITRF08  5.4685 yrs  #=   14
       ce it ve  14.73  298.85   1.31  0.318    FSD0 Start/stop times:1994.3986-1999.8671
       ce it cv  14.73  298.85   0.00000   Corr. coeff. for FSD0
       ce it vn  14.73  298.85   1.63  0.167    FSD1 ITRF08  5.4575 yrs  #=    9
       ce it ve  14.73  298.85   1.33  0.214    FSD1 Start/stop times:1994.4096-1999.8671
       ce it cv  14.73  298.85   0.00000   Corr. coeff. for FSD1
       ce it vn  15.24  298.71   1.40  0.063    CASS ITRF08 10.9879 yrs  #=   20
       ce it ve  15.24  298.71   1.18  0.111    CASS Start/stop times:2001.4288-2012.4167
       ce it cv  15.24  298.71   0.00000   Corr. coeff. for ceSS
       ce it vn  15.34  298.69   1.51  0.084    FRSH ITRF08 10.9906 yrs  #=   21
       ce it ve  15.34  298.69   1.07  0.117    FRSH Start/stop times:2001.4452-2012.4358
       ce it cv  15.34  298.69   0.00000   Corr. coeff. for FRSH
       ce it vn  15.51  298.72   1.42  0.071    CNCD ITRF08 10.0877 yrs  #=   25
       ce it ve  15.51  298.72   1.18  0.109    CNCD Start/stop times:2001.4534-2011.5411
       ce it cv  15.51  298.72   0.00000   Corr. coeff. for CNCD
       ce it vn  15.67  296.38   1.42  0.132    AVES ITRF08  3.8740 yrs  #=   28
       ce it ve  15.67  296.38   1.13  0.231    AVES Start/stop times:1994.3740-1998.2479
       ce it cv  15.67  296.38   0.00000   Corr. coeff. for AVES
       ce it vn  17.67  298.21   1.26  0.384    CN00 ITRF08  0.7689 yrs  #=  282
       ce it ve  17.67  298.21   1.12  0.737    CN00 Start/stop times:2012.6407-2013.4096
       ce it cv  17.67  298.21  -0.00308   Corr. coeff. for CN00
       ce it vn  17.72  295.20   1.36  0.057    VIKH ITRF08  6.7644 yrs  #= 2170
       ce it ve  17.72  295.20   1.08  0.044    VIKH Start/stop times:2006.6425-2013.4068
       ce it cv  17.72  295.20  -0.00329   Corr. coeff. for VIKH
       cw it vn  15.03  273.93   0.71  0.095    GLCO ITRF08 10.2882 yrs  #=   13
       cw it ve  15.03  273.93   1.08  0.184    GLCO Start/stop times:2000.1790-2010.4671
       cw it cv  15.03  273.93   0.00000   Corr. coeff. for GLCO
       cw it vn  14.97  273.76   0.66  0.138    SFDP ITRF08  4.3607 yrs  #=    6
       cw it ve  14.97  273.76   1.13  0.244    SFDP Start/stop times:2000.1762-2004.5369
       cw it cv  14.97  273.76   0.00000   Corr. coeff. for SFDP
       cw it vn  14.92  273.62   0.67  0.062    MNTO ITRF08 10.2991 yrs  #=    9
       cw it ve  14.92  273.62   1.10  0.112    MNTO Start/stop times:2000.1680-2010.4671
       cw it cv  14.92  273.62   0.00000   Corr. coeff. for MNTO
       cw it vn  14.51  274.29   0.54  0.167    CMP1 ITRF08  5.2142 yrs  #=    6
       cw it ve  14.51  274.29   1.17  0.236    CMP1 Start/stop times:2000.1926-2005.4068
       cw it cv  14.51  274.29   0.00000   Corr. coeff. for CMP1
       cw it vn  14.04  276.62   0.61  0.107    PUEC ITRF08  5.1233 yrs  #=   13
       cw it ve  14.04  276.62   1.10  0.197    PUEC Start/stop times:2001.0397-2006.1630
       cw it cv  14.04  276.62   0.00000   Corr. coeff. for PUEC
       cw it vn  12.58  278.28   0.69  0.061    SAN0 ITRF08  5.4932 yrs  #= 1764
       cw it ve  12.58  278.28   1.25  0.063    SAN0 Start/stop times:2007.9356-2013.4288
       cw it cv  12.58  278.28   0.11575   Corr. coeff. for SAN0
       cw it vn  12.57  274.63   0.73  0.057    PORT ITRF08 11.9563 yrs  #=   22
       cw it ve  12.57  274.63   0.95  0.110    PORT Start/stop times:2000.6134-2012.5697
       cw it cv  12.57  274.63   0.00000   Corr. coeff. for PORT
       cw it vn  12.52  278.27   0.72  0.066    SANA ITRF08  9.1616 yrs  #=   22
       cw it ve  12.52  278.27   1.31  0.115    SANA Start/stop times:1994.1082-2003.2699
       cw it cv  12.52  278.27   0.00000   Corr. coeff. for SANA
       cw it vn  12.41  274.19   0.59  0.058    TEUS ITRF08 11.9836 yrs  #=   23
       cw it ve  12.41  274.19   0.97  0.090    TEUS Start/stop times:2000.5888-2012.5724
       cw it cv  12.41  274.19   0.00000   Corr. coeff. for TEUS
       cw it vn  12.92  274.78   0.67  0.250    RIOB ITRF08  2.5496 yrs  #=   12
       cw it ve  12.92  274.78   1.18  0.429    RIOB Start/stop times:2000.6025-2003.1521
       cw it cv  12.92  274.78   0.00000   Corr. coeff. for RIOB
```

```
      ce it vn  17.76  295.42   1.36  0.030    CRO1 ITRF08 17.6740 yrs  #= 6018
      ce it ve  17.76  295.42   1.10  0.031    CRO1 Start/stop times:1995.7822-2013.4562
      ce it cv  17.76  295.42  -0.01438   Corr. coeff. for CRO1
      ce it vn  16.93  297.65   1.47  0.151    RDON ITRF08  1.2860 yrs  #=  403
      ce it ve  16.93  297.65   1.04  0.129    RDON Start/stop times:2012.3975-2013.6836
      ce it cv  16.93  297.65   0.02801   Corr. coeff. for RDON
      cw it vn  13.38  278.64   0.30  0.400    CN35 ITRF08  0.7389 yrs  #=  268
      cw it ve  13.38  278.64   0.92  0.767    CN35 Start/stop times:2012.6899-2013.4288
      cw it cv  13.38  278.64  -0.01010   Corr. coeff. for CN35
site  it it vn  16.26  298.47   1.44  0.082    ABMF ITRF08  2.8438 yrs  #=  977
site  it it ve  16.26  298.47   1.20  0.089    ABMF Start/stop times:2010.6671-2013.5110
site  it it cv  16.26  298.47  -0.03874   Corr. coeff. for ABMF
site  it it vn  12.22  298.36   1.52  0.049    GRE0 ITRF08  5.9397 yrs  #= 4214
site  it it ve  12.22  298.36   1.36  0.052    GRE0 Start/stop times:2007.4863-2013.4260
site  it it cv  12.22  298.36  -0.11443   Corr. coeff. for GRE0
site  it it vn  14.59  299.00   1.50  0.080    LMMF ITRF08  2.8438 yrs  #= 1023
site  it it ve  14.59  299.00   1.25  0.091    LMMF Start/stop times:2010.6671-2013.5110
site  it it cv  14.59  299.00   0.01081   Corr. coeff. for LMMF
site  it it vn  14.73  298.85   1.58  0.122    FSD0 ITRF08  5.4685 yrs  #=   14
site  it it ve  14.73  298.85   1.31  0.318    FSD0 Start/stop times:1994.3986-1999.8671
site  it it cv  14.73  298.85   0.00000   Corr. coeff. for FSD0
site  it it vn  14.73  298.85   1.63  0.167    FSD1 ITRF08  5.4575 yrs  #=    9
site  it it ve  14.73  298.85   1.33  0.214    FSD1 Start/stop times:1994.4096-1999.8671
site  it it cv  14.73  298.85   0.00000   Corr. coeff. for FSD1
site  it it vn  15.24  298.71   1.40  0.063    CASS ITRF08 10.9879 yrs  #=   20
site  it it ve  15.24  298.71   1.18  0.111    CASS Start/stop times:2001.4288-2012.4167
site  it it cv  15.24  298.71   0.00000   Corr. coeff. for ceSS
site  it it vn  15.34  298.69   1.51  0.084    FRSH ITRF08 10.9906 yrs  #=   21
site  it it ve  15.34  298.69   1.07  0.117    FRSH Start/stop times:2001.4452-2012.4358
site  it it cv  15.34  298.69   0.00000   Corr. coeff. for FRSH
site  it it vn  15.51  298.72   1.42  0.071    CNCD ITRF08 10.0877 yrs  #=   25
site  it it ve  15.51  298.72   1.18  0.109    CNCD Start/stop times:2001.4534-2011.5411
site  it it cv  15.51  298.72   0.00000   Corr. coeff. for CNCD
site  it it vn  15.67  296.38   1.42  0.132    AVES ITRF08  3.8740 yrs  #=   28
site  it it ve  15.67  296.38   1.13  0.231    AVES Start/stop times:1994.3740-1998.2479
site  it it cv  15.67  296.38   0.00000   Corr. coeff. for AVES
site  it it vn  17.67  298.21   1.26  0.384    CN00 ITRF08  0.7689 yrs  #=  282
site  it it ve  17.67  298.21   1.12  0.737    CN00 Start/stop times:2012.6407-2013.4096
site  it it cv  17.67  298.21  -0.00308   Corr. coeff. for CN00
site  it it vn  17.72  295.20   1.36  0.057    VIKH ITRF08  6.7644 yrs  #= 2170
site  it it ve  17.72  295.20   1.08  0.044    VIKH Start/stop times:2006.6425-2013.4068
site  it it cv  17.72  295.20  -0.00329   Corr. coeff. for VIKH
site  it it vn  15.03  273.93   0.71  0.095    GLCO ITRF08 10.2882 yrs  #=   13
site  it it ve  15.03  273.93   1.08  0.184    GLCO Start/stop times:2000.1790-2010.4671
site  it it cv  15.03  273.93   0.00000   Corr. coeff. for GLCO
site  it it vn  14.97  273.76   0.66  0.138    SFDP ITRF08  4.3607 yrs  #=    6
site  it it ve  14.97  273.76   1.13  0.244    SFDP Start/stop times:2000.1762-2004.5369
site  it it cv  14.97  273.76   0.00000   Corr. coeff. for SFDP
site  it it vn  14.92  273.62   0.67  0.062    MNTO ITRF08 10.2991 yrs  #=    9
site  it it ve  14.92  273.62   1.10  0.112    MNTO Start/stop times:2000.1680-2010.4671
site  it it cv  14.92  273.62   0.00000   Corr. coeff. for MNTO
site  it it vn  14.51  274.29   0.54  0.167    CMP1 ITRF08  5.2142 yrs  #=    6
site  it it ve  14.51  274.29   1.17  0.236    CMP1 Start/stop times:2000.1926-2005.4068
site  it it cv  14.51  274.29   0.00000   Corr. coeff. for CMP1
site  it it vn  14.04  276.62   0.61  0.107    PUEC ITRF08  5.1233 yrs  #=   13
site  it it ve  14.04  276.62   1.10  0.197    PUEC Start/stop times:2001.0397-2006.1630
site  it it cv  14.04  276.62   0.00000   Corr. coeff. for PUEC
site  it it vn  12.58  278.28   0.69  0.061    SAN0 ITRF08  5.4932 yrs  #= 1764
site  it it ve  12.58  278.28   1.25  0.063    SAN0 Start/stop times:2007.9356-2013.4288
site  it it cv  12.58  278.28   0.11575   Corr. coeff. for SAN0
site  it it vn  12.57  274.63   0.73  0.057    PORT ITRF08 11.9563 yrs  #=   22
site  it it ve  12.57  274.63   0.95  0.110    PORT Start/stop times:2000.6134-2012.5697
site  it it cv  12.57  274.63   0.00000   Corr. coeff. for PORT
site  it it vn  12.52  278.27   0.72  0.066    SANA ITRF08  9.1616 yrs  #=   22
site  it it ve  12.52  278.27   1.31  0.115    SANA Start/stop times:1994.1082-2003.2699
site  it it cv  12.52  278.27   0.00000   Corr. coeff. for SANA
site  it it vn  12.41  274.19   0.59  0.058    TEUS ITRF08 11.9836 yrs  #=   23
site  it it ve  12.41  274.19   0.97  0.090    TEUS Start/stop times:2000.5888-2012.5724
site  it it cv  12.41  274.19   0.00000   Corr. coeff. for TEUS
site  it it vn  12.92  274.78   0.67  0.250    RIOB ITRF08  2.5496 yrs  #=   12
site  it it ve  12.92  274.78   1.18  0.429    RIOB Start/stop times:2000.6025-2003.1521
site  it it cv  12.92  274.78   0.00000   Corr. coeff. for RIOB
```

```
site  it it vn  17.76  295.42   1.36  0.030    CRO1 ITRF08 17.6740 yrs  #= 6018
site  it it ve  17.76  295.42   1.10  0.031    CRO1 Start/stop times:1995.7822-2013.4562
site  it it cv  17.76  295.42  -0.01438  Corr. coeff. for CRO1
site  it it vn  16.93  297.65   1.47  0.151    RDON ITRF08  1.2860 yrs  #=  403
site  it it ve  16.93  297.65   1.04  0.129    RDON Start/stop times:2012.3975-2013.6836
site  it it cv  16.93  297.65   0.02801  Corr. coeff. for RDON
site  it it vn  13.38  278.64   0.30  0.400    CN35 ITRF08  0.7389 yrs  #=  268
site  it it ve  13.38  278.64   0.92  0.767    CN35 Start/stop times:2012.6899-2013.4288
site  it it cv  13.38  278.64  -0.01010  Corr. coeff. for CN35
```

Appendix E

Inversion Results

DeMets et al., 2007 values, 1 plate, 15 sites, ITRF fixed

```
*********INVERSION RESULTS - CDeMets *****
>> File header is
caribbean gps site velocities - IGS08


----------- INPUT DATA STATISTICS ------------

# PLATES:  2  # of DATA:   30 DOF:  27
Fixed plate is   it
Optimal angular velocities are in file fort.7

----------- BEGIN ITERATIVE SEARCH ------------

Results from Iteration  0
-------------------------
>  Trial angular velocities
>   ca      0.000      0.000    0.5000

>  Chi**2   Reduced Chi**2
   ********    *******

> Convergence criteria are:  0.009459633  0.003273831
0.002573694


Results from Iteration  1
-------------------------
>  Trial angular velocities
>   ca     37.494   -102.620    0.2423

>  Chi**2   Reduced Chi**2
     35.846     1.3276

> Convergence criteria are:  0.000000000  0.000000000
0.000000000

----------- END ITERATIVE SEARCH ------------

 The best fitting angular velocities are:
 plate id     Lat     Long     W deg/Myr
 ----- --  ------  ------   ------
    it       0.0     0.0      .00
    ca      37.494-102.620   0.2423

Final chi**2 and reduced chi**2 are   35.846 and 1.3276
```

2D 1-sigma error ellipse and 1D 1-sigma angular velocity uncertainty

Plate id	Ellipse axes major	Ellipse axes minor	azimuth of major axis (CCW from east)	rot. rate uncert.
ca	2.91	0.97	149.43	0.0122

Data Type	# Data	Chi**2	Data Importance
Rates	0	0.00	0.00
Transforms	0	0.00	0.00
Slip vectors	0	0.00	0.00
Baselines	0	0.00	0.00
Vn/Ve pairs	30	35.85	3.03

Plate IDs		Data Type	Lat (N)	Long (E)	Datum	S.D.	Pred	Wt. Res.	Imp.	Pred. az CCW of E	SITE
ca	it	vn	15.67	296.38	1.420	0.132	1.346	0.559	0.065	90.00	AVES
ca	it	ve	15.67	296.38	1.130	0.231	1.131	-0.005	0.024	0.00	AVES
ca	it	vn	13.09	300.39	1.710	0.186	1.459	1.348	0.159	90.00	BARB
ca	it	ve	13.09	300.39	0.810	0.104	1.244	-4.176	0.039	0.00	BARB
ca	it	vn	14.51	274.29	0.540	0.167	0.622	-0.493	0.079	90.00	CMP1
ca	it	ve	14.51	274.29	1.170	0.236	1.076	0.398	0.023	0.00	CMP1
ca	it	vn	17.76	295.42	1.300	0.039	1.318	-0.465	0.701	90.00	CRO1
ca	it	ve	17.76	295.42	1.100	0.047	1.049	1.087	0.564	0.00	CRO1
ca	it	vn	14.73	298.85	1.580	0.122	1.417	1.338	0.098	90.00	FSD0
ca	it	ve	14.73	298.85	1.310	0.318	1.180	0.410	0.013	0.00	FSD0
ca	it	vn	14.73	298.85	1.630	0.167	1.417	1.277	0.052	90.00	FSD1
ca	it	ve	14.73	298.85	1.330	0.214	1.180	0.703	0.028	0.00	FSD1
ca	it	vn	15.03	273.93	0.800	0.133	0.609	1.433	0.128	90.00	GLCO
ca	it	ve	15.03	273.93	0.990	0.321	1.053	-0.197	0.013	0.00	GLCO
ca	it	vn	14.92	273.62	0.690	0.134	0.598	0.684	0.130	90.00	MNTO
ca	it	ve	14.92	273.62	1.170	0.246	1.057	0.459	0.021	0.00	MNTO
ca	it	vn	12.57	274.63	0.590	0.289	0.634	-0.154	0.025	90.00	PORT
ca	it	ve	12.57	274.63	1.330	0.380	1.157	0.455	0.010	0.00	PORT
ca	it	vn	14.04	276.62	0.500	0.230	0.705	-0.891	0.033	90.00	PUEC
ca	it	ve	14.04	276.62	1.300	0.441	1.102	0.449	0.007	0.00	PUEC
ca	it	vn	12.92	274.78	0.670	0.250	0.640	0.121	0.034	90.00	RIOB
ca	it	ve	12.92	274.78	1.180	0.429	1.143	0.086	0.007	0.00	RIOB
ca	it	vn	17.90	288.33	0.910	0.093	1.100	-2.044	0.081	90.00	ROJO
ca	it	ve	17.90	288.33	0.910	0.161	0.998	-0.545	0.049	0.00	ROJO
ca	it	vn	12.52	278.27	0.720	0.066	0.763	-0.650	0.342	90.00	SANA
ca	it	ve	12.52	278.27	1.310	0.115	1.169	1.227	0.105	0.00	SANA
ca	it	vn	14.97	273.76	0.660	0.138	0.603	0.411	0.121	90.00	SFDP
ca	it	ve	14.97	273.76	1.130	0.244	1.055	0.306	0.022	0.00	SFDP
ca	it	vn	12.41	274.19	0.750	0.209	0.619	0.628	0.051	90.00	TEUS
ca	it	ve	12.41	274.19	1.040	0.362	1.163	-0.339	0.011	0.00	TEUS

DeMets et al., 2007 values-updated, 1 plate, 15 sites, ITRF fixed

```
*********INVERSION RESULTS - CDeMets *****
>> File header is
caribbean gps site velocities - IGS08


----------- INPUT DATA STATISTICS ------------

# PLATES:  2  # of DATA:   30 DOF:  27
Fixed plate is   it
Optimal angular velocities are in file fort.7

----------- BEGIN ITERATIVE SEARCH ------------

Results from Iteration  0
-------------------------
>  Trial angular velocities
>   ca      0.000      0.000    0.5000

>  Chi**2   Reduced Chi**2
   ********    *******

> Convergence criteria are:  0.009501628  0.003308453  0.002562150


Results from Iteration  1
-------------------------
>  Trial angular velocities
>   ca     37.017   -103.183    0.2438

>  Chi**2   Reduced Chi**2
     46.118     1.7081

> Convergence criteria are:  0.000000000  0.000000000  0.000000000

----------- END ITERATIVE SEARCH ------------

 The best fitting angular velocities are:
 plate id     Lat     Long     W deg/Myr
 ----- --  ------  ------   ------
    it       0.0     0.0      .00
    ca      37.017-103.183   0.2438

Final chi**2 and reduced chi**2 are   46.118 and 1.7081

 2D 1-sigma error ellipse and 1D 1-sigma angular velocity uncertainty
 Plate   Ellipse axes  azimuth of major axis  rot. rate
   id    major   minor   (CCW  from east)      uncert.
   --    -----   -----   ----------------      -------
   ca     1.79    0.67         146.77         0.0082

 Data Type    # Data     Chi**2   Data Importance
----------    ------     -------   ---------------
```

Rates	0	0.00	0.00
Transforms	0	0.00	0.00
Slip vectors	0	0.00	0.00
Baselines	0	0.00	0.00
Vn/Ve pairs	30	46.12	3.02

Plate IDs	Data Type	Lat (N)	Long (E)	Datum	S.D.	Pred	Wt. Res.	Imp.	Pred. az CCW of E	SITE
ca it	vn	15.67	296.38	1.420	0.132	1.380	0.302	0.042	90.00	AVES
ca it	ve	15.67	296.38	1.130	0.231	1.122	0.035	0.012	0.00	AVES
ca it	vn	13.09	300.39	1.710	0.186	1.494	1.163	0.096	90.00	BARB
ca it	ve	13.09	300.39	0.810	0.104	1.236	-4.095	0.020	0.00	BARB
ca it	vn	14.51	274.29	0.540	0.167	0.651	-0.662	0.026	90.00	CMP1
ca it	ve	14.51	274.29	1.170	0.236	1.064	0.450	0.012	0.00	CMP1
ca it	vn	17.76	295.42	1.360	0.029	1.352	0.283	0.788	90.00	CRO1
ca it	ve	17.76	295.42	1.100	0.033	1.039	1.838	0.590	0.00	CRO1
ca it	vn	14.73	298.85	1.580	0.122	1.451	1.059	0.061	90.00	FSD0
ca it	ve	14.73	298.85	1.310	0.318	1.171	0.437	0.007	0.00	FSD0
ca it	vn	14.73	298.85	1.630	0.167	1.451	1.073	0.032	90.00	FSD1
ca it	ve	14.73	298.85	1.330	0.214	1.171	0.743	0.014	0.00	FSD1
ca it	vn	15.03	273.93	0.710	0.095	0.638	0.762	0.084	90.00	GLCO
ca it	ve	15.03	273.93	1.080	0.184	1.041	0.213	0.019	0.00	GLCO
ca it	vn	14.92	273.62	0.670	0.062	0.626	0.703	0.203	90.00	MNTO
ca it	ve	14.92	273.62	1.100	0.112	1.045	0.494	0.052	0.00	MNTO
ca it	vn	12.57	274.63	0.730	0.057	0.663	1.177	0.219	90.00	PORT
ca it	ve	12.57	274.63	0.950	0.110	1.146	-1.780	0.058	0.00	PORT
ca it	vn	14.04	276.62	0.610	0.107	0.734	-1.160	0.052	90.00	PUEC
ca it	ve	14.04	276.62	1.100	0.197	1.090	0.049	0.017	0.00	PUEC
ca it	vn	12.92	274.78	0.670	0.250	0.668	0.007	0.011	90.00	RIOB
ca it	ve	12.92	274.78	1.180	0.429	1.132	0.113	0.004	0.00	RIOB
ca it	vn	17.90	288.33	0.910	0.093	1.132	-2.392	0.044	90.00	ROJO
ca it	ve	17.90	288.33	0.910	0.161	0.987	-0.477	0.025	0.00	ROJO
ca it	vn	12.52	278.27	0.720	0.066	0.793	-1.099	0.118	90.00	SANA
ca it	ve	12.52	278.27	1.310	0.115	1.158	1.323	0.053	0.00	SANA
ca it	vn	14.97	273.76	0.660	0.138	0.631	0.207	0.040	90.00	SFDP
ca it	ve	14.97	273.76	1.130	0.244	1.043	0.357	0.011	0.00	SFDP
ca it	vn	12.41	274.19	0.590	0.058	0.647	-0.984	0.220	90.00	TEUS
ca it	ve	12.41	274.19	0.970	0.090	1.151	-2.014	0.088	0.00	TEUS

1 plate, 24 sites, ITRF08 fixed

```
*********INVERSION RESULTS - CDeMets *****
>> File header is
caribbean gps site velocities - IGS08


----------- INPUT DATA STATISTICS ------------

# PLATES:  2  # of DATA:   48 DOF:  45
Fixed plate is   it
Optimal angular velocities are in file fort.7

----------- BEGIN ITERATIVE SEARCH ------------

Results from Iteration  0
-------------------------
>  Trial angular velocities
>   ca      0.000      0.000    0.5000

>  Chi**2   Reduced Chi**2
   ********    *******

> Convergence criteria are:  0.009459468  0.003462410  0.002684867


Results from Iteration  1
-------------------------
>  Trial angular velocities
>   ca     37.185   -101.950    0.2545

>  Chi**2   Reduced Chi**2
     34.020     0.7560

> Convergence criteria are:  0.000000000  0.000000000  0.000000000

----------- END ITERATIVE SEARCH ------------

 The best fitting angular velocities are:
 plate id     Lat     Long     W deg/Myr
 ----- --  ------  ------   ------
    it       0.0     0.0      .00
    ca      37.185-101.950   0.2545

Final chi**2 and reduced chi**2 are   34.020 and 0.7560

 2D 1-sigma error ellipse and 1D 1-sigma angular velocity uncertainty
 Plate   Ellipse axes  azimuth of major axis  rot. rate
   id    major   minor   (CCW  from east)      uncert.
   --    -----   -----   ----------------      -------
   ca     1.40    0.47         149.98         0.0061

 Data Type    # Data     Chi**2   Data Importance
----------    ------     -------   ---------------
```

Rates	0	0.00	0.00
Transforms	0	0.00	0.00
Slip vectors	0	0.00	0.00
Baselines	0	0.00	0.00
Vn/Ve pairs	48	34.02	2.99

Plate IDs	Data Type	Lat (N)	Long (E)	Datum	S.D.	Pred	Wt. Res.	Imp.	Pred. az CCW of E	SITE
ca it	vn	16.26	298.47	1.440	0.082	1.463	-0.283	0.057	90.00	ABMF
ca it	ve	16.26	298.47	1.200	0.089	1.162	0.422	0.039	0.00	ABMF
ca it	vn	12.22	298.36	1.520	0.049	1.460	1.223	0.168	90.00	GRE0
ca it	ve	12.22	298.36	1.360	0.052	1.309	0.979	0.117	0.00	GRE0
ca it	vn	14.59	299.00	1.500	0.080	1.479	0.261	0.062	90.00	LMMF
ca it	ve	14.59	299.00	1.250	0.091	1.227	0.247	0.038	0.00	LMMF
ca it	vn	14.73	298.85	1.580	0.122	1.475	0.864	0.026	90.00	FSD0
ca it	ve	14.73	298.85	1.310	0.318	1.221	0.279	0.003	0.00	FSD0
ca it	vn	14.73	298.85	1.630	0.167	1.475	0.930	0.014	90.00	FSD1
ca it	ve	14.73	298.85	1.330	0.214	1.221	0.507	0.007	0.00	FSD1
ca it	vn	15.24	298.71	1.400	0.063	1.470	-1.118	0.097	90.00	CASS
ca it	ve	15.24	298.71	1.180	0.111	1.202	-0.197	0.025	0.00	CASS
ca it	vn	15.34	298.69	1.510	0.084	1.470	0.478	0.054	90.00	FRSH
ca it	ve	15.34	298.69	1.070	0.117	1.198	-1.094	0.023	0.00	FRSH
ca it	vn	15.51	298.72	1.420	0.071	1.471	-0.715	0.076	90.00	CNCD
ca it	ve	15.51	298.72	1.180	0.109	1.192	-0.110	0.026	0.00	CNCD
ca it	vn	15.67	296.38	1.420	0.132	1.400	0.154	0.018	90.00	AVES
ca it	ve	15.67	296.38	1.130	0.231	1.170	-0.174	0.006	0.00	AVES
ca it	vn	17.67	298.21	1.260	0.384	1.455	-0.509	0.002	90.00	CN00
ca it	ve	17.67	298.21	1.120	0.737	1.108	0.017	0.001	0.00	CN00
ca it	vn	17.72	295.20	1.360	0.057	1.363	-0.049	0.148	90.00	VIKH
ca it	ve	17.72	295.20	1.080	0.044	1.083	-0.074	0.097	0.00	VIKH
ca it	vn	15.03	273.93	0.710	0.095	0.618	0.973	0.072	90.00	GLCO
ca it	ve	15.03	273.93	1.080	0.184	1.091	-0.057	0.009	0.00	GLCO
ca it	vn	14.97	273.76	0.660	0.138	0.611	0.355	0.035	90.00	SFDP
ca it	ve	14.97	273.76	1.130	0.244	1.093	0.153	0.005	0.00	SFDP
ca it	vn	14.92	273.62	0.670	0.062	0.606	1.036	0.173	90.00	MNTO
ca it	ve	14.92	273.62	1.100	0.112	1.095	0.048	0.025	0.00	MNTO
ca it	vn	14.51	274.29	0.540	0.167	0.631	-0.546	0.023	90.00	CMP1
ca it	ve	14.51	274.29	1.170	0.236	1.115	0.235	0.006	0.00	CMP1
ca it	vn	14.04	276.62	0.610	0.107	0.719	-1.016	0.045	90.00	PUEC
ca it	ve	14.04	276.62	1.100	0.197	1.142	-0.213	0.008	0.00	PUEC
ca it	vn	12.58	278.28	0.690	0.061	0.780	-1.482	0.132	90.00	SAN0
ca it	ve	12.58	278.28	1.250	0.063	1.210	0.638	0.078	0.00	SAN0
ca it	vn	12.57	274.63	0.730	0.057	0.644	1.508	0.189	90.00	PORT
ca it	ve	12.57	274.63	0.950	0.110	1.200	-2.276	0.028	0.00	PORT
ca it	vn	12.52	278.27	0.720	0.066	0.780	-0.910	0.102	90.00	SANA
ca it	ve	12.52	278.27	1.310	0.115	1.212	0.849	0.025	0.00	SANA
ca it	vn	12.41	274.19	0.590	0.058	0.627	-0.645	0.189	90.00	TEUS
ca it	ve	12.41	274.19	0.970	0.090	1.206	-2.625	0.042	0.00	TEUS
ca it	vn	12.92	274.78	0.670	0.250	0.650	0.081	0.010	90.00	RIOB
ca it	ve	12.92	274.78	1.180	0.429	1.186	-0.013	0.002	0.00	RIOB
ca it	vn	17.76	295.42	1.360	0.030	1.370	-0.322	0.325	90.00	CRO1
ca it	ve	17.76	295.42	1.100	0.031	1.083	0.539	0.326	0.00	CRO1
ca it	vn	16.93	297.65	1.470	0.151	1.438	0.209	0.021	90.00	RDON
ca it	ve	16.93	297.65	1.040	0.129	1.131	-0.709	0.014	0.00	RDON
ca it	vn	13.38	278.64	0.300	0.400	0.794	-1.234	0.003	90.00	CN35
ca it	ve	13.38	278.64	0.920	0.767	1.177	-0.335	0.001	0.00	CN35

2 plates, 24 sites, ITRF08 fixed

```
*********INVERSION RESULTS - CDeMets *****
>> File header is
caribbean gps site velocities - IGS08


----------- INPUT DATA STATISTICS ------------

# PLATES:  3  # of DATA:   48 DOF:  42
Fixed plate is   it
Optimal angular velocities are in file fort.7

----------- BEGIN ITERATIVE SEARCH ------------

Results from Iteration  0
-------------------------
>  Trial angular velocities
>   ce      0.000      0.000    0.5000
>   cw      0.000      0.000    0.5000

>  Chi**2   Reduced Chi**2
   ********    *******

> Convergence criteria are:  0.009469778  0.002309885  0.002412420


Results from Iteration  1
-------------------------
>  Trial angular velocities
>   ce     35.789    -97.178    0.2802
>   cw     58.506   -145.355    0.1321

>  Chi**2   Reduced Chi**2
     25.148     0.5988

> Convergence criteria are:  0.000000000  0.000000000  0.000000000

----------- END ITERATIVE SEARCH ------------

 The best fitting angular velocities are:
 plate id     Lat     Long     W deg/Myr
 ----- --  ------  ------   ------
    it       0.0     0.0      .00
    ce      35.789 -97.178   0.2802
    cw      58.506-145.355   0.1321

Final chi**2 and reduced chi**2 are   25.148 and 0.5988

 2D 1-sigma error ellipse and 1D 1-sigma angular velocity uncertainty
 Plate   Ellipse axes  azimuth of major axis  rot. rate
   id    major   minor   (CCW  from east)      uncert.
   --    -----   -----   ----------------      -------
   ce     6.59    0.51         156.49         0.0313
```

cw 33.29 1.54 161.47 0.0285

Data Type	# Data	Chi**2	Data Importance
Rates	0	0.00	0.00
Transforms	0	0.00	0.00
Slip vectors	0	0.00	0.00
Baselines	0	0.00	0.00
Vn/Ve pairs	48	25.15	5.97

Plate IDs		Data Type	Lat (N)	Long (E)	Datum	S.D.	Pred	Wt. Res.	Imp.	Pred. az CCW of E	SITE
ce	it	vn	16.26	298.47	1.440	0.082	1.474	-0.414	0.066	90.00	ABMF
ce	it	ve	16.26	298.47	1.200	0.089	1.175	0.282	0.050	0.00	ABMF
ce	it	vn	12.22	298.36	1.520	0.049	1.470	1.017	0.192	90.00	GRE0
ce	it	ve	12.22	298.36	1.360	0.052	1.347	0.259	0.480	0.00	GRE0
ce	it	vn	14.59	299.00	1.500	0.080	1.493	0.088	0.083	90.00	LMMF
ce	it	ve	14.59	299.00	1.250	0.091	1.250	-0.003	0.070	0.00	LMMF
ce	it	vn	14.73	298.85	1.580	0.122	1.488	0.757	0.034	90.00	FSD0
ce	it	ve	14.73	298.85	1.310	0.318	1.243	0.210	0.005	0.00	FSD0
ce	it	vn	14.73	298.85	1.630	0.167	1.488	0.852	0.018	90.00	FSD1
ce	it	ve	14.73	298.85	1.330	0.214	1.243	0.405	0.012	0.00	FSD1
ce	it	vn	15.24	298.71	1.400	0.063	1.483	-1.311	0.121	90.00	CASS
ce	it	ve	15.24	298.71	1.180	0.111	1.221	-0.366	0.038	0.00	CASS
ce	it	vn	15.34	298.69	1.510	0.084	1.482	0.335	0.067	90.00	FRSH
ce	it	ve	15.34	298.69	1.070	0.117	1.216	-1.249	0.034	0.00	FRSH
ce	it	vn	15.51	298.72	1.420	0.071	1.483	-0.887	0.095	90.00	CNCD
ce	it	ve	15.51	298.72	1.180	0.109	1.209	-0.267	0.037	0.00	CNCD
ce	it	vn	15.67	296.38	1.420	0.132	1.398	0.166	0.021	90.00	AVES
ce	it	ve	15.67	296.38	1.130	0.231	1.186	-0.244	0.008	0.00	AVES
ce	it	vn	17.67	298.21	1.260	0.384	1.465	-0.533	0.003	90.00	CN00
ce	it	ve	17.67	298.21	1.120	0.737	1.111	0.012	0.001	0.00	CN00
ce	it	vn	17.72	295.20	1.360	0.057	1.354	0.100	0.269	90.00	VIKH
ce	it	ve	17.72	295.20	1.080	0.044	1.087	-0.151	0.152	0.00	VIKH
cw	it	vn	15.03	273.93	0.710	0.095	0.660	0.525	0.107	90.00	GLCO
cw	it	ve	15.03	273.93	1.080	0.184	1.109	-0.156	0.056	0.00	GLCO
cw	it	vn	14.97	273.76	0.660	0.138	0.659	0.007	0.055	90.00	SFDP
cw	it	ve	14.97	273.76	1.130	0.244	1.109	0.086	0.032	0.00	SFDP
cw	it	vn	14.92	273.62	0.670	0.062	0.658	0.193	0.293	90.00	MNTO
cw	it	ve	14.92	273.62	1.100	0.112	1.109	-0.082	0.147	0.00	MNTO
cw	it	vn	14.51	274.29	0.540	0.167	0.663	-0.734	0.029	90.00	CMP1
cw	it	ve	14.51	274.29	1.170	0.236	1.116	0.228	0.030	0.00	CMP1
cw	it	vn	14.04	276.62	0.610	0.107	0.678	-0.634	0.068	90.00	PUEC
cw	it	ve	14.04	276.62	1.100	0.197	1.128	-0.144	0.039	0.00	PUEC
cw	it	vn	12.58	278.28	0.690	0.061	0.688	0.032	0.508	90.00	SAN0
cw	it	ve	12.58	278.28	1.250	0.063	1.149	1.603	0.340	0.00	SAN0
cw	it	vn	12.57	274.63	0.730	0.057	0.665	1.142	0.220	90.00	PORT
cw	it	ve	12.57	274.63	0.950	0.110	1.140	-1.725	0.121	0.00	PORT
cw	it	vn	12.52	278.27	0.720	0.066	0.688	0.485	0.393	90.00	SANA
cw	it	ve	12.52	278.27	1.310	0.115	1.150	1.395	0.112	0.00	SANA
cw	it	vn	12.41	274.19	0.590	0.058	0.662	-1.241	0.255	90.00	TEUS
cw	it	ve	12.41	274.19	0.970	0.090	1.140	-1.894	0.185	0.00	TEUS
cw	it	vn	12.92	274.78	0.670	0.250	0.666	0.016	0.011	90.00	RIOB
cw	it	ve	12.92	274.78	1.180	0.429	1.136	0.102	0.008	0.00	RIOB
ce	it	vn	17.76	295.42	1.360	0.030	1.362	-0.082	0.536	90.00	CRO1
ce	it	ve	17.76	295.42	1.100	0.031	1.086	0.438	0.518	0.00	CRO1
ce	it	vn	16.93	297.65	1.470	0.151	1.444	0.170	0.022	90.00	RDON
ce	it	ve	16.93	297.65	1.040	0.129	1.140	-0.773	0.018	0.00	RDON
cw	it	vn	13.38	278.64	0.300	0.400	0.690	-0.975	0.013	90.00	CN35
cw	it	ve	13.38	278.64	0.920	0.767	1.141	-0.289	0.002	0.00	CN35

2 plates, 24 sites, Caribbean (west) fixed

```
*********INVERSION RESULTS - CDeMets *****
>> File header is
caribbean gps site velocities - IGS08


----------- INPUT DATA STATISTICS ------------

# PLATES:  3  # of DATA:   48 DOF:  42
Fixed plate is   cw
Optimal angular velocities are in file fort.7

----------- BEGIN ITERATIVE SEARCH ------------

Results from Iteration  0
-------------------------
>  Trial angular velocities
>   it      0.000      0.000    0.5000
>   ce      0.000      0.000    0.5000

>  Chi**2   Reduced Chi**2
   ********    *******

> Convergence criteria are:  0.007983810  0.001967615  0.001429710


Results from Iteration  1
-------------------------
>  Trial angular velocities
>   it    -58.506     34.645    0.1321
>   ce     15.210    -81.341    0.1952

>  Chi**2   Reduced Chi**2
     25.148     0.5988

> Convergence criteria are:  0.000000000  0.000000000  0.000000000

----------- END ITERATIVE SEARCH ------------

 The best fitting angular velocities are:
 plate id     Lat     Long     W deg/Myr
 ----- --  ------  ------   ------
    cw       0.0     0.0      .00
    it     -58.506  34.645   0.1321
    ce      15.210 -81.341   0.1952

Final chi**2 and reduced chi**2 are   25.148 and 0.5988

 2D 1-sigma error ellipse and 1D 1-sigma angular velocity uncertainty
 Plate   Ellipse axes  azimuth of major axis  rot. rate
   id    major   minor   (CCW  from east)      uncert.
   --    -----   -----   ----------------      -------
   it    33.29    1.54          18.53         0.0285
```

ce	5.25	1.73	9.29	0.0739

Data Type	# Data	Chi**2	Data Importance
Rates	0	0.00	0.00
Transforms	0	0.00	0.00
Slip vectors	0	0.00	0.00
Baselines	0	0.00	0.00
Vn/Ve pairs	48	25.15	5.97

Plate IDs	Data Type	Lat (N)	Long (E)	Datum	S.D.	Pred	Wt. Res.	Imp.	Pred. az CCW of E	SITE
ce it	vn	16.26	298.47	1.440	0.082	1.474	-0.414	0.066	90.00	ABMF
ce it	ve	16.26	298.47	1.200	0.089	1.175	0.282	0.050	0.00	ABMF
ce it	vn	12.22	298.36	1.520	0.049	1.470	1.017	0.192	90.00	GRE0
ce it	ve	12.22	298.36	1.360	0.052	1.347	0.259	0.480	0.00	GRE0
ce it	vn	14.59	299.00	1.500	0.080	1.493	0.088	0.083	90.00	LMMF
ce it	ve	14.59	299.00	1.250	0.091	1.250	-0.003	0.070	0.00	LMMF
ce it	vn	14.73	298.85	1.580	0.122	1.488	0.757	0.034	90.00	FSD0
ce it	ve	14.73	298.85	1.310	0.318	1.243	0.210	0.005	0.00	FSD0
ce it	vn	14.73	298.85	1.630	0.167	1.488	0.852	0.018	90.00	FSD1
ce it	ve	14.73	298.85	1.330	0.214	1.243	0.405	0.012	0.00	FSD1
ce it	vn	15.24	298.71	1.400	0.063	1.483	-1.311	0.121	90.00	CASS
ce it	ve	15.24	298.71	1.180	0.111	1.221	-0.366	0.038	0.00	CASS
ce it	vn	15.34	298.69	1.510	0.084	1.482	0.335	0.067	90.00	FRSH
ce it	ve	15.34	298.69	1.070	0.117	1.216	-1.249	0.034	0.00	FRSH
ce it	vn	15.51	298.72	1.420	0.071	1.483	-0.887	0.095	90.00	CNCD
ce it	ve	15.51	298.72	1.180	0.109	1.209	-0.267	0.037	0.00	CNCD
ce it	vn	15.67	296.38	1.420	0.132	1.398	0.166	0.021	90.00	AVES
ce it	ve	15.67	296.38	1.130	0.231	1.186	-0.244	0.008	0.00	AVES
ce it	vn	17.67	298.21	1.260	0.384	1.465	-0.533	0.003	90.00	CN00
ce it	ve	17.67	298.21	1.120	0.737	1.111	0.012	0.001	0.00	CN00
ce it	vn	17.72	295.20	1.360	0.057	1.354	0.100	0.269	90.00	VIKH
ce it	ve	17.72	295.20	1.080	0.044	1.087	-0.151	0.152	0.00	VIKH
cw it	vn	15.03	273.93	0.710	0.095	0.660	0.525	0.107	90.00	GLCO
cw it	ve	15.03	273.93	1.080	0.184	1.109	-0.156	0.056	0.00	GLCO
cw it	vn	14.97	273.76	0.660	0.138	0.659	0.007	0.055	90.00	SFDP
cw it	ve	14.97	273.76	1.130	0.244	1.109	0.086	0.032	0.00	SFDP
cw it	vn	14.92	273.62	0.670	0.062	0.658	0.193	0.293	90.00	MNTO
cw it	ve	14.92	273.62	1.100	0.112	1.109	-0.082	0.147	0.00	MNTO
cw it	vn	14.51	274.29	0.540	0.167	0.663	-0.734	0.029	90.00	CMP1
cw it	ve	14.51	274.29	1.170	0.236	1.116	0.228	0.030	0.00	CMP1
cw it	vn	14.04	276.62	0.610	0.107	0.678	-0.634	0.068	90.00	PUEC
cw it	ve	14.04	276.62	1.100	0.197	1.128	-0.144	0.039	0.00	PUEC
cw it	vn	12.58	278.28	0.690	0.061	0.688	0.032	0.508	90.00	SAN0
cw it	ve	12.58	278.28	1.250	0.063	1.149	1.603	0.340	0.00	SAN0
cw it	vn	12.57	274.63	0.730	0.057	0.665	1.142	0.220	90.00	PORT
cw it	ve	12.57	274.63	0.950	0.110	1.140	-1.725	0.121	0.00	PORT
cw it	vn	12.52	278.27	0.720	0.066	0.688	0.485	0.393	90.00	SANA
cw it	ve	12.52	278.27	1.310	0.115	1.150	1.395	0.112	0.00	SANA
cw it	vn	12.41	274.19	0.590	0.058	0.662	-1.241	0.255	90.00	TEUS
cw it	ve	12.41	274.19	0.970	0.090	1.140	-1.894	0.185	0.00	TEUS
cw it	vn	12.92	274.78	0.670	0.250	0.666	0.016	0.011	90.00	RIOB
cw it	ve	12.92	274.78	1.180	0.429	1.136	0.102	0.008	0.00	RIOB
ce it	vn	17.76	295.42	1.360	0.030	1.362	-0.082	0.536	90.00	CRO1
ce it	ve	17.76	295.42	1.100	0.031	1.086	0.438	0.518	0.00	CRO1
ce it	vn	16.93	297.65	1.470	0.151	1.444	0.170	0.022	90.00	RDON
ce it	ve	16.93	297.65	1.040	0.129	1.140	-0.773	0.018	0.00	RDON
cw it	vn	13.38	278.64	0.300	0.400	0.690	-0.975	0.013	90.00	CN35
cw it	ve	13.38	278.64	0.920	0.767	1.141	-0.289	0.002	0.00	CN35

2 plates, 24 sites, Caribbean (east) fixed

```
*********INVERSION RESULTS - CDeMets *****
>> File header is
caribbean gps site velocities - IGS08


----------- INPUT DATA STATISTICS ------------

# PLATES:  3  # of DATA:   48 DOF:  42
Fixed plate is   ce
Optimal angular velocities are in file fort.7

----------- BEGIN ITERATIVE SEARCH ------------

Results from Iteration  0
-------------------------
>  Trial angular velocities
>   it      0.000      0.000    0.5000
>   cw      0.000      0.000    0.5000

>  Chi**2   Reduced Chi**2
   ********    *******

> Convergence criteria are:  0.008726351  0.003592960  0.001876711


Results from Iteration  1
-------------------------
>  Trial angular velocities
>   it    -35.789     82.822    0.2802
>   cw    -15.210     98.659    0.1952

>  Chi**2   Reduced Chi**2
     25.148     0.5988

> Convergence criteria are:  0.000000000  0.000000000  0.000000000

----------- END ITERATIVE SEARCH ------------

 The best fitting angular velocities are:
 plate id     Lat     Long     W deg/Myr
 ----- --  ------  ------   ------
    ce       0.0     0.0      .00
    it     -35.789  82.822   0.2802
    cw     -15.210  98.659   0.1952

Final chi**2 and reduced chi**2 are   25.148 and 0.5988

 2D 1-sigma error ellipse and 1D 1-sigma angular velocity uncertainty
 Plate   Ellipse axes  azimuth of major axis  rot. rate
   id    major   minor   (CCW  from east)      uncert.
   --    -----   -----   ----------------      -------
   it     6.59    0.51          23.51         0.0313
```

cw	5.25	1.73	170.71	0.0739

Data Type	# Data	Chi**2	Data Importance
Rates	0	0.00	0.00
Transforms	0	0.00	0.00
Slip vectors	0	0.00	0.00
Baselines	0	0.00	0.00
Vn/Ve pairs	48	25.15	5.97

Plate IDs		Data Type	Lat (N)	Long (E)	Datum	S.D.	Pred	Wt. Res.	Imp.	Pred. az CCW of E	SITE
ce	it	vn	16.26	298.47	1.440	0.082	1.474	-0.414	0.066	90.00	ABMF
ce	it	ve	16.26	298.47	1.200	0.089	1.175	0.282	0.050	0.00	ABMF
ce	it	vn	12.22	298.36	1.520	0.049	1.470	1.017	0.192	90.00	GRE0
ce	it	ve	12.22	298.36	1.360	0.052	1.347	0.259	0.480	0.00	GRE0
ce	it	vn	14.59	299.00	1.500	0.080	1.493	0.088	0.083	90.00	LMMF
ce	it	ve	14.59	299.00	1.250	0.091	1.250	-0.003	0.070	0.00	LMMF
ce	it	vn	14.73	298.85	1.580	0.122	1.488	0.757	0.034	90.00	FSD0
ce	it	ve	14.73	298.85	1.310	0.318	1.243	0.210	0.005	0.00	FSD0
ce	it	vn	14.73	298.85	1.630	0.167	1.488	0.852	0.018	90.00	FSD1
ce	it	ve	14.73	298.85	1.330	0.214	1.243	0.405	0.012	0.00	FSD1
ce	it	vn	15.24	298.71	1.400	0.063	1.483	-1.311	0.121	90.00	CASS
ce	it	ve	15.24	298.71	1.180	0.111	1.221	-0.366	0.038	0.00	CASS
ce	it	vn	15.34	298.69	1.510	0.084	1.482	0.335	0.067	90.00	FRSH
ce	it	ve	15.34	298.69	1.070	0.117	1.216	-1.249	0.034	0.00	FRSH
ce	it	vn	15.51	298.72	1.420	0.071	1.483	-0.887	0.095	90.00	CNCD
ce	it	ve	15.51	298.72	1.180	0.109	1.209	-0.267	0.037	0.00	CNCD
ce	it	vn	15.67	296.38	1.420	0.132	1.398	0.166	0.021	90.00	AVES
ce	it	ve	15.67	296.38	1.130	0.231	1.186	-0.244	0.008	0.00	AVES
ce	it	vn	17.67	298.21	1.260	0.384	1.465	-0.533	0.003	90.00	CN00
ce	it	ve	17.67	298.21	1.120	0.737	1.111	0.012	0.001	0.00	CN00
ce	it	vn	17.72	295.20	1.360	0.057	1.354	0.100	0.269	90.00	VIKH
ce	it	ve	17.72	295.20	1.080	0.044	1.087	-0.151	0.152	0.00	VIKH
cw	it	vn	15.03	273.93	0.710	0.095	0.660	0.525	0.107	90.00	GLCO
cw	it	ve	15.03	273.93	1.080	0.184	1.109	-0.156	0.056	0.00	GLCO
cw	it	vn	14.97	273.76	0.660	0.138	0.659	0.007	0.055	90.00	SFDP
cw	it	ve	14.97	273.76	1.130	0.244	1.109	0.086	0.032	0.00	SFDP
cw	it	vn	14.92	273.62	0.670	0.062	0.658	0.193	0.293	90.00	MNTO
cw	it	ve	14.92	273.62	1.100	0.112	1.109	-0.082	0.147	0.00	MNTO
cw	it	vn	14.51	274.29	0.540	0.167	0.663	-0.734	0.029	90.00	CMP1
cw	it	ve	14.51	274.29	1.170	0.236	1.116	0.228	0.030	0.00	CMP1
cw	it	vn	14.04	276.62	0.610	0.107	0.678	-0.634	0.068	90.00	PUEC
cw	it	ve	14.04	276.62	1.100	0.197	1.128	-0.144	0.039	0.00	PUEC
cw	it	vn	12.58	278.28	0.690	0.061	0.688	0.032	0.508	90.00	SAN0
cw	it	ve	12.58	278.28	1.250	0.063	1.149	1.603	0.340	0.00	SAN0
cw	it	vn	12.57	274.63	0.730	0.057	0.665	1.142	0.220	90.00	PORT
cw	it	ve	12.57	274.63	0.950	0.110	1.140	-1.725	0.121	0.00	PORT
cw	it	vn	12.52	278.27	0.720	0.066	0.688	0.485	0.393	90.00	SANA
cw	it	ve	12.52	278.27	1.310	0.115	1.150	1.395	0.112	0.00	SANA
cw	it	vn	12.41	274.19	0.590	0.058	0.662	-1.241	0.255	90.00	TEUS
cw	it	ve	12.41	274.19	0.970	0.090	1.140	-1.894	0.185	0.00	TEUS
cw	it	vn	12.92	274.78	0.670	0.250	0.666	0.016	0.011	90.00	RIOB
cw	it	ve	12.92	274.78	1.180	0.429	1.136	0.102	0.008	0.00	RIOB
ce	it	vn	17.76	295.42	1.360	0.030	1.362	-0.082	0.536	90.00	CRO1
ce	it	ve	17.76	295.42	1.100	0.031	1.086	0.438	0.518	0.00	CRO1
ce	it	vn	16.93	297.65	1.470	0.151	1.444	0.170	0.022	90.00	RDON
ce	it	ve	16.93	297.65	1.040	0.129	1.140	-0.773	0.018	0.00	RDON
cw	it	vn	13.38	278.64	0.300	0.400	0.690	-0.975	0.013	90.00	CN35
cw	it	ve	13.38	278.64	0.920	0.767	1.141	-0.289	0.002	0.00	CN35

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