Assessment of South America Mid-Plate Strain Rates through GNSS Velocities Estimated from SIRGAS-C Time Series

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We are investigating terrain deformations of long range and persistence that take place on continental scale over the stable shield of continental South America. The crustal deformation is being investigated by correlating with velocities and directions obtained from time series of approximately 60 GNSS stations deployed in Brazil and neighboring countries that take part of the Continuous network of the Geocentric Reference System for the Americas (SIRGAS-C). We attempt to estimate velocities and mid-plate strain rates using the best GNSS stations located in the stable South America mid-plate. The velocities have been estimated by Least Square Estimation (LSE) using SIRGAS weekly time series with a stochastic model composed of white noise plus flicker or random walk noises. Variance Component Estimation (VCE; Amiri-Simkooei et al., 2007) has been applied to classify the type of noise and compose the time series stochastic model. In addition, the time series breaks and offsets are taken into account in the LSE. The noises were classified as white plus flicker noise in approximately 70% of the horizontal component and most of random walk appears for stations located in the Amazon and Pantanal basins or near the coastal zones. The estimated formal precision reach about 0.10 mm/year with RMS of residual near 1.5 and 4.5 mm respectively for horizontal and vertical velocities. The estimated velocities by LSE were also computed by using the MIDAs code (Blewit et al 2015) and the results show an agreement of the order of 0.30 mm/y. The computed strain rates in the central part of Brazil indicate shortening, consistent with the predominance of reverse faulting mechanisms. When a station pair includes one station near the coast, the linear strain rates indicate extension. However, strain rates do not clearly indicate a preferred principal direction and do not seem compatible with the stress patterns derived from the focal mechanisms. In addition, the rate of seismic moment release indicates strain rates from earthquake occurrence two to three orders of magnitude lower than the observed strain rates from the geodetic network. Assessment of South America linear strain rates computed through estimated GNSS velocities will be discussed.

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