

3-dimensional GPS velocities in Colombia and their implications for interplate coupling

*Sindy Carolina Lizarazo¹, Takeshi Sagiya², Hector Mora-Paez³

1. Graduate School of Environmental Studies, Nagoya University, 2. Disaster Mitigation Research Center, Nagoya University, 3. Geological Survey of Colombia

Colombia is located in a region of complex interactions among the Caribbean, Nazca and South American plates, as well as the North Andean and Panama-Choco blocks. As a consequence of this tectonic setting, active faulting and intense seismicity are occurring especially in the areas of plate subduction or collision. The GeoRED project by the Geological Survey of Colombia installed a permanent GPS network in Colombia to study the regional kinematics with an intention to improve disaster mitigation activities. An initial velocity field was obtained and discussed by Mora et al. (2019) based on data from 60 sites under the ITRF2008 reference frame.

Here we present an updated result of Colombian GPS velocity field with 80 sites. The daily coordinates are calculated under the ITRF2014 reference frame with GAMIT-GLOBK software. We calculate 3-dimensional velocities with HECTOR software (Bos et al., 2013) based on the daily coordinates for the period from January 2014 to March 2016. There was no earthquake larger than magnitude 6 in Colombia, so the velocity pattern represents that of the interseismic period. For this time period, enhancement of the permanent network provides a better spatial resolution of the deformation pattern in some regions.

The results show a general consistency with the previous study, demonstrating the correctness of the current approach. In addition, vertical components show a slight of coastal uplifts at a few mm/year along the Nazca subduction zone. These signals indicate the lower limit of the plate coupling on the plate interface and we discuss the interplate coupling based on the 3-dimensional velocity data. Also, a significant margin-normal contraction is identified along a part of the Caribbean subduction zone near Colombia-Panama border. However, the vertical signal is not significant compared to the horizontal contraction, indicating that the elastic coupling model may not be applicable to this area.

Keywords: GPS velocities, Interplate coupling, Subduction, Deformation