Interseismic deformation of the Quito fault (Ecuador) from GPS and InSAR

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Abstract

The _˜2.5 M inhabitant capital region of Ecuador sits above an active reverse fault system, whose seismic potential has yet to be quantified. Using GPS, Alvarado et al., (2014) showed that ∼4 mm/yr of horizontal shortening is currently accommodated across the Quito fault. These preliminary results were then used by Beauval et al. (2014) to propose a seismic hazard model for Quito.

In order to better constrain the present-day deformation associated with the Quito fault, we complement the set of geodetic data with continuous GPS stations and interferometric synthetic aperture radar (InSAR) measurements produced from a series of 18 ERS SAR data (ESA). This data set covers the Quito Fault System over an area of 85 km by 30 km and spans the period from 1993 to 2000.

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We first perform a simple inversion on a selected data set of GPS to infer a new and better-constrained kinematic model of the fault to determine both the slip rate and the locking distributions at depth. We find very shallow structures with a slip rate around 4mm/yr constant along strike. We then perform a joint inversion of both data set (GPS and InSAR). Sharp gradients of displacements observed both for GPS and InSAR suggest that the fault might be creeping up to the surface.
Previous PSHA studies have shown that the Quito fault fully controls the hazard in Quito city (Beauval et al. 2014). The results will be used to improve the forecast of earthquakes on the Quito Fault system, for Probabilistic Seismic Hazard Assessment in Quito.