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Active crustal deformation of the El Salvador Fault Zone (ESFZ) using GPS data: Implications in seismic hazard assessment

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El Salvador, Central America, is part of the Chortis block in the northwestern boundary of the Caribbean plate. This block is interacting with a diffuse triple junction point with the Cocos and North American plates. Among the structures that cut the Miocene to Pleistocene volcanic deposits stands out the El Salvador Fault Zone (ESFZ): It is oriented in N90º–100ºE direction, and it is composed of several structural segments that deform Quaternary deposits with right-lateral and oblique slip motions. The ESFZ is seismically active and capable of producing earthquakes such as the February 13, 2001 with Mw 6.6 (Martínez-Díaz et al., 2004), that seriously affected the population, leaving many casualties. This structure plays an important role in the tectonics of the Chortis block, since its motion is directly related to the drift of the Caribbean plate to the east and not with the partitioning of the deformation of the Cocos subduction (here not coupled) (Álvarez-Gómez et al., 2008). Together with the volcanic arc of El Salvador, this zone constitutes a weakness area that allows the motion of forearc block toward the NW.

The geometry and the degree of activity of the ESFZ are not studied enough. However their knowledge is essential to understand the seismic hazard associated to this important seismogenic structure. For this reason, since 2007 a GPS dense network was established along the ESFZ (ZFESNet) in order to obtain GPS velocity measurements which are later used to explain the nature of strain accumulation on major faults along the ESFZ.

The current work aims at understanding active crustal deformation of the ESFZ through kinematic model. The results provide significant information to be included in a new estimation of seismic hazard taking into account the major structures in ESFZ.