

Earthquake Potential in Central Costa Rica based on Geodetic Observations

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The Central Costa Rica Deformed Belt is the extension of the North Panama Deformed Belt, a diffuse predominant northwest dextral-strike and conjugated northeast sinistral-strike faulting area, that represents the western border of the Panama Microplate. This diffuse boundary crosses Central Costa Rica from the Caribbean Coast, including the active Cordillera Volcanica Central, the Metropolitan Area (most dense population area in Costa Rica) and the Central Pacific coastline to intersects the Meso American Trench along the subduction of the Cocos Plate.

We integrated interseismic geodetic data with seismicity records and inland faulting traces in order to evaluate earthquake potential in 4 kinematic models with different spatial geometries of the tectonic configuration around Central Costa Rica. Crustal deformation in Central Costa Rica and surroundings is modeled as result: i.kinematic effects of rigid block motions, ii.elastic deformation due to the interaction on subduction and inland tectonic interfaces and iii.internal strain of each tectonic block. We adopted the Markov Chain –Monte Carlo method in order to approximate the solution for each kinematic model.

Our estimation of the velocity field in Costa Rica suggests that the crustal deformation in Costa Rica is mainly arranged in three groups: 1). Northwestern Costa Rica is dominated by a northward deformation with rates up to 30 mm a^{-1} , rotating and decreasing up to 20 mm a^{-1} northwestward following the Central American Forearc. 2). Southeastern Costa Rica shows deformation to the North-east up to 40 mm a^{-1} (opposite to northwestern Costa Rica). 3). Central Costa Rica is characterized by a diffuse deformation pattern oriented mainly to northward, with deformation rates up a half of those observed in northwestern and southeastern Costa Rica. According to the values of slip deficit in interfaces of each model and analysis of local seismicity, we provide results about the earthquake potential in Central Costa Rica, where it is possible to reach earthquakes higher than Mw. 6.5 in all models.

Keywords: Central Costa Rica, Earthquake potential Costa Rica, Crustal Deformation Costa Rica