

Kinematic Analysis of the Northern Longitudinal Valley From Geodetic and Seismic Observations

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Abstract

Longitudinal Valley (LV), extended from Hualien to Taitung between the Central Range (CR) and the Coastal Range (CoR) in the eastern Taiwan, is considered as a plate boundary formed by the convergence between the Eurasian and Philippine Sea plates. Previous studies reveal ~30 mm/yr shortening in the southern part of the LV; however, many interesting tectonic and geologic features in the northern LV are worth to discuss. Our relocation of $M > 2.0$ background seismicity in the northern LV using HypoDD revealed an east dipping LV fault and a west-dipping lineament beneath the middle Central Range, while the lineament gradually becomes horizontal as extended to the east. In this study, we analyzed GPS data from 38 continuous stations together with Envisat and ALOS images processed by PSInSAR (Persistent Scatterers InSAR) technique to study the interseismic ground deformation of the northern LV area. Our geodetic analysis reveal that the GPS horizontal velocity field decreases toward the north from ~25 mm/yr to <10 mm/yr across the latitude of ~23.5°, with a clockwise rotation of velocity directions from northwest to north and further to east in the Hualien area. In addition, the vertical velocities show subsidence in the most of the area with rates up to 10 mm/yr. Moreover, the mean Line-Of-Sight (LOS) velocity of the 2004-2008 Envisat data show up to 5 mm/yr away from satellite in the Coastal Range area, and 2007-2010 ALOS data reveal about 10 mm/yr at the central LV area. Due to the different characteristic of GPS and InSAR data: GPS have high accuracy in three direction (North, East, Up) but less data points while InSAR have wild distribution but only measure in one dimension (LOS direction). We tried to calculate the three dimensional velocity (N, E, U) on the nodes of triangle mesh from GPS and InSAR using a method which is proposed by Wang et al. [2012] and Walters et al. The calculated velocities on nodes well express the graduated changes velocity field in three direction, E, N, U.

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