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The study of characteristics of Longitude Valley Fault derived from the dense continuous GPS array, southeastern Taiwan

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Taiwan is situated at the junction between the southeast-facing Ryukyu arc-trench system and the western-facing Luzon arc-Manila Trench system. The 150 km long, NNE-striking Longitudinal Valley Fault (LVF) in eastern Taiwan is an extremely active high-angle thrust fault. It bounds the Coastal Range and the Longitudinal Valley, which is considered a collision boundary between the Philippine Sea and the Eurasian plates. The Central Range is quite different geology structure from the Coastal Range. The Central Range is composed of the pre-Tertiary metamorphic basement and weakly metamorphosed Cenozoic argillite-slate series. The Coastal Range consist of Neogene andesitic volcanic units and associated turbidite sediments. The difference of those two geological provinces make LVF presents different characteristics in five different area. There are Hualien, Ruisui, Yuli, Chihshang, and Taitung area. In this study, we collect the continuous GPS data from a very dense array in the Longitudinal Valley area from 2009 to 2015 utilized to study the spatial variation of crustal motion along the LVF. With respect to Penghu station (S01R) in the Chinese continental margin, velocities for stations on the western side of the LVF (Longitudinal Valley and eastern Central Range) are 17–37 mm/yr in directions 280–312°, whereas those on the eastern side of the LVF, the Coastal Range, are 25–68 mm/yr in directions 300–325°. A major velocity discontinuity of about 20-25 mm/yr across the Longitudinal Valley is attributed to the aseismic slip along the LVF as revealed by trilateration data previously. The south of Fengping area, the velocity of Coastal Range is 30–40 mm/yr in 315–332° relative to the Central Range, while the near-fault motions are about 13–33 mm/yr in 309–336°. Various partitions on the left-lateral strike-slip and convergent components along the LVF are found. In the southern Longitudinal Valley crustal motion is mainly accommodated on the LVF and the Luyeh Fault. In contrast, those in the central and northern Longitudinal Valley are partly taken up on the faults to the east of the LVF or result in the elastic deformation of the Coastal Range. The crustal deformation in the northern Longitudinal Valley area is likely to be distributed in the several NE-striking thrusts in a horsetail pattern and obliquely cut the northern Coastal Range, with a small portion of fault-slips along the LVF. Overall, the LVF with different characteristics in different area, the velocity discontinuity suggest us the high strain accumulate here with high seismogenic potential.