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Spatial and temporal variations of surface deformation along the Longitudinal Valley, eastern Taiwan, observed by Persistent SAR Interferometry using ERS, Envisat, and ALOS archives

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Longitudinal Valley of eastern Taiwan is the location with rapid convergence between the Eurasian plate and the Philippine Sea plate, which consumed around 30 mm^{-1} of the 82 mm^{-1} of the continuous convergence between these two plates. The force has produced prominent landscape and frequent seismicity along this collisional boundary. The area is the most active fault zone in Taiwan. However, the spatial distribution of surface deformation by the tectonic convergence remains unclear and their changes in surface deformation along time are not well studied either.

In this research, we focus on both the spatial and temporal variation in the surface deformation along the collisional boundary. 41 ERS (1993 $\sim$ 2001)and 19 Envisat ASAR radar images from Track 461, frame 3123 and 3141, and 28 ALOS PalSAR images (frames 444-460, 445-450) were used to extract surface deformation signals from the plate suture. The archives from three radar satellites represent three different time periods of observations. We applied StaMPS PSI method (Persistent Scatterer InSAR) to the area of study, which spans the entire Longitudinal Valley of Taiwan from Hualien city to Taitung city, to observe the surface displacements in eastern Taiwan. Our investigation indicates that the Longitudinal Valley can be divided into at least three segments in terms of relative changes in ranges between the approaching Coastal Range and the Longitudinal Valley. Comparison between PSI and leveling results indicates that PSI may be slightly under-estimated the magnitude of velocity relative to the ones derived from leveling.

By comparing the data derived from different radar image archives, we observe significant change of surface deformation through time. Investigating the effects of larger earthquakes near the area of interest is underway to determine whether larger earthquakes perturb the long term tectonic trend in eastern Taiwan.