**Application of InSAR technology to investigate the surface deformation of the 0403 Hualien seismic series**

Tsai Yun Hsieh. 1\*, Hsuan Ren.2, Chung Pai Chang.3

1Center for Space and Remote Sensing Research: Student, National Central University, Taiwan (R.O.C)

2 Center for Space and Remote Sensing Research: Associate Professor, National Central University, Taiwan (R.O.C)

3 Center for Space and Remote Sensing Research: Professor, National Central University, Taiwan (R.O.C)

[\*112022001@cc.ncu.edu.tw](mailto:*112022001@cc.ncu.edu.tw)

***ABSTRACT***

Taiwan is formed by the convergence of the Eurasian Plate and the Philippine Sea Plate. Being located at the boundary of these two plates results in frequent earthquakes. Hualien, being the closest region to this boundary, experiences even more intense seismic activity. On the morning of April 3 this year, a magnitude 7.2 earthquake occurred in the offshore area near Hualien, with a focal depth of 22.5 kilometers. The causative fault was a northeast-southwest striking thrust fault. In addition to the surface deformation caused by the mainshock, the earthquake triggered hundreds of aftershocks, several of which were larger than magnitude 6, also causing significant surface deformation. Therefore, this study aims to use InSAR technology to observe the impact of the earthquake sequence on surface deformation.

In recent years, with the rapid development of satellite geodesy technology, it has provided fast, accurate, and effective information. The analytical methods used in this study are Differential Interferometric Synthetic Aperture Radar (DInSAR) and Persistent Scatterer Interferometric Synthetic Aperture Radar (PSInSAR). DInSAR observes surface deformation during the co-seismic period by comparing radar images taken before and after the earthquake. The concept of PSInSAR is to select these permanent scatterers in a series of images, calculate their phase changes over time, and then obtain displacement information at each point by eliminating errors from satellite baselines and topographic effects, tracking continuous surface deformation, and providing spatial and temporal distribution information of surface deformation.

Since this earthquake was mainly caused by thrust fault activity, significant vertical surface uplift or subsidence can be observed through InSAR technology. The multiple aftershocks will continue to accumulate on the basis of the mainshock's surface deformation. DInSAR can observe the deformation amount and characteristics of each earthquake event, while PSInSAR can monitor the continuous surface deformation from the mainshock to the subsequent aftershocks. Earthquakes change the stress state of faults in the region, and the frequent aftershocks of this event are likely to trigger other fault activities and increase the activity around the faults.

**Keywords:** InSAR, earthquake, surface deformation, earthquake sequence