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Sensing Radar Interferometry and Precise Localization of the North Korean Nuclear Explosions

Radar data from remote sensing satellites is being used as additional mean for the verification of underground nuclear explosions. The Differential Interferometry Synthetic Aperture Radar (DInSAR) analysis provide the evidence of a non-recurring surface displacement of up to 10 cm after the January 2016 explosion about 3 km northwest of the tunnel entrance at the North Korean test site. This result is consistently proved for the subsequent nuclear test in September 2016. The strong spatial and temporal coincidence of these observations with the seismic data suggests a correlation with the underground tests. The seismograms of the five events from seismic stations at regional distances from the source, are individually correlated, and display a high coherence between the corresponding signals. This allows to estimate relative travel time differences and to perform the relative localization with a high accuracy. In combination with the results of the radar interferometry, the locations of the explosions are estimated relative to the center of the surface displacement of the January 2016 event. As result, the tests in 2009, 2013, and 2016 are conducted within a radius of 450 m, whereas the 2006 event is about 2700 m to the East from that.

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