Geophysical Research Abstracts
Vol. 20, EGU2018-13089, 2018
EGU General Assembly 2018

Surface deformation detection by 6th nuclear test in North Korea using multi-kernel SAR offset method

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On September 3rd 2017, strong artificial seismic signals from North Korea were detected in KMA (Korea Meteorological Administration) seismic network. The location of the epicenter is estimated to be Punggye-ri nuclear test site. This event recorded as the largest 6th Nuclear Test. However, the event was not studied well due to accessibility and geodetic measurements. Therefore, we used remote sensing data to analyze surface changes around Mt.Mantap area. First of all, we used Pleiadas-A/B high resolution satellite optical images which were acquired before and after 6th nuclear test. We detected widespread surface damage around the top of Mt.Mantap such as landslide. This phenomenon may be caused by a very strong underground nuclear explosion test. Second, we tried to detect surface deformation using InSAR method with Advanced Land Observation Satellite-2 (ALOS-2). Even though ALOS-2 data used L-band long wavelength, it is not working well because of decorrelation on interferogram. The main reason would be large deformation near the Mt.Mantap area. To overcome this limitation of decorrelation, we applied pixel offset method to measure deformation. This method is using cross correlation of intensity of two SAR images in the direction of along track and Line-Of-Sight (LOS). However, this method is affected by window kernel size. So we applied various window sizes from 32 to 224 in 16 steps. To increase time-consume, we applied parallel processing method. Finally, we could retrieve 2D surface deformation of about 3m in maximum in the west side of Mt.Mantap.