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Localized landslide risk assessment with multi pass L band DInSAR analysis

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In terms of data availability and error correction, landslide forecasting by Differential Interferometric SAR (DInSAR) analysis is not easy task. Especially, the landslides by the anthropogenic construction activities frequently occurred in the localized cutting side of mountainous area. In such circumstances, it is difficult to attain sufficient enough accuracy because of the external factors inducing the error component in electromagnetic wave propagation. For instance, the local climate characteristics such as orographic effect and the proximity to water source can produce the significant anomalies in the water vapor distribution and consequently result in the error components of InSAR phase angle measurements. Moreover the high altitude parts of target area cause the stratified tropospheric delay error in DInSAR measurement. The other obstacle in DInSAR observation over the potential landside site is the vegetation canopy which causes the decorrelation of InSAR phase. Thus rather than C band sensor such as ENVISAT, ERS and RADARSAT, DInSAR analysis with L band ALOS PLASAR is more recommendable. Together with the introduction of L band DInSAR analysis, the improved DInSAR technique to cope all above obstacles is necessary. Thus we employed two approaches i.e. StaMPS/MTI (Stanford Method for Persistent Scatterers/Multi-Temporal InSAR, Hopper et al., 2007) which was newly developed for extracting the reliable deformation values through time series analysis and two pass DInSAR with the error term compensation based on the external weather information in this study. Since the water vapor observation from spaceborne radiometer is not feasible by the temporal gap in this case, the quantities from weather Research Forecasting (WRF) with 1 km spatial resolution was used to address the atmospheric phase error in two pass DInSAR analysis. Also it was observed that base DEM offset with time dependent perpendicular baselines of InSAR time series produce a significant error even in the advanced time series techniques such as StaMPS/MTI. We tried to compensate with the algorithmic base together with the usage of high resolution LIDAR DEM. The target area of this study is the eastern part of Korean peninsula centered. In there, the landslide originated by the geomorphic factors such as high sloped topography and localized torrential down pour is critical issue. The surface deformations from error corrected two pass DInSAR and StaMPS/MTI are crossly compared and validated with the landslide triggering factors such as vegetation, slope and geological properties. The study will be further extended for the application of future SAR sensors by incorporating the dynamic analysis of topography to implement practical landslide forecasting scheme.