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Time Series Surface Deformation Analysis in the Seguam Volcano for Verifying the Refined SBAS Technique

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The refined SBAS method has been improved to estimate time series surface deformation by additional several processing to the traditional SBAB technique. The small baseline subset (SBAS) technique has been developed to measure the time series surface deformation. This method is especially efficient to measure time series surface deformation which is not temporally connected by using singular value decomposition (SVD) and minimize atmospheric effects from temporally high pass and spatially low pass filtering. However, it has still phase unwrapping error and time varying noise component because of the linear deformation assumption. The refined SBAS technique can use to compensate remaining error components for iterative approaching and finite difference method. This processing can be summarized in these words. Most of all, phase unwrapping error should be reduced as much as possible for the precise time series deformation. To achieve this work, all interferograms need to be classified into high quality and low quality images according to be in existence of phase jumping pixels in the interferogram. Occasionally, we must use low quality images for connecting temporal time series without any gap between each interferogram. We also use iteration procedure to estimate atmospheric effects, topographic errors and time series surface deformation for more precise outcome. Furthermore, the finite difference smoothing approach is applied for mitigating the temporal noise and we carry out procedures to correct any possible phase bias at the reference points by orbital error and atmospheric effects. In this study, the refined SBAS technique using simulated interferograms is verified by restoration the time series surface deformation from simulation of each component consisting of interferogram such as surface deformation, topographic error, atmospheric artificial effect, orbital error and temporal decorrelation.

For verifying the refined SBAS technique, we have proved by restoration of simulation interferograms between estimation of time series surface deformation from each epoch interferogram and time series surface deformation with/without topographic error, atmospheric artificial effects, orbital errors and temporal decorrelation by using the refined SBAS processing on the Seguam Volcano. Especially, two calderas of Seguam Volcano are significantly good testing area for verifying the refined SBAS method due to retain two different time series surface deformation patterns which are constantly subsidence and periodically uplift and subsidence phenomenon by dynamic magma resources activation. We have attested time series surface deformation from the refined SBAS method through correlation coefficient maps between true time series deformation and simulated time series deformation map after the refined SBAS processing.