An improved approach for crustal deformation monitoring using Enhanced Small BAseline Subset (ESBAS) technique

Sanaz Vajedian 1, Mahdi Motagh 2

1 Department of Surveying and Geomatics Engineering, University of Tehran, Tehran, Iran; E-Mail: vajedian@ut.ac.ir
2 GFZ German Research Center for Geosciences, Potsdam, Germany; E-Mail: motagh@gfz-potsdam.de

Small BAseline Subset (SBAS) technique is being increasingly used as a geodetic method of choice for time series deformation analysis related to a variety of natural and anthropogenic processes. The method relies on an appropriate interferometric combination of SAR images with small temporal and spatial baseline. In this study we modify several aspects within the chain of the standard SBAS processing and develop a method called Enhanced SBAS (ESBAS) to improve deformation monitoring using SAR data, in particular for mountainous regions. Our modification includes filtering prior to phase unwrapping, topographic correction within 3-dimensional phase unwrapping, and reducing the effect of atmospheric noise either by external data like GPS or based on the band-pass decomposition of both topography and interferometric phase.

We evaluate the effectiveness of our enhanced method (ESBAS) for several case studies including deformation related to tectonic, volcano and mass movement processes. We show that the use of modified processing makes the long-term monitoring of fault or landslide creep more feasible as compared to the standard SBAS processing, where either atmospheric artifacts or DEM error effects disturb the creep signal. The results are compared with field measurements to better evaluate the performance of ESBAS algorithm.