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Application of polarimetric optimizatiom methods in surface deformation monitoring using InSAR

M. Esmaeili [a], M. Motagh [a,b]

[a] Department of Surveying and Geomatics Engineering, Faculty of Engineering, University of Tehran, Tehran, Iran – maesmaeili@ut.ac.ir
[b] GFZ German Research Centre for Geosciences, Department of Geodesy and Remote Sensing, Section of Remote Sensing, 14473, Potsdam, Germany – motagh@gfz-potsdam.de

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ABSTRACT:

Time-series analysis of Synthetic Aperture Radar (SAR) data using the two techniques of Small Baseline Subsets (SBAS) and Persistent Scatterer Interferometric SAR (PSInSAR) extends the usage of conventional interferometry technique in deformation monitoring and mitigating much of its limitations. Both methods try to identify pixels where the portion of spatiotemporal decorrelations on the phase is negligible. However, using dual/quad polarized data provide us additional tool to improve further the capability of time-series analysis. In this paper, we use polarimetric optomization methods to improve the performance of PSInSAR and SBAS techniques. The main step of the algorithm is choosing the best scattering mechanism of pixels in time, based on minimizing Amplitude dispersion Index (ADI) or maximizing coherence optimization by using dual/quad polarization data. To evaluate the polarimetric optimization approach in identifying coherent pixels in time-series analysis, we implemented the method using 17 dual polarization SAR data (HH/VV) acquired by TerraSAR-X data from July 2013 to January 2014 over Tehran plain, Iran. Tehran is affected by high rate of subsidence due to over extraction of ground water resources and it includes both agricultural and urban regions. This helps us to assess the performance of the techniques for different land uses. The conventional (single pole) and optimized polarization results are compared together and with external GPS observations of a single station located in the area.