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Generation of deformation time series from SAR data sequences in areas affected by large dynamics: insights from Sierra Negra caldera, Galápagos Islands

Francesco Casu, Andrea Manconi, Antonio Pepe, and Riccardo Lanari
IREA-CNR, Napoli, Italy (manconi.a@irea.cnr.it)

Differential Synthetic Aperture Radar Interferometry (DInSAR) is a remote sensing technique that allows producing spatially dense deformation maps of the Earth surface, with centimeter accuracy. To this end, the phase difference of SAR image pairs acquired before and after a deformation episode is properly exploited. This technique, originally applied to investigate single deformation events, has been further extended to analyze the temporal evolution of the deformation field through the generation of displacement time-series. A well-established approach is represented by the Small BAseline Subset (SBAS) technique (Berardino et al., 2002), whose capability to analyze deformation events at low and full spatial resolution has largely been demonstrated. However, in areas where large and/or rapid deformation phenomena occur, the exploitation of the differential interferograms, thus also of the displacement time-series, can be strongly limited by the presence of significant misregistration errors and/or very high fringe rates, making unfeasible the phase unwrapping step.

In this work, we propose advances on the generation of deformation time-series in areas affected by large deformation dynamics. We present an extension of the amplitude-based Pixel-Offset analyses by applying the SBAS strategy, in order to move from the investigation of single (large) deformation events to that of dynamic phenomena. The above-mentioned method has been tested on an ENVISAT SAR data archive (Track 61, Frames 7173-7191) related to the Galapagos Islands, focusing on Sierra Negra caldera (Galapagos Islands), an active volcanic area often characterized by large and rapid deformation events leading to severe image misregistration effects (Yun et al., 2007). Moreover, we present a cross-validation of the retrieved deformation estimates comparing our results to continuous GPS measurements and to synthetic deformation obtained by independently modeling the interferometric phase information when available.

References:

P. Berardino et al., (2002), A new algorithm for Surface Deformation Monitoring based on Small Baseline Differential SAR Interferograms, IEEE Transactions on Geoscience and Remote Sensing, vol. 40, 11, pp. 2375-2383.

S-H. Yun et al., (2007), Interferogram formation in the presence of complex and large deformation, Geophys. Res. Lett., vol. 34, L12305.