Cal_Val approach for DInSAR Deformation Rates Products using GNSS data

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Abstract

Future SAR missions are going towards the generation of higher level products that shall translate the complex backscatter measured by radar into geophysical observables [1]. Such products will cover a wide range of scientific applications hence requiring specific concepts for their Calibration/Validation.

Large scale deformation rates measurements are going to be an important scientific output for missions like Tandem-L or NISAR [1], [2]. The requirements proposed by the scientific community are very challenging (1 mm/y over hundreds of kilometres) therefore concrete strategies to validate and eventually to calibrate such products are needed. In this work a Cal/Val concept for DInSAR derived deformation rates measurements using GNSS data is presented.

The technique exploits the knowledge of the variance/covariance of both DInSAR and GNSS errors [3]. Based on that the velocities are combined accounting for the spectral properties of their errors [4]. Such a combination compares spatially the difference between DInSAR and GNSS deformation rates providing first of all a validation of the residual error varying the distance. Moreover, since the DInSAR provides relative measurements, the approach could also be used to accommodate the interferometric derived deformation rates on a network of absolute GNSS measurements, deriving also a description of the error of the merged/calibrated product. The technique is used for the deformation rates but could be extended more generally to the single measurements of the time series.

The proposed approach has been tested on several real datasets in order to address some potential application like the realization of national ground motion services or the measurements of large-scale tectonic motions maps. Sentinel 1 A/B stacks acquired over different area of interest have been processed and analysed. Examples of Holland, North Anatolian Fault and Basins and Range areas will be provided. The results shows the validation of the DInSAR results w.r.t. the 1 mm/y requirement assessing the feasibility of large scale deformation maps.

Bibliography

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