



Multi-temporal InSAR Datastacks for Surface Deformation Monitoring: a Review

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In the last decade extensive processing of thousands of satellite radar scenes acquired by different sensors (e.g. ERS-1/2, ENVISAT and RADARSAT) has demonstrated how multi-temporal data-sets can be successfully exploited for surface deformation monitoring, by identifying objects on the terrain that have a stable, point-like behaviour. These objects, referred to as Permanent or Persistent Scatterers (PS), can be geo-coded and monitored for movement very accurately, acting as a “natural” geodetic network, integrating successfully continuous GPS data. After a brief analysis of both advantages and drawbacks of InSAR datastacks, the paper presents examples of applications of PS measurements for detecting and monitoring active faults, aquifers and oil/gas reservoirs, using experience in Europe, North America and Japan, and concludes with a discussion on future directions for PSInSAR analysis. Special attention is paid to the possibility of creating deformation maps over wide areas using historical archives of data already available. This second part of the paper will briefly discuss the technical features of the new radar sensors recently launched (namely: TerraSAR-X, RADARSAT-2, and CosmoSkyMed) and their impact on space geodesy, highlighting the importance of data continuity and standardized acquisition policies for almost all InSAR and PSInSAR applications. Finally, recent advances in the algorithms applied in PS analysis, such as detection of “temporary PS”, PS characterization and exploitation of distributed scatterers, will be briefly discussed based on the processing of real data.