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Subsidence affecting some areas within Rome city revealed by ground measurements and multitemporal InSAR technique

Stramondo S.(1), Marra F.(1), Bozzano F.(2), Wegmuller U.(3), Cinti F.(1), Moro M.(1), Saroli M.(1)

1. Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy
2. University La Sapienza, Rome, Italy
3. GAMMA Remote Sensing

We propose the results of the interferometric analysis of surface displacements in the urban area of Rome. The Interferometric Point Target Analysis (IPTA) is a method to exploit the temporal and spatial characteristics of interferometric signatures collected from point targets to accurately map surface deformation histories, terrain heights, and relative atmospheric path delays. The use of targets with point like scatter characteristics has the advantage that there is much less geometric decorrelation. This permits phase interpretation even for large baselines above the critical one. Consequently, more image pairs may be included in the analysis. Important advantages are the potential to find scatterers in low-coherence areas and that interferometric image pairs with large baselines may be included in the analysis. Finding usable points in low-coherence regions fills spatial gaps in the deformation maps while the ability to use large baselines improves the temporal sampling. The available SAR dataset has been delivered by ESA in the Category1 3258 and ranges the period 1992-2005. In particular ERS1-ERS2 data covers 1992-2000, while Envisat ASAR 2002-2005. The detected subsidence rate is on the order of few mm/year for both time intervals. The velocity map clearly points out some areas affected by faster vertical soil movements. The latter reaches 10 mm/year. The over position of the SAR data on a map showing the boundaries of the alluvial plains of the Tiber River and its tributaries evidences the correspondence with the presence of the soft soils constituting the recent alluvial valleys. The analysis of the time-series, compared to a detailed investigation of

the lithostratigraphy of the alluvial sediments, and combined with a temporal reconstruction of the expansion of the city over the alluvial valleys, allowed us to depict the main factors controlling the observed subsidence. These are: the in situ effective stress conditions, the related compressibility and viscous characteristics of the loaded soils, the thickness of the compressible stratum, the time since loading instant, and the entity of loading. However, one sector exists (in the Grottaperfetta stream valley) that is characterized by an anomalous high and time-lasting subsidence. Original data on the lithopstratigraphic setting of this alluvial valley allowed us to identify the possible causes of its peculiar behaviour.