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Statistical elaborations of PS DInSAR data applied to the analysis of the subsidence affecting the Venetian coast

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Subsidence is a hazard that may have natural or anthropic origin. It can affect wide areas causing important economic losses. The area of the Venetian coast is affected by subsidence mainly due to the exploitation of its resources (gas and water). In particular, about 40% of the Italian extraction activities are on this area and here the subsidence arise in conjunction with the industrial revolution (1950-1970). An effective monitoring system is necessary for the correct management of the resources exploitation that, very often, is not supervised. To this aim, the innovative DInSAR techniques have been effectively employed as monitoring systems for the risk assessments of various instability phenomena, such as subsidence, landslides, volcanic eruptions, earthquakes, sinkholes. These techniques represent a powerful investigation tool for their high spatial and multi-temporal coverage, fast data acquisition, and overall low costs. Their results are the displacement estimates along the satellite Line of Sight (LOS), the velocity map and the displacements time series for the whole observation period.
In the present work, the ERS and ENVISAT DInSAR data, achieved through the Persistent Scatterers (PS) technique, have been used to produce the iso-kinetic maps of deformation for an area of about 4300 Km2. Here, the mean velocities computed along the ERS and ENVISAT observation periods 1992-2000 and 2003-2010 have been interpolated through the Ordinary Kriging (OK) method. Simulated values and estimations of subsidence uncertainties have been analysed to advance the current understanding on the phenomenon that affects the study area. The achieved maps give information about the spatial distribution of the rates of deformation, which could be correlated with the available geological, hydrogeological and geotechnical data, as well as with the recorded damage to the structures and infrastructures. Then, local Authorities can use these maps as useful tools for the monitoring and management of the ground deformation caused by natural and anthropic factors.