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DORIS downstream service: a support to civil defence autorithies in landslides and subsidence risk management

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DORIS is an advanced FP7-EU project for the design of a pre-operational advanced downstream service aimed at detecting, mapping, monitoring and forecasting surface deformations, including landslides and ground subsidence, by exploiting multiple Earth Observation (EO) and ground-based (non-EO) data technologies. Ground deformations are the result of a variety of natural and human-induced causes and triggers. These phenomena are frequent and widespread in Europe, causing extensive economic damage to private properties and public assets and their social impact is relevant. In Europe, the large number of areas affected by ground deformations, the frequency and extent of the triggering events, the extent of the impact and the magnitude of the damage, make it mandatory a multiscale, systemic approach. Further, the complexity and extent of the problem is such that it cannot be tackled (and solved) at an individual, site-specific scale, or using a single technique or methodology. The problem can be approached only through the integration of data and information taken at different scales, and with the collaborative efforts of multiple expertise. With this respect, the several satellite sensors now available, including about forty passive – optical – sensors and nine active – synthetic aperture radar (SAR) – sensors, provide valuable technological alternatives to traditional methods and tools to detect, map, monitor and forecast ground deformations over large areas and with the required accuracy. The temporal continuity and the geometric compatibility among time series of ERS-1, ERS-2 and ENVISAT data represents an unprecedented opportunity to generate very long time series of ground deformations. This provides exclusive information for an improved understanding of the long term behavior of slow and very-slow ground deformation phenomena.
In this context, DORIS intends to exploit the extensive catalogues of multiple C-band SAR sensors to provide, via a joint analysis, additional information on ground displacements through the generation of very long deformation time series, spanning an almost 20 year time interval by properly combining ERS-1, ERS-2 and ENVISAT data.
In this work we present the preliminary results relevant to selected European areas (Umbria (Central Italy), Nebrodi (Sicily, Southern Italy), Zermatt (Switzerland), Silesian Coal basin (Poland), Mallorca (Spain) and Budapest basin (Hungary)) affected by ground deformation, highlighting as such EO data and technologies can significantly improve the ability of European Civil Defence authorities to assess and manage the risk induced by natural and man-made hazards.