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## How to manage a monitoring service based on satellite interferometry: a practical approach from the Tuscany region (central Italy)

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Thanks to the launch of the ESA's Sentinel-1 constellation the scientific community re-evaluated the way to use these data, shifting from a static view of the territory to a continuous streaming of ground motion measurements from space. The Tuscany region (central Italy) has been the first worldwide region to adopt a satellite continuous monitoring service for ground deformation. Taking advantage from the wide area coverage, short revisiting time, cost efficiency and non-invasiveness of the satellite interferometric techniques, in addition to the increased processing capabilities, it was possible to set up a 12 days updated system. The processing chain combines the SqueeSAR algorithm and a time-series data mining algorithm aimed to highlight benchmarks, named "anomalous points", with significant trend variations. The anomalous points are radar-interpreted in order to classify all of them according to possible causes (e.g. landslide, subsidence, uplift, mining activity). The results of each update of the service are delivered to the regional authorities in the form of a bulletin. It contains a map of the tuscan municipalities differently coloured according to the number of anomalous points, their persistence and relevance. In case of anomalous points representing a potential threat, a field campaign for field-verifying the situation and the potential active phenomena is conducted.

A sheet survey has been realized for the field campaign in order to collect several useful information with the final aim of qualitatively estimating the risk and suggesting short-term actions to be taken by local entities. It is useful to have a complete vision on several elements following a sort of checklist (i.e. general information for describing the phenomena, intensity of the event noting down the damage, exposure of elements) drastically reducing the subjectivity of the surveyors. The whole procedure, from the download and processing of the satellite raw images to the field surveys, requires less than 10 days. The monitoring service provides extremely useful information for prevention, monitoring and risk management activities related to hydrogeological phenomena. Another important consequence is the raised awareness of local and regional authorities in terms of geohazards affecting their territories.

