
PSInSAR: Using Satellite Radar Data to Measure Surface Deformation Remotely

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Remote sensing techniques utilising satellite radar images from Earth-orbiting spacecraft, have revolutionised the field of crustal deformation research since their first geophysical application, about a decade ago. SAR interferometry (InSAR) has been developed first but severe limitations have prevented routine monitoring.

The solution is given by the Permanent Scatterers technique (PSInSAR), an operational tool for a quantitative, high precision, multi-scale monitoring of land deformation. This approach has been developed by Politecnico di Milano (POLIMI) and TRE (a POLIMI spin-off) and has been patented in Italy, EU and USA. In the PS approach long series of acquisitions gathered repeatedly over the same target area are processed. It is possible to resolve surface motions at a precision of ~0.5 mm/yr and small-scale features, including motions of individual targets (e.g. a bridge or a dam), not previously recognised by traditional InSAR.

There are many potential applications, e.g. monitoring of subsidence due to natural or human activities (oil and water extraction), landslides, seismic faults. The large archive of data, acquired by the ERS1&2 satellites since 1992 allows one to analyse past phenomena – and ENVISAT, RADARSAT and forthcoming radar missions will extend this capability in the future. To date, more than 400,000 Km² has been already processed in Europe, Japan and USA. Examples carried out on different environments will be shown.

The PS technique has been introduced into the market and is now widely adopted by many Public Administrations, Civil Protection Agencies and Institutions, by research institutes and university, and by Italian corporations of the energy and oil-gas sector.
