Pro and Cons of non-linear SqueeSAR Time Series compared with other monitoring systems in landslides study

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The new generations of Persistent Scatterer data (es. SqueeSAR, Ferretti et al., 2011) allow to have a high density of interferometric data in the alpine area, especially in correspondence of slow landslides, due to the widespread debris coverage which help in the geo-hazard assessment. The improvement in the time series quality allows also to understand the behavior of some processes and to have a best comparison with traditional monitoring system and/or rainfall data.

In this work we evaluate the potentiality and the limitation of PS time series in the study of slow landslides.

We have analyzed some case histories in Piemonte and Liguria regions in which a wide dataset of PS were produced with SqueeSAR processing using the data of ERS (1992-2001) Radarsat Sensor (2003- 2009). The case histories analyzed are representative of landslides located in different geological settings (Alps, Apennine, Langhe Hills) with different condition of monitoring systems and PS data.

In this work also some post-processing elaborations to improve the quality and the interpretation of time series was set up. The time series of PS were compared with the time series of other monitoring systems, mainly inclinometers and GPS in order to validate the data. The time series were compared also with rainfall data in order to understand the behavior of landslides.

The main problems of time series were analyzed, in particular the phase unwrapping that can affect landslides moving more than $\lambda/4$ between two satellite acquisitions. This is a problem that may affect also very slow landslides with an under estimation of the rate of movement.

The results suggest that the comparison of different monitoring system is not an east issues, each system measure the displacement in different way, direction, frequency, precision, etc.., that is necessary to know.

It is quite common that the measurements of PS and other monitoring data doesn't match at first look even both data are corrected, we simply measure two different thing. To have different monitoring systems may be also an opportunity: it was possible to make a cross validation and to solve some problems in the measurements. For instance in a case PS data allowed to discover a sliding surface deeper than inclinometers length, in another case inclinometers data allowed to find a phase unwrapping in PS time series.