

Geophysical Research Abstracts
Vol. 16, EGU2014-5326, 2014
EGU General Assembly 2014
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Monitoring and understanding crustal deformation by means of GPS and InSAR data

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Monitoring deformation of the Earth's crust by using data acquired by both the GNSS and SAR techniques allows describing crustal movements with high spatial and temporal resolution. This is a key contribution for achieving a deeper and better insight of geodynamic processes. Combination of the two techniques provides a very powerful means, however, before combining the different data sets it is important to properly understand their respective contribution. For this purpose, strictly simultaneous and long time series would be necessary. This is not, in general, a common case due to the relatively long SAR satellites revisit time. A positive exception is represented by the data set of COSMO SKYMed (CSK) images made available for this study by the Italian Space Agency (ASI). The flyover area encompasses the city of Bologna and the smaller nearby town of Medicina where permanent GPS stations are operational.

At the times of the CSK flyovers, we compared the GPS and SAR Up and East coordinates of a few stations as well as differential tropospheric delays derived by both techniques. The GPS time series were carefully screened and corrected for the presence of discontinuities by adopting a dedicated statistical procedure. The comparisons of both the estimated deformation and the tropospheric delays are encouraging and highlight the need for having available a more evenly sampled SAR data set.