



On the use of optical satellite data in atmospheric corrections for satellite InSAR applications

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SAR interferometric (InSAR) techniques allow us to estimate displacements of the earth's surface with a centimeter to millimetric precision. InSAR techniques date back to 1989 when L-band SEASAT SAR data was first exploited to this aim and in the last few years the capability of different interferometric techniques has been considerably improved. Moreover, the finer spatial resolution and the short revisit time of the most recent satellite SAR, such as TERRA and COSMO-SkyMed constellations appear very promising for further significant improvements. Nevertheless, even if radar are all weather sensors it is also important to improve the estimation and minimization of effects of atmospheric delays..

Atmospheric delay which may affects radar signal is mainly due to the spatial heterogeneity of tropospheric water vapor. Currently there are different methods to estimate and reduce the atmospheric effects in the InSAR applications. These approaches can be divided into four main types methods based on:

- 1 . Stacking SAR interferograms which degrade the temporal resolution of the DInSAR measures and tend to mix useful geophysical signals, in particular transient signals, making them undetectable.
- 2 . Analysis of correlation between interferograms or between the interferometric phases and elevations. These thecniques allow us to only model and reduce lower tropospheric noise which correlates different interferograms or with significant values in elevation.
- 3 . Techniques based on permanent scatterer (PS). PS techniques require a large number of images, and do not provide satisfactory results when atmospheric effects are similar (in the spatial or temporal domain) to geophysical signals.
- 4 . Techniques based on the use of external data, such as (i) meteorological data, (ii) GPS, (iii) high resolution meteorological models and (iv) satellite data, such as MODIS (Moderate Resolution Imaging Spectroradiometer) and/or MERIS (Medium Resolution Imaging Spectrometer).

Among the above quoted approaches, great attention has been devoted to the use of satellite-based Precipitable Water Vapour (PWV) products due to the technical improvements achieved in the last years in terms of resolution and accuracy. Both MODIS and MERIS PWV products have been adopted for atmospheric correction in InSAR techniques.