



## **Comparison of Interferometric SAR and Multispectral time series for determination of Atmospheric Phase Screen**

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Although SAR Differential Interferometry established in the last years as reliable tool for the measurement of very small land displacements, it has also become evident that the phase disturbances resulting from the propagation of the radio signal through a temporally and spatially varying atmosphere cannot be completely. The so-called Atmospheric Phase Screen (APS) can introduce, in severe cases, errors as large as centimetres or even tens of centimetres in the estimated deformations.

The introduction of Interferometric Stacking techniques, like the Small Baseline Subset (SBAS) and Persistent Scatterers (PS) approaches, based on the analysis of Interferometric SAR time series, allowed both to extend the estimation of single displacements to their monitoring over long time periods, and to separate the temporally systematic effects, mainly due to geological phenomena, from temporally incoherent ones, ascribed to the APS. This results in more accurate single deformation measurements and, indirectly, in estimates of the date-by-date contribution of the atmospheric variability.

Recently, independent approaches based on the modelling of the phase effects due to the heterogeneity of the atmospheric water vapour as derived from Multispectral imagery has been successfully applied to the estimation of the APS, improving the possibility of obtaining accurate deformation measurements also for single differential interferograms. These approaches rely on the availability of cloud-free Multispectral acquisitions as temporally close as possible to the SAR ones: for this reason the ESA ENVISAT mission, with both the Advanced SAR (ASAR) and the MEdium Resolution Imaging Spectrometer (MERIS) instrument on-board, capable of simultaneous acquisitions, is a very interesting platform to exploit with such techniques.

This paper compares the two approaches and the results in the estimation of the APS (and of the corresponding land displacement measurements) as obtained from Interferometric Stacking techniques and from water vapour modelling from Multispectral acquisitions, based on a time series of 32 ENVISAT ASAR and MERIS data pairs, acquired between 2002 and 2010 over the Dead Sea area.

This analysis allows to better identify the advantages and disadvantages of the two approaches, to quantify the dependence of the quality of the estimated APS from different parameter settings and assumptions, and to draw better conclusions on the final accuracy that can be expected in the measured deformations.