InSAR tropospheric correction methods: A statistical comparison

D. P. S. Bekaert[a,b,*], R. J. Walters[a], T. J. Wright[a], A. J. Hooper[a], D. J. Parker[b]
[a]COMET, School of Earth and Environment, University of Leeds, United Kingdom
[b]ICAS, School of Earth and Environment, University of Leeds, United Kingdom

Observing small magnitude surface displacements through InSAR is highly challenging, and requires advanced correction techniques to reduce noise. In fact, one of the largest obstacles facing the InSAR community is related to tropospheric noise correction. Spatial and temporal variations in temperature, pressure, and relative humidity result in a spatially-variable InSAR tropospheric signal, which masks smaller surface displacements due to tectonic or volcanic deformation. Correction methods applied today include those relying on weather model data, GNSS and/or spectrometer data. Unfortunately, these methods are often limited by the spatial and temporal resolution of the auxiliary data. Alternatively a correction can be estimated from the high-resolution interferometric phase by assuming a linear or a power-law relationship between the phase and topography. For these methods, the challenge lies in separating deformation from tropospheric signals. We will present results of a statistical comparison of the state-of-the-art tropospheric corrections estimated from spectrometer products (MERIS and MODIS) , a low and high spatial-resolution weather model (ERA-I and WRF), and both the conventional linear and power-law empirical methods. We evaluate the correction capability over Southern Mexico, Italy, and El Hierro, and investigate the impact of increasing cloud cover on the accuracy of the tropospheric delay estimation. We find that each method has its strengths and weaknesses, and suggest that further developments should aim to combine different correction methods.

All the presented methods are included into our new open source software package called TRAIN - Toolbox for Reducing Atmospheric InSAR Noise *(Bekaert et al., in review)*, which is available to the community

Bekaert, D., R. Walters, T. Wright, A. Hooper, and D. Parker (in review), Statistical comparison of InSAR tropospheric correction techniques, *Remote Sensing of Environment*