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New wavelet based InSAR time series (WAB-InSAR) technique eliminating atmospheric and topographic artifact using wavelet transforms and lead to accurate saptio-temporal deformation filed mapping

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Modern geodetic techniques like InSAR and GPS provide valuable and near real time observations of the deformation field. Because of the variety of environmental interferences and incompleteness of the models, those observations are usually tainted with different source of systematic and random errors. Therefore the task of filtering those artifacts to obtain accurate and precise measurements is necessary.
Here we present and implement a new approach for InSAR time series generation. We utilize the full capacity of the wavelet transforms in different steps to eliminate the unwanted effect of the atmosphere and errors in the digital elevation model (DEM).
The advantages of WAB-InSAR are sorted as; 1- being free from any initial model, 2- using Legendre wavelets to eliminate DEM shortcoming, 3- using 3D wavelet transform to spatio-temporal filtering out atmospheric artifacts,4- being pixel wise approach and filtering out the low quality pixels from the data base and 5- being able to retrieve even very low rate of deformation field. At last to show the capacity of the technique we applied it to selected volcanic areas around the world and validate with independent ground-truth geodetic data.