

Internship available – Master 1 or 2 (Lyon & Paris)

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Tracking hydrological deformation using InSAR and data-mining techniques in Albania.

Analyse des mouvements verticaux récents par InSAR et fouille de données en Albanie.

Context :

The large amount of radar images acquired over Albania since the launch of the Sentinel-1A mission in 2014 gives us the opportunity to capture significant (cm/yr) non-tectonic deformation of the Earth surface associated with anthropogenic activities (water pumping, gas and oil extraction, etc see Métois *et al.* 2020) or temporal variations in the hydrological loading (e.g. aquifer filling/discharge cycle, see Silverii *et al.* 2018). These types of deformation have been disregarded for a long time and may alter our estimates of the tectonic associated deformation which may be of lower rates (mm/yr), leading to inaccurately estimated seismic hazard. There is therefore a huge challenge in properly quantifying and locating the surface deformations associated with hydrology and human activities, that are *a-priori* unknown.

We will benefit from long (2014-2021) and temporally highly resolved (one measurement every 6 to 12 days) InSAR time series processed in the area in the frame of the Flatsim CNES/ForM@Ter service over the Balkans area, including Albania.

By disentangling different kinds of deformation from this large amount of data, we want to take advantage from non-supervised data-mining techniques to isolate spatially and temporally consistent signals.

Aims :

During this internship, the intern will apply data-mining techniques developed by INSA-Lyon researchers to detect groups of pixels on the InSAR displacement maps that share a similar temporal behavior. He/She will develop sampling strategies of the original time-series that will be adapted to the duration and spatial extend of the expected or unexpected signals. In a final step, comparison of the observed signals and their temporal signature will be conducted with the seismotectonic and geological contexts of the area.

Tools :

The intern will use python libraries developed by the InSAR community to navigate through the time-series and understand its characteristics. He/She will use the DFTS-P2Miner data-mining software developed at INSA Lyon and Université de Savoie by the team of Catherine Pothier (<https://sites.google.com/view/dfts-miner-tutorial>). Geographic visualization tools such as Google Earth or QGIS will be used to interpret the results.

Scientific team :

The intern will mainly be supervised by Catherine Pothier (INSA Lyon, LIRIS) for data-mining and coding, and with Marianne Métois and Cécile Lasserre (LGLTPE, Lyon) for interpretation of the InSAR time-series. She/He will also benefits from collaborations with Raphaël Grandin (IPGP, Paris) and Christophe Rigotti (INSA Lyon, LIRIS).

Pay: for M2 intern 554€/month (CNES TOSCA funding)