Post-doc offer: 2-year funding in the ANR EDAM (Earth Deformation from Automatic Mapping) project, start date: between March 2025 - Nov 2025, mostly based in Grenoble. It is highly probable that a mobility of 2 to 3 months in New York will be performed, as Sophie Giffard-Roisin will be visitor at Columbia University for 1 year. A second mobility (few weeks) to Peru is also envisioned at the end of the post-doc in order to transfer the knowledge and discuss with the Peruvian Observatories.

Context: Most of geological natural hazards such as earthquakes and landslides remain, still up to now, unpredictable. Nonetheless, the processes governing them are today well apprehended thanks to advances in geophysics and in particular rupture physics. However, sustainable planning of territory development, hazard prevention and management still require precise mappings as inputs to physical and statistical models (mappings of potentially active faults, of the structures, of the existing landslides and thus of the high susceptibility areas). In this way, one of the geohazard challenge, in particular in South America and Peru, consists in documenting these surface information over large territories. We can make profit of the rich and various geoscientific acquisitions, among which remote sensing. Nonetheless, the current mapping is limited by the amount of information that can be extracted, most of the time still manually, at a large scale both in space (hundreds of squared kilometers) and time (from thousands of years to months).

Current self-supervised models are not suited to extract the subtle features related to earth deformation. Constructing such models implies the combination, on top of optical satellite images, of a topographical map (i.e. digital elevation model, DEM) and to SAR phase information (such as in the form of interferograms) for the study of active moving objects. Only one single preliminary short study shows the potential of a self-supervised learning approach using phase SAR information, yet using a single InSAR band, without incorporating other bands such as optical or DEM, and focusing only on a denoising task.

Post-doc subject: The post-doc will focus on detecting current slow deformations (both landslides and earthquakes) by using interferometric SAR (InSAR). He.she will develop a foundation model able to capture active deformation features. In particular, this implies combining both optical-related (RGB, topography) and radar-related (wrapped interferograms and temporal coherence map), consisting of both static (RGB, topography, coherence) and temporal baselines (for example 12, 24 and 72 days wrapped interferograms). We will work in radar geometry in order to minimize the distorsions. This self-supervised model will then be used for two downstream tasks, the identification of faults (earthquake ruptures and creeping faults) and the detection of landslide movements (slow-moving landslides and landslides ruptures). A first landslide database over Peru, as well as a baseline U-net segmentation model, has already been performed in 2024 at ISTerre and will be the starting point. Interferograms are also already computed within ISTerre, thanks to the FlatSIM / ISDeform SNO, and the remote sensing for earth deformation expertise within the team will be a nice environment for this interdisciplinary post-doc.

Profile: Hold a PhD in Remote sensing/deep learning for image-video processing/geoscience, with a curiosity towards both the natural hazards applications and the methods, and good communication skills.

Send an email to sophie.giffard@univ-grenoble-alpes.fr as soon as possible (if possible before 18/12/2024) with your CV.