Postdoctoral Research Position in Remote Sensing:

Remote Sensing Data for Improving Hydrological/Hydraulic Models – Var River Watershed (France)

Institution: UMR 7329 Géoazur / Mediterranean Institute for Risk, Environment, and Sustainable Development (IMREDD)

- **Contract Type**: Fixed-term (24-month contract)
- **Category**: A
- **Workload**: Full-time
- **Location**: UMR 7329 Géoazur, 250 Rue Albert Einstein 06905 Sophia Antipolis / IMREDD, Technopole Nice Meridia 9, Rue Julien Lauprêtre 06200 Nice

Position Overview: Remote sensing, particularly satellite-based, enables access to a wide range of data, tools, and services that can facilitate water resource management. For the Var River watershed (France), operational physically-based numerical models (hydrological, hydraulic, and hydrogeological) are integrated into a decision support tool (AquaVar), managed by the Eau d'Azur Authority (REA). These spatially distributed models require reliable input data/measurements (DEM, vegetation cover, soil moisture, etc.) that ideally reflect the spatial and temporal variability of the measured parameters. Integrating data from satellite remote sensing (especially for monitoring changes in snow cover or river morphology) is a priority to improve the input data for AquaVar models. Although many systems exist for measuring these key modeling variables, few are directly and systematically used by operational services. Due to a technical and transfer gap, such products are rarely available, and few spatially distributed hydrological models operate continuously on an entire watershed for real-time modeling. Access to and inclusion of remote sensing products could significantly enhance the quality of hydrological modeling. New monitoring indicators could complement traditional ones and reinforce predictive work (e.g., implementing scenarios for unconventional water reuse strategies, considering river morphology evolution, vegetation cover, and snowpack changes).

This postdoctoral position is part of the "Act and Innovate for Water" (AIO) France 2030 – ADEME project, conducted in partnership with Xylem, Eau d'Azur Authority, and Université Côte d'Azur. Working within the "Risks on a Changing Planet" research team at the Geoazur laboratory and IMREDD, and in collaboration with another postdoc focused on hydrodynamic flow modeling, you will address these challenges by developing an operational methodology for integrating remote sensing data on the spatio-temporal evolution of hydromorphological features, snow cover, and other hydrological variables into the AquaVar decision-support system.

Missions: You will map the available open-source data suitable for these objectives and critically analyze them for use in operational services. You will develop scripts to process satellite data (non-territorial) to generate dedicated digital indicators and cartographic products (particularly "snow" and "morphology" indicators from satellite images). Key areas of study include:

- **Snow-covered area** in the upper watershed (Var River),
- **Potential sediment transport quantification**, by assessing braided riverbed shifts using multi-year seasonal time series,
- **Seasonal changes** in soil moisture, vegetation cover, and evapotranspiration,
- **Impacts of extreme hydroclimatic events** (e.g., storms Alex, Aline, droughts),
- **Transferability of methods** to similar hydrosystems, tested on other watersheds.

Key Responsibilities : Share results and knowledge internally and externally, and, where necessary, support Ph.D. students and interns in their research projects.

- Publish findings in scientific journals.

Required Qualifications

- Expertise in remote sensing, with demonstrated skills in satellite product and service utilization. A background in climatology or hydrology/hydraulics is desirable. You should be comfortable with:
  - Spatial modeling and geospatial feature extraction,
  - Specialized image processing software (ENVI, ERDAS, QGIS, ArcGIS, SNAP),
  - Data analysis from various sensors: multi- and hyperspectral, radar, lidar, with knowledge of key satellite products (Sentinel, Landsat, MODIS, SPOT),
  - Classification techniques (supervised and unsupervised),
  - Interpreting geospatial indicators (NDVI, NDWI, etc.) for diverse applications,
  - Programming languages for geospatial data processing (Python, R, MATLAB),
  - Image processing and geospatial data libraries (GDAL, rasterio, scikit-learn, PyTorch/TensorFlow, OpenCV),
  - Automation and data flow management (scripting, pipelines, handling large datasets).

Background : Ph.D. in Remote Sensing, following a Master's degree or engineering school background in hydrology/hydraulics. Alternatively, a **Ph.D. in Hydrogeology or Hydrology** with substantial remote sensing experience. Proficiency in spatial tools for image processing and analysis of data from various sensors (multi- and hyperspectral, radar, lidar) with knowledge of main satellite products (Sentinel, Landsat, MODIS, SPOT). Ph.D. defense must be completed before January 2025. Prior postdoctoral or project management experience is a plus.

Research Environment: the Geoazur lab contributes significantly to understanding geophysical and geological phenomena, anticipates natural hazards, and fosters scientific collaboration at national and international levels. Under the supervision of Dr. Morgan Abily (Hydraulic Engineer) and Dr. Benoît Viguier (Hydrogeologist), you will contribute to advancing water resource knowledge in Mediterranean regions, focusing on recharge processes, hydromorphological evolution, and numerical modeling. Your work, in collaboration with the Eau d'Azur Authority, will support efficient water resource management amid increasing anthropogenic and hydroclimatic pressures.

As an innovation and partnership institute, IMREDD fosters collaboration between research, industry, and local governments in four strategic areas: Energy, Mobility, Risk, Environment. You will contribute to projects experimenting with inclusive and innovative solutions for the future of regional development, engaging with "Smart City" challenges and supporting the resilience and quality of life in our communities.

Application
Please apply via email to morgan.abily@univ-cotedazur.fr. The ideal application includes a CV and a motivation/recommendation letter, which we will review carefully. Please mention the reference for this position in the subject line of your email and cover letter.