

## Research engineer at CNRM (Météo-France/CNRS) for the production and the analysis of satellite climate data records

**Application deadline:** *February 20<sup>th</sup>, 2019 (strict deadline)*

**Duration of contract:** *12+12 months (from June 2019 to May 2021)*

**Start:** *June 2019*

### Context:

Surface albedo has been defined as an Essential Climate Variable (ECV) due to its impact on climate and its role as indicator of environmental degradation. For example, changes of land cover may modify the albedo of the surface (aka, the quantity of energy reflected back to space), thus altering the energy balance of our planet. Albedo varies in space and time as a result of natural processes (snowfall, vegetation growth, etc.) and human activities (forest clearing, crop sowing/harvesting, etc.). Remote sensing from space offers the only viable tool of measuring and monitoring the global heterogeneity of the albedo of the Earth's surface.

The LSA-SAF program of EUMETSAT (<http://lsa-saf.eumetsat.int/>) provides reliable and up-to-date information on how our planet and its climate are changing to help decision makers to define environmental policies and decide mitigation actions. The EUMETSAT/LSA-SAF project started in 1999 with research and development activities. The delivered operational products include land surface albedos, temperature, short-wave and long-wave downwelling radiation fluxes, and many others. After twenty years (1999-2019) of research, development, and progressive operational activities, Météo-France built on a strong expertise on satellite retrieval of the surface albedo and down-welling short-wave radiation variables. Based on that experience, we started in 2016 within the framework of the COPERNICUS/C3S\_312 project to develop consistent surface albedo products from the 80's until now using multiple sensors from the past to the current generation of instrument. This will complete the LSA-SAF albedo archive for the past period. This work will lead in 2019 to more than 35 years of products characterizing the albedo properties of the surface and 15 years of long-wave downwelling radiation fluxes from different satellite sensors.

### Objective:

The objective of the open position is to take in charge the evolution of the existing scientific algorithms for the retrieval of surface albedo from different sensors. The candidate will improve them up to state-of-art research. The candidate will take part of the next scientific challenges related to the next generation of European satellites and the emergence of artificial intelligence (value added of using machine learning techniques). The candidate will analyze the long term climate data records in order to detect potential trends and to quantify the impact on climate. Finally, candidate will also participate to the effort in the development of open source scientific code in order to share our expertise in the remote sensing of the Earth.

The successful candidate will join the remote sensing team of the CNRM (<http://www.umr-cnrm.fr/remote-sensing/>), which is the Météo-France research laboratory and contributes to the observation of land surfaces at the continental scale through spaceborne remote sensing techniques. Today the remote sensing team is composed of 6-7 people working on the retrieval of radiative properties of the Earth's surface and the overlying atmospheric aerosols in the visible and near infrared domains.

### Required skills:

The candidate must hold a PhD in optical remote sensing, IT, or mathematics with skills in various domains:

- Experience with processing great volumes of data, such as datasets of hundreds of 10000x10000-pixel images, is required.
- Knowledge on radiative transfer and retrieval of biophysical properties from satellite are needed. Experience in the field of remote sensing in the visible and near infrared domains will be highly appreciated. Theoretical knowledge and practical experience in machine learning techniques, and signal processing will be also highly appreciated. Solid background in physics, mathematics and statistics will also help.
- Preferred programming languages are python and Fortran. Knowledge of appropriate [python packages](#) is required, as well as HDF5 and NetCDF file formats. A good proficiency in linux command shell and software version tracking is required.
- A good level of English is necessary for reading and writing technical and project documentation, as well as to participate to teleconferences.

*According to her/his abilities and interests, the candidate will also have the opportunity to participate in the research activities of the team and publicate his/her findings in scientific articles.*

### Practical aspects:

The candidate will be based at the CNRM laboratory in Toulouse. Toulouse is a vibrant city that is recognized worldwide for its space research institutes and space industry. The net monthly salary will be between 2600 and 3200 euros commensurate with experience. The net salary includes French social security.

### Application procedure:

Interested candidates should send the following documents by e-mail to Drs. D. Carrer and X. Ceamanos ([dominique.carrer@meteo.fr](mailto:dominique.carrer@meteo.fr), [xavier.ceamanos@meteo.fr](mailto:xavier.ceamanos@meteo.fr)):

- Resume detailing experience in research, technical skills, scientific publications and proceedings
- Motivation letter explaining research interests and motivation for the job