Job Title : Research scientist/engineer, Post doctoral fellowship :

Application Deadline : April 15, 2021

Duration : 1 year with possible extension for one year

Location : Centre d'Etudes Spatiales de la BIOsphère, Toulouse, France

Scientific background

The SMOS (Soil Moisture and Ocean Salinity) satellite is a passive microwave interferometer that monitors the Earth surface emission at L-band (1.4 GHz) since Nov 2009. This ESA (European Space Agency) and CNES (Centre Nationales d'Etudes Spatiales) mission allows to retrieve surface soil moisture (SM) and the vegetation optical depth (L-VOD) over land surfaces at global scale. The validation of the retrieved soil moisture is a challenging task due to the coarse spatial resolution of the instrument (40 km for SMOS measurements) compared to the very local measurements of the in-situ information. It is however crucial to evaluate the performances of the mission. Differences coming from geophysical scales, sampling, representativeness between SMOS coarse scale retrieved soil moisture and in-situ soil moisture are included in error metrics. They need to be assessed and quantified to possibly remove them from the error metrics in to access to the true mission and algorithms performances.

Aim of this work

The aim of this project is then to : I) assess the performances of SMOS SM compared to existing database, but most importantly, to specify the areas where SMOS fulfills its requirements (precision < 0.04 m3/m3) ; ii) to study the sub-footprint variability of SMOS measurement (~40km spatial resolution) and better assess the mismatch between low-spatial-resolution satellite data and high-resolution in-situ measurements and ; iii) research developments using Neural Network is foreseen.

The candidate will be working (but not restricted to) with in-situ SM from the International Soil Moisture Network (ISMN, **https://ismn.geo.tuwien.ac.at/en/**), ESA level 2 data, CATDS level 3 data (https://www.catds.fr/).

Expected profile of the applicants:

The candidate should ideally have a PhD in remote sensing or a related field. Knowledge in microwave radiative transfer, statistics and skills in programming with Matlab are required. The applicant should have excellent oral and writing skills in English.

Work Context

The post-doctoral fellow will be based at CESBIO in Toulouse.

https://www.cesbio.cnrs.fr/

The candidate will be part of a group of about 12 persons dedicated to the SMOS mission (calibration/validation, retrieval algorithm, applications in hydrology) and will benefict from their knowledge and experience on the mission.

This project implies interactions with groups from Vienna University (Technische Universität Wien-TU Wien), AWST which is an Austrian company based in Vienna, and with ESA which is supporting the project. Meetings abroad are expected.

Monthly net salary ranges from 2000 € to 2400 € depending on experience and qualifications.

Applications

Inquires and applications (resume and motivation letter) should be sent before Mid April, 2021, by e-mail to Arnaud Mialon (arnaud.mialon@cesbio.cnes.fr), Yann Kerr (yann.kerr@cesbio.cnes.fr) and Philippe Richaume (philippe.richaume@cesbio.cnes.fr)

References:

- Kerr, Y. H., Waldteufel, P., Richaume, P., Wigneron, J. P., Ferrazzoli, P., Mahmoodi, A., ... & Delwart, S. (2012). The SMOS soil moisture retrieval algorithm. *IEEE transactions on geoscience and remote sensing*, *50*(5), 1384-1403.
- Molero, B., Leroux, D. J., Richaume, P., Kerr, Y. H., Merlin, O., Cosh, M. H., & Bindlish, R. (2018). Multi-Timescale Analysis of the Spatial Representativeness of In Situ Soil Moisture Data within Satellite Footprints. *Journal of Geophysical Research: Atmospheres*, *123*(1), 3-21.
- Molero Beatriz (2017) Thèse : Différence d'échelle spatiale entre les mesures satellitaires et in situ d'humidité du sol : analyse par des approches spatio-temporelles. Université Paul Sabatier, Toulouse III (manuscrit)

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