

Job Title:	Post-doctoral scientist / Research engineer : Carbon cycle monitoring using microwave remote sensing data
Application Deadline:	2021/1/31
Duration	One year
Location	Centre d'Etude Spatial de la BIOSphère, Toulouse.

Scientific background

The SMOS (Soil Moisture and Ocean Salinity) satellite is a passive microwave interferometer that is providing, for the first time, L-band (1.4 GHz) observations of the Earth since 2009. The multi-angular capability of SMOS allows retrieving simultaneously soil moisture and the optical depth at L-band, which is mainly related to vegetation water content and is known as L-band Vegetation Optical Depth (L-VOD). L-VOD is highly sensitive to above ground biomass (Rodriguez-Fernandez et al. 2018, Mialon et al. 2020) and can be used to monitor the evolution of large scale carbon stocks (Brandt et al. 2018, Fan et al. 2019) and for data assimilation into carbon cycle models (Scholze et al. 2019).

Aim of this work

The main goal of this position is to contribute to the analysis of SMOS L-VOD data and its applications (biomass monitoring, large scale carbon stocks, vegetation hydric state, ...). In particular, the candidate will work within the consortium of the ESA Land Carbon Constellation project investigating the relationships between SMOS L-VOD and VOD from other sensors as well as optical indices and solar induced fluorescence. Should he/she be interested, there will be ample possibilities, time permitting, to join other existing research projects of the CESBIO SMOS group.

Expected profile of the applicants:

The candidate should ideally have a PhD in remote sensing or a related field. Knowledge in plant physiology is an asset. The applicant should be autonomous and should have strong teamwork skills. The applicant should have excellent oral and writing skills in English and he/she should master array programming in Python or Matlab.

Work Context

The post-doctoral fellow will be based at the CESBIO facilities in Toulouse but he/she will work in collaboration with other international scientists and ESA. Short trips abroad are expected.

The CESBIO (Centre d'Etudes Spatiales de la Biosphère) is a joint research unit of Université Toulouse 3 Paul Sabatier (UT3), the Centre National d'Etudes Spatiales (CNES), the Centre National de la Recherche Scientifique (CNRS), the Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement (INRAE) and the Institut de Recherche pour le Développement (IRD). The laboratory aims at doing research in the domains of observation and modeling of the continental surfaces, addresses the interface between physical and biological sciences and participates in the specification of space missions and analysis of remotely sensed data to improve understanding of continental biosphere dynamics and functioning at various temporal and spatial scales. CESBIO hosts the PIs of two European Space Agency (ESA) satellite missions (SMOS and Biomass missions) and of the French-Israeli Venus satellite. The CESBIO is the lead « Expert Support Laboratory » for land applications with SMOS for ESA and « Expertise Center » for the SMOS French ground segment, the CATDS (Centre Aval de Traitement de Données SMOS).

Monthly gross salary ranges from 2184 to 3500 € depending on experience and qualifications. Social security benefits are provided.

Applications

Inquires and applications (resume and motivation letter) should be sent before January, 31st, 2021, by e-mail to Nemesio Rodriguez-Fernandez (nemesio.rodriguez@cesbio.cnes.fr) and Arnaud Mialon (arnaud.mialon@cesbio.cnes.fr).

References:

- Brandt, M., Wigneron, J. P., Chave, J., Tagesson, T., Penuelas, J., Ciais, P., Rasmussen K, Tian F., Mbow C., Al-Yaari A., Rodriguez-Fernandez, N. et al. (2018). Satellite passive microwaves reveal recent climate-induced carbon losses in African drylands. *Nature ecology and evolution*, 2, 827-835
- Fan, L., Wigneron, J. P., Ciais, P., Chave, J., Brandt, M., Fensholt, Mialon, A., Rodríguez-Fernández, N, Kerr Y, Tian F., Peñuelas, J. (2019). Satellite-observed pantropical carbon dynamics. *Nature plants*, 5(9), 944-951. <https://doi.org/10.1038/s41477-019-0478-9>
- Mialon, A. ; Rodríguez-Fernández, N.J. ; Santoro, M. ; Saatchi, S. ; Mermoz, S. ; Bousquet, E. ; Kerr, Y.H. Evaluation of the Sensitivity of SMOS L-VOD to Forest Above-Ground Biomass at Global Scale. *Remote Sens.* 2020, 12, 1450.
- Rodríguez-Fernández, N. J., Mialon, A., Mermoz, S., Bouvet, A., Richaume, P., Al Bitar, A., Al-Yaari, A., Brandt, M., Kaminski, T., Le Toan, T., Kerr, Y. H., and Wigneron, J.-P. : The high sensitivity of SMOS L-Band vegetation optical depth to biomass, (2018) *Biogeosciences*, 15, 4627-4645, <https://doi.org/10.5194/bg-2018-49>
- Scholze, M., Kaminski, T., Knorr, W., Voßbeck, M., Wu, M., Ferrazzoli, P., Y. Kerr, Mialon, Richaume, Rodríguez-Fernández, Vittucci, Wigneron, Mecklenburg, Drusch (2019). Mean European carbonsink over 2010-2015 estimated by simultaneous assimilation of atmospheric CO₂, soil moisture, and vegetation optical depth. *Geophysical Research Letters*, 46, <https://doi.org/10.1029/2019GL085725>