

<b>Job Title:</b>	<b>Soil moisture neural network retrieval from SMOS brightness temperatures</b>
<b>Application Deadline:</b>	2012/02/01
<b>Duration</b>	One year
<b>Location</b>	Centre d'Etude Spatial de la BIOSphère, Toulouse.

### Job Description

The Centre for the Study of the Biosphere from Space (CESBIO) is a research group (UMR 5126) between Paul Sabatier University – Centre National de la Recherche Scientifique – Centre National d'Etudes Spatiales and the Institut pour la Recherche et le Développement. The laboratory aims at doing research in the domains of observation and modelling of the continental surfaces, addresses the interface between physical and biological sciences and participates in the specification of space missions and the treatment of remotely sensed data to develop the knowledge on continental biosphere dynamics and functioning at various temporal and spatial scales.

See [http://www.cesbio.ups-tlse.fr/index\\_us.htm](http://www.cesbio.ups-tlse.fr/index_us.htm)

This post-doctoral work is a one year contract financed by the European Space Agency (ESA) as an answer to the ESA SMOS+ ITT 6704. It would ideally begin in January/February 2012.

### Scientific background & Aim of this work:

CESBIO, is largely involved in the SMOS mission and this from the onset. The SMOS team consists of roughly 10 persons and has mainly close links and interactions with ESA, CNES as well as many research groups in France and Europe / rest of the world.

The SMOS (Soil Moisture & Ocean Salinity) - satellite carries a very innovative passive microwave 2D radio-interferometer operating at L-band which offers unprecedented measurements over the Earth consisting in fully polarised brightness temperatures measurements at multiple incidences angles for all pixel. The average resolution of 50 km (see <http://www.cesbio.ups-tlse.fr/us/indexsmos.html> and the blog [http://www.cesbio.ups-tlse.fr/SMOS\\_blog](http://www.cesbio.ups-tlse.fr/SMOS_blog)). The CESBIO, in collaboration with expert support laboratories (ESL), the Service of Aéronomie Paris, the INRA Bordeaux and the Tor Vergata University of Rome, designed and breadboarded the Level 2 soil moisture retrieval algorithm (as described in the Algorithm Theoretical Basis Document (ATBD)). The soil moisture retrieval is based on minimizing the distance between observed and modelled brightness temperatures using an iterative Levenberg-Marquart minimizer to find the optimal soil moisture at each grid point. The ATBD has been developed into the Soil Moisture Level 2 Prototype Processor (SML2PP) by the Canadian company Array Computing System; the SML2PP has been in use since SMOS' launch (2009/11/02) and generates soil moisture products.

The main goal of this post-doctoral work is to study and propose an artificial neural network (ANN) approach for direct inverse mapping of brightness temperatures profiles to soil moisture. All the necessary data since SMOS launch, more than two year worth of SMOS observations, associated products and auxiliary data files (vegetation maps, ECMWF weather forecast , ...) are available at CESBIO. SMOS ANN' soil moisture retrieval implies to accommodate with variable length inputs, sparse SM ground truth at a smaller spatial and time resolution, noisy observations, large data sets handling which are some of the most challenging aspects. Other observations system, such as ASCAT backscatter sigma-naughts might also be considered either as a complementary observations or as a cross comparison system.

Results of these analyses are opened for publication.

### Professional profile of the applicants:

The candidate should have a PhD in either applied mathematics or geosciences where he developed strong qualifications in neural networks used for real sized inverse problems. Knowledge in remote sensing (ideally in microwave radiometry) is expected. The applicant should also be rather autonomous, and creative. The ability to read and write technical documentation in English language is required. The post-doctoral fellow will be based in Toulouse but he will work in collaboration with other international scientists and ESA, meaning that the applicant should fully master English as a spoken language.

Applications (resume and motivation letter) should be sent by email to the following contacts list:

<b>Contacts:</b>	Yann Kerr CESBIO 18 avenue. Edouard Belin, bpi 2801, 31401 Toulouse cedex 9 Tel: 05 61 55 85 22 email: <a href="mailto:yann.kerr@cesbio.cnes.fr">yann.kerr@cesbio.cnes.fr</a>	Philippe Richaume CESBIO 18 avenue. Edouard Belin, bpi 2801, 31401 Toulouse cedex 9 Tel: 05 61 55 74 87 email: <a href="mailto:philippe.richaume@cesbio.cnes.fr">philippe.richaume@cesbio.cnes.fr</a>
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