3-YEAR POST-DOC POSITION AT LSCE:

DATA ASSIMILATION IN A REGIONAL ECOSYSTEM-ATMOSPHERE MODELLING FRAMEWORK FOR THE STUDY OF CO_2 NATURAL FLUXES IN EUROPE

Context:

The regional quantification of CO_2 ecosystem to atmosphere fluxes and the understanding of the underlying processes are critical to predict the fate of the European carbon budget and to support greenhouse gas (GHG) emission mitigation in the context of global changes. Recent and promising approaches rely on the use of data assimilation techniques with state of the art ecosystem and transport models. On one hand, the atmospheric inversion method derives the surface fluxes that best fit with atmospheric CO_2 measurements, using an atmospheric transport model. On the other hand, complementary systems are currently developed to assimilate a wide range of carbon related observations to optimize the parameters of process-based terrestrial carbon models (CCDASs). The ICOS infrastructure now provides an unprecedented amount of atmospheric CO_2 measurements, eddy covariance carbon, water and energy flux measurements and biomass data in Europe that can be exploited with these systems to better understand the variations of ecosystem fluxes at high spatial and temporal resolution.

The post doc will be connected to the EUROCOM bilateral project (between LSCE in France and the University of Lund in Sweden) in collaboration with other leading European institute in the field of carbon data assimilation. EUROCOM aims at studying the European ecosystem fluxes and associated uncertainties at high space and time resolution, based on the development of a novel regional modeling framework capable of assimilating various carbon cycle measurements from ICOS and from satellite observation. EUROCOM will also coordinate an inter-comparison of state of the art regional model data fusion approaches (inversions and CCDASs) from the European research community.

LSCE is an internationally renowned institute in the field of biogeochemical cycles and climate research. It has a strong expertise in inverse modeling of GHG fluxes and in the development of carbon cycle data assimilation systems. It has developed a variational meso-scale inversion framework at European scale solving for 6-hourly fluxes on a grid of 50 by 50 km based on the CHIMERE transport model (Broquet et al. 2011, JGR; Broquet et al. 2013, ACP) as well as an advanced data assimilation framework to optimize the parameters of the ORCHIDEE vegetation model (see http://orchidas.lsce.ipsl.fr/).

Position summary:

The successful candidate will run and analyse the results of i) the European variational atmospheric inversion system and ii) the coupling between this system and a regional CCDAS based on a new version of ORCHIDEE (including management effects on forest, grass and crops). He will thus directly participate to the development and application of the first regional model data-fusion approach combining atmospheric inversion and optimization of process-based terrestrial model parameters to assimilate multiple-data streams (atmospheric CO_2, eddy covariance fluxes, satellite vegetation indices and possibly biomass measurements). He will study the recent dynamics of CO2 ecosystem fluxes in Europe (mean fluxes and inter-annual variations) and the underlying processes, using the results of this coupled system and the results from the University of Lund based on a similar approach. He will also help to establish an inter-comparison of regional data assimilation systems in Europe that use ICOS observations.

The successful candidate will work nearly full time at LSCE (LSCE, CEA-Orme des Merisiers, 91191 Gif sur Yvette cedex, France), with the teams dedicated to inverse modeling, ecosystem

modeling and GHG atmospheric measurements. He will also have the opportunity to spend some time at the Lund University for inter-comparison exercises using the framework of the Carbon Portal of ICOS.

APPLICATIONS:

The candidate should have a PhD with experience / knowledge in data assimilation, carbon cycle, atmospheric modeling, ecosystem modeling or more generally in modeling tools and statistics. The candidate should be autonomous and able to work with computing tools such as Fortran and/or python, and with complex model codes in UNIX environment. He should also have good communication skills.

The salary will be commensurate with experience, on the order of 33000 euros net per year, including full health care and retirement pension benefits. Applications should include a CV and a cover letter, and if possible the names of two reference persons. They should be sent to Grégoire Broquet (gregoire.broquet@lsce.ipsl.fr) and Philippe Peylin (philippe.peylin@lsce.ipsl.fr). The applications should be sent, and the position will start in as soon as possible.

SOME RELEVANT PUBLICATIONS:

Broquet, G., F. Chevallier, P. Rayner, C. Aulagnier, I. Pison, M. Ramonet, M. Schmidt, A. T. Vermeulen, and P. Ciais (2011), A European summertime CO2 biogenic flux inversion at mesoscale from continuous in situ mixing ratio measurements, *Journal of Geophysical Research-Atmospheres*, *116*, doi:Artn D23303.

Broquet, G., et al. (2013), Regional inversion of CO2 ecosystem fluxes from atmospheric measurements: reliability of the uncertainty estimates, *Atmospheric Chemistry and Physics*, *13*(17), 9039-9056, doi:Doi 10.5194/Acp-13-9039-2013.

Kuppel, S., Peylin, P., Chevallier, F., Bacour, C., Maignan, F., and A.D. Richardson (2012), Constraining a global ecosystem model with multi-site eddy-covariance data, *Biogeosciences*, 9, 10.

Kuppel, S., Chevallier, F. and P. Peylin, (2013), Quantifying the model structural error in carbon cycle data assimilation systems, *geoscientific model development*, 6, 1, 45-55, DOI:10.5194/gmd-6-45-2013.

Santaren, D., Peylin, P., Viovy, N., and P. Ciais (2007), Optimizing a Process based Ecosystem Model with Eddy-Covariance Flux Measurements: Part 1. A Pine Forest in Southern France, *Global Biogeochemical cycle*, 21 (2).