



Post-Doc opportunities about the GLOBAL METHANE CYCLE at Laboratoire des Sciences du Climat et de l'Environnement (LSCE, France):

A 2-year Post-Doc on Evaluating inverse models and assessing the transport of biomass burning emissions

This position is open in the framework of a US *Gordon and Betty Moore Foundation project*: Tropical FLUXNET-CH₄. The tropics are an important source region for methane emissions (around 65%), yet we lack measurements to constrain land surface models with flux tower data, and atmospheric inverse systems with atmospheric methane concentrations. Atmospheric inverse system, also called top-down approaches, combine information from atmospheric measurements and prior knowledge of methane fluxes at the surface to statistically optimize methane sources (and sinks) while reducing the difference model-observations. Different inverse systems contribute to the Global Methane Budget that is regularly release to the community (Kirschke et al., 2013; Saunois et al., 2016 ; 2020). For the coming budget 2000-2020 simulations have been performed by 7 inverse systems, creating an ensemble of more than 20 simulations. The resulting emissions distributions and trends varies among the simulation ensemble.

This work aims at developing a systematic method to evaluate the different inverse systems against independent observations (surface, satellite - not used in the inversions, Aircraft data, Aircore profiles, TCCON columns), and propose metrics to assess the performance of the individual simulations. Deeper studies will focus on the Tropics and, specifically on the vertical and horizontal transport of biomass burning emissions.

The work will be divided in different tasks:

- Gather the 3D optimized atmospheric field of methane from the inverse modelling groups
- Analyze the individual simulated growth rate, then the vertical profiles in comparison with data from the different observing systems
- Analyze the consistency of the emissions distribution patterns among the simulations, especially in the Tropics
- Analyze the transport of biomass burning plumes in the Tropics
- Develop and test the addition of a pyrogenic injection height module in the LMDz transport model, and perform forward and inverse runs with the CIF-LMDz to test the sensitivity of the model; a special focus will be the impact of the injection heights in the model as seen by satellite platforms.

The successful candidate will be hired for 12 (extensible to 24 months) and work in Saclay (20 km South of Paris), France, under the guidance of the inverse modelling team at LSCE, developing links between the GCP different inverse modelling groups worldwide.

Education and Experience:

A Master Degree or a Ph.D. in Atmospheric Sciences, Applied Mathematics, Scientific Computing, or a related physical or applied science.

Knowledge, Skills And Abilities:

- Familiarity with at least one of: atmospheric modeling, atmospheric physics and chemistry, data assimilation
- Computer skills and interest in programming is requested (Python, Shell, and Fortran to some extent)
- High interest for numerical modelling
- Notions on data assimilation will be appreciated

Applications to be sent asap

Contact:

Please contact Dr. Marielle Saunois (marielle.saunois@lsce.ipsl.fr) and Dr. Antoine Berchet (antoine.berchet@lsce.ipsl.fr)