Title: PhD student position "Assessing the intra-mesh variability of regional atmospheric models from a landscape approach"

Background

Agro-environmental issues may require the integration of processes (transfer of nitrogen pollutants in the case of the PhD position) at large spatial scales (i.e. regional and national scales). Models of air pollution or climate (e.g. CHIMERE, EMEP) operating at regional scales use spatial resolutions ranging from 5x5 km^2 up to 50x50 km^2. Simulations may lead to under- or over-estimates of Nr concentrations and flows since those models do not take into account spatial interactions in Nr flows and their variability within meshes. However, spatial interactions may be significant between Nr sources (animal housing, manure storage, manure spreading) and Nr sinks (e.g. semi-natural agro-ecosystems) at the landscape scale (zone around 5x5 km^2). They depend on the characteristics of the Nr sources, the soil and weather conditions, management of nitrogen fertilizer and manure by farmers, landscape structure (e.g. land use, land use change, protected areas). Evaluating those complex interactions need to take into account all pathways of Nr involved in the Nr cascade. Only few projects have attempted this integration. Amongst them, the NitroScape model couples four pathways of Nr transformation and transfer within landscapes: Nr management within farms, vertical transfer of Nr through agro-ecosystems, lateral transfer of Nr by the atmospheric and hydrological pathways between agro-ecosystems.

Objectives

The applicant will develop and test a methodology to quantify biases and uncertainties of regional atmospheric models dealing with Nr flows and air pollution (CHIMERE, EMEP). The expected results are the assessment of the intra-mesh variability of regional models of atmospheric transfer from results simulated with the NitroScape model which integrates Nr processes at the landscape scale. The applicant will aim at providing tools or recommendations (e.g. simplified landscape model, initialization of regional models, determination of thresholds or formalisms for meshing regional models, quantification of uncertainties...) for the improvement and use of regional atmospheric models. He will also analyze the impact of agricultural activities, land use change within landscapes and climate change on Nr issues (e.g. Nr transfer and deposition, air quality, pollution of sensitive areas).

Requirements

Applicants should have a master level degree in environmental physics, statistics/applied mathematics or environmental science. Skills in modelling, model analysis, numerical analysis and use of programming tools will be beneficial. Good knowledge of spoken and written English as well as good knowledge of spoken and written French will be required, together with a willingness to engage in international collaborative environment.

Conditions

The duration of the position will be three years.
The project will start in November 2012 (negotiable).
The applicant will be located at the INRA/AgroParisTech Joint Research Unit "Environnement et Grandes Cultures" (EGC) at Thiverval-Grignon, near Paris, France (https://www4.versailles-grignon.inra.fr/egc/).
The applicant will also work at the CNRS/UPEC/UPD Joint Research Laboratory "Laboratoire Interuniversitaire des Systèmes Atmosphériques" (LISA) at Créteil, near Paris, France (http://www.lisa.univ-paris12.fr/).
The project will be supervised by Dr. Jean-Louis Drouet and Dr. Pierre Cellier at EGC and Dr. Matthias Beekmann at LISA.
Research will be carried out under Work Package 8 (Assessing local and regional variation of models of air pollution) of the FP7-EU Project ECLAIRE (http://www.eclaire-fp7.eu/) and Challenge 4 (Studying the N-P-C cycles) of the INRA Environment and Agronomy Scientific Department (http://www.inra.fr/environnement_agronomie).
The salary will be according to the guidelines of the French public service.

Application

Please send your applications including a letter of interest, CV and the names and contact information of two referees to Jean-Louis Drouet, drouet@grignon.inra.fr
Deadline for application: 15 September 2012.