# Job Offer post doctoral level at INRA

Simulating $N_2O$ emissions with the CERES-EGC model : calibration, improvement and validation using measurement data representative of typical French agricultural practices.

## 1. General context and job description

Process-based simulation models are a useful tool to evaluate green house gas inventories of agricultural systems and the effects of changing agricultural practices on both yield and the environment. They therefore have a unique potential to predict $N_2O$ emissions from arable soils on both the plot-scale and regional/continental scales.

These mechanistic models have the advantage of accounting for the variability of the physical, chemical and biological properties of soils as well as the interaction with climate. However, their parameterisation is still a challenge. The use and development of these models in the perspective of spatial extrapolation is limited by the availability of spatially explicit measurements of soil properties and $N_2O$ fluxes but also by the knowledge of typical agricultural practices used. The question of the validity of obtained results and their associated uncertainty is often not sufficiently assessed even though it is fundamental in the decision making process.

In this context, the objective of the proposed work is to evaluate how one can use $N_2O$ emission data collected in laboratory conditions as well as in the field to parameterise the $N_2O$ emission module used in the CERES-EGC crop model as a first step. In a second stage, a thorough evaluation of the model will be conducted using data collected in a measurement network on different agricultural systems, in different sites in France and to deduce the uncertainty related to the simulations using a Bayesian approach. Tests on experimental data will also be used to introduce the effects of soil manipulation on $N_2O$ emissions.

The candidate is also expected to valorise his work by publication in peer reviewed journals.

## 2. Means available

The recruited candidate will be based in the Environment and Arable crops unit (EGC) in Grignon and more precisely will be part of the biosphere-atmosphere research team which primarily focuses on the measurement and modelling of fluxes of green house gases and atmospheric pollutants between agro-ecosystems and the atmosphere. The privileged spatial scales run from the agricultural field (few hectares) to the region (several $km^2$) with some measurements done in controlled laboratory conditions. The applicant will benefit from local expertise on crop simulation models more specifically the CERES-EGC model. He/she will also benefit from ongoing projects with the GES-$N_2O$ UMT as well as from collaborations both at the national and European scales with teams that are widely known in their expertise on modelling $N_2O$ emissions namely: Agroimpact in Laon, the Soil Science Unit in Orléans and the Institute of Meteorology and Climate Research-Atmospheric Environmental Research (IMK-IFU) in Germany. He/she will have access to local and European databases (for example the CASDAR NO-GAS measurement network, the Nitroeurope, InGOS and Eclaire integrated projects).

## 3. Desired qualifications

Expertise in Biogeochemical cycles and agriculture, experience in modeling and statistics, taste for data analysis, and scientific rigour. Minimal knowledge of the Fortran programming language is necessary.

## 4. Working conditions

**Degree :** Doctoral degree in agricultural or Environmental sciences or equivalent experience in research

**Duration:** 12 months (possibility of extending to 24 months)

**Start date :** 1 January 2012

**Salary :** 2,220 € /month (before tax) approximately 1,810 € net

**Location :** UMR INRA-AgroParisTech, Environnement et Grandes Cultures, Grignon, France

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