

INRA (National Agricultural Research Institute), Rennes, France

## 3-year PhD position

### Ammonia Emission and Dispersion at the Landscape Scale

We are seeking a highly motivated PhD student with a background and interests in environmental science and physics, fluid dynamics, micrometeorology, air pollution and interactions with terrestrial ecosystems, to contribute to our research program on reactive nitrogen cycling in agricultural systems and rural landscapes.

Ammonia (NH<sub>3</sub>) is a major atmospheric pollutant, emitted mostly by agricultural activities and especially by intensive animal farming systems, that contributes to a range of environmental impacts including ecosystem acidification and eutrophication, atmospheric particulate matter formation, indirect nitrous oxide emissions, and loss of ecosystem biodiversity.

The successful candidate will contribute to the development of a mobile, vehicle-based atmospheric NH<sub>3</sub> measurement platform, using state-of-the-art Cavity Ringdown Spectroscopy – Quantum Cascade Laser (CRDS-QCL) technology to measure high-frequency NH<sub>3</sub> concentrations and emission plumes downwind of agricultural point sources across agricultural landscapes. Inverse and forward atmospheric dispersion modelling techniques (eg Windtrax, FIDES) will be used to infer the source strength of animal housing and manure storage areas, and to model the dispersion and deposition of NH<sub>3</sub> at the scale of the surrounding landscape (a few km<sup>2</sup>).

The candidate must demonstrate the ability to operate, maintain, calibrate fast optical sensors for trace gas measurements in the field; to design real time data acquisition systems; and to develop data analysis routines for the assimilation into emission/dispersion modelling frameworks of the large concentration datasets generated by NH<sub>3</sub> measurement field campaigns.

Programming skills are essential (eg C++, Fortran, Visual Basic) and a basic knowledge of geographic information systems (GIS) would be a bonus. A readiness for extensive fieldwork, and a willingness to undertake measurement campaigns in all seasons and to deal with technical issues related to the optical NH<sub>3</sub> analyser and the whole sampling/analysis/acquisition/processing chain, are necessary. A full valid driving license is required, and the candidate must be proficient in French or English .

The 3-yr PhD stipend includes a net salary of 1433 Euro/month and full contributions to the French public pension scheme. The expected start date is 1<sup>st</sup> September 2014.

Applicants should send a curriculum vitae and a cover letter outlining their research interests to Dr Chris Flechard ([chris.flechard@rennes.inra.fr](mailto:chris.flechard@rennes.inra.fr)), with cc to Dr Benjamin Loubet ([benjamin.loubet@grignon.inra.fr](mailto:benjamin.loubet@grignon.inra.fr)).