



Two Research Scientist positions offer

Oceanic and land N₂O emission modelling within the IPSL Earth System Model

Background

ESM2025 (<https://www.esm2025.eu/>) is an ambitious European project on Earth System Modelling. The project started on June 2021 and is funded by the European Commission's H2020 programme for 4 years. ESM2025 relies on an international team from 19 European institutes composed of Earth system scientists and model developers, experts in model evaluation and feedback analysis, as well as specialists in climate education and science-policy dialogue. The project aims to develop the next generation of Earth System Models (ESMs). It will contribute to the production of an improved set of climate projections that will support European climate services and IPCC assessments, thus helping to better guide public action in the implementation of the Paris Agreement. One of the key objectives of the project is to better account for interactions between the components (land, ocean, atmosphere) of the Earth System Models, regarding the Nitrogen cycle and in particular N₂O emissions. While there are strong interactions between climate and N₂O emissions, current ESM experiments are performed in concentration-driven mode for N₂O (i.e. the prescribed atmospheric N₂O concentrations), which prevents of quantifying and analysing climate feedbacks on N₂O emissions. One expectation of the ESM2025 project is to move to emission-driven mode experiments for N₂O with IPSL-ESM.

Positions description

In the framework of ESM2025, the two positions will aim at improving the modelling of N₂O emissions from ocean and land components of the IPSL ESM.

One position is dedicated to the modelling of N₂O emissions within the ORCHIDEE model, the land component of IPSL-ESM. The proposed work involves two main steps. The first one consists in including past developments on crop modelling (Wu et al., 2016) in the main version of ORCHIDEE (i.e. that is coupled to the IPSL ESM), as modelling crop phenology and growth is key to model the N₂O fluxes. The second step will focus on the nitrogen cycle itself. The current modelling approach already accounts for nitrification/denitrification activities and their environmental controls such as soil water content and temperature, but only considers a single reservoir along the soil column for the different N compounds. One major expected improvement is to develop a multi-layer scheme for the soil N cycle and in particular soil N₂O emissions.

The other position is dedicated to the modelling of N₂O emissions within the PISCES model, the marine biogeochemistry component of IPSL-ESM. Whereas the actual N₂O parameterization employed in PISCES is only tied to oxygen consumption, it is expected to improve this parameterization by linking N₂O production to simulated ocean nitrification/denitrification and to better include potential environmental controls (ocean temperature, acidity, light) on these processes.

Specific tasks for the two positions consist in:

- Implementing a new modelling framework for N₂O emissions in PISCES or ORCHIDEE;
- Evaluating new N₂O modelled emissions against independent estimates for the historical period and in particular present-day conditions;
- Communicating on your activity through presentations to conferences;
- Writing manuscripts reporting on the model development and evaluation.

Home institution

Pierre Simon Laplace Institute (IPSL, <https://www.ipsl.fr/>) is a research cluster of nine institutes involved in climate change research. IPSL employs over 300 permanent researchers, 200 technical and administrative staff, and over 450 PhD students and postdoctoral researchers, spanning 30 nationalities. Their research mission is to contribute toward better understanding of the interactions between human activities in the Earth system, and the environment and climate dynamics at different timescales. The IPSL oversees the development of an Earth system model (IPSL-CM), which is one of the ESMs contributing to the IPCC Assessment Reports.

Qualifications

We are seeking highly motivated individuals with a PhD degree in environmental sciences or applied physics. We are looking for candidates with the ability to develop code and to integrate scientific knowledge into numerical models. Required skills are:

- Knowledge on numerical modelling of biological or physical systems;
- Programming (Fortran) & Unix environment (shell commands / scripts);
- Writing skills (scientific publications) and oral expression, in English;
- Strong teamwork skills (communication & collaborative work) ;

Contract duration: 24 months with possible one-year extension

Starting date: The position is available from April 1st, 2023 and will remain open until filled.

Location: Paris region - France. Gif-sur-Yvette, 25 km southwest of Paris for the position on ORCHIDEE development; Paris and/or Gif-sur-Yvette for the position on PISCES development.

Salary: with full social and health benefits, commensurate with work experience (2900-4450 € gross salary).

More information

Send an email to Nicolas Vuichard (nicolas.vuichard@lsce.ipsl.fr) for the position on land N₂O emissions; to Marion Gehlen (marion.gehlen@lsce.ipsl.fr) and Laurent Bopp (bopp@lmd.ipsl.fr) for the position on oceanic N₂O emissions.

How to apply

For the position on land N₂O emissions: <https://emploi.cnrs.fr/Offres/CDD/FR636-EVEMAG-101/Default.aspx?lang=EN>

For the position on oceanic N₂O emissions: <https://emploi.cnrs.fr/Offres/CDD/FR636-EVEMAG-100/Default.aspx?lang=EN>