Post-doctoral position in
Vegetation and Nutrient Limitations modelling
at the National Centre for Meteorological Research (CNRM)
Météo-France, Toulouse, France

Context

Météo-France is offering a postdoctoral research position in vegetation modelling, specifically the effect of nutrient limitations on land carbon uptake, as part of the EU-funded Horizon 2020 project ESM2025 – Earth System Models (ESM) for the future. This position is available for 18 to 24 months, depending on the candidate's experience. The position will be based in Toulouse at the National Centre for Meteorological Research (CNRM), a joint research unit of Météo-France and CNRS.

About the project

ESM2025 (01/06/2021 – 31/05/2025) is a multidisciplinary project that develops the next generation of European Earth System Models with improved representations of climate response to biophysical processes, anthropogenic emissions and land use.

Work environment

The position will be based at CNRM (42 avenue Gaspard Coriolis, Toulouse, France). The successful candidate will join the climate group of CNRM, focusing on understanding interactions between the various components of the climate system, the response of the climate system to anthropogenic forcing, sources of variability, and long-term predictability.

Salary

Salary will be provided according to Météo-France salary rates. Depending on the experience of the selected candidate, the gross monthly salary shall be from 3280 to 4025€.

Science

Land ecosystems and ocean biogeochemistry play key roles in the global carbon cycle, and affect the concentration of atmospheric CO_2 and subsequent changes in surface air temperature (Canadell et al. 2021). The response of the terrestrial biosphere to the increasing CO2 was identified as a prominent source of uncertainty in future climate projections (Jones and Friedlingstein, 2020).

One of the processes contributing to this uncertainty of the carbon cycle feedback is the nitrogen cycle (Zaehle and Dalmonech, 2011) and to a lesser extent the phosphorus cycle (Reich et al., 2009), which are incorporated in only a small number of ESMs.

Models neglecting these nutrient limitations are likely overestimating the terrestrial C sequestration in the present and future (Goll et al, 2012). Terrestrial Biosphere Models (TBMs) have progressively been incorporating these nutrient limitations (see Davies-Barnard et al, 2020). Arora et al. (2020) noted a reduced uncertainty in the response of the land carbon sink to rising CO2 for TBMs incorporating a representation of the nitrogen cycle.

ISBA, the TBM used at CNRM (Decharme et al, 2019; Delire et al, 2020) doesn't represent nutrient limitations explicitly but uses an empirically based parametrisation reducing specific leaf area with increasing CO2 concentration and an *ad hoc* representation of downregulation similar to Arora et al. (2009). This approach has given reasonable results but is not scientifically satisfying, especially going into the future.

The objective is to improve the response of the carbon cycle simulated by ISBA with the inclusion of a more realistic representation of nutrients limitation prioritizing the N-cycling as the nitrogen cycle is a keystone piece of many cutting-edge scientific questions. The candidate will have the opportunity to explore other linkages or scientific questions related with the agriculture/irrigation or to changes in allocation in response to increasing CO2. The successful candidate will also evaluate the model and perform new post-CMIP6 future scenarios with the model to analyse the evolution of the land carbon sink and its response to rising CO2.

Requirements and qualification

A PhD in sciences is required and an experience in land-surface numerical modelling would be greatly appreciated. A good practise of written and spoken English is required. All the tasks require gook skills in Fortran, Python and Unix, as well as scientific writing.

Application and timeline

For full consideration, an application letter including a detailed statement of research interest, along with a curriculum vitae – Including research experience, publications and conferences and computing skills – and the names, telephones and email addresses of 2 referees should be sent by email before December 1st 2022 to:

christine.delire[at]meteo.fr and bertrand.decharme[at]meteo.fr

After examination of the applications, a shortlist of candidates will be auditioned in December, making it possible to start in February or March 2023.

References

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