

The Laboratoire de Météorologie Dynamique (LMD), seeks a postdoctoral researcher to join a project on the numerical simulation of heated smoke vortices in the stratosphere. This research is part of the ASTuS project, led by LMD with other French and European institutions, funded by Agence Nationale de la Recherche (ANR).

Smoke vortices were first discovered in 2020 after the cataclysmic Australian wildfires, whose stratospheric plume self-organized into a number of mesoscale anticyclonic vortices. The largest one, which survived 3 months, rose from 16 to 35 km and travelled over more than 66,000 km. Similar structures have now been identified in previous occurrences of stratospheric wildfire plumes, such as those of Canada in 2017. The ascent and stability of the vortices appear due to the internal heating provided by sunlight-absorbing aerosols but the associated dynamical processes are still poorly understood. This is a new challenge for geophysical fluid dynamics that this project aims at solving.

The proposed research aims at studying the dynamics of smoke vortices by the mean of numerical simulations with an adapted version of the Weather Research and Forecast model. The postdoc will explore idealized flow configurations but also perform realistic case studies, which will be confronted to observational data from the 2020 and 2017 cases. This work will be carried out in close collaboration with other team members involved in observational and impact studies, theoretical modeling and laboratory experiments.

The LMD is a leading laboratory in atmospheric sciences with activities ranging from satellite and in situ measurements to climate modelling. It is part of the Institut Pierre-Simon Laplace, a consortium of laboratories which a leader in climate change studies. The LMD is also binded to other laboratories on its three sites the Ecole Normale Supérieure, the Ecole Polytechnique and Sorbonne Université.

The successful applicant will work with Dr Aurélien Podglajen and Dr Bernard Legras at LMD and other project participants in the Paris area. The main working location will be Ecole Polytechnique on its Palaiseau campus with frequent visits to the other site of the LMD at Ecole Normale Supérieure (ENS) in the center of Paris. The successful applicant will be employed by ENS with a salary between 2800€ and 3600€ depending on previous experience.

Scientists holding or on the point of completing a PhD with background in geophysical fluid dynamics, modelling of atmospheric processes or numerical fluid mechanics are especially encouraged to apply. Good practice of English and demonstrated numerical skills in programming (in particular python, Fortran) are required. The initial appointment is for two years with a possible extension for another year subject to satisfactory performance. The starting date of the appointment should be in the first quarter of 2023. The application, including a CV, a statement describing research interests and how they would contribute to the project, and contact information, should be submitted by 20 October 2022 to bernard.legras@lmd.ipsl.fr and aurelien.podglajen@lmd.ipsl.fr under the subject "ASTuS Post-Doc Application". For more information on the project, contact the same addresses with subject "ASTuS Post-Doc Information"

References:

Khaykin, S., Legras, B., Bucci, S., Sellitto, P., Isaksen, L., Tencé, F., Bekki, S., Bourassa, A., Rieger, L., Zawada, D., Jumelet, J., and Godin-Beekmann, S.: The 2019/20 Australian wildfires generated a persistent smoke-charged vortex rising up to 35 km altitude, *Commun Earth Environ*, 1, 22, <https://doi.org/10.1038/s43247-020-00022-5>, 2020.

Lestrelin, H., Legras, B., Podglajen, A., and Salihoglu, M.: Smoke-charged vortices in the stratosphere generated by wildfires and their behaviour in both hemispheres: comparing Australia 2020 to Canada 2017, *Atmos. Chem. Phys.*, 21, 7113–7134, <https://doi.org/10.5194/acp-21-7113-2021>, 2021.

