CALL FOR APPLICATIONS

18-MONTH POSTDOCTORAL FELLOWSHIP
AT METEO-FRANCE (TOULOUSE, FRANCE)

Applications are invited for a **18-month** position starting in **April 2021**, to work in the Mesoscale Meteorological group in collaboration with the Experimental and Instrumental group of the CNRM (Centre National de Recherches Météorologiques) on the following topic:
"**Large Eddy simulations of fog during the SOFOG3D campaign and impact of heterogeneities**"

The deadline for applications is **20 January 2021**.

Scope

The post-doctoral fellowship is funded by the Research National Agency (ANR) through the **SOFOG3D** (SOuth west FOGs 3D) project, coordinated by Frédéric Burnet (CNRM).

The primary objective of the SOFOG3D project is to advance our understanding of fog processes at the smallest scale to improve forecasts of fog events by numerical weather prediction (NWP) models. Despite long-standing interest in studying fog processes, there are still many unknowns in the physical mechanisms driving fog variability (turbulence, radiation, microphysics, aerosols, local wind circulations and surface-vegetation fluxes) and how they interact. For this purpose, a field campaign, also called SOFOG3D, specifically designed to explore both horizontal and vertical variability of fog layers, has been conducted during winter 2019-2020 in the South-West of France with innovative sensors including in situ and remote sensing networks and Unmanned Aerial Vehicle (UAV) fleet. During the 6 months campaign, 15 Intensive Observation Periods (IOP) have been performed (20 nights of operations) with the tethered balloon, including 7 with UAV flights with some legs reaching ~5 km long, and 180 radiosoundings were launched (60 on the super-site). The instrumented domain offered a broad range of vegetation types (forest, crops, grass …) over a terrain with smooth hills. The SOFOG3D project aims to conduct process studies on very well documented situations, using synergy between 3D high-resolution Large Eddy Simulation (LES) and unprecedented detailed observations. A specific objective will be to study the impact of surface heterogeneities (types of vegetation, rivers, in addition to orography) on the fog life cycle, as some of the main processes driving the fog formation and evolution are soil-atmosphere interaction and turbulence.

The main goal of the work planned here is to provide validated 3D numerical simulations of the most documented fog cases of the campaign at the metric scale running with the Meso-NH model, and to deliver a comprehensive description of the impact of surface hetereogeneities.

Work description

The successful candidate will run LES of the most documented fog cases of the campaign with the Meso-NH model at metric vertical resolution and approximately ten meters of horizontal resolution, using the operational AROME analyses at the initialization and lateral coupling, and a downscaling approach with the grid-nesting technique. Meso-NH (Lac et al., 2018), coupled with

the SURFEX (Masson et al., 2013) platform, will be used with advanced physical parametrizations (the most recent vegetation, microphysical and radiation schemes) and the finest surface data bases.
As a first step, the Post-Doc researcher will validate the simulations with the measurements from surface stations, flux-mast, in situ aerosol and microphysics probes , lidars, BASTA cloud radars, a network of 16 meteorological stations, microwave radiometers, radiosoundings, tethered balloon, and UAV (these observations would have been validated through two other tasks of the project). She/He will conduct sensitivity tests with the parametrizations involved in LES.
As a second step, she/he will evaluate the impact of surface heterogeneities on the fog life cycle variability between the sites. For this purpose, Meso-NH-SURFEX will be used as a laboratory : some vegetation characteristics of the studied valley will be modified to evaluate their impact at different stages of the fog life cycle. The TKE and surface budgets will make possible to quantify the key contribution of turbulent mixing and near-surface soil interaction during the formation phase of fog as pointed out by Maronga and Bosveld (2017).

Required qualifications

1. A PhD in meteorology or related fields.
2. Demonstrated skill/proficiency in post-processing and visualization software (e.g. Python, NCL, ...).
3. Good English level and demonstrated autonomy, communication and writing skills.

Experience in numerical mesoscale modeling is required. Knowledge of the Meso-NH model will be an advantage, as well as a skill of simulation validation with measurements.

Practical information

The successful applicant will be contracted by CNRS and will work in the Mesoscale Meteorological group of CNRM at the “Météopole” site in Toulouse, France. Brut salary is commensurate to qualifications and experience, and ranges from 2648 to 3678 euros per month.

For full consideration, an application letter including a detailed statement of the candidates’ research interest for the position, alongside a full curriculum vitae (research experience, publications, conferences, programming skills and languages) as well as contact details for two referees (names, e-mail and phone) should be sent by e-mail by 20 th January 2021 to:

Christine Lac (christine.lac@meteo.fr) and Frédéric Burnet (frederic.burnet@meteo.fr)

For more details about this call, feel free to contact:
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References :
Lac, C., J.-P. Chaboureau, V. Masson, J.-P. Pinty, P. Tulet, J. Escobar, M. Leriche, and co-authors (2018): Overview of the Meso-NH model version 5.4 and its applications, *Geosci. Model Dev.*, *11*, 1929-1969.
Maronga, B., & Bosveld, F. C. (2017). Key parameters for the life cycle of nocturnal radiation fog: a comprehensive large-eddy simulation study. *Quarterly Journal of the Royal Meteorological Society*, *143*(707), 2463-2480.
Masson, V., P. Le Moigne, E. Martin, S. Faroux, and co-authors (2013): The SURFEXv7.2 land and ocean surface platform for coupled or offline simulation of earth surface variables and fluxes, Geosci. Model Dev., 6, 929-960.