

CALL FOR APPLICATION
24-MONTH POSTDOCTORAL FELLOWSHIP at IPSL/LMD-PARIS

Applications are invited for a 24-month postdoctoral position starting 1st October 2014 at the latest at LMD in Paris, France (<http://www.lmd.jussieu.fr>) to work on the following subject: "Simulations and analyses of past and future heat-wave events in a hierarchy of models". The project involves two research entities (IPSL-LMD and CNRM-GAME) and will require short to medium stays at CNRM (Toulouse). The deadline for application is June 13th.

Context and objectives:

The work proposed here is part of the French project "Extreme Climate Scenarios and Nuclear Energy" (SEEN in French). It is devoted to the update of the extreme temperature values to be expected in the future, in a context of increased occurrence of heat waves and droughts as projected by the climate models for the 21st century. This update is particularly important for the security of nuclear power plants. Significant spread exists in the projected continental temperatures (mean as well as extreme) but it is generally agreed that the moisture/temperature feedback (Cheruy et al. 2013, Cheruy et al. 2014, Stefanon et al. 2013), together with the interplay between the general circulation and regional characteristics are key point to assess the quality and the realism of the near surface meteorology.

For addressing the uncertainties in the projected extreme temperature over Europe, we plan to use a hierarchy of simulations allowing to diagnose realistic heat waves simulations and to test their sensitivity to synoptic environment, boundary layer structure and soil moisture availability.

In this context, we will collaborate with the other partners of SEEN to extract and analyze heat waves in Regional Climate Model (RCM) simulations available in CMIP5/Euro-Cordex database (e.g. Vautard 2013). We will focus on the source of spread for the near surface temperature for heat-waves situations simulated by state of the art climate models. The results of this study will permit to define "optimal conditions" for the heat wave occurrence and to construct sensitivity study for reinforced heat waves conditions, allowing to investigate the range of variations of near surface temperature (in the present as well as in the future climate). For this purpose we will use most recent versions of the CNRM-GAME ARPEGE and IPSL-CM climate models in order to exploit the improvements of the atmospheric and land-surface physical parameterizations (Hourdin et al. 2013, Cheruy et al. 2013, Campoy et al. 2013). The latter have been demonstrated to improve significantly the near surface climate in summer over the mid-latitudes with respect to the CMIP5 simulations.

Two approaches are proposed. The first one relies on 3D simulations for reinforced optimal conditions (e.g. particular pattern of SST, particular soil moisture conditions, zoomed and nudged version of the IPSL climate model with a refined grid close to the Euro-Cordex ones over Europe, the model trajectory will be forced to follow the real synoptic evolution by relaxing the large scale circulation towards meteorological analyzes outside of the zoomed area. Idealized simulations for the changing climate (Time-slice experiment with forced SST deduced from the Ocean-atmosphere fully coupled CMIP5 runs) will also be exploited.

For the second approach, we propose to investigate the possible range of variation of extreme temperature in the highly manageable Single Column Model (SCM) framework. To start with, we will construct a case study based on the unprecedented 2003 event thanks to detailed high resolutions simulations (De Munck et al., 2012) which will allow investigating the behavior of the sub-grid scale variables, eventually diagnose drawbacks of the physical parameterizations and provide guidelines for their improvement. We will analyze the near

surface temperature sensitivity to pronounced “heat wave” conditions using 3D environment extracted from ARPEGE and LMDZ as well.

The work will be organized according to the following guidelines:

1. Collaborate with the others partners of SEEN project to define “optimal heat waves situations” and identify the major sources of spread in near surface temperature in state of the art of climate simulations.
2. Produce and analyse 3D simulations for intensified heat wave environment with the LMDZOR model in its zoomed and nudged version (Euro-Cordex grid).
3. Contribute to build an idealized 1D framework (Derbyshire et al. 2004, Svensson et al. 2010) to evaluate and improve the atmospheric physics of the ARPEGE and LMDZ models (in particular optimize the extraction of the large scale forcings from the 3D models for the construction of SCM cases).
4. Establish the extent to which the SCM modeling framework is able to replicate an extreme event such as summer 2003 (Black et al. 2004, Fischer et al. 2007, Garcia-Herrera et al. 2010).
5. Improve our understanding of the physical processes involved when heat waves occur and evaluate the physical parameterizations involved. If usefull, high-resolution reference simulations of the 2003 case study will be exploited.
6. Write project reports and scientific articles, and give presentations in SEEN meetings and international conferences.

This position is funded by the French National Agency for Research (ANR) through the SEEN (Extreme Climate Scenarios and Nuclear Energy; Scénarios climatiques Extrêmes et Energie Nucléaire in french) project.

Required qualifications:

The successful applicant will hold a PhD in a relevant field, a research track record in one or more of the following areas: atmospheric modelling, coupled climate modelling, land Surface modelling. Applicants should also be able to demonstrate programming skills in a Unix/Linux environment (e.g. FORTRAN 9X, shell scripts, R) as well as possessing excellent written and oral communication skills. Help in the writing of reports for the SEEN is part of the job.

The successful applicant will be contracted by IPSL/LMD and will be based at IPSL/LMD for 21 to 24 months including short to medium stays at CNRM/GAME in Toulouse. The opened position will start 1st October 2014 at the latest for 24-month duration. The net salary is commensurate with qualifications and experiences, ranging from 1900 to 2400 euro after most of the taxes and health insurance premiums have been deducted. Note there might be an additional income tax on top of that, but depending on nationality.

For full consideration, applicants are asked to submit a curriculum vitae (including research experience, publications and conferences, and computing skills), an application letter including a detailed statement of research interest and the names, telephone and email address of 2 referees. Applications should be sent by email before June 13th to:

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For more details about LMD activities, please visit : <http://www.lmd.jussieu.fr>

For more details about CNRM-GAME climate research activities, please visit:
<http://www.cnrm.meteo.fr/gmgec/>

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