

Postdoctoral position available at Université Paris-Saclay  
**Climatology in shallow caves: coupled heat and mass transfer**

*Project description*

The prediction of the climate in prehistoric caves like that of Lascaux is an issue for the conservation of cave paintings. The small temperature differences in these wet caves can cause evaporation and condensation at the walls that may, in some cases, deteriorate the paintings. This project aims at understanding coupled heat and mass transfer in shallow caves from direct numerical simulations in order to better predict intense condensation events likely to alter the walls. The novelty of the project is to consider radiative transfer in the cave, taking into account significant H<sub>2</sub>O and CO<sub>2</sub> content. First numerical simulations will be performed using available tools coupling natural convection flows and radiative transfer in structured geometries. The model will be gradually refined to include the coupling with the conduction in the rock, and evaporation/condensation phenomena at the walls. A final objective is the development of reduced order models of coupled heat and mass transfer in the cave for a few representative seasonal conditions.

*Working offer*

The grant is for a one-year duration and the salary will be about 2300 €/month (net of taxes). The research will be conducted at EM2C ([http://em2c.centralesupelec.fr/en/le\\_laboratoire](http://em2c.centralesupelec.fr/en/le_laboratoire)) and FAST (<http://www.fast.u-psud.fr/>) laboratories of the CNRS and of the Université Paris-Saclay. The labs are situated in Gif-sur-Yvette and Orsay, France, about 40 minutes by train (RER B) from central Paris.

*Starting date*

Spring or summer 2020, depending on applicants' availabilities. A two months delay is to be expected for non-EU applicants to obtain security clearance from the CNRS.

*Applications*

Candidates having a PhD with a background in one or more of the following areas are invited to apply: heat transfer, radiative transfer, fluid mechanics. Expertise in numerical simulation and modelling is sought. Candidates must provide:

- a brief letter indicating research background and research interests
- a résumé (curriculum vitae) with a list of publications
- names of one or more referees willing to provide letters of recommendation

*Contact*

Please send applications by e-mail to:

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