

3-yr PhD position (alternatively: 2-yr postdoc) on modelling of polythermal glacier evolution (+fieldwork) at Universidad Politécnica de Madrid

The project

The PhD project focuses on the thermomechanical modelling of the evolution of polythermal glaciers under a warming climate, considering various GHG emission scenarios, paying special attention to Svalbard glaciers. It is to be developed under the frames of the Horizon Europe Research and Innovation Action LIQUIDICE (<https://eu-liquidice.eu/>), running from 1 Feb 2025 to 31 Jan 2029, which involves 15 partners and 3 associated partners.

The PhD project has a focus on numerical modelling of glacier thermomechanics, but it also has a component of regional climate modelling and/or downscaling (which can be given more or less emphasis depending on the qualifications and interests of the candidate). It also has a component of fieldwork, mostly to collect further ground-penetrating radar (GPR) data on Svalbard to be used for calibration/validation of the models (we note that most - nearly all - of the necessary data - DEMs, GPR, meteo/climate - is either already available to the team or freely available; further data collection is mostly aimed at providing to the PhD candidate fieldwork skills and a better insight into the data constraints and limitations). Additionally, the team has been running a surface mass balance monitoring programme for more than 22 years at two glaciers in Livingston Island (South Shetland Islands, Antarctica), with the logistic support of Juan Carlos I Station. The PhD candidate is expected to occasionally collaborate in this fieldwork, but this would require a limited dedication (1 or 2 one-month fieldwork campaigns along her/his PhD period).

The modelling of the evolution of polythermal glaciers would be carried out using the software IGM (<https://github.com/jouvetg/igm>). Although it already incorporates an enthalpy module, critical for modelling polythermal glacier evolution, it has not been tested in detail so far (just for some very simple synthetic models), so further improvements are expected, and this is why numerical modelling and programming skills are required. We have available (and will collect some more) data on the cold-to-temperate transition surface (CTS) of Svalbard polythermal glaciers (for the 1990s onwards) and these data will be key to the calibration and validation of the models. The use of HCLIM (HARMONIE-Climate) climate model is initially planned, and for this we will count of the expert guidance by Dr. Ruth Mottram (Danish Meteorological Institute), who will co-supervise the thesis together with Prof. Francisco Navarro (Universidad Politécnica de Madrid). Moreover, LIQUIDICE consortium includes a great deal of climate modellers and experts in regional climate data downscaling. A main objective of the project would be comparing the differences (for long-term glacier evolution, to 2100 and beyond) between considering an isothermal model a thermomechanical model.

The working environment

Universidad Politécnica de Madrid (UPM) is the largest Spanish technological university in Spain, with 36.000 students and over 2.900 faculty and researchers. Within UPM, the work will be carried out in a section of the Department of Applied Mathematics located at the School of Telecommunication Engineering, within a research group focused on numerical methods in science and engineering (led by Prof. Francisco Navarro) <https://www.gsnci.upm.es/en/home/>,

which has a subgroup fully focused on glaciology. The core of the latter is currently formed by three faculty members, a Marie Curie postdoc fellow and two PhD students (the one being hired would become the third one).

In addition to her/his research work, the PhD student is expected to collaborate as lab assistant to courses on numerical methods/models in Environmental or Biomedical Engineering. This work typically involves 30-60 hours per year, and the lab assistant always does her/his duties supervised in person by a faculty member, i.e. she/he does not teach alone but helps the faculty member in solving lab questions/doubts by the students. This teaching duty, rather than being an obligation, is a way provided to the PhD students to gain some teaching experience.

The contract

The PhD contract is planned for 3 years, ideally starting in September or October 2025, with possible extension for another year or half a year. It is a full-time position (37.5h/week). The annual gross salary will be 20,000 € for the first year, 21,000 for the second and 22,000 for the third. **IMPORTANT:** Although there is a preference for PhD students, postdoc candidates could also be considered, but in this case the contract would be some shorter (2-2.5 years) and with a higher salary (25-30%), so if you really like the project and feel qualified, do not hesitate to apply.

Required qualifications and skills

- MSc in Engineering, Physics, Mathematics or Computer Science (Environmental Sciences or Physical Geography, only if accompanied by a solid background in maths and programming).
- Numerical methods and data analysis skills.
- Programming experience (Python, Matlab...).
- Motivation for teamwork and motivation and availability for fieldwork (no more than a month/year).
- Good command of English language.

Application and deadline

For application, send a CV, transcripts for BSc and MSc, and a brief cover letter describing your motivation for the position, together with the names of two references. All of it should be sent by e-mail to francisco.navarro@upm.es, **no later than 24 August 2025** (though the earlier the better).

NOTE: A pdf version of this advertisement can be downloaded from

<https://drive.upm.es/s/amKYY5cz9T7WrCs>