Project Title: A unified approach to climate, sea-level, and coastal change projections in the UK

Lead Institution/Department: University of Bristol, School of Geographical Sciences
Primary Supervisor: Prof. Dan Lunt
Co-Supervisors: Prof. Jeff Neal, School of Geographical Sciences; Dr Stephen Cornford, School of Geographical Sciences; Laura Limer, Quintessa Limited; Dr Matt Palmer, Met Office.

Project Summary

In this project, you will develop exciting new techniques to make predicitons of UK flood innundation, accounting for future changes in sea level, rainfall and runoff. One focus will be on making predicitions beyond the usual timescale of the year 2100 - with potential applications to nuclear waste and energy safety.

Project Details

This PhD project will provide a framework for projecting local sea level and coastal flooding risk, unified across multiple timescales.

You will gain skills in flood modelling, and predicting future climate and sea level change, underpinned by robust statistical methods, inlcuding machine learning.

A framework for assessing impacts of future environmental change on geological disposal facilities (GDFs) for nuclear waste has been set out through an International Atomic Energy Agency (IAEA) coordinated project (Lindborg et al, 2018). This is based on modelled estimates of climate variables such as sea level, temperature, and rainfall, which are produced by global-scale models and then downscaled to specific regions. For short-term (~100 year) projections, a standard approach is to use climate model outputs associated with the IPCC. On longer timescales (>~10,000 years), for which standard climate models are too computationally expensive to be applied, the utility of a statistical approach based on multiple “snapshot” climate model simulations has been demonstrated (Lord et al, 2019). However, there are several issues associated with this approach in the context of potential GDF sites in the UK, which will be addressed here. Firstly, short-term and long-term climate projections would be inconsistent, as they are produced by different modelling frameworks. Secondly, the framework does not extend to evaluating how the climate projections can be translated into coastal risk. This project will address these issues.

References

- Lindborg, T., Thorne, M., Andersson, E., Becker, J., Brandefelt, J., Cabianca, T., Gunia, M., Ikonen, A.T.K., Johansson, E., Kangasniemi, V., Kautsky, U., Kirchner, G., Klos, R., Kowe, R., Kontula, A., Kupiainen, P., Lahdenperä, A.M., Lord, N.S., Lunt, D.J., Näslund, J.O., Nordén, M., Norris, S., Pérez-Sánchez, D., Proverbio, A.,

Riekki, K., Rübel, A., Sweeck, L., Walke, R., Xu, S., Smith, G. & Pröhl, G. : Climate change and landscape development in post-closure safety assessment of solid radioactive waste disposal: Results of an initiative of the IAEA, Journal of Environmental Radioactivity. 183, 41-53, 2018.

- Shaw, J., Kesserwani, G., Neal, J., Bates, P., and Sharifian, M. K.: LISFLOOD-FP 8.0: the new discontinuous Galerkin shallow-water solver for multi-core CPUs and GPUs, Geosci. Model Dev., 14, 3577–3602, https://doi.org/10.5194/gmd-14-3577-2021, 2021.
- Lord, N., Lunt, D., Thorne, M.: Modelling changes in climate over the next 1 million years, SKB Technical Report TR-19-09, 2019.

Essential/Desirable Skills

Some familiarity with computer programming (e.. python, R, Fortran, or other languages) would be a major benefit to this project.

Entry requirements

You must have a UK 2:1 honours degree or higher in a relevant subject. You can also have its international equivalent.

If English is not your first language, you will need an International English Language Testing System (IELTS) overall score of 6.5, with a minimum of 6.0 in all components. Visit our English language proficiency pages to find out about other qualifications we accept.

Useful Links

- https://www.bristol.ac.uk/geography/courses/postgraduate/
- https://www.bristol.ac.uk/study/postgraduate/research/geographical-sciencesphysicalgeography/
- Flood-CDT Projects | National Oceanography Centre

How To Apply

The deadline for application is **8 January 2026**. Please apply to the 'Geography (PhD)' here: https://www.bristol.ac.uk/study/postgraduate/apply/.