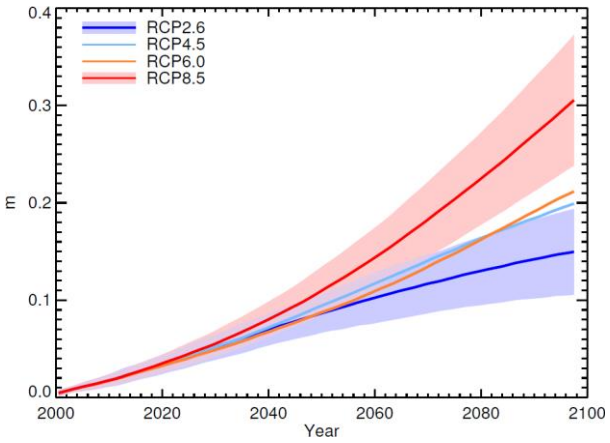
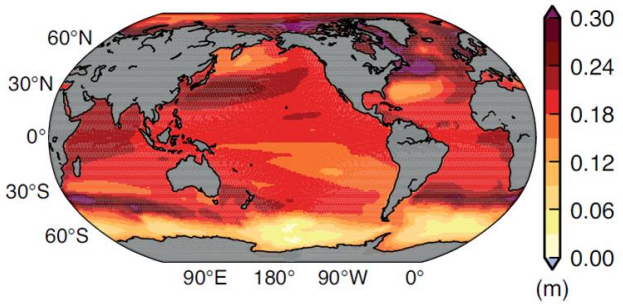
Further particulars: Postdoctoral research associates in ocean heat uptake and sea level change

These two posts are for fixed terms because they are funded by grants for particular projects from the UK Natural Environment Research Council (NERC).

The two projects were devised separately, but they are related in content. Both of them are motivated by the societal need for reliable projections of future regional sea level change, which has an adverse impact on the populations and ecosystems of coastal and low-lying areas, and is expected to increase for many centuries due to greenhouse-gas-forced climate change. Sea-level rise during the 21st century could threaten the livelihoods of 90-350 million people and cost 3-11% of world GDP. Efforts to adapt to or mitigate the problems that it will cause are compromised by uncertainties in projections, arising from the large spread of results exhibited by atmosphere–ocean general circulation models (AOGCMs), in both the global mean and the regional patterns. Consequently the World Climate Research Programme (WCRP) has identified regional sea level change as one of its "Grand Challenges", calling for high-priority internationally collaborative and innovative research on the subject.



Global mean sea level rise due to thermal expansion projected for various emissions scenarios. The coloured bands show the likely range for the scenarios of greatest and least greenhouse gas emissions.



Model-mean projection of local sea level change due to ocean density and circulation change at the end of the century under scenario RCP4.5.

Both projects refer to the flux-anomaly-forced model intercomparison project (FAFMIP), which is a global model intercomparison project, involving ten climate centres worldwide. Prof Gregory chairs its steering group. FAFMIP was designed to support the WCRP Grand Challenge, and is a component of the Coupled Model Intercomparison Project Phase 6 (CMIP6), which will be the main source of climate projections for the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, to be published in 2021. In FAFMIP, the ocean in each AOGCM is subjected to a common set of perturbative surface fluxes of momentum (windstress), heat and water, having the magnitude and pattern typically expected in response to CO_2-forced climate change. This design is intended to reveal the model spread in the ocean responses to flux perturbations, by removing the spread in the flux perturbations themselves.

Post JTR00138 is funded by a NERC standard grant to Prof Gregory and his co-investigator Prof Laure Zanna of the University of Oxford, who will also supervise a PDRA funded by the grant; the project will be a collaboration between our two groups and involve the FAFMIP

participants. This project aims to identify, quantify and constrain the causes of the ocean model spread in sea level projections. The project will entail detailed analysis aimed at new physical understanding of key aspects of ocean climate change and their representation in models, especially interior heat transport and circulation change, offering the potential to refine projections. It will employ novel diagnostic methods for separated interior transport processes in a water-mass-following framework, and the new experimental designs and results of FAFMIP. We will test our hypotheses with further AOGCM experiments.

Post JTR00138 is funded by a NERC large grant as part of a collaborative project (TICTOC) of six UK institutions, led by Dr Elaine McDonagh of the National Oceanography Centre at Southampton, and with an international programme advisory board chaired by Dr John Church of the University of New South Wales. TICTOC involves both observational oceanography and ocean modelling, with our involvement being in the latter, in which we expect to work closely with Profs Laure Zanna and Samar Khatiwala at the University of Oxford, who will also supervise a PDRA in this project. TICTOC aims to characterise and understand regional ocean heat content change and the consequent sea level rise, with the aim of devising methods to reduce the uncertainty in projections of regional sea level change. To do this, it will combine AOGCM results with estimates of the propagation of heat added at the surface into the ocean interior based on observational data for the uptake of passive tracers (such as CFCs, SF_6 and ^{14}C) within the ocean. These methods will be evaluated using FAFMIP experiments.

Both posts are based at the Department of Meteorology at the University of Reading, within the climate programme (NCAS-Climate) of the National Centre for Atmospheric Science (NCAS), which is a distributed institute of NERC comprising groups at several universities. Prof Gregory is a senior scientist in NCAS-Climate. NCAS-Climate includes more than 50 scientists at Reading, and provides a core-strategic programme and national capability in modelling and understanding the climate system. The Department of Meteorology is a thriving centre for atmospheric and ocean science with more than 200 research and academic staff and 40 research students. In the most recent UK Research Assessment Exercises 86% of its research was graded as world-class or internationally excellent.