PROJECT TITLE: The Visible Ocean: Colour-Driven Feedbacks in a Coupled Regional Earth-System Model and the impact of heatwaves and storms

Project Science Theme: Climate Change and Risk
Project keywords: Antarctica, rainfall, ice-shelves, observations, modelling

Lead Institution: Plymouth Marine Laboratory
Lead Supervisor: Dale Partridge
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Co-supervisor: Susan Kay, PML

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Project description:

Accurate forecasting of marine and atmospheric extremes is critical for protecting coastal ecosystems, supporting communities and enhancing climate resilience. Yet current forecasting neglect key feedbacks between ocean biology and the atmosphere, particularly those driven by phytoplankton-induced changes in ocean colour. Phytoplankton alter the ocean colour, influencing how solar radiation is taken up by the upper ocean. Recent research showed that these changes can contribute to surface warming. Such feedbacks become especially important during marine heatwaves and severe storms, when interactions between the ocean, atmosphere and ecosystem intensify.

This PhD will investigate: To what extent do ocean-colour feedbacks alter ocean-atmosphere interactions during extreme events and how can these processes be integrated into next-generation forecasting systems?

The student will extend the cutting-edge kilometre-scale Regional Environmental Prediction (REP) modelling system to represent phytoplankton ocean-colour feedbacks across the UK and Northwest European Shelf. By coupling marine ecosystem processes with high-resolution ocean and atmospheric modelling, the student will investigate how biological changes in the ocean influence forecasting of extreme events.

The student will shape the research according to their interests, with potential directions including model development, ocean biogeochemistry, marine ecosystem dynamics, weather forecasting and societal applications.

Training will cover high-performance computing, Earth-System modelling, marine biology and forecasting. The collaboration between Bristol, PML and the Met Office provides an exceptional interdisciplinary environment combining world-leading expertise in marine ecosystems, high-resolution modelling and forecasting, ensuring high scientific and societal impact.

The project aims to advance understanding of ocean-atmosphere interactions while assessing whether ocean-colour feedbacks can improve next-generation prediction of extreme events and their impacts on coastal ecosystems and society.

CASE Partner

The Met Office will provide access to the model code, high-performance computing resources, and JASMIN storage; contribute expertise in high-resolution, coupled regional Earth-system modelling; and host the PhD student for a minimum of six months during the project, providing hands-on training, collaboration, and research support.

Useful recruitment links:

For information relating to the research project please contact the lead Supervisor via: dapa@pml.ac.uk

Add Bristol application details.

The application deadline is Thursday 7 January 2027 at 2359 GMT