

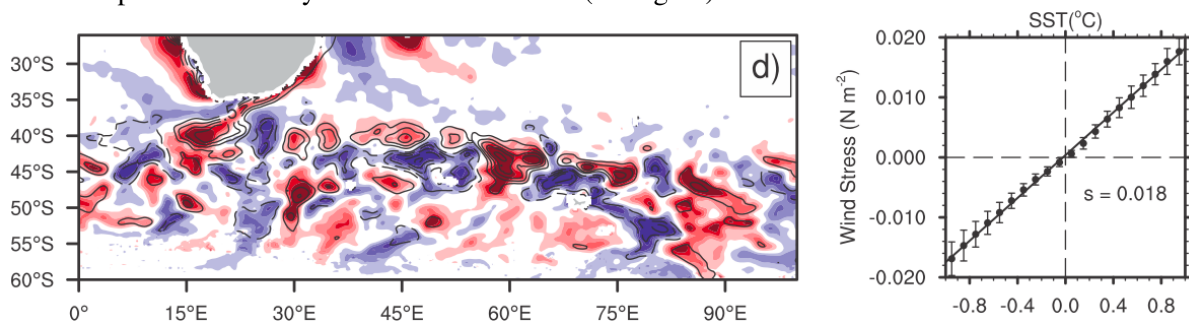
Air-sea exchanges at the ocean mesoscale: a driver of the ocean circulation?

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With the increasing quality of satellite measurements of winds and Sea Surface Temperature (SST), it has become apparent that vigorous air-sea interactions occur on the scale of ocean mesoscale eddies (50-100 km). Ocean eddies populate the global ocean, with thousands of them found at anytime. Observations show that the Atmospheric Boundary Layer (ABL) adjusts to the large SST anomalies associated with ocean eddies. Through this mechanism, the ocean imprints its turbulent structure onto the global marine ABL and drives a rich atmospheric variability on scales of 100's km (see figure)



Example of the influence of small-scale oceanic temperature anomalies (black) on the surface wind stress (color), here near the tip of Africa (from Bryan et al. 2010). Warm ocean eddies drive a more intense turbulent mixing in the ABL and stronger surface wind stresses (and vice-versa).

Air-sea interactions at the ocean mesoscale are a new frontier in our understanding of the coupled system. Most studies of the Eddy-ABL interaction have focused on its impacts on the atmospheric circulation. Effects on oceans have received much less attention. The goal of the thesis is to understand and to quantify the impact of the Eddy-ABL interaction on the ocean circulation.

The new high-resolution coupled simulation (ORCA012/N512) developed at the Met Office offers a fantastic opportunity to investigate this topic. Preliminary analysis showed that the model captures the SST-wind relationship with the observed intensity, providing a solid basis to explore new ground.

This thesis will seek to clarify the mechanisms by which the Eddy-ABL interaction influence the large-scale ocean circulation. To this end, the student will start by analyzing outputs of the Met Office high-resolution coupled simulation and then design dedicated numerical experiments (with simple configurations first) to get to the dynamics. Further directions could include exploring observations, or deriving a parameterization of the Eddy-ABL interaction for climate models.

Training opportunities:

This project offers opportunities to attend courses on a variety of ocean and atmosphere related topics, including physical oceanography and numerical modelling. The student will acquire skills in computational technics, and will have the opportunity for placements at Hadley Center at the Met Office.

Student profile:

This project would be suitable for students with a degree in physics, mathematics or a closely related environmental or physical science. The student should have a particular interest for geophysical fluid dynamics, ocean modelling and physical oceanography.

Funding particulars:

NERC CASE sponsorship pending. <http://www.reading.ac.uk/nercdtp>