Mapping ocean mixing using autonomous gliders: Indian Ocean and Antarctic shelf seas (HALL_UENV17NEX)

University of East Anglia - School of Environmental Sciences
Qualification type: PhD
Location: Norwich
Funding for: UK Students, EU Students
Funding amount: £14,296
Hours: Full Time, Part Time

Placed on: 8th November 2016
Closes: 16th January 2017
Reference: HALL_UENV17NEX
Supervisor: Dr Robert Hall
No. of positions available: 1
Start Date: October 2017
Project description:
How much turbulent mixing occurs in the ocean and where this mixing takes place is one of the unanswered questions in physical oceanography. Direct measurements of turbulence at a limited number of locations appear to underestimate the background level of mixing relative to indirect estimates based on an advective-diffusive balance between global mean stratification and global upwelling. It is clear that mixing does not occur uniformly throughout the ocean interior, but as a community we are far from identifying all the global "hotspots" of mixing. The spatial distribution is of particular importance because mixing and associated sub-gridscale processes have to be parameterised in large-scale ocean circulation and climate models, typically as a spatially uniform diffusivity. However, predictions from such models can be sensitive to where mixing is enhanced. A better understanding of the spatial distribution (and temporal variability) of turbulent mixing in the ocean is therefore essential for development of realistic mixing parameterisations. This project will use new and existing measurements of turbulence collected using autonomous ocean gliders, along with recently developed and established analysis methods, to investigate the spatial distribution and temporal variability of turbulent mixing in multiple areas of the global ocean.

Methodology
The student will use high-resolution temperature data from microstructure gliders, along with standard temperature/salinity measurements collected by these and other gliders, to make estimates of turbulent mixing rate. Within the wider project, independent estimates of mixing rate will be made using microstructure shear data following the methods of Fer et al. (2014) and Palmer et al. (2015). These will be used for cross-validation.

Training
This project has been shortlisted for funding by the NexUSS NERC-EPSRC CDT (http://www.southampton.ac.uk/nexuss), which provides state-of-the-art, highly experiential training in the application and development of cutting-edge Smart and Autonomous Observing Systems for the environmental sciences, alongside comprehensive personal and professional

development. There will be extensive opportunities for students to expand their multi-disciplinary outlook through interactions with a wide network of academic, research and industrial / government / policy partners.
The student will be registered at University of East Anglia (UEA), and hosted at UEA School of Environmental Sciences. The student will join both the UEA Glider Science Group (www.ueaglider.uea.ac.uk) and the BAS Glider Group. Specific training will include:

- Autonomous ocean glider data processing, quality control, and analysis techniques
- Microstructure data processing and analysis techniques
- Ocean glider operations, including preparation, deployment, and piloting
- Participation in oceanographic research cruises
- Numerical modelling of dynamic ocean processes
- Presentation of research at international conferences and workshops

Person specification: Minimum entry 2:1 in Engineering, Geophysics, Mathematics, Environmental Science, Oceanography, Marine Science, Physics, or other numerate subject.