

BIANNUAL ACHIEVEMENTS REPORT

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Reporting period: October 2017 to March 2018

Dear Colleague

Please find attached template to report on the outcomes and impacts of NERC programme for which you are science co-ordinator for the period from October 2017 to March 2018. Please email your completed report to reporting@nerc.ac.uk by 14 May 2018.

Please provide narrative under the following headings:

- *Key achievements (please try to keep within 200 words each)*
- *Overall progress with the programme (100-200 words as a guide)*
- *Any notable issues encountered (if any and remedial actions undertaken, if needed)*
- *Any newsworthy activity planned or known about in the next 6-9 months*

This reporting process is intended to be high-level, light touch and flexible. In a programme consisting of multiple projects, please try to do more than list achievements from individual projects. Consider how achievements integrate together and report on activity at the programme level. Please try to be concise. Ideally, the whole report should not exceed one side.

Between reports, if there are any significant good news stories, delays or issues affecting the programme, please let us know as soon as possible.

Please note, if there are any significant delays or issues affecting delivery of the programme please contact the programme manager immediately and do not wait until the biannual achievement report to notify us.

If you require further help in completing the report, please do not hesitate to contact us reporting@nerc.ac.uk.

Programme/investment	The UK Overturning in the Subpolar North Atlantic Program (UK-OSNAP)		
Completed by	Penny Holliday	Date	04 May 2018

Key achievements

- 3 glider sections on OSNAP Mission #10 were achieved across the Rockall-Hatton Basin.
- Major progress in adjoint modelling component: computed the lagged sensitivity of transport across OSNAP to surface fields (wind stress, heat fluxes, freshwater fluxes), and ocean temperature and salinity to determine the dynamical mechanisms affecting transport.
- Major progress analysing array data to characterise circulation in boundary currents (moorings, gliders)
- Finalising the OSNAP method with the international community, including work at a PI meeting in Feb
- New papers Gary et al, 2018, Journal of Geophysical Research - Oceans, 10.1002/2017JC013350 and Mackay et al, 2018, Journal of Ocean and Atmosphere Technology, DOI: 10.1175/JTECH-D-17-0198.1
- High profile editorial articles in Science and Nature in Feb 2018
- Hosted a joint workshop with The US Ocean Observatories Initiative in Nov 2017 (Southampton)
- A 2-year costed extension to the Large Grant was approved by NERC

Overall progress

- Overall progress is **very good** as several manuscripts are now submitted and in advanced stages of preparation, including a high profile, high impact paper presenting the primary project goal: the time series of subpolar North Atlantic overturning circulation and property transport (Lozier et al)
- Two manuscripts from the Eastern Boundary array: one quantifying the transport of the North Atlantic Current from the glider sections (under revision), second is on the circulation in Rockall Trough (in prep).
- Preparing two manuscripts from the adjoint modelling analysis: one on the sensitivity of the 26N AMOC to surface heat and freshwater fluxes over the Subpolar Gyre, second is a sensitivity analysis
- A manuscript on the deep western boundary current in the Irminger Sea is in preparation
- A manuscript on the MOC and gyrescale circulation in summers of 2014 and 2016 is in revision

Notable issues (if any)

- Because of the failure to recover RTADCP1 in 2017, this instrument was not deployed and so there is a gap in the measurement programme for the Shelf Edge Current. We have undertaken work to: 1. Model deployment methodologies (free-fall & parachute deployments) and; 2. Extensive tank testing of the assembly and functioning of the lander release mechanism. These have shown that: 1. free-fall deployments are risky because the lander is unstable in free-fall and could land upside down and; 2. The lander release mechanisms appear to be robust. Planning for a new deployment in 2018 are underway.
- Our adjoint calculations have demonstrated that surface heat fluxes over the Subpolar Gyre strongly impact surface freshwater fluxes. Therefore, these two types of buoyancy input into the ocean cannot be used as independent sources of forcing in historical reconstructions of OSNAP transport. We resolved these problems by calculating the sensitivity of overturning to fully prescribed total surface heat and freshwater fluxes that are provided as purely external input into the model.

Upcoming newsworthy activities

- Publication of the OSNAP array results expected around July-August 2018. We should aim for this to be accompanied by a major NERC press release.

Upcoming cruises are good activities for news and outreach:

- Turnover of the Ellett mooring array during the OSNAP cruise in July 2018 on the RV Armstrong
- OSNAP Glider Mission #11 deployment (final mission)
- Recovery of the Irminger Sea Deep Western Boundary Array in June 2018 from RV Maria S Merian