

## EnvEast NERC DTP call for studentship proposals 2014



### Shining new light: Using chemiluminescence to measure and understand diel variability in seawater DMS

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**Background:** Dimethylsulfide (DMS) is a gas produced by algae in the oceans. Once in the atmosphere it influences atmospheric chemistry and is thought to affect Earth's radiative balance (albedo) through the formation of particles and clouds. Current techniques for measuring seawater DMS levels are limited either by the requirement for manual involvement or by power and cost limitations. This has limited our understanding of the spatial and temporal variability in DMS, an uncertainty in current climate models that needs to be reduced (Carslaw et al., 2013). There is some evidence that seawater DMS concentration may follow a diel cycle (Gali et al., 2013). Autonomous measurement capability would greatly facilitate an assessment of variability (e.g. diel cycles) in seawater DMS.

**Approach:** You will work with top researchers at Plymouth Marine Laboratory (PML), the University of East Anglia (UEA) and Plymouth University to develop a chemiluminescent approach to measuring DMS in seawater. You will field test the equipment during deployments on the PML research vessel, *Plymouth Quest*, which undertakes weekly trips into the English Channel to sample at the Western Channel Observatory<sup>§</sup>. You will spend time at UEA to apply the new technique to measure DMS production in a range of marine phytoplankton cultures over diel cycles. If trials are successful, there may also be the opportunity for you to participate in a research cruise on the RRS James Clark Ross across the Atlantic: UK to the Falkland Islands.



**Requirements and Training:** We seek an enthusiastic, numerate student to establish a system to develop an automated method to measure DMS using a technique that quantifies the light emitted when ozone reacts with DMS. Emphasis will be placed upon reducing the size of instrumentation and cost of analysis. At PML you will learn to use existing techniques for DMS analysis (gas chromatography, mass spectrometry) and will compare results from these with the approach you have developed. To automate the approach, you will also receive training from Dr Simon Ussher in flow injection techniques.

Candidates must be prepared to go to sea for periods of up to 8 weeks on a research voyage spanning sub-tropical to polar climates. He/she must have achieved at least a 2:1 BSc Honours in a physical science (chemistry, environmental science, physics) and be capable of independent and team work. Candidates are encouraged to contact the lead supervisor (Tom Bell, [tbe@pml.ac.uk](mailto:tbe@pml.ac.uk)) with any scientific enquiries and for further details.

#### References:

- Carslaw, K. S., et al. (2013) Large contribution of natural aerosols to uncertainty in indirect forcing, *Nature*, 503, 67-71.
- Gali, M., et al. (2013) Diel patterns of oceanic dimethylsulfide (DMS) cycling: Microbial and physical drivers, *Global Biogeochemical Cycles*, 27, 620-636, Doi 10.1002/Gbc.20047.
- Green, B. C., et al. (2012) Optimisation of a fast DMS sensor (FDS) for real time quantification of dimethyl sulfide production by algae, *Biogeochemistry*, 110, 163-172, Doi 10.1007/s10533-011-9678-8.
- Nagahata, T., et al. (2013) Simple field device for measurement of dimethyl sulfide and dimethylsulfoniopropionate in natural waters, based on vapor generation and chemiluminescence detection, *Analytical Chemistry*, 85, 4461-4467, Doi 10.1021/Ac303803w.

<sup>§</sup> [www.westernchannelobservatory.org.uk/](http://www.westernchannelobservatory.org.uk/)