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Beaufort Gyre Exploration Project: Dispatch 35: The Bens from Bangor

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We are the only UK representatives on the cruise and are here to measure turbulence in the upper ocean. We have shipped our turbulence profiler over the Atlantic to St Johns to work on the Louis for our first experience of the Canadian Arctic.

Bangor University is located in the north of Wales about 2 hours from the cities of Liverpool and Manchester and just across the Irish Sea from Dublin. The ocean science department is located in the small seaside village of Menai Bridge which is named after the 250 year old suspension bridge built by Thomas Telford. Located on the fast flowing Menai Strait and surrounded by the shallow waters of the Irish Sea we are experienced in measuring strong turbulence in seasonally stratified waters from our research vessel the RV prince Madog. However, in recent years we have been expanding our expertise into the polar oceans where the turbulent mixing of heat and freshwater play a crucial role in the earth's climate.

Our collaboration with the JOIS project is part of a larger UK consortium called TEA-COSI (The Environment of the Arctic – Climate Ocean and Sea Ice). Principle investigator Dr. Sheldon Bacon has brought together collaborators from around the UK for this project which aims to try and understand how the reduction in the sea ice is likely to affect the thermohaline circulation and the warming effect it has on the UK climate. Bangor University's role in the project is run by Dr Tom Rippeth and looks at mixing processes in the Arctic and in particular how the reduction in sea ice will expose the ocean surface to the wind for longer period. This will increase the potential for turbulent mixing, possibly changing the rate of dense water formation.

The instrument we are using to measure turbulence is a Rockland VMP 500 (Vertical Microstructure Profiler). This records the small sideways forces on piezoelectric sensors to measure the velocity shear from small eddies as it free-falls through the water up to a depth of 500m. We recover the VMP using a hydraulic winch and in order to allow the VMP to free-fall we use a hydraulic line puller to feed out excessive cable. We flew over from the UK to St Johns to mobilise our equipment so that when we flew out to meet the ship everything would be in place for us to start measurements. Our winch was welded down to the deck and a 3m boom was constructed for lifting the VMP over the gunwale. However like all well laid plans things changed. When we arrived on the ship the crew wanted to move one of the large foredeck winches to make way for the mooring deployments. This meant that our winch had to move to make way for it. This lead to the worrying situation of starting the cruise in heavy seas with our winch yet to be welded onto its new pad, and no sign of being ready for our first station. However someone upstairs felt sorry for us and the weather calmed and our winch was welded down with almost an hour before our first measurement. We have now been working out of the A-frame doors, which has been a great improvement since we don't need to clear the gunwale when deploying the instrument. It does however mean I have to put on a harness every time we do a station which can be a real pain with cold fingers at 4am!

We have completed almost 40 stations now with only a few days of the cruise remaining. Since there has been so little ice in the Canadian Basin in this record low year for sea ice the wind has had a real chance to play a role. We have seen some interesting features in the data, with some strong turbulence at the base of the surface layer transferring heat from the Pacific water into the surface layer. While deeper down we have seen mixing at the base of the Pacific water where it meets the Atlantic water mass. We also took an opportunity to get off the ship and onto the sea ice where we deployed a 1200kHz ADCP through the ice to try and measure the turbulence generated by the drift from the ice. ADCPs use the acoustic echo from particles in the water and with water this clear the signals are very low.

So with one week to go we are getting ready to pack our equipment back into our little container for shipping to the UK and preparing for the series of flights which will eventually deliver us back home to Wales after 6 weeks away.

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