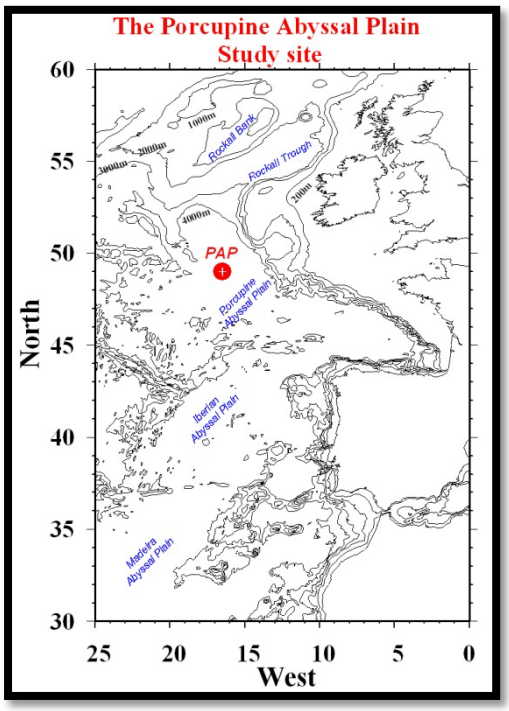
Meteor Cruise 108

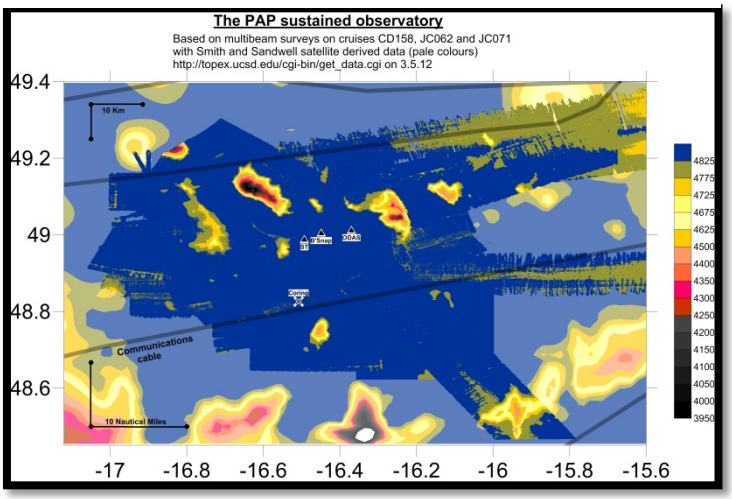
To the Porcupine Abyssal Plain (PAP) sustained observatory



The Porcupine Abyssal Plain Observatory is a sustained, multidisciplinary observatory in the North Atlantic coordinated by the National Oceanography Centre, Southampton. For over 20 years the observatory has provided key time-series datasets for analysing the effect of climate change on the open ocean and deep-sea ecosystems.

More information on PAP can be found in NOC's website at: http://noc.ac.uk/pap where the most current data can be found:http://noc.ac.uk/pap/data PAP is one of the 23 fixed-point open ocean observatories included in the Europe-funded project FixO3, coordinated by Professor Richard Lampitt at NOC: http://www.fixo3.eu/

The 4-year project started in September 2013 with the aim to integrate the open ocean observatories operated by European organizations and is a collaboration of 29 partners from 10 different countries.



The PAP sustained observatory is about 300m southwest of Ireland. Since 1989, this environmental study site in the Northeast Atlantic has become a major focus for international and interdisciplinary scientific research and monitoring including water column biogeochemistry, physics and seafloor biology. The first autonomous equipment included the sub-surface sediment trap mooring and the Bathysnap seafloor time-lapse camera system

(both since 1989). Since 2002, a full depth multidisciplinary mooring has been in place with sensors taking a diverse set of biogeochemical and physical measurements of the upper 1000m of the water column. In 2010, collaboration between the Natural Environment Research Council (NERC) and the UK Met Office led to the first atmospheric measurements at the site and this has continued since then to great effect.

The main mooring of the observatory broke last December during the horrendous winter storms which destroyed a number of Met Office moorings around the UK. However we were fortunate that the break occurred just below the main sensor frame and as a result we were able to recover it along with the massive Ocean Data Acquisition System (ODAS) buoy after it had drifted towards Ireland. We were therefore able to recover all of the sensors and, most importantly, the data stored in them. Prior to Meteor cruise 108 they were all refurbished and ready for deployment at PAP along with a few additional sensors. It is, in fact, one of our most sophisticated deployments to date with additional sensors and samplers and new ways of managing and transmitting data to the surface and from there by satellite to NOC. In addition we plan to recover a set of sediment traps which have been collecting sinking material in the lower part of the water column for the past 12 months and we will then deploy a new set. The Bathysnap time-lapse camera system which has been taking photos of the seabed at 4800m will be recovered as well to give an assessment of the behaviour of the benthic animals and how the seabed appearance changes in response to deposition of material. A new one will then be deployed ready for recovery next year.

These are the autonomous systems we will work on, but as is usually the case with our trips to PAP, we will also make observations on the temporal variability of the water column and seabed fauna - a task which is difficult or impossible to do autonomously. Furthermore we will on this occasion carry out some entirely novel research into the distribution and characteristics of marine snow particles in the top few hundred meters of the water column. These are inanimate particles which are the principle vehicles by which material sinks out of the upper sunlit zone and to the abyss, taking carbon down with them and out of contact with the atmosphere for centuries. Not only will we characterise the particles in situ using three different optical systems but we will collect them using the Marine Snow catcher and will then carry out a variety of experiments on them with colleagues from Bremen.

6-13th July 2014

On Sunday 6th July we set off from Las Palmas towards PAP. It was a slow start with a slight delay leaving Las Palmas and a stiff head wind on the way north. We did a CTD and acoustic release test on passage which was successful and on 11th July just before midnight we started in earnest with a couple of megacorer deployments. On 11th July we also carried out a very successful CTD deployment attached to which was the Underwater Vision Profiler (UVP5) kindly loaned to us by Rainer Kiko at IFM-GEOMAR, Kiel followed by a Snow camera system deployment (with PELAGRA-Cam and Holocam) before deployment of the Marine Snow Catcher or "Snatcher" and drifting sediment traps. This was to provide a diverse and intensive look at those snowy particles. Morten Iversen from the University of Bremen is on board with a team working on various studies on aggregates in the laboratory as well as material collected by drifting sediment traps. All the optics seem to be working on deck and will all give a different perspective, which will be extremely useful to get fresh insights.

Jon Campbell and others preparing the ODAS buoy (PAP 1) for deployment.

The team on board is far too small in number, which is a challenge but everyone, from the ship side and the scientific complement is working in a highly integrated manner which is a delight.

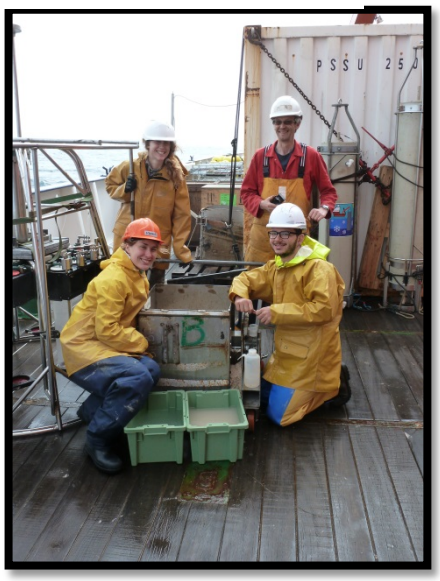
The Parflux sediment traps which are a pivotal element of the PAP observatory were prepared on passage and the sensors for the ODAS mooring (PAP 1) all seem to be working fine on deck (see photo above). The next level of proof will be deck tests of all the sensors together and assembled in the frame.

13- 20th July 2014

Deployment of the ODAS buoy and PAP 1 mooring was delayed till Tuesday 15th so that some fine tuning of the software could be carried out and at the end of this the entire complex system seemed to be working very well on deck. The main observatory PAP1 was deployed also to a great team work by NOC sensors and moorings group lead by Paul Provost and the excellent ship side led by Boatswain Peter Hadamek. Fresh data immediately started to be transmitted to the PAP website thanks to the intensive efforts of Jon Campbell on board Meteor and Maureen Pagnani on land at the British Oceanographic Data Centre (BODC).

The snow camera system.

The long term moored sediment trap mooring was recovered with perfect samples for promising analysis. The Bathysnap time lapse camera was also successfully recovered with some stunning images of the seabed every 8 hours over the past year and this was re-deployed for another year. Additionally, drifting sediment traps from the University of Bremen were deployed and recovered twice. The snow camera system has been successfully deployed many times, while the UVP has been deployed several times to great effect but with some occasional technical glitches. A Snatcher was deployed twice returning a large number of aggregates which Morten Iversen and his team from Bremen has worked on well. All conductivity, temperature and depth (CTD) profiles went well and we deployed a megacorer and box core on several occasions with some of the highest success rate to date at PAP.



Brian Bett and the benthic team, happy to have a perfect sample of sediment in the box corer.

This was partly due to the very calm weather which makes such deployments more reliable. Later in the week we deployed the deep sediment traps for another year and recover the old observatory mooring, which broke last December.

The weather has been perfect but rather cloudy therefore no satellite data is available at this time.

Richard Lampitt

Chief scientist M 108