National Oceanography Centre

FROM COAST TO DEEP OCEAN – MAKING SENSE OF CHANGING SEAS

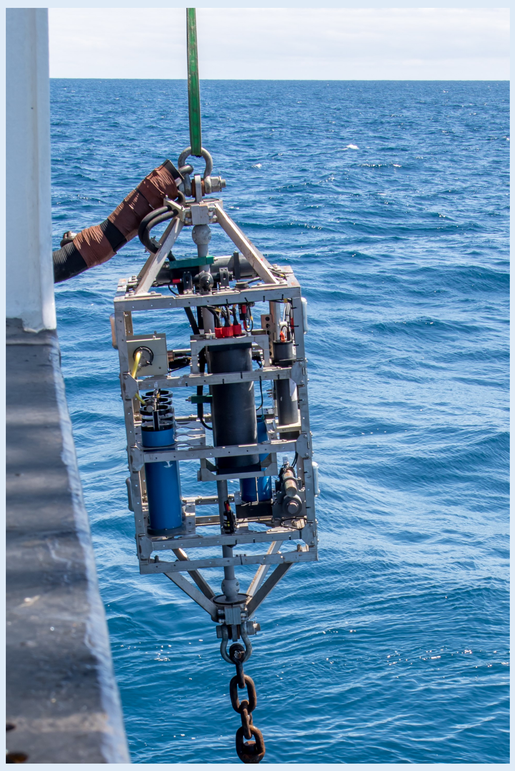
Porcupine Abyssal Plain Autonomous Telemetered Fixed Point Observatory

Introduction

For over 30 years the observatory has provided key time series datasets for analysing the effect of climate change on the open ocean and deep-sea ecosystems.

Observations are made at Pelagic and Benthic regions, currently the PAP1 Mooring contains sensors at 1m (buoy) and 30m (bespoke frame) depth as well as sea surface MET data. Work is ongoing to enable near Real Time communications with the sea floor (4850m).

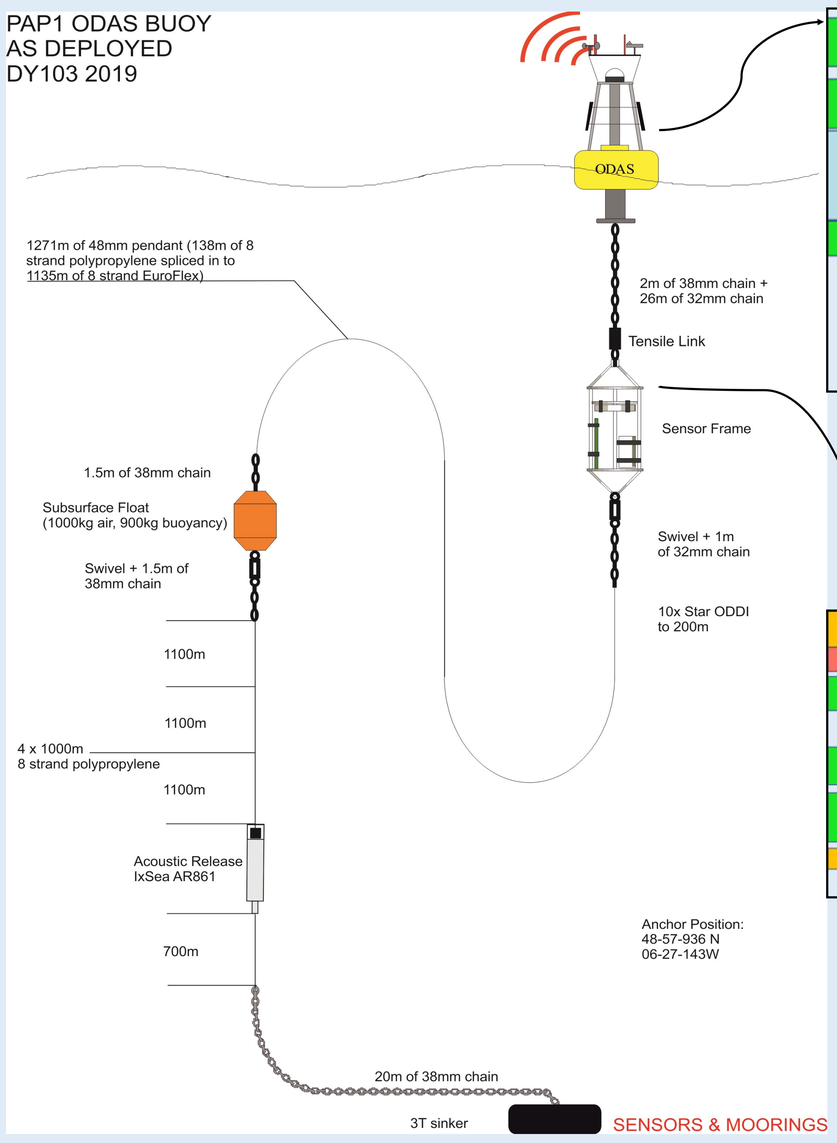
Variable (*r-t)	Depths measured (m)	Sensor(s) used
Atmosphere/Sea surface (from 2010)		
Wind speed and direction	atmosphere	Gill acoustic sensor and revolution magnetic compass
Relative humidity	atmosphere	Rotronic Hygroclip R/S sensor
Air and sea surface temperature	atmosphere and surface (approx. 1.5m depth)	Electrical Resistance Thermometer (ERT)
Atmospheric pressure	atmosphere	Druck RPT350 pressure sensor
Wave height/period	surface	Datawell heave sensor (17.5 min average)
Water column (autonomous since 2002)		
Temperature(*)	30 (2002–2008 additional microcats from 40–1000m) 40, 60, 75, 90, 110, 130, 150, 200, 250, 300, 1000	Microcat (Seabird SBE-37 IMPs)
Salinity(*)	30 (2002–2008 additional microcats from 40–1000m) 40, 60, 75, 90, 110, 130, 150, 200, 250, 300, 1000	Microcat (Seabird SBE-37 IMPs)
Chl-A*	30	Fluorometer (WETLabs FLNTUSB; Turner Cyclops)
Nitrate*	30	SATLANTIC SUNA
PAR* (Irradiance)	surface* and 30	Satlantic OCR-507 ICSW and OCR-507 R10W + Bioshutter2
Dissolved CO_2*	30	ProOceanus CO_2-Pro
Dissolved O_2	30 (new in 2010)	Aanderaa optode
Current	30 (new in 2010)	Aanderaa RCM (30m) ADCP (4800m)
Turbidity*	30	WETLabs FLNTUSB
Pressure*	30	Microcat + fluorometer
POC (sub-surface mooring)	3000, 3050, 4700	McLane Sediment Trap
Total dissolved gas pressure	30	ProOceanus GTD-Pro
	Seafloor (4800m depth) since 1989	
Images	seafloor	digital camera (time-lapse)
Marine fauna	seafloor	e.g., trawls, corers, camera, hydrophone
Sediment (geochemistry)	seafloor	trawls, corers, camera

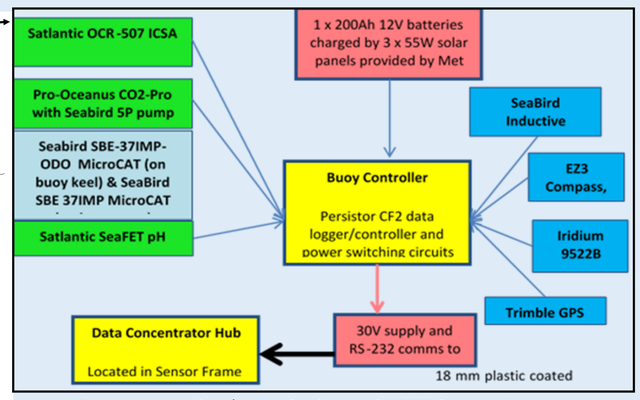


Technical Challenges and Solutions

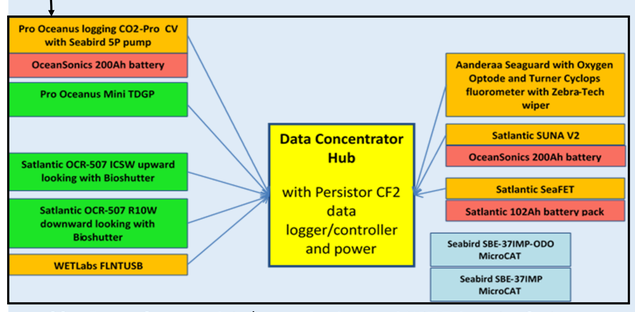
- Unsheltered strong sea conditions—Electrical harnesses and sensors vulnerable.
- Two near identical buoy and frame combinations to allow build and test before sailing.
- Data is our most valuable asset. Redundant data storage, power supply and satellite modems fitted.
- Onboard engineering sensors (inertial, main mooring load cell, power monitoring, communication data monitoring) to provide feedback on engineering decisions.

Mooring and Telemetry Schematic Overview





Buoy Sensors, data/power backup and NRT Telemetry Systems



30m Frame Sensors, data/power backup and NRT Telemetry Systems

- Mooring replaced every 4 years.
- Buoy, Frame and Sensors serviced every 12 months.
- Redundancy for both power supply and data storage.
- NRT Data telemetered multiple times per day, with two way communications—example from 5 sensors during 2019 below:

Contact

Chris Cardwell

chris.cardwell@noc.ac.uk

Project Lead:

Sue Hartman—suh@noc.ac.uk

PAP Website including Near Real Time Data

www.noc.ac.uk/PAP