



**PML**

Plymouth Marine  
Laboratory

Pioneering knowledge and understanding  
of the marine environment for society's  
health, wealth and future

## Science meeting national and global challenges

### Co-ordinated and multidisciplinary

The world's largest ecosystem, the global ocean, is fundamental to sustaining life on Earth. It regulates our climate and provides half the oxygen we breathe, it supplies us with food, energy and essential minerals. It carries international trade and provides millions of jobs in associated industries. As demand for these goods and services increases the ocean faces unprecedented challenges and threats. Plymouth Marine Laboratory (PML) delivers high quality, solution-driven science to understand and manage the pressures placed on the marine environment and hence improve future wellbeing. A co-ordinated, multidisciplinary approach to tackling these complex societal challenges lies at the heart of PML's strategy.

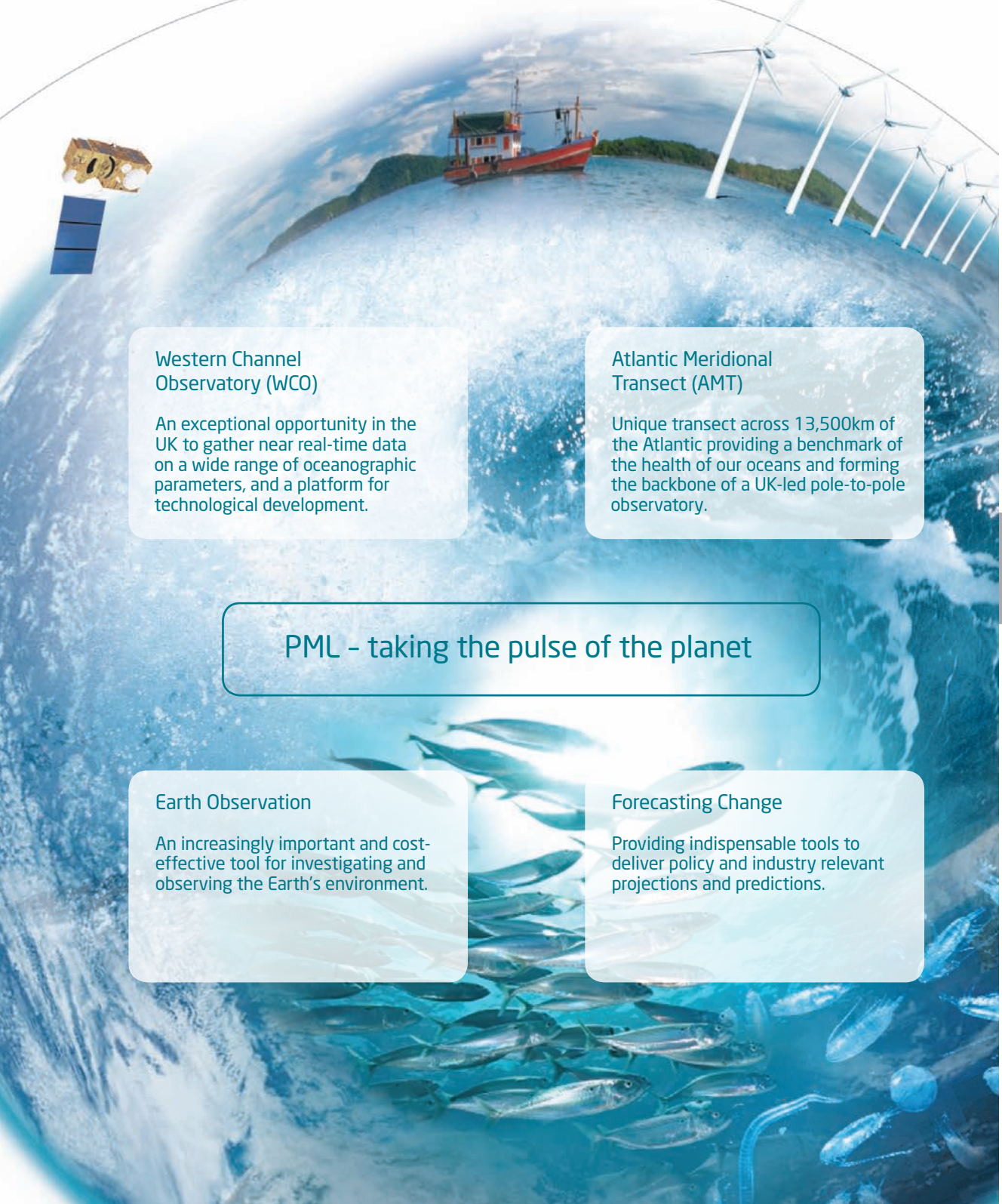
### Working with others

With partnerships worldwide in more than 60 countries and with over 500 organisations, PML works with research organizations, governments, policy makers, environmental managers and industry to understand how the ocean works and to help monitor human activities in, and impacts on, the ocean.

### Application and development

PML's research is consistently recognised as being of international significance and relevance. This publication highlights how our research directly contributes to the UK's *in situ* and remote observational capability of the oceans, detecting, understanding and forecasting long-term environmental change and the impact of human activity. For over 40 years PML has applied science to understand the marine environment, while spearheading the development of new techniques and methodologies to improve knowledge and facilitate the emergence of a solution space. For further information, including PML's other science research and outputs, visit [www.pml.ac.uk](http://www.pml.ac.uk).





### Western Channel Observatory (WCO)

An exceptional opportunity in the UK to gather near real-time data on a wide range of oceanographic parameters, and a platform for technological development.

### Atlantic Meridional Transect (AMT)

Unique transect across 13,500km of the Atlantic providing a benchmark of the health of our oceans and forming the backbone of a UK-led pole-to-pole observatory.

## PML - taking the pulse of the planet

### Earth Observation

An increasingly important and cost-effective tool for investigating and observing the Earth's environment.

### Forecasting Change

Providing indispensable tools to deliver policy and industry relevant projections and predictions.



## Atlantic Meridional Transect (AMT)

### Robust, significant and reliable data providing a benchmark of the health of our oceans

Crossing a range of ecosystems over 13,500km the annual AMT provides repeated measurements of fundamental indicators of our ocean's health along a complete transect of the Atlantic Ocean, forming the backbone of a UK-led pole-to-pole observatory.

The measurements of hydrographic and bio-optical properties, plankton community structure and primary production conducted on the AMT since 1995 onwards represent the most coherent set of repeated biogeochemical observations over ocean basin scales in the world. This unique dataset has been critical in identifying the biogeographical provinces of the Atlantic Ocean. It has led to several important discoveries concerning the validation of ocean colour algorithms, size distributions of plankton communities, and rates of primary production and respiration, among others. Of special importance is the identification of regional sinks and sources of carbon dioxide and observations of carbon storage and cycling in remote and rarely visited regions of the ocean. Particularly noteworthy have been the systematic measurements contrasting the

conditions and functioning of the northern and southern oligotrophic gyres.

The AMT has also provided a unique training platform for early career scientists. Over 240 scientists from 22 countries and 66 institutes have participated on the AMT, producing 250 scientific papers and over 70 PhD theses.

With unrivalled access across the Atlantic basin, the AMT provides a perfect platform for technology development, prototyping and testing. It plays a crucial role, in conjunction with the UK Met Office for the release of Argo and Bio-Argo floats, in remote areas where observations are sparse or non-existent. The AMT is uniquely placed to act as a critical reference point for satellite sensors, and for the calibration and validation of the next generation of Europe's environmental satellite platforms.



**Find out more**

[www.amt-uk.org](http://www.amt-uk.org)

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*The AMT is funded by the NERC and is co-ordinated by PML in conjunction with NOC.*

Pioneering Marine Laboratory

Delivering quality with impact

**PML**

Plymouth Marine  
Laboratory

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[www.pml.ac.uk](http://www.pml.ac.uk)

[www.amt-uk.org](http://www.amt-uk.org)

[www.westernchannelobservatory.org.uk](http://www.westernchannelobservatory.org.uk)



## Earth Observation

### An increasingly important and cost-effective tool for investigating and observing the Earth's environment

Satellites provide large spatial scale observations of the Earth's surface, resulting in continuous information on how the ocean functions, how it interacts with the atmosphere and the terrestrial environment, and how it is being affected by global change. Satellites can infer a range of variables including ocean colour, temperature, height, salinity and sea surface roughness. Earth observation (EO) complements *in situ* sampling from ships, profiling floats, moorings and other platforms.

With a global EO processing capability, PML plays a key role in supporting the UK and international science communities with EO data processing. PML is at the forefront of developing and refining techniques, improving the accuracy of the information that can be gained from satellites and aircraft. It develops products to support policy and management decisions: for example, EO data can be used to locate and identify potentially harmful algal blooms, which may threaten aquaculture facilities. PML-developed algorithms have already been used

to identify persistent ocean fronts, which are biodiversity hot spots, facilitating the designation of marine protected areas.



Within the UK PML provides data processing and analysis services to end users for the NERC Earth Observation Data Acquisition and Analysis Service (NEODAAS), a dual node facility with NEODAAS-Dundee, within the NERC National Centre for EO. A key activity is to provide near-real time or rapid response EO data to help guide research vessels and aircraft to features of interest, such as transient algal blooms, or dynamic eddies, thus maximising science that can be performed. PML also contributes global and regional data processing to the European Copernicus Marine project. PML operates the NERC Airborne Research and Survey Facility (ARSF) Data Analysis Node (DAN) serving UK and international environmental science through aircraft data processing. This enables a high quality, cost-effective means of observation of terrestrial, freshwater, estuarine, marine, cryospheric and atmospheric environments at high temporal, spatial and spectral resolution.

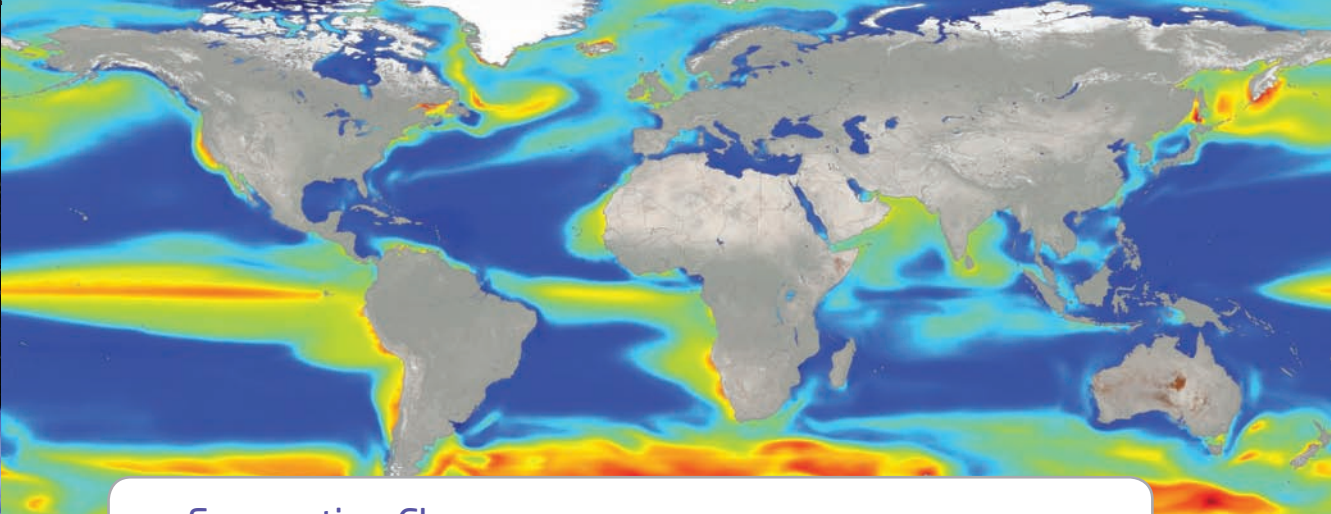


Find out more

[www.pml.ac.uk](http://www.pml.ac.uk)

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Data are available from [www.neodaas.ac.uk](http://www.neodaas.ac.uk)  
and <http://neodc.nerc.ac.uk>



# Forecasting Change

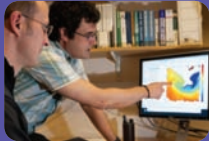
## Providing indispensable tools to deliver policy and industry relevant projections and predictions

Demand for tools to support ecosystem based management initiatives, answering questions concerning climate change, marine resource management and prediction of future trends are the major drivers for ecosystem model development and implementation.

PML refines and builds new physical and biological models to address emerging challenges facing the global ocean and the life it contains. Policy makers and ocean users are increasingly calling for projections about how the ocean may change and how this in turn may affect the goods and services the ocean provides. Combining ecological, physical and chemical data into process-based models goes some way to addressing these requests, but it is when we couple them with economic and resource exploitation models that we are able to demonstrate how the ocean may fare in the future. Not only does PML develop new methods, it also applies models to pressing questions, contributing to the development of sustainable pathways for the ocean and its resources, and enhancing our understanding of how the ocean works and how we should manage it.



The UK is a global leader in ocean biogeochemical modelling, with PML at the forefront of modelling shelf seas ecosystems. PML's particular emphasis is on coupled hydrodynamic-ecosystem models, statistical methods, model skill assessment, climate impact work, ocean acidification and carbon mitigation strategies, at scales that range from a few kilometres to the global ocean.



The PML European Regional Seas Ecosystem Model (ERSEM) is a world-leading marine ecosystem model that underpins PML's modelling efforts, and represents a unique capacity in the UK. In 2014 its code was made publicly available, and it has since been taken up by more than 130 users.

Further model development will focus on improving forecasting capabilities for specific industrial applications, such as aquaculture development, optimal location of marine renewable energy infrastructures and carbon dioxide capture and storage facilities.

**Find out more**

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