

# Marine Systems Modelling

The National Oceanography Centre's Marine Systems Modelling Group is a world-leader in the modelling of the global oceans and shelf seas. This includes the modelling of ocean circulation and heat transport, marine ecosystems, sea-ice, turbulence, surface waves, sediment transport, tides and storm surges.

The Group's aim is to ensure its models provide accurate descriptions of the current state of the oceans and shelf seas and additionally provide predictions of future change by comparing model results with direct observations.

To help do this the Group also works closely with partners such as the UK Met Office, Living With Environmental Change (LWEC) partners, other NERC centres and key university groups.

The Group is split into five subgroups, each with its own scientific goals and objectives;

## **Shelf and Coastal Processes**

Aim of developing, validating and using models to understand physical processes and their links to biogeochemistry within shelf and coastal seas, from the shelf edge to the coastal boundary.

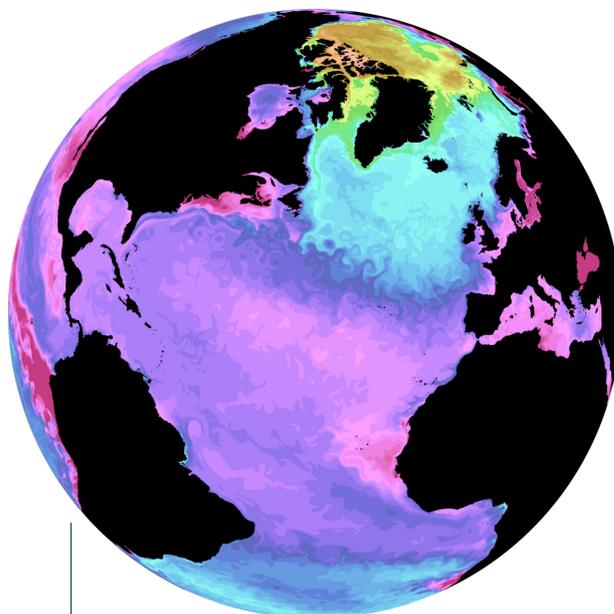
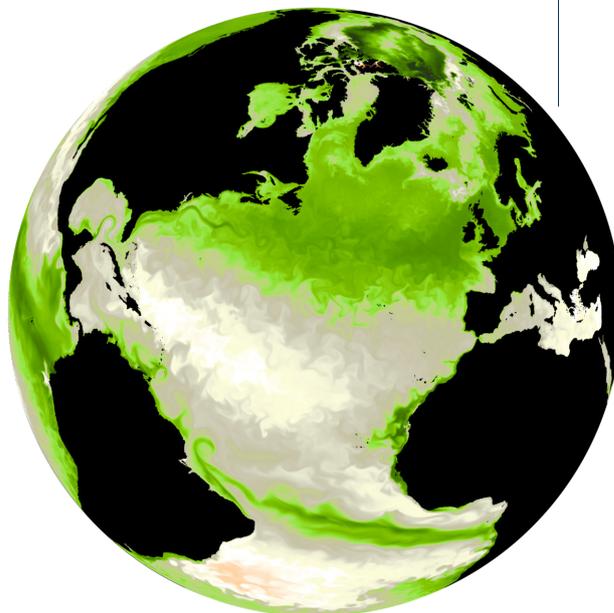
## **Shelf and Coastal Impacts**

Looking at how climate change and humans impact on coastal and shelf seas, with research concentrated mainly in the European and Arctic Seas.

## **Global High Resolution Ocean Modelling**

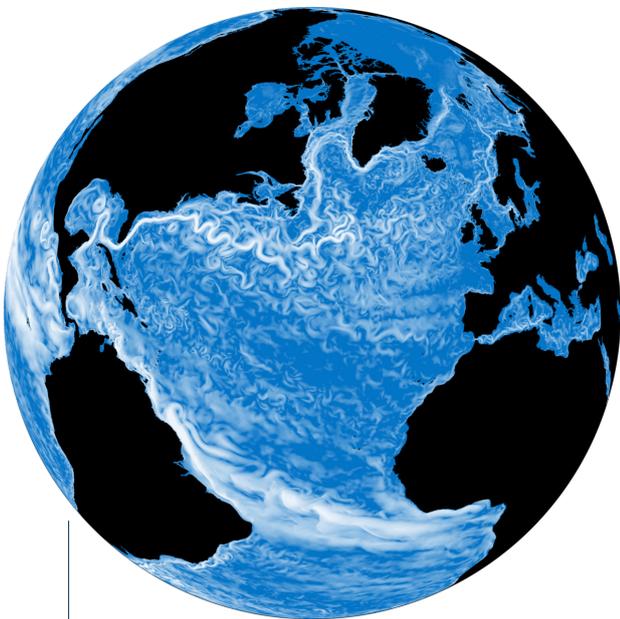
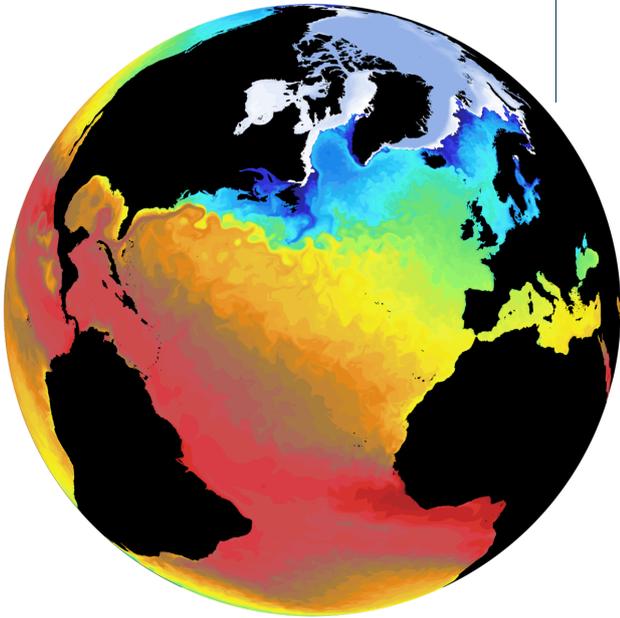
Development and maintenance of cutting edge numerical global ocean models and to study the ocean and ocean sea-ice dynamics.

Ocean ecosystems model highlighting levels of phytoplankton



Ocean acidification showing the level of ocean pH

Ocean and climate model showing surface temperature and sea-ice



Ocean circulation model demonstrating surface currents

## Climate and Uncertainty

Attempting to answer questions such as whether global warming will result in a change to the ocean circulation and what the consequences of this will be.

## Biogeochemical Modelling

aims to build and use marine ecosystem models as a means of understanding and predicting the role and importance of living systems in the ocean.

Modelling is a very useful tool in the study of ecological systems as models can provide opportunities to explore ideas that may not be possible to field test. Models that represent the interactions between physical and biological processes can help in the understanding of the role that marine life plays in regulating atmospheric CO<sub>2</sub> and how this will respond to climate change.

For example, models can predict the consequences for animals higher up in the food chain such as zooplankton and fish on changes in the abundance of phytoplankton in different areas of the ocean.

Phytoplankton are microscopic algae that grow in the surface waters of the ocean and, like plants on land, consume carbon dioxide (CO<sub>2</sub>), which is absorbed into the ocean from the atmosphere. The growth of the phytoplankton depends on sunlight and a supply of nutrients. This supply is influenced by ocean circulation, including eddies, currents, and vertical processes that bring nutrients to the surface from deeper waters in the ocean.