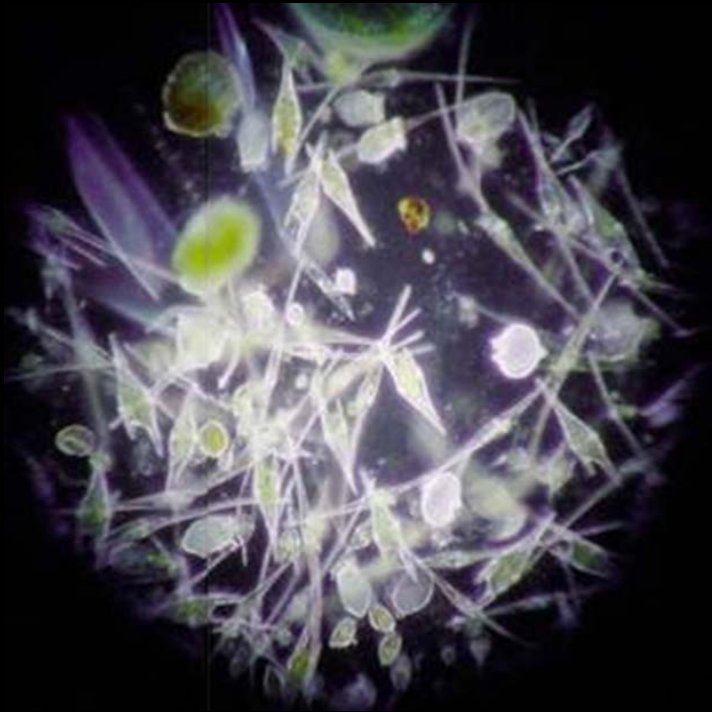


Angela Hatton  
National Oceanography Centre



**Marine Science:  
Microbial to Global**



Atlantic from Space Workshop  
23<sup>rd</sup> January 2019

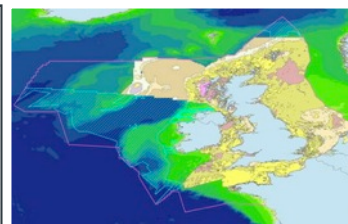
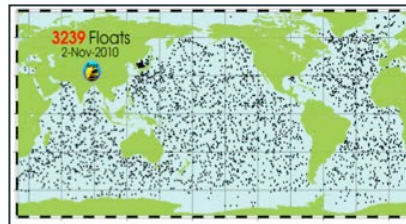
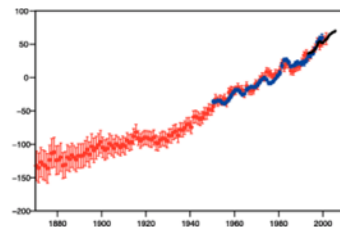
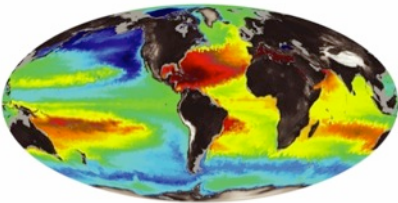
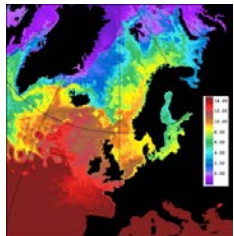


# National Oceanography Centre

NATURAL ENVIRONMENT RESEARCH COUNCIL

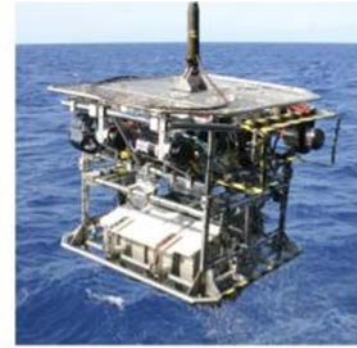
## Research expertise in:

- Southampton & Liverpool
- 500 NERC staff –scientists, technologists and data scientists.
- £60 million budget.
- Host UK National Marine Facilities, including two ocean class research ships.
- Sea level changes and impacts
- Basin-scale observing of global ocean change
- Global & shelf ocean modelling
- Heat, carbon penetration into deep ocean
- Deep-sea frontier – ecosystems, resources, hazards
- Autonomy & sensor technology





# Research infrastructure and data assets for oceanography



British Oceanographic Data Centre

Ships and National Marine Facility  
Platforms and Sensors



**National  
Oceanography Centre**  
NATURAL ENVIRONMENT RESEARCH COUNCIL

[noc.ac.uk](http://noc.ac.uk)

**NERC** SCIENCE OF THE  
ENVIRONMENT



# High-powered ship-based systems for deep-sea mapping and observation







## Long-endurance platforms for multi-month missions





# Science and Technology

Basin and  
decadal scale

Sustained  
observations

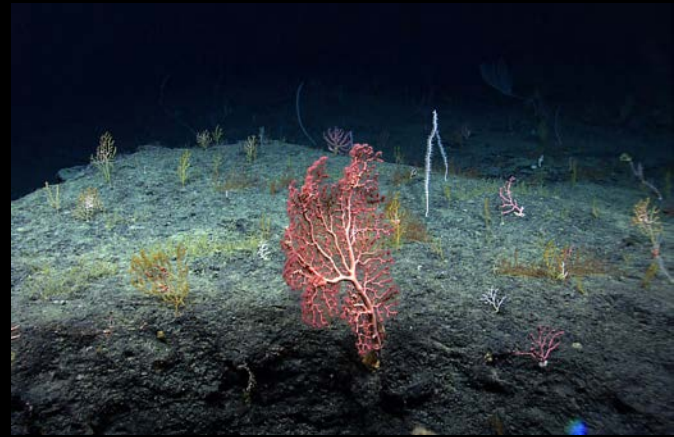
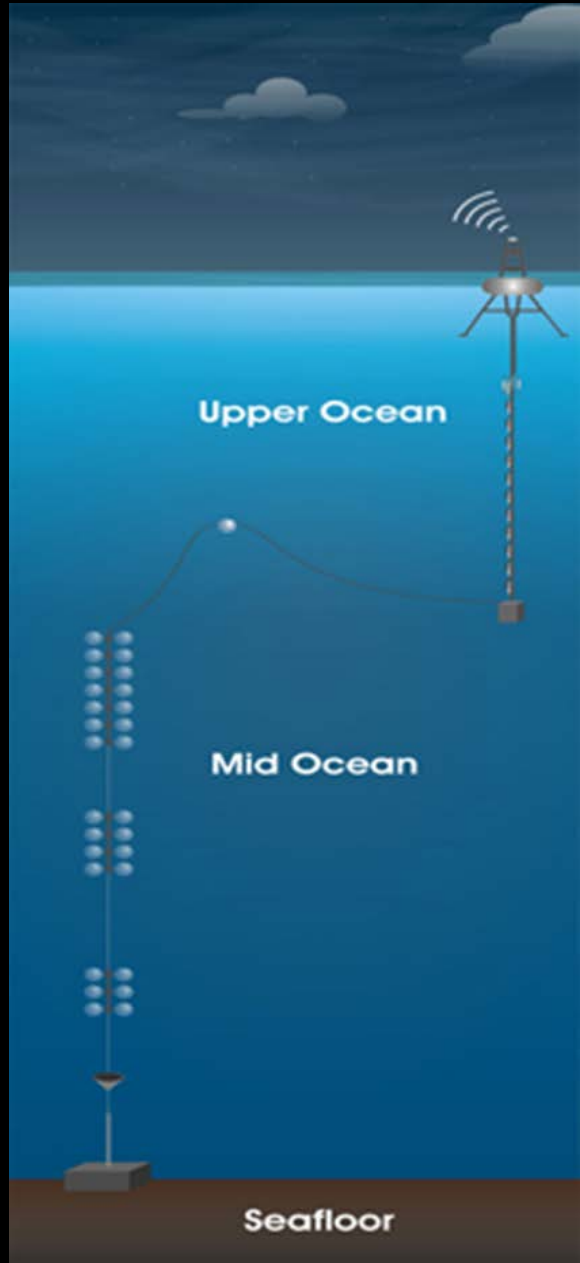
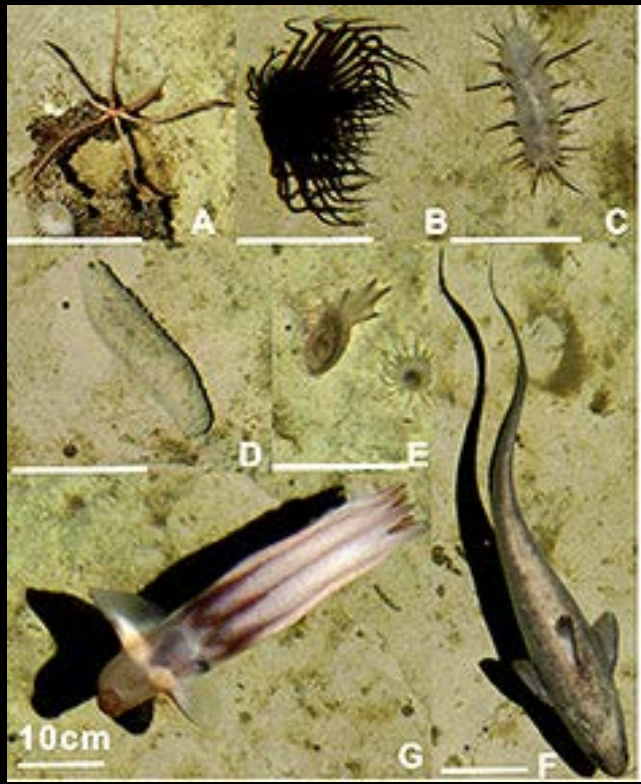
Making sense of  
global scale  
change and  
variability

Role of coastal  
and continental  
shelf seas in the  
global system

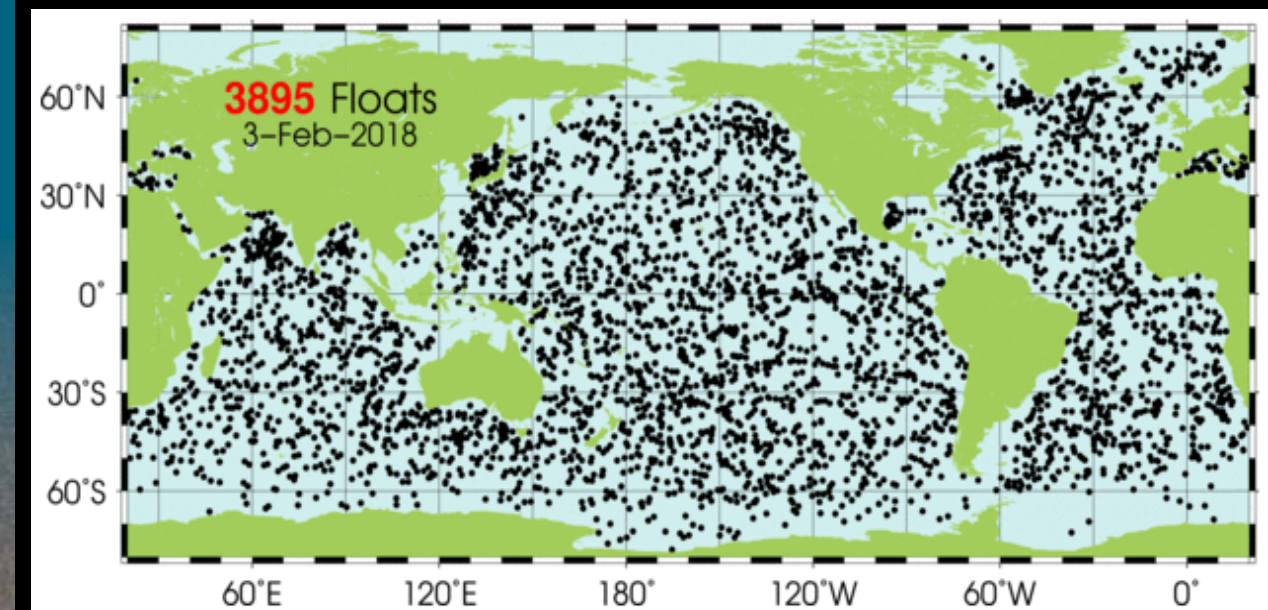
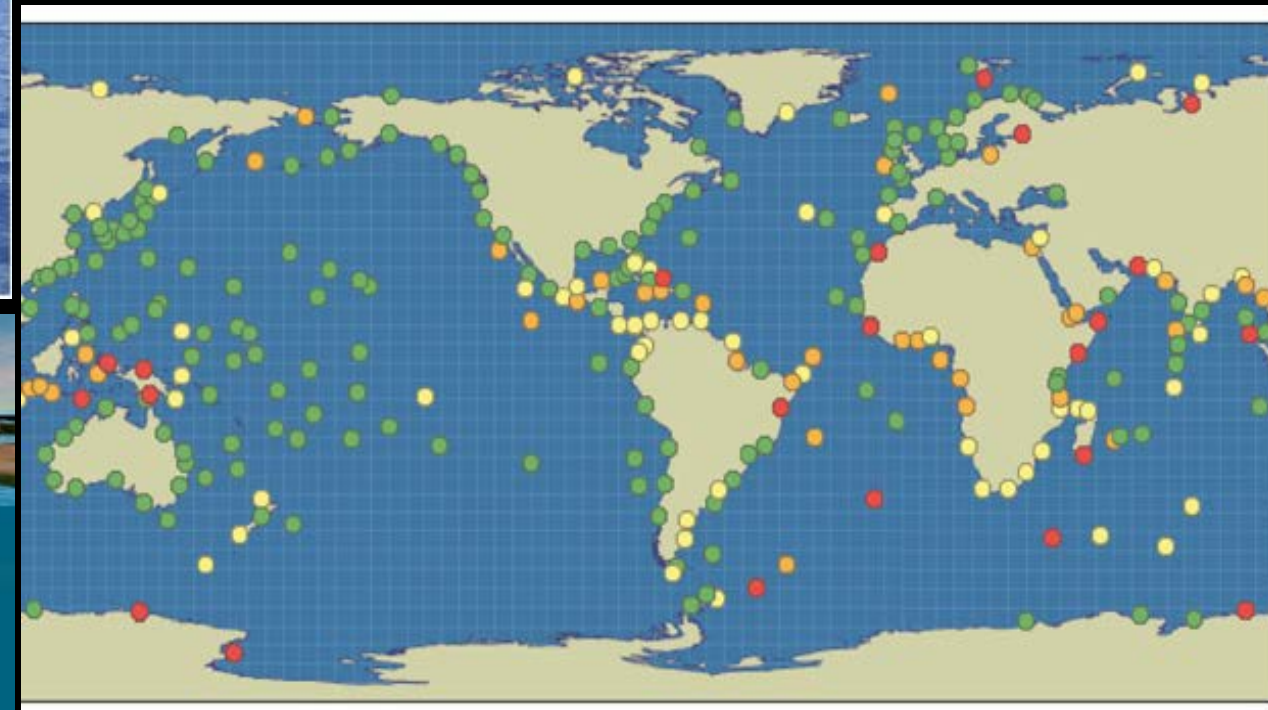
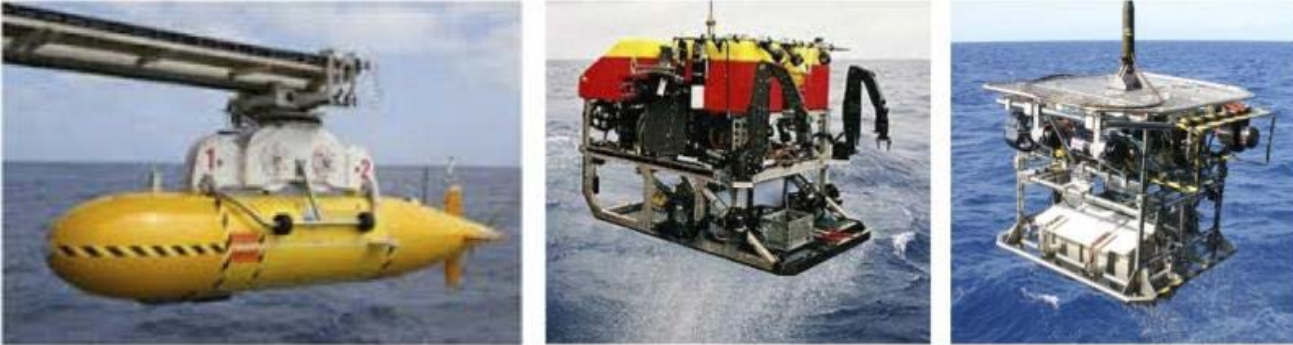




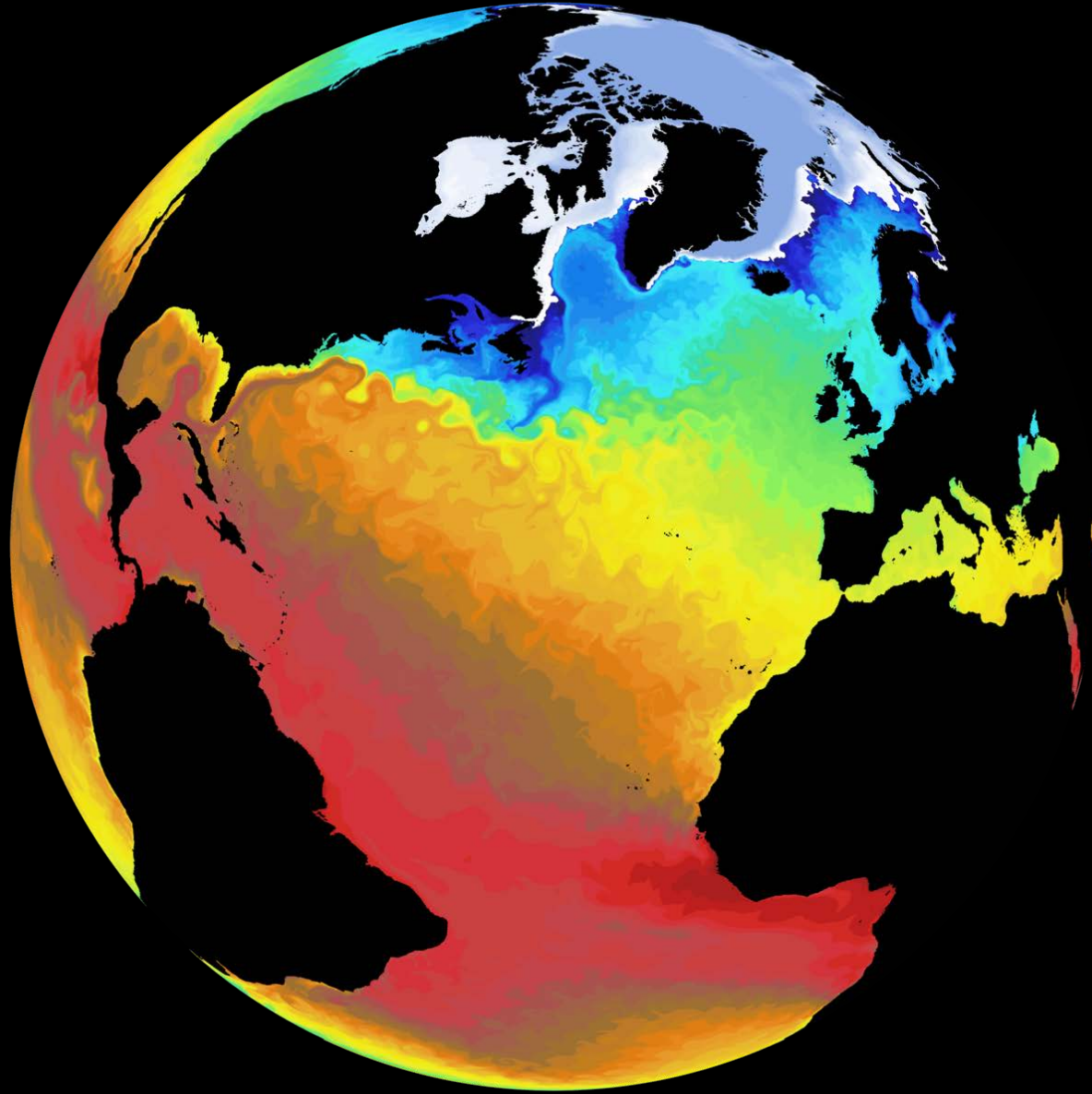












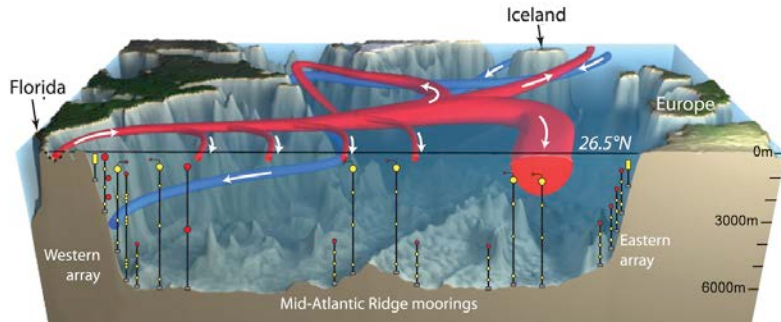
High resolution  
global ocean  
model  
development

The ocean model  
in Met Office  
climate and  
seasonal weather  
prediction  
systems

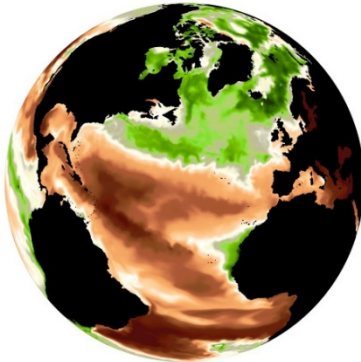


# Underpinning National Capability:

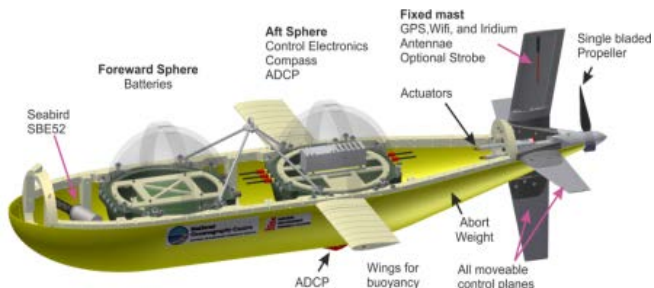
Providing the methodology for investigating basin-decadal scale change & variability



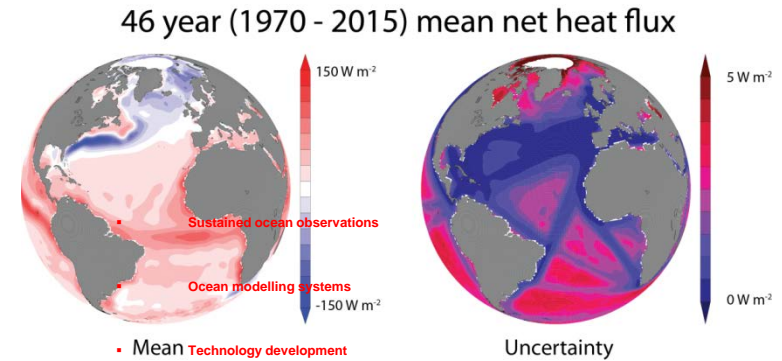
Sustained ocean observations



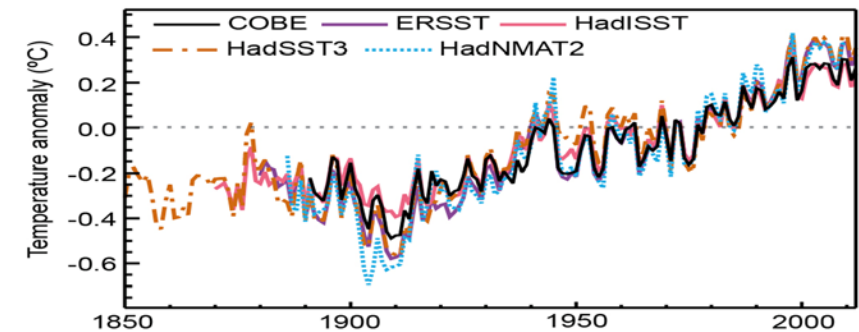
Community ocean modelling systems



Transformative technology development



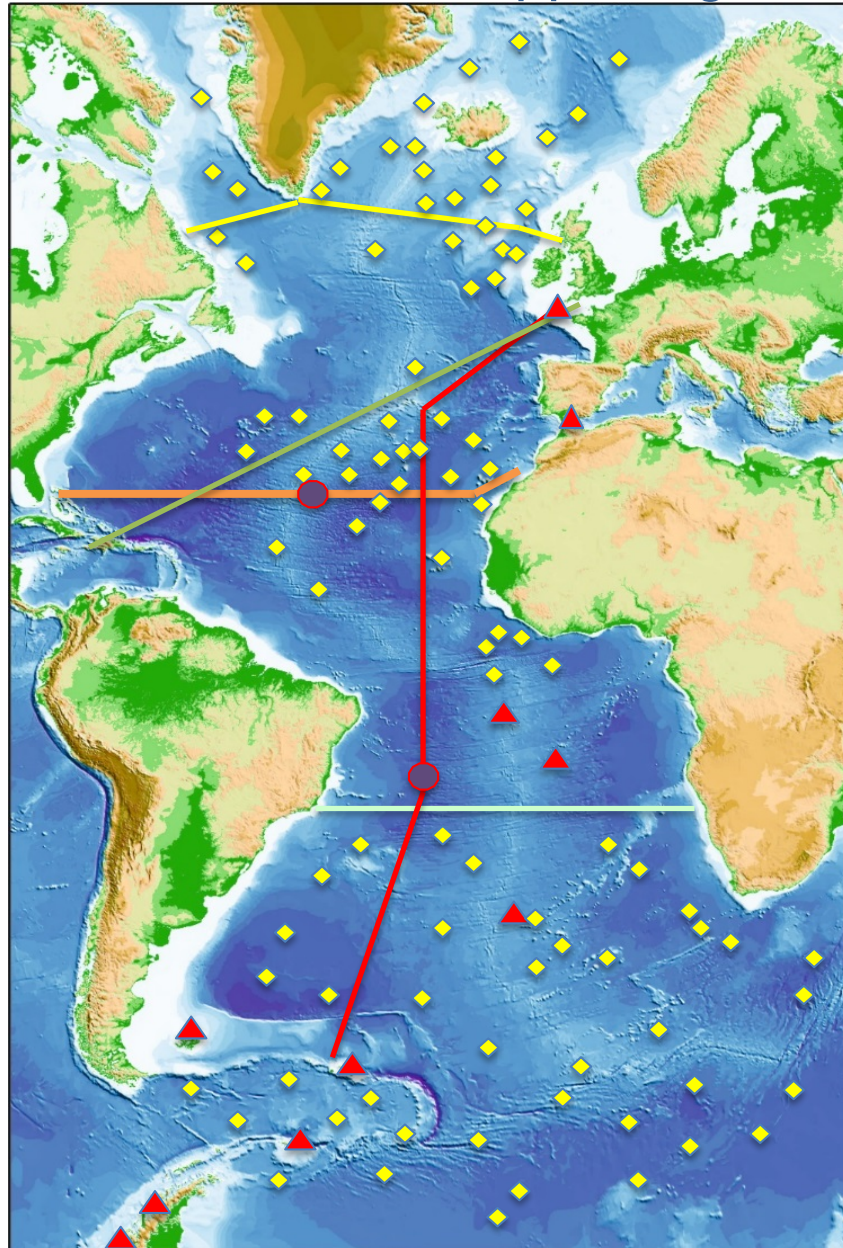
Global data synthesis and integration





# Climate Linked Atlantic Sector Science - Hydrographic sections and Global climate

## Supporting the UK contribution to global ocean observations

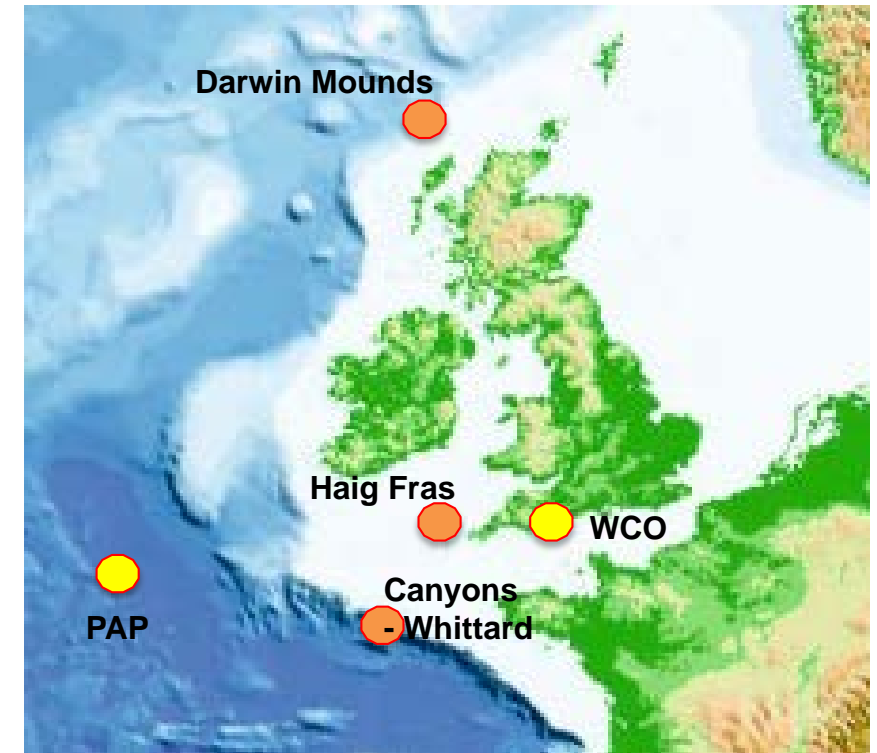


- 26° N
- 57° N
- 24° S
- AMT Transect
- Caribbean-UK
- ◆ UK Argo Float
- ▲ SATGN Tide Gauge

### CPR contribution to GACS



- GO-SHIP Hydrographic Sections
- ICOS stations & transect
- Surface marine climate data records
- ARGO
- GLOSS tide gauges



- ICOS long time series FPOs
- MPAs



## Academic Engagement

Supporting the academic community and developing the next generation of marine scientists



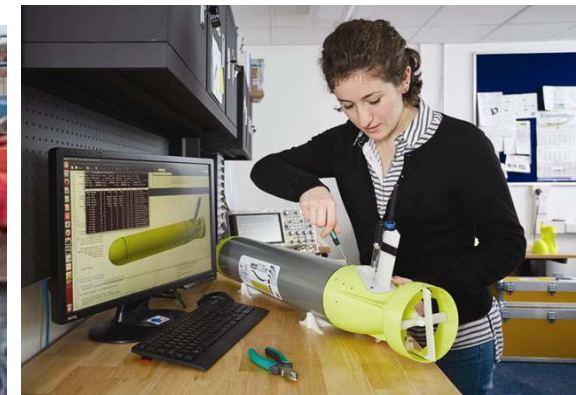
Access to resources – ship time,  
model outputs and training

Training graduate students & early  
career researchers

Internships

Marine Science Summer School

Enhanced collaboration





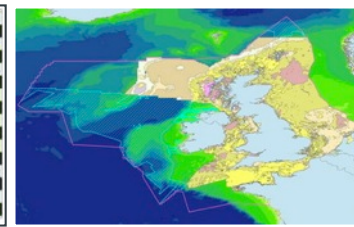
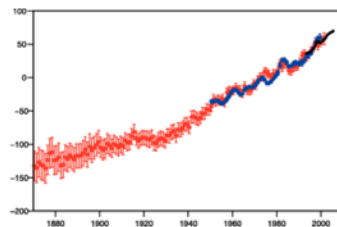
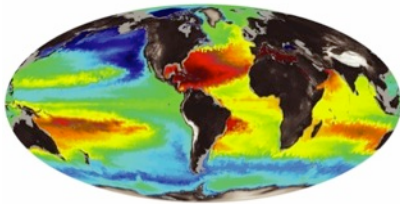
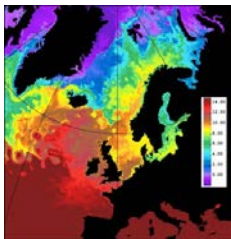


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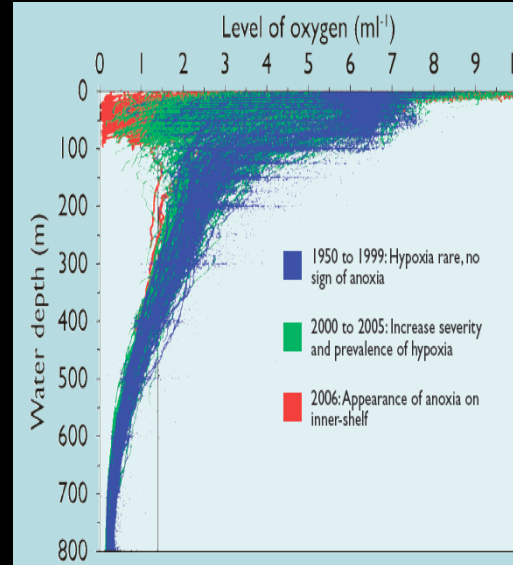
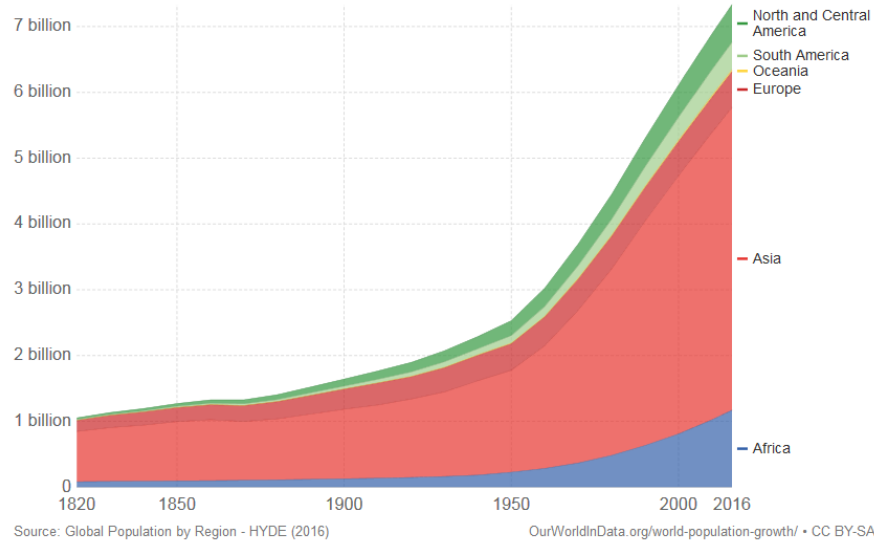




# The ocean environment is changing and variable

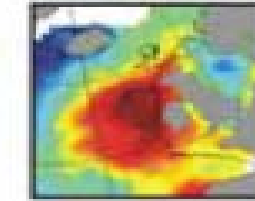
## Increased pressure from human impacts and natural causes

World population by world regions

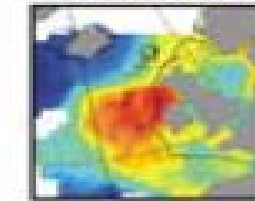


Cold-temperate species

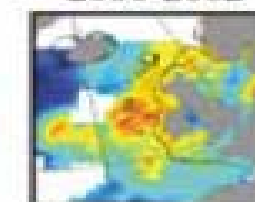
1958-1981



1982-1999



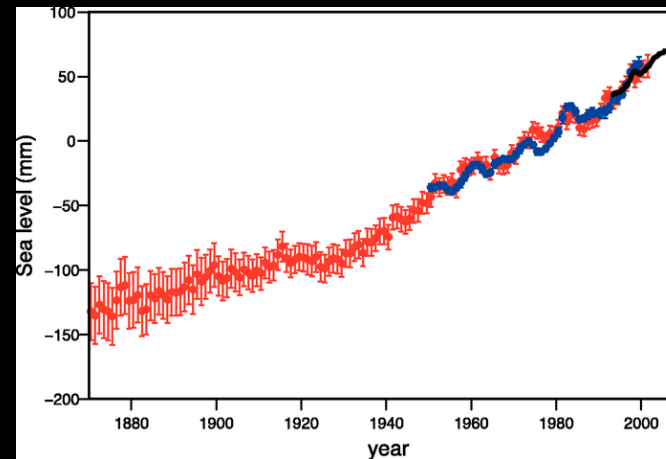
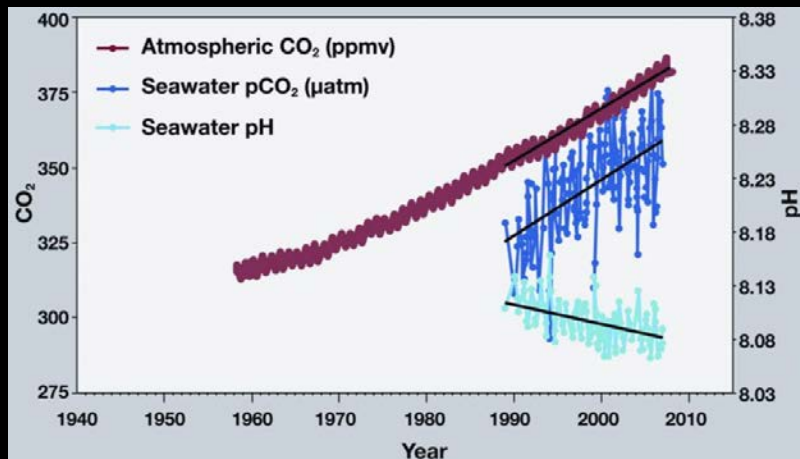
2000-2002



Pollution



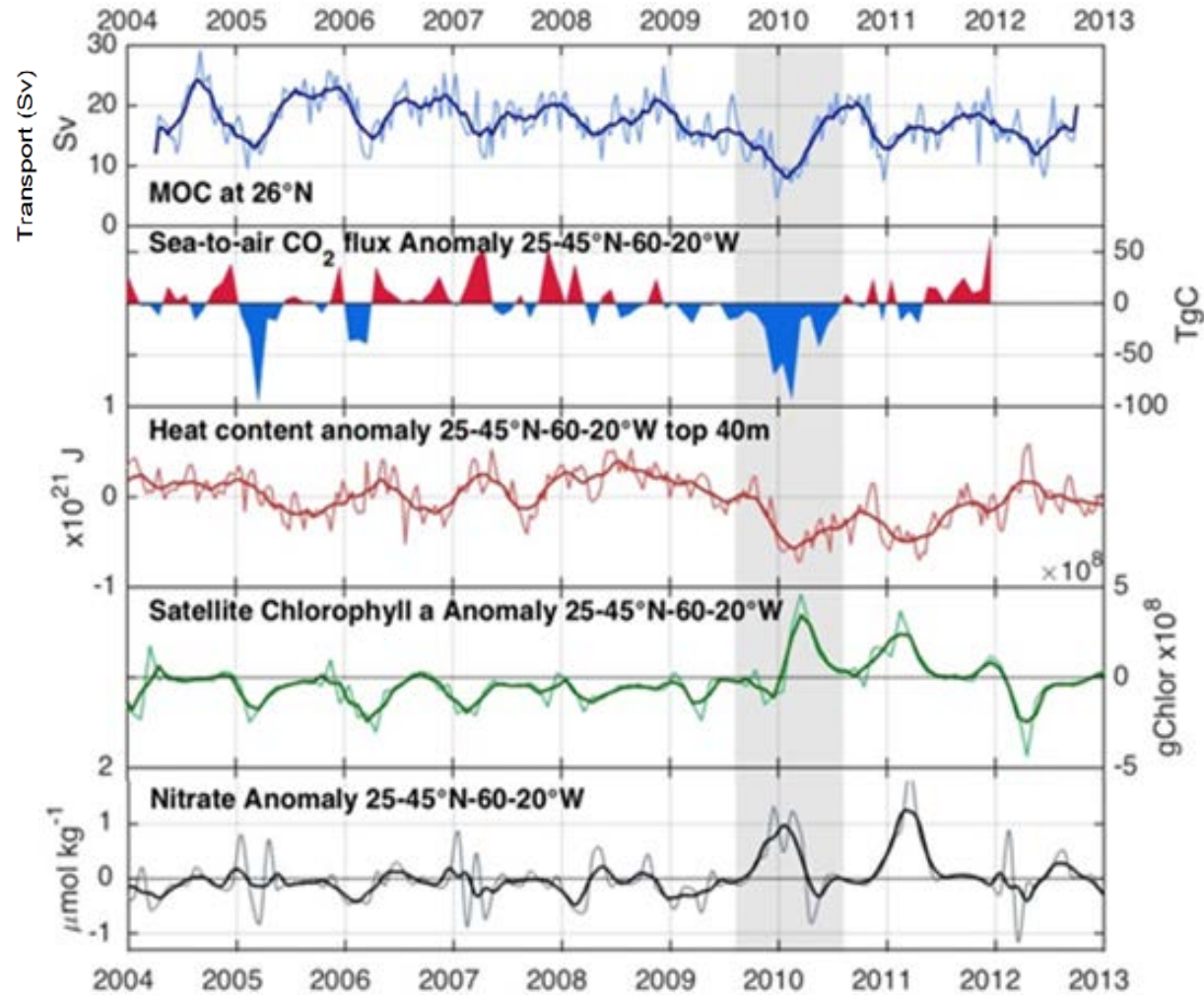
Sea Ice



Increased demand for ocean resources



# The ocean is changing and variable – at basin and global scale



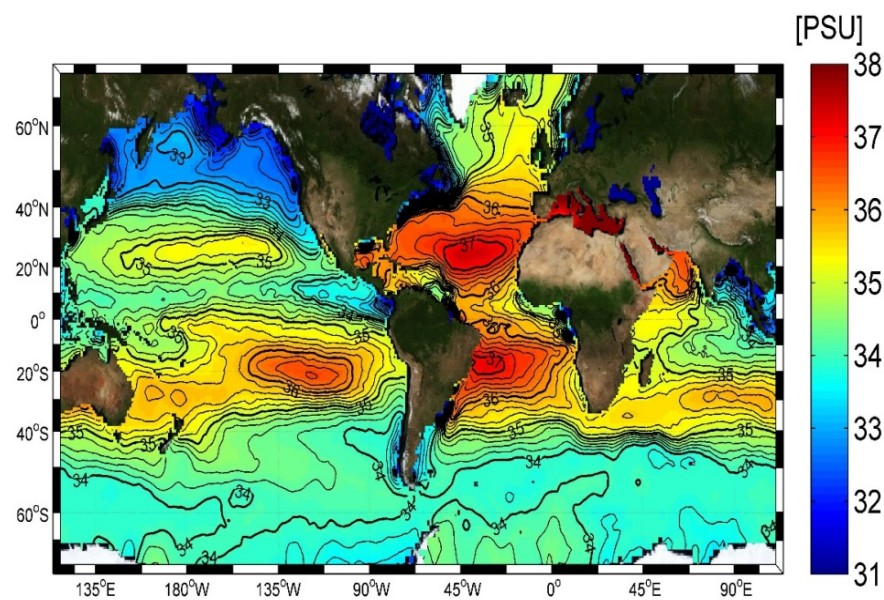
Major impacts on society and economy



Changing physics (AMOC, heat content), changing biogeochemistry (CO<sub>2</sub> flux, primary production), changing ecosystems (surface plankton)

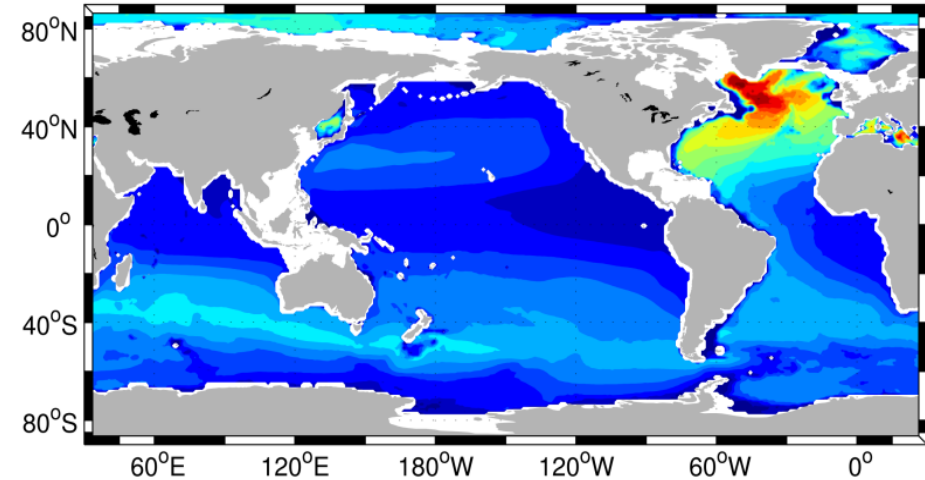




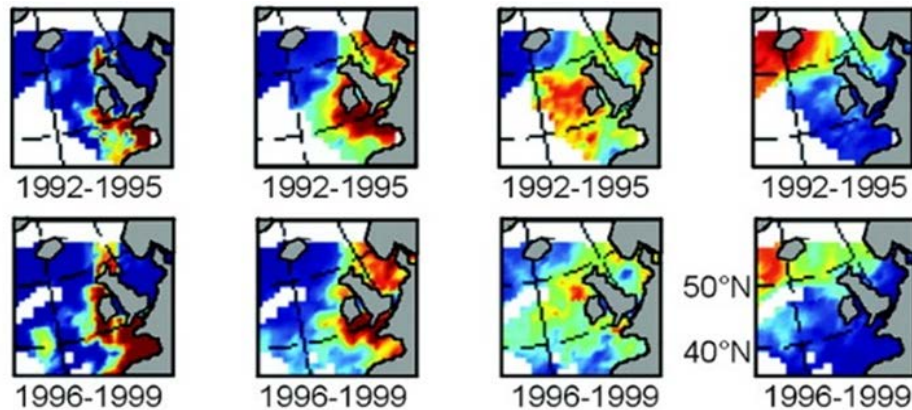


What is the current state of the hydrological cycle and how will changes in ocean salinity impact it into the future

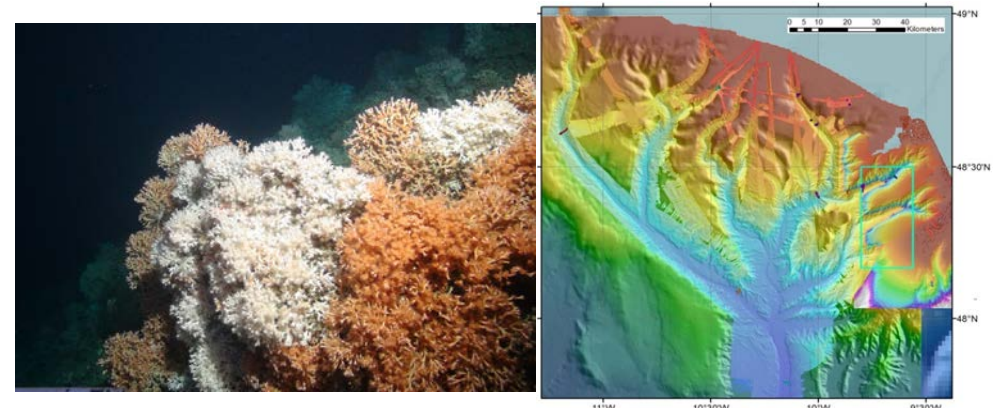
### Canth storage – column inventory



How physical and biological uptake, transfer and storage of carbon in the deep ocean interact to determine the North Atlantic CO<sub>2</sub> sink and how this will change in the future



How the structure, diversity and productivity of biological communities are changing in response to abrupt or episodic disturbance events compared to natural change



How the natural and anthropogenic drivers of basin and decadal changes are altering the Atlantic ecosystem, and consequences for ecosystem functioning and services