

Ocean predictions and observations in response to the climate emergency

16 October 2019, Edinburgh



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Ocean predictions and observations in response to the climate emergency

Dr. Steffen M. Olsen

Danish Meteorological Institute



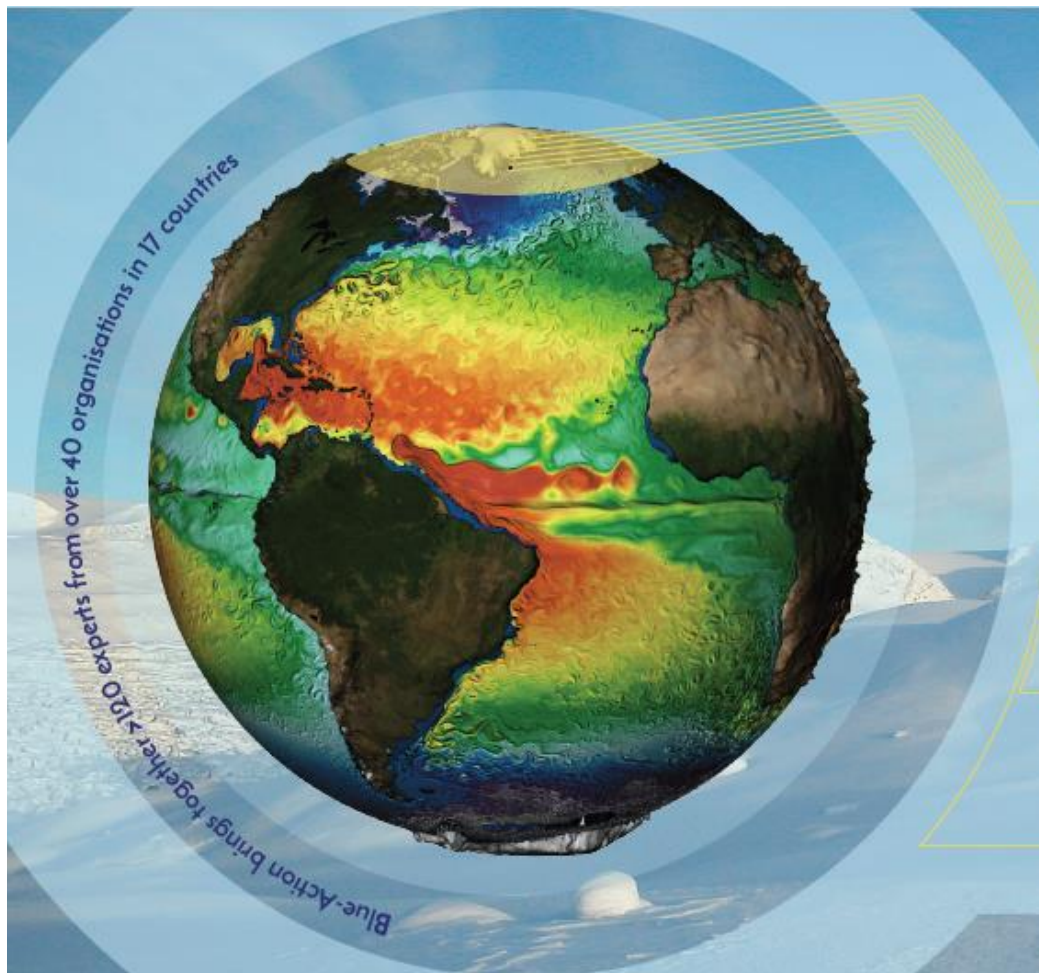
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smo@dmi.dk

[@SteffenMalskaer](https://twitter.com/SteffenMalskaer)

Blue-Action project

UNDERSTANDING THE IMPACT OF A
CHANGING ARCTIC ON NORTHERN
HEMISPHERE WEATHER AND CLIMATE



2016-2020

Funded by H2020

Coordination

Steffen M. Olsen

DMI (lead)

Daniela Matei

MPI (co-lead)

42 Partners

Science, industry,
organizations

EU and non-EU:

USA, Canada,
Russia, China,
Korea

Mission

- To actively improve our ability to describe, model, and predict Arctic climate change and its impact on Northern Hemisphere climate
- To develop new methods to characterise climate conditions where extreme weather system forms across the Northern Hemisphere and establish their link to Arctic climate change
- To enable robust and reliable forecasting and deliver better predictions at sub-seasonal to decadal scales.
- Co-design a series of case studies with organisations and industries that rely on accurate weather and climate forecasting

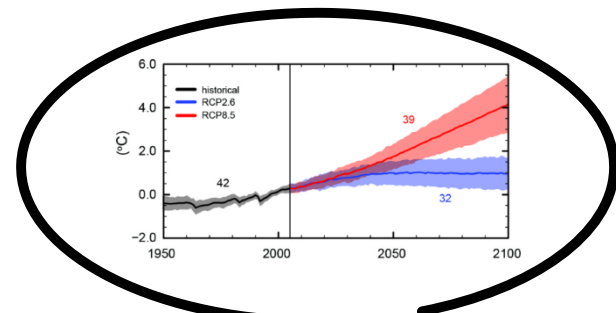


Timescales

Predictions

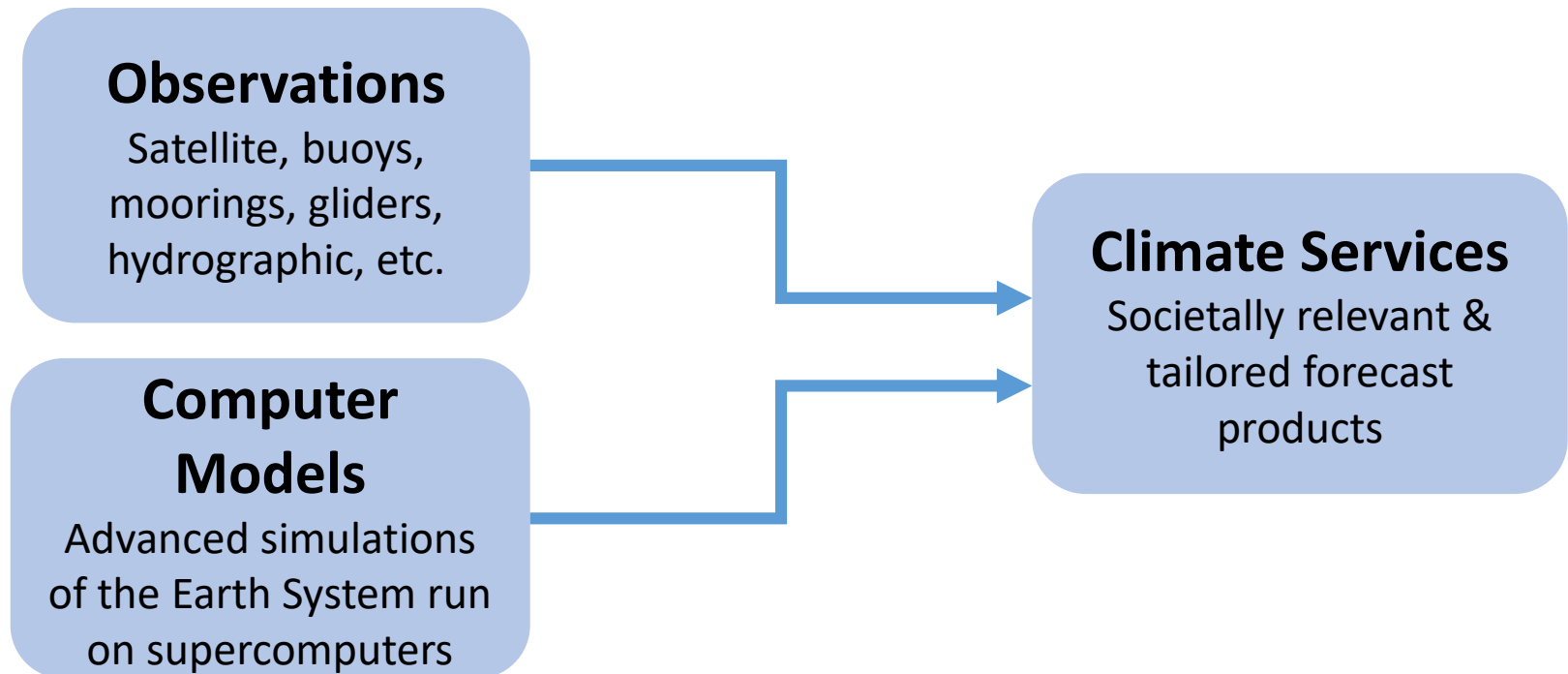


Projections



Days Weeks Months Seasons Years Decades Centuries

Building blocks of climate predictions and climate services



9:00-9:15	All	Arrival/refreshments
9:15-9:20	Steffen M. Olsen Danish Meteorological Institute, Denmark	Welcome and introduction
9:20-9:30	Bee Berx Marine Scotland, UK	Climate change: Scottish context
9:30-9:40	Stuart Cunningham Scottish Association for Marine Science, UK	Ocean observations and Atlantic networks
9:40-9:50	Noel Keenlyside University of Bergen, Norway	Current climate models in the North Atlantic
9:50-10:00	Mark Payne Danish Technical University, Denmark	Climate services and fish forecasts
10:00-10:20	All	Questions, feedback and discussion
10:20-10:25	Steffen M. Olsen Danish Meteorological Institute, Denmark	Wrap up
10:25-10:45	All	Networking

Scotland and global climate change

Dr. Bee Berx

Marine Scotland Science



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barbara.berx@gov.scot

[@b_berx](https://twitter.com/b_berx)

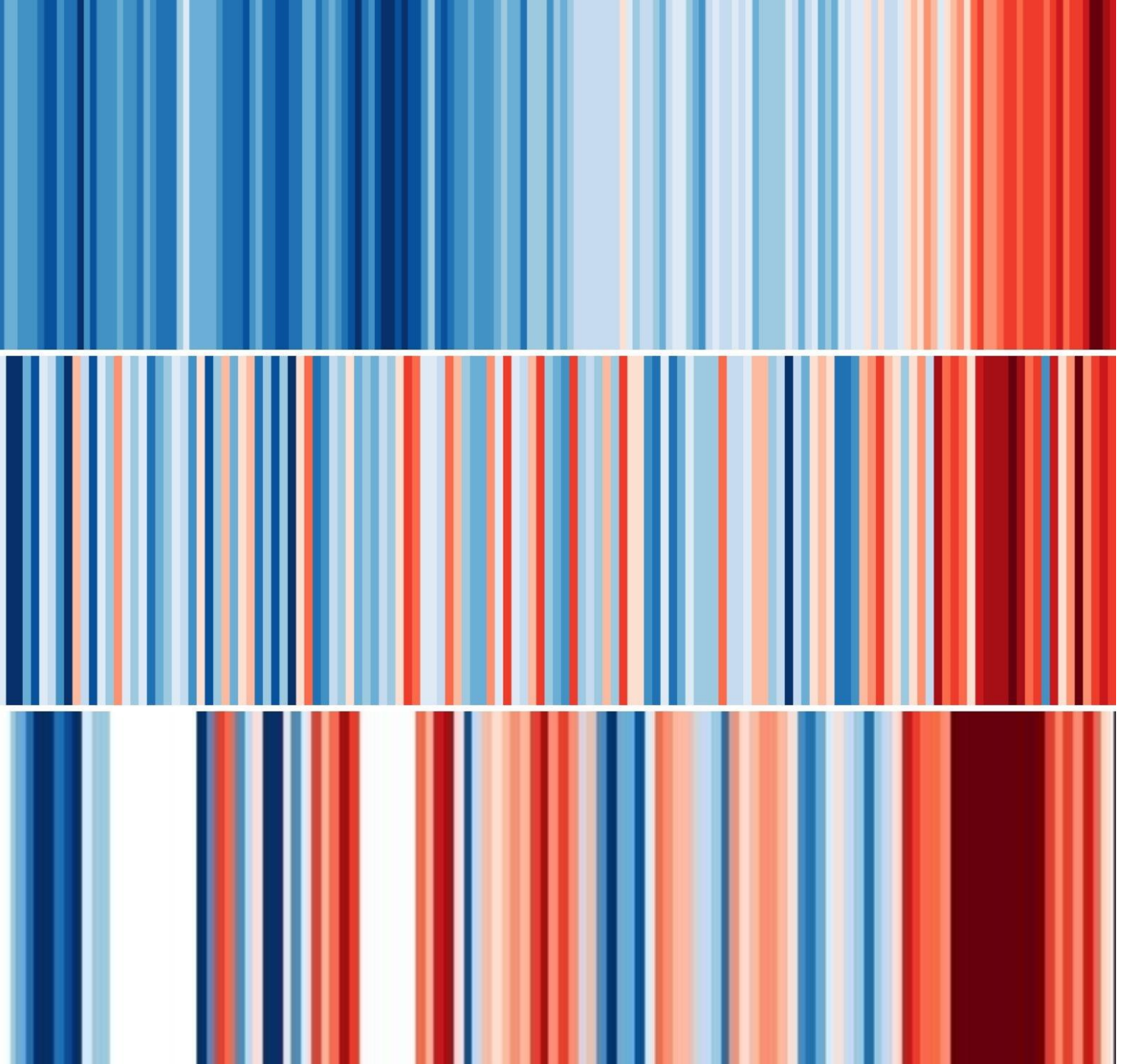


There is a global climate
emergency.

Global

Scotland

**Scottish
waters**



BLUE ACTION




Scotland's climate is changing!



We could experience a **hot summer** like 2018 on average every other year by **2050**.



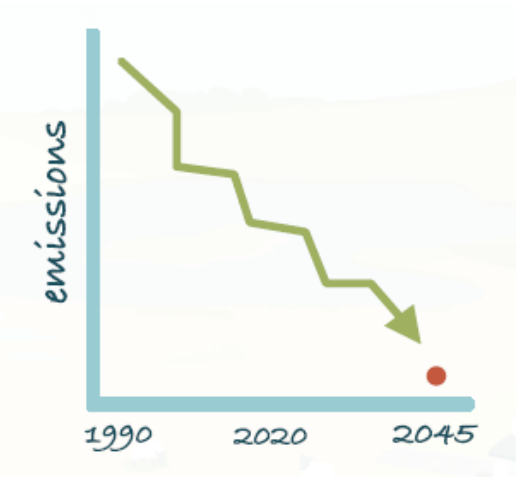
Extreme weather events, such as Storm Ali in September 2018, are expected to become **more frequent**.



Sea level rose by **8cm** between **1900** and **1990**, and is likely to have risen by a similar amount by **2030**.



Scotland's contribution to climate change will end completely by **2045**



Scotland has almost halved its emissions since **1990**

CLIMATE READY SCOTLAND: Second Scottish Climate Change Adaptation Programme 2019-2024

September 2019

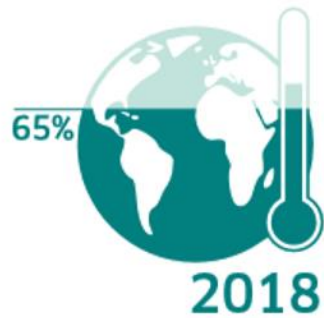


CLIMATE CHANGE PLAN

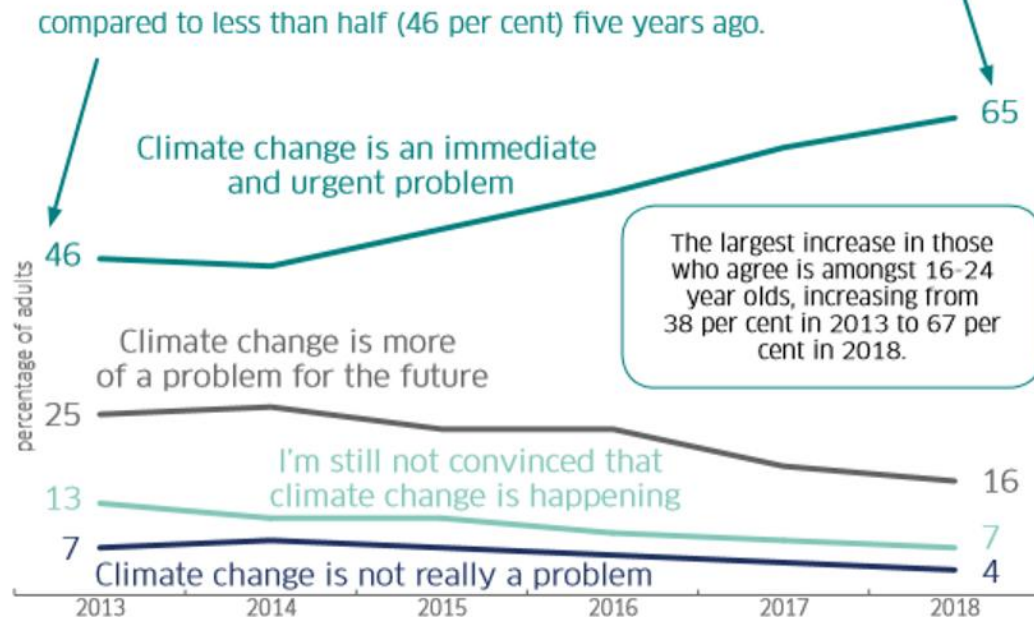
Third Report on Proposals and Polices 2018-2032
Summary Document



Scottish public perception



Almost two thirds (65 per cent) of adults viewed climate change as an immediate and urgent problem



In 2018, around three quarters (74 per cent) of adults agreed they understood what actions they should take to help tackle climate change.

Scottish Centre for Aquatic Climate Change Studies

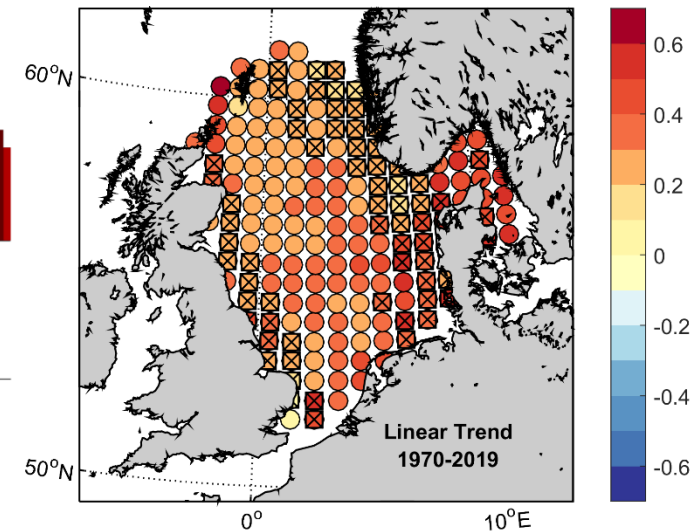
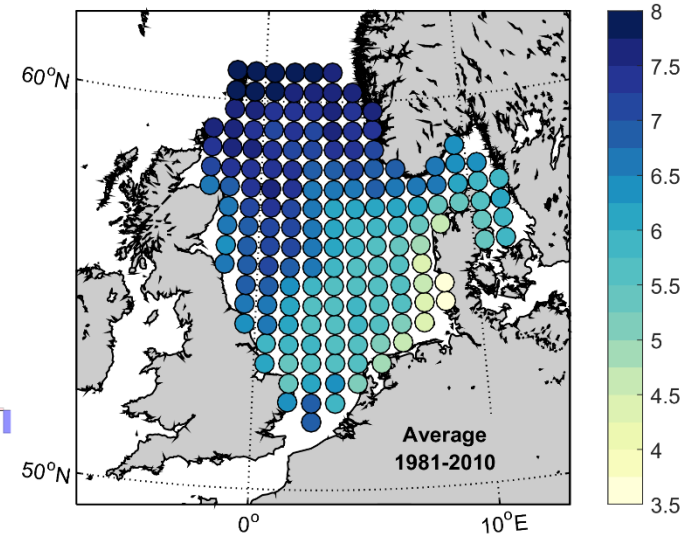
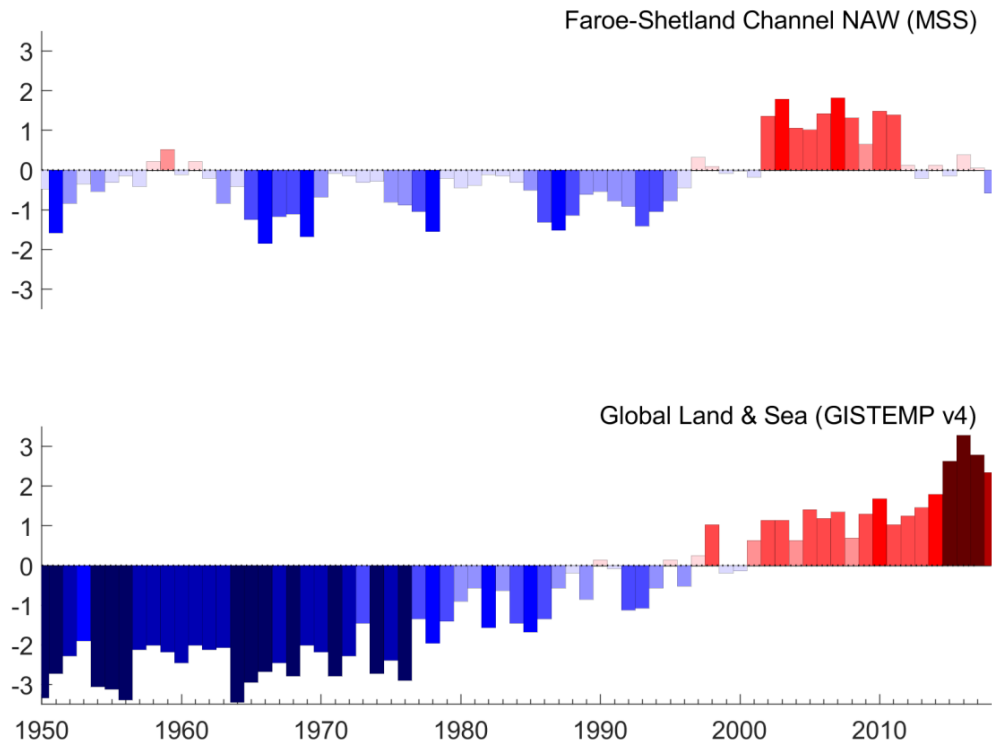
SCAACS

Commitment in the Programme for Government to establish a virtual centre in 2020.

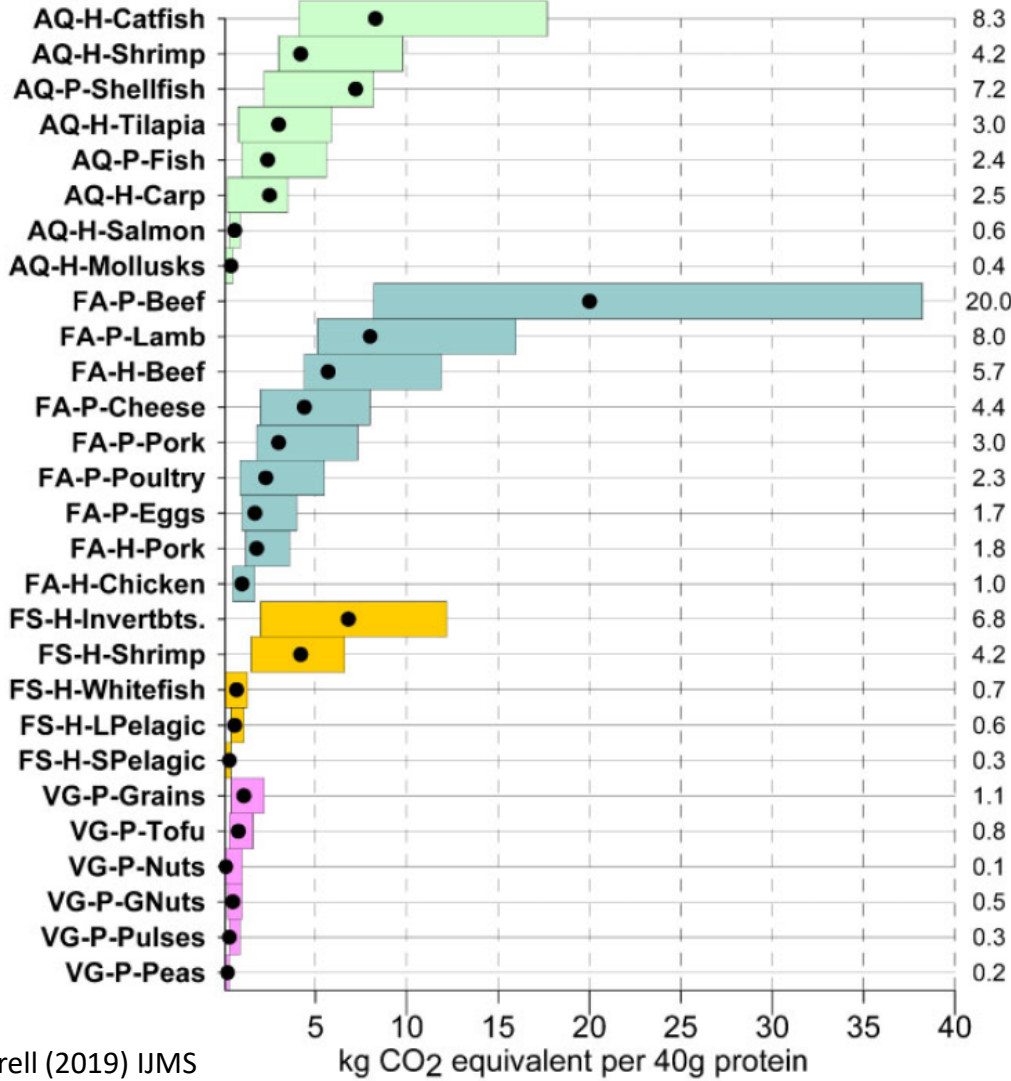
Aims

- To coordinate climate change science funded by the Scottish Government in the marine and freshwater environment
- To create stronger links between Scottish Government and academia for aquatic research addressing climate change impact, monitoring, mitigation and adaptation.

Monitoring for climate change signals and impacts



Fish and shellfish as low emissions protein



Turrell (2019) IJMS

Image by Patrick Down

Observations In Response To The Climate Emergency

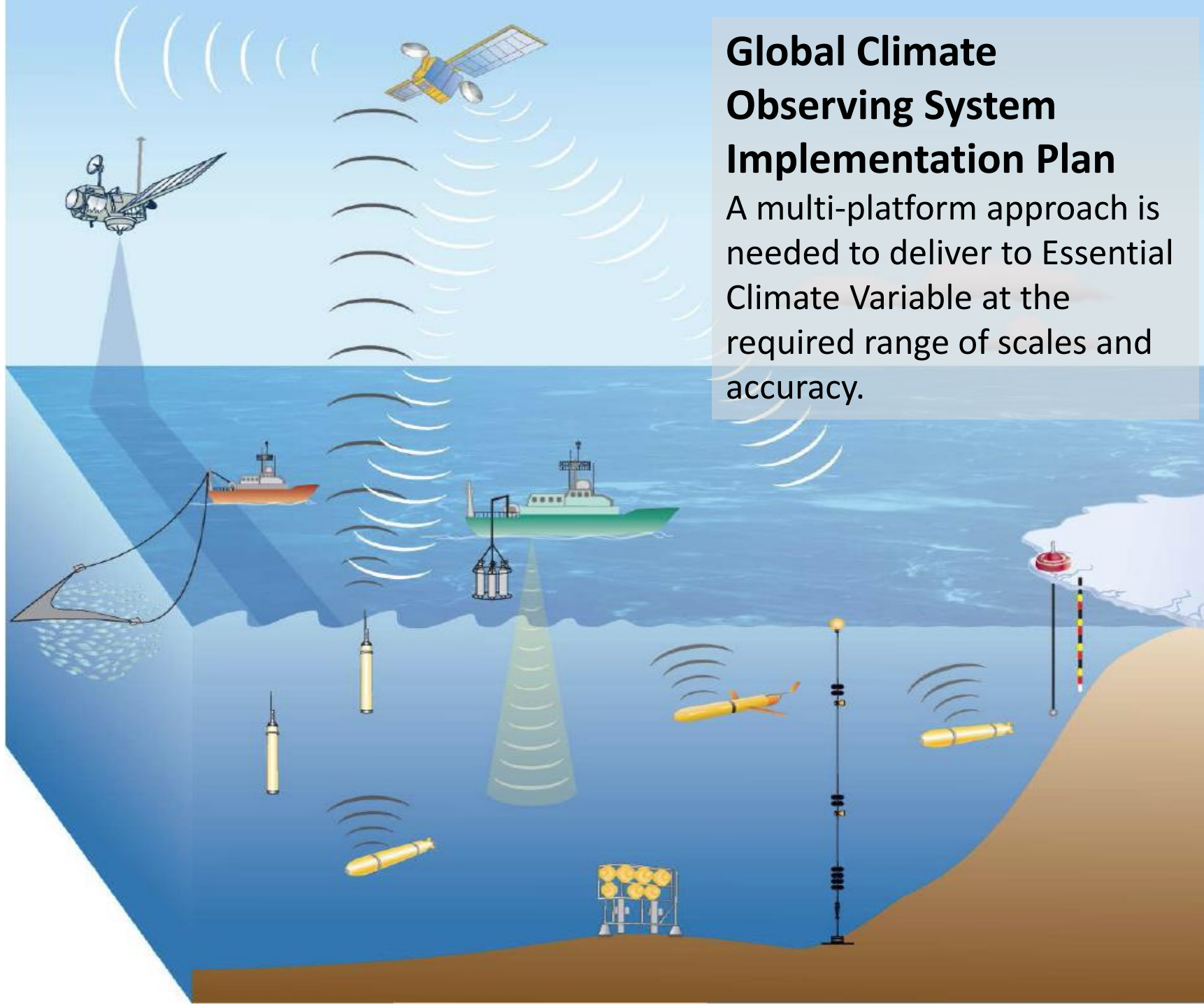
Prof. Stuart A. Cunningham

Scottish Association for Marine Science



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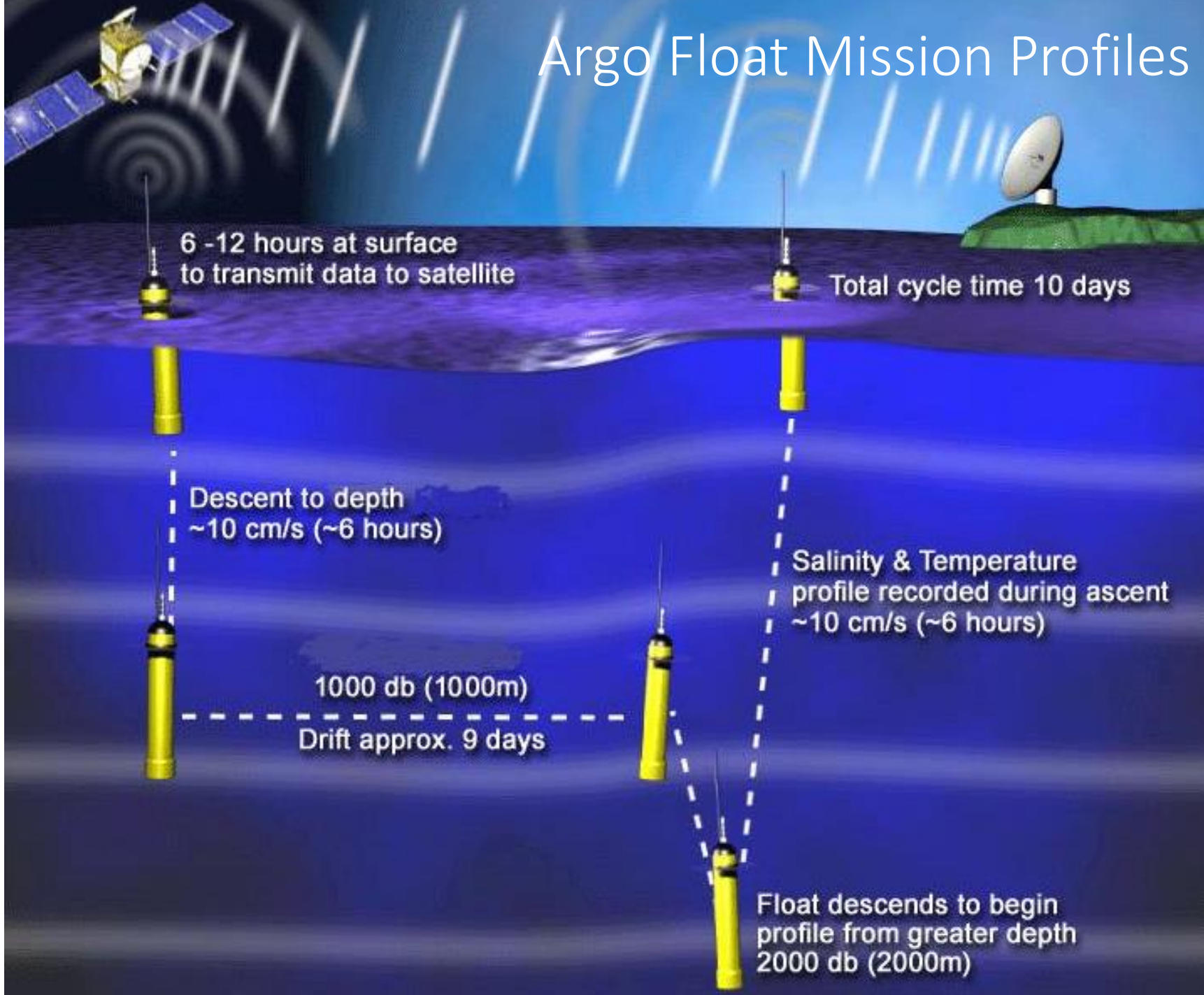
Stuart.Cunningham@sams.ac.uk

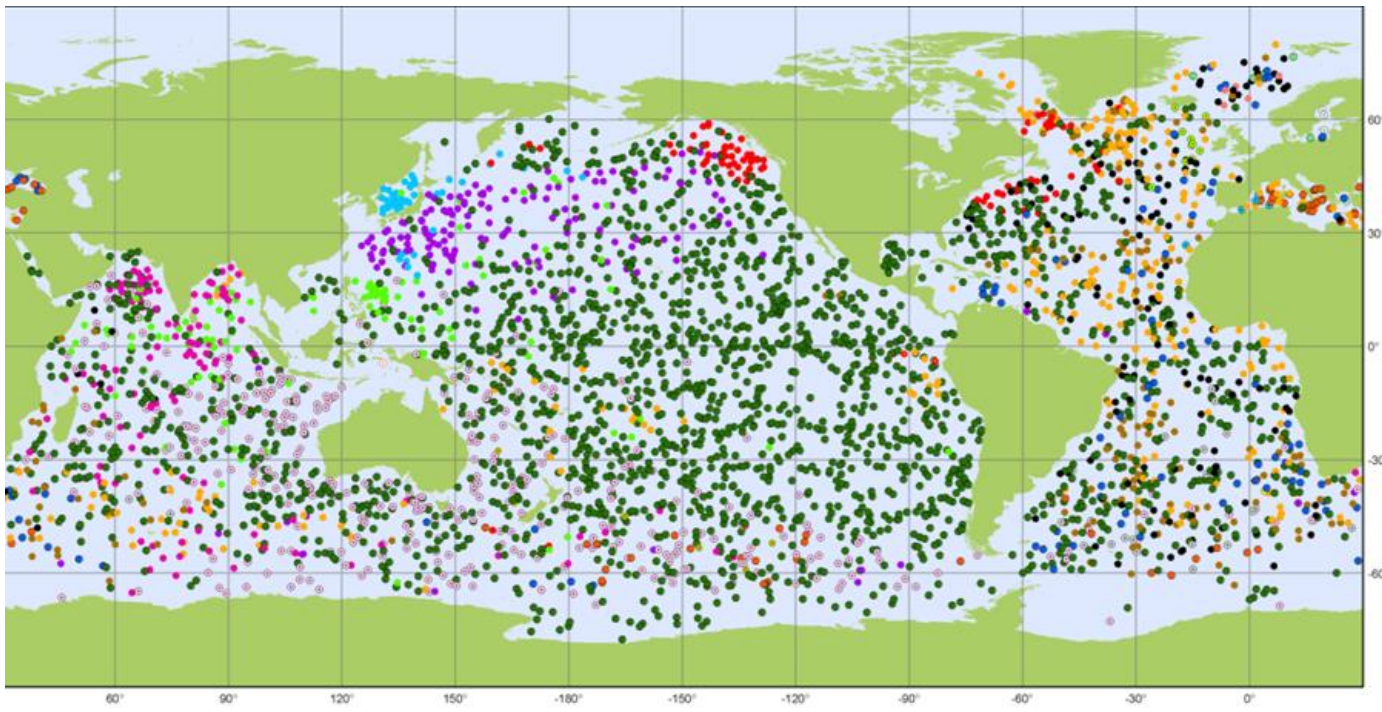


Global Climate Observing System Implementation Plan

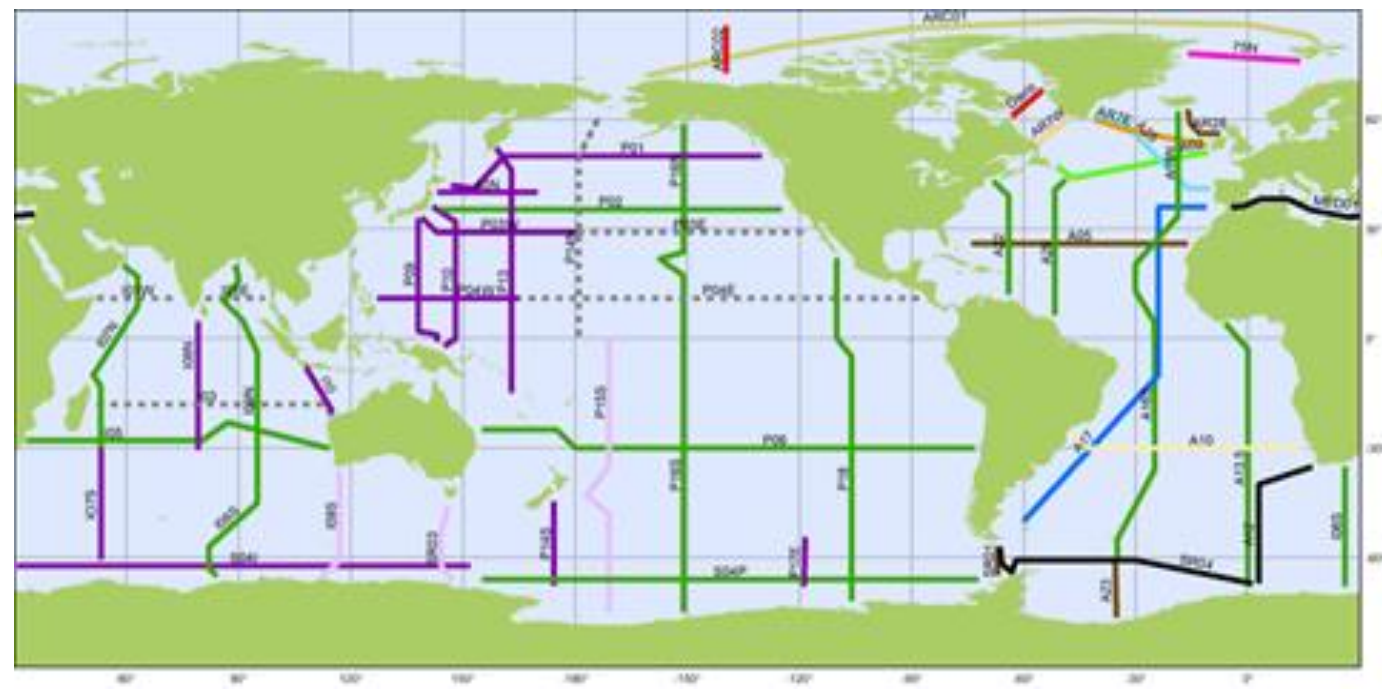
A multi-platform approach is needed to deliver to Essential Climate Variable at the required range of scales and accuracy.

Argo Float Mission Profiles

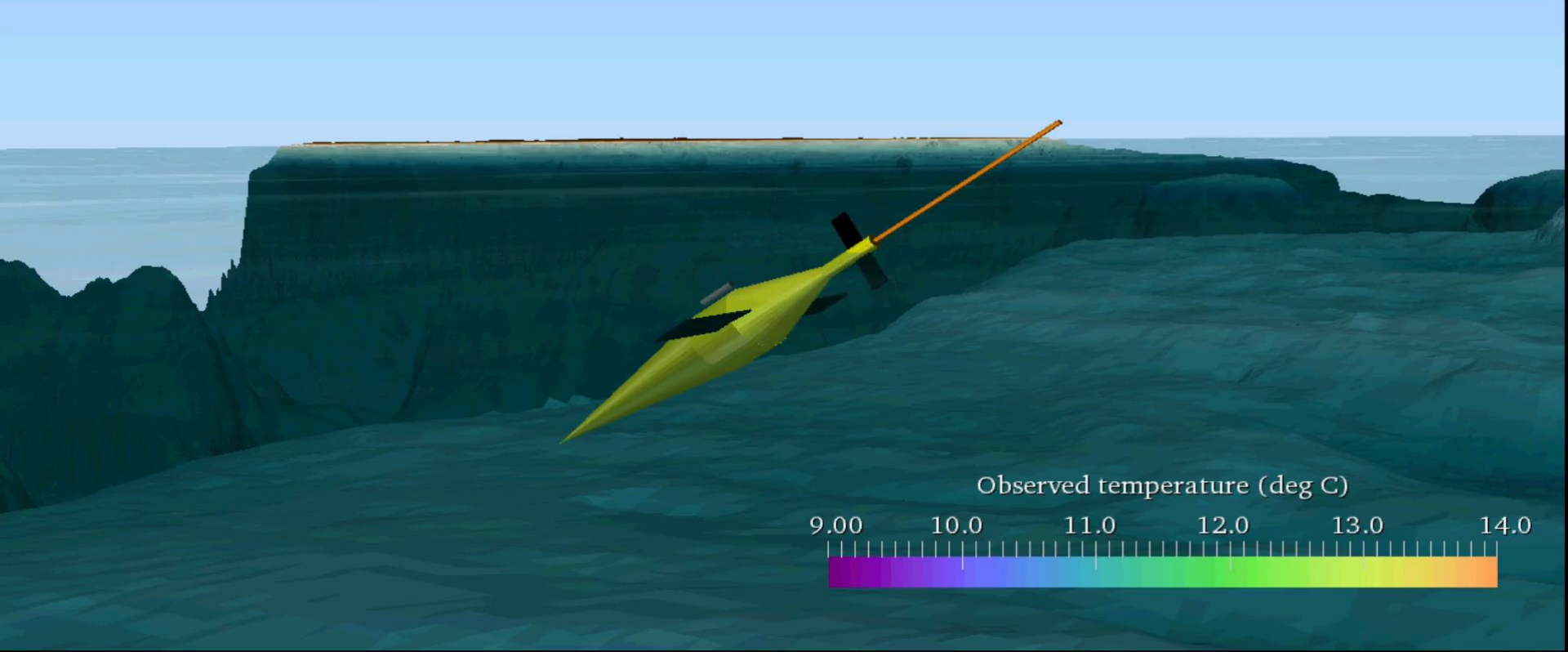




Global Argo
Float
Network
(2003 →)

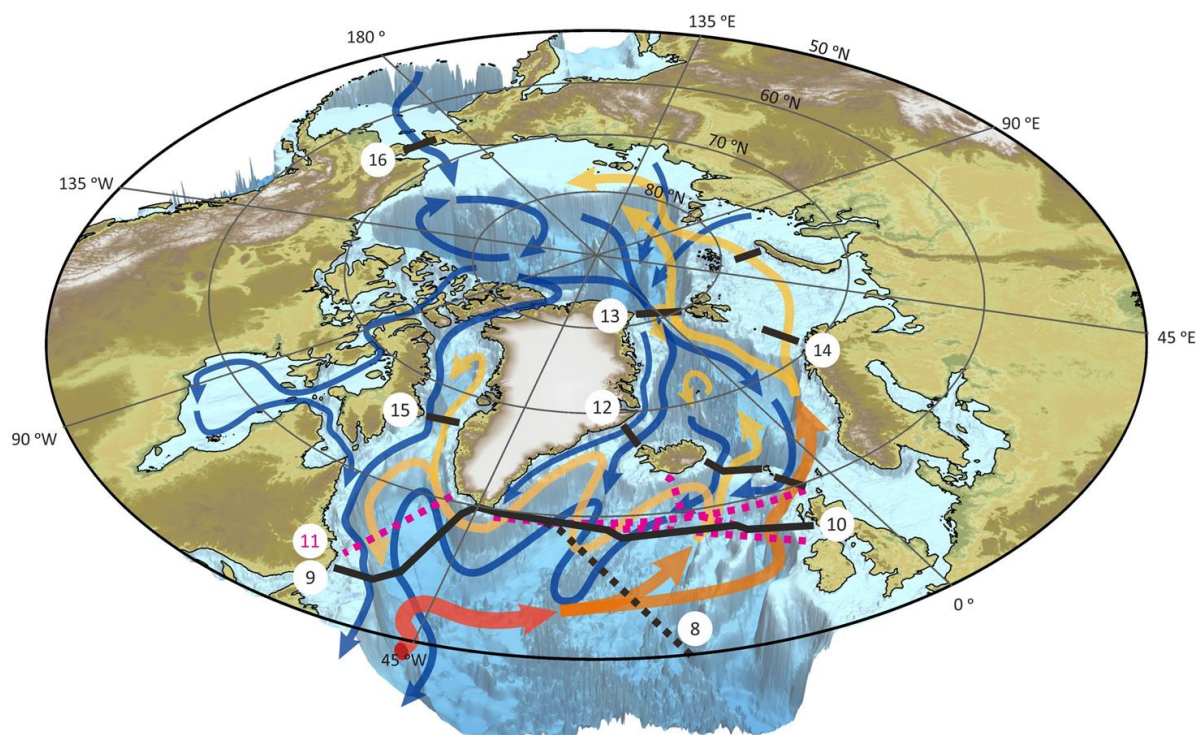
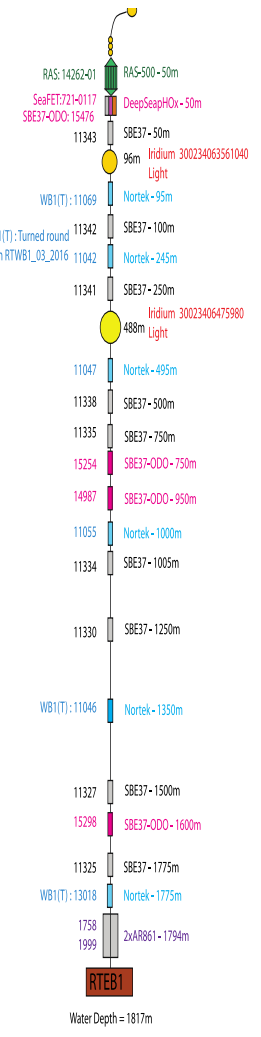
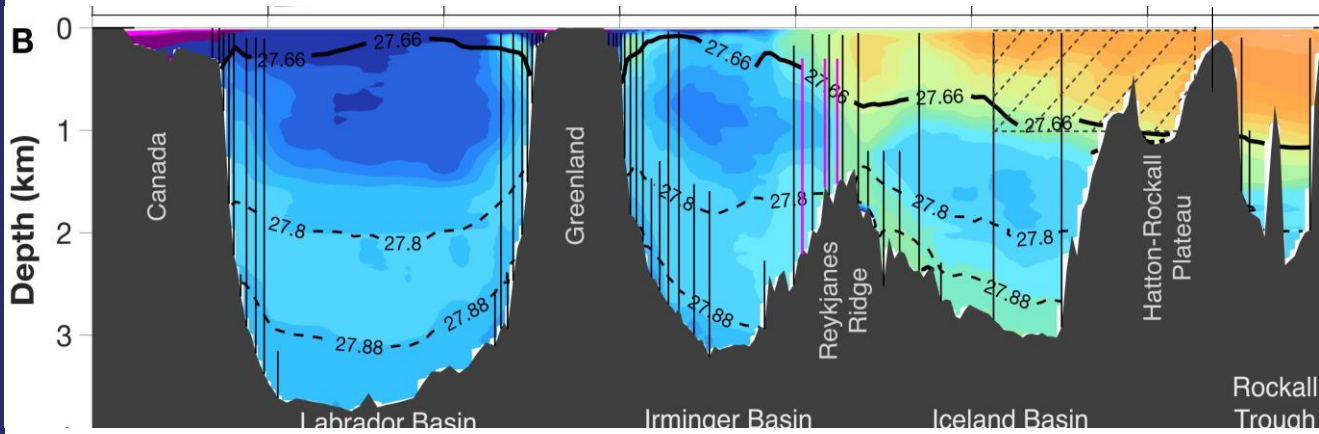


Global
Ocean
Research
Ship Hydro-
graphic
Programme



SAMS Glider Team

Mooring Programmes



A typical deep-ocean mooring

Climate Predictions – how will the North Atlantic change over the next few years

Prof. Noel Keenlyside

University of Bergen, Bjerknes Centre for Climate Research

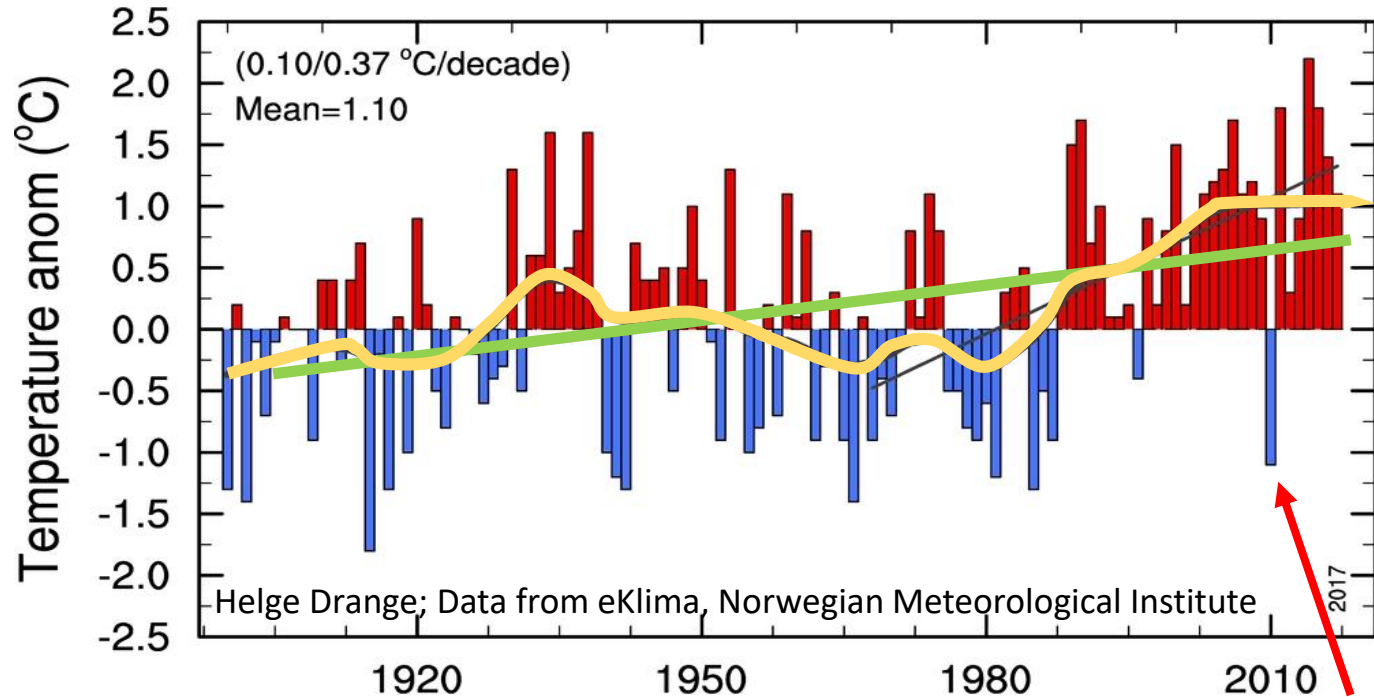


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Noel.Keenlyside@gfi.uib.no

The different types of climate prediction

Annual mean temperature for Norway as deviations to the long-term mean



Long-term trend
caused mainly by
global warming

IPCC

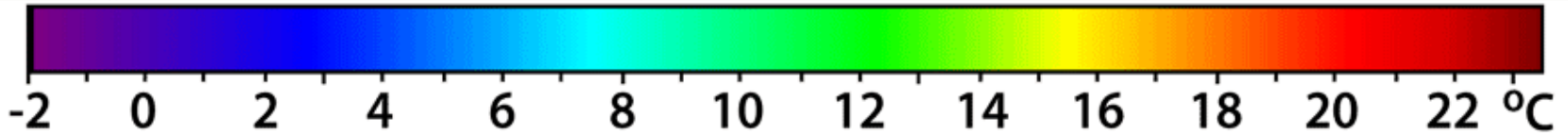
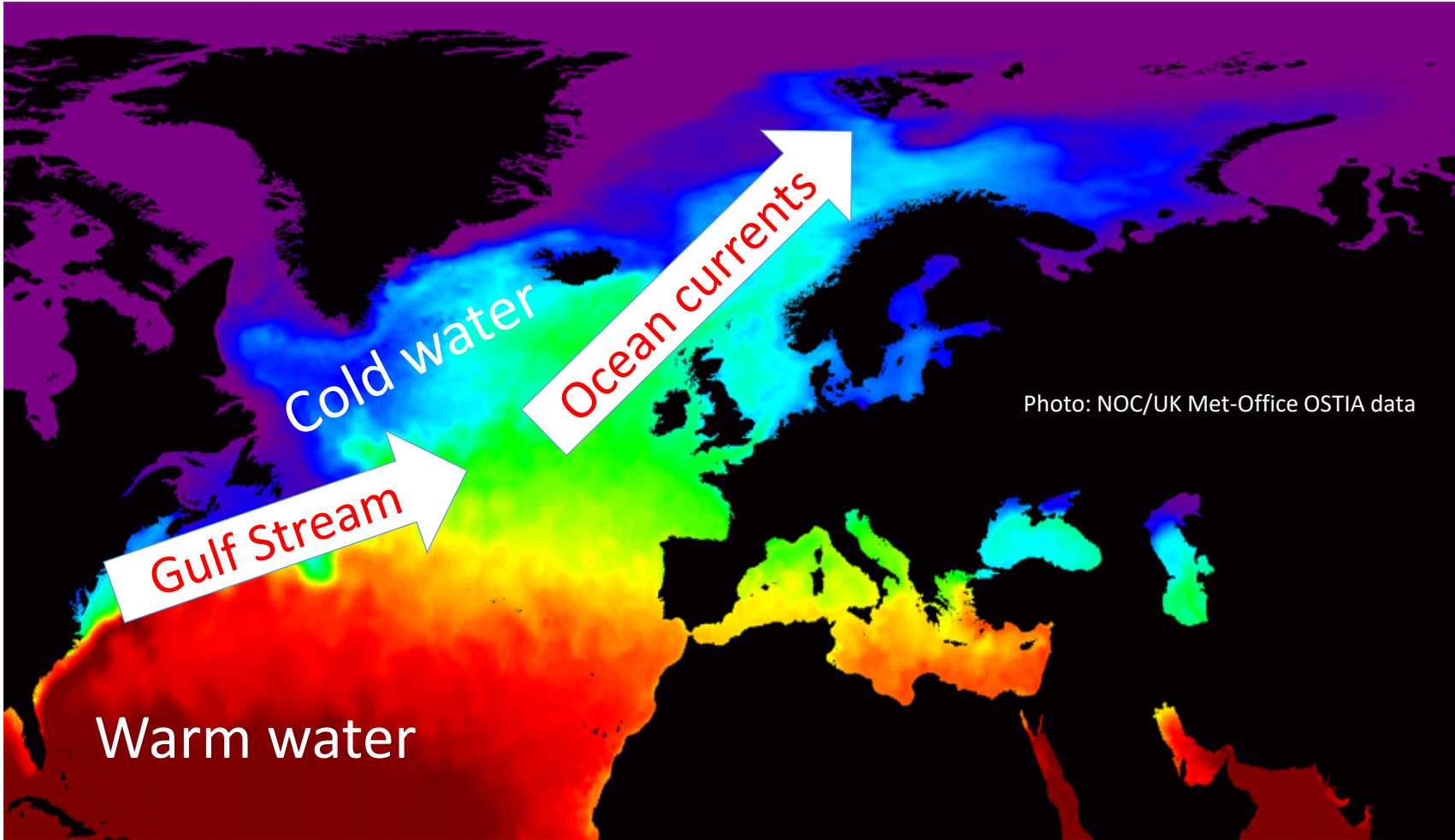
Decade to decade
changes caused by
both natural and
anthropogenic factors

Decadal prediction

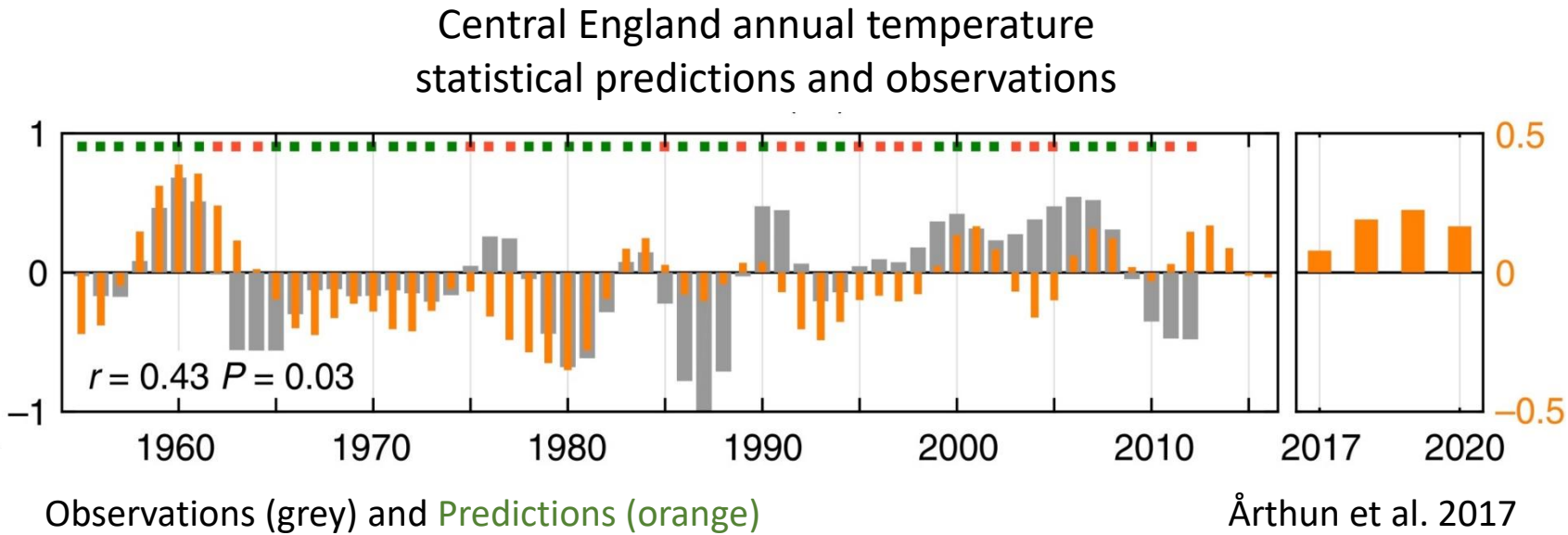
Year to year fluctuations
caused by natural
processes in the climate
system

Seasonal prediction

Ocean currents transport heat to high-latitudes influencing the climate



Ocean currents transport heat to high-latitudes influencing the climate



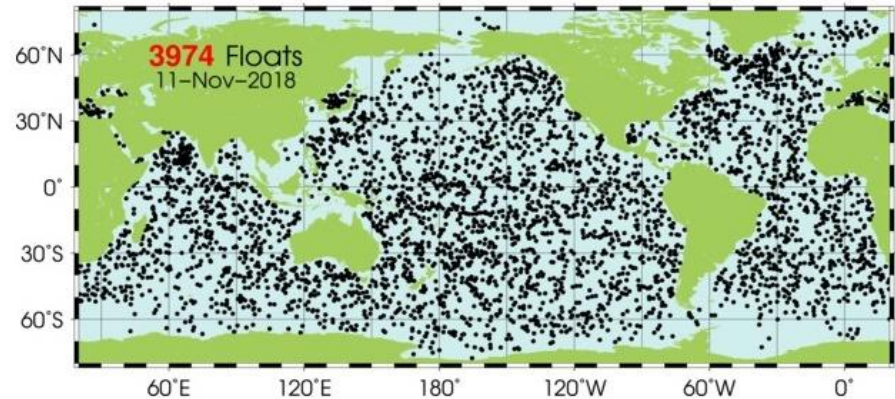
Elements of a numerical climate prediction

Comprehensive numerical models



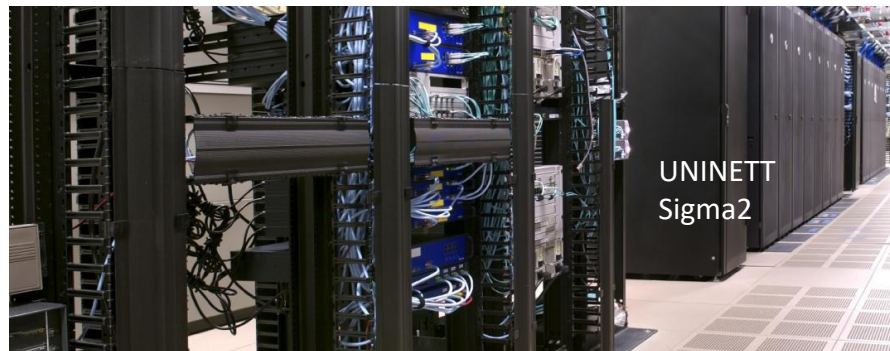
Image source: [NOAA](http://www.noaa.gov).

Detailed climate observations



<http://www.argo.ucsd.edu>

Powerful super computers

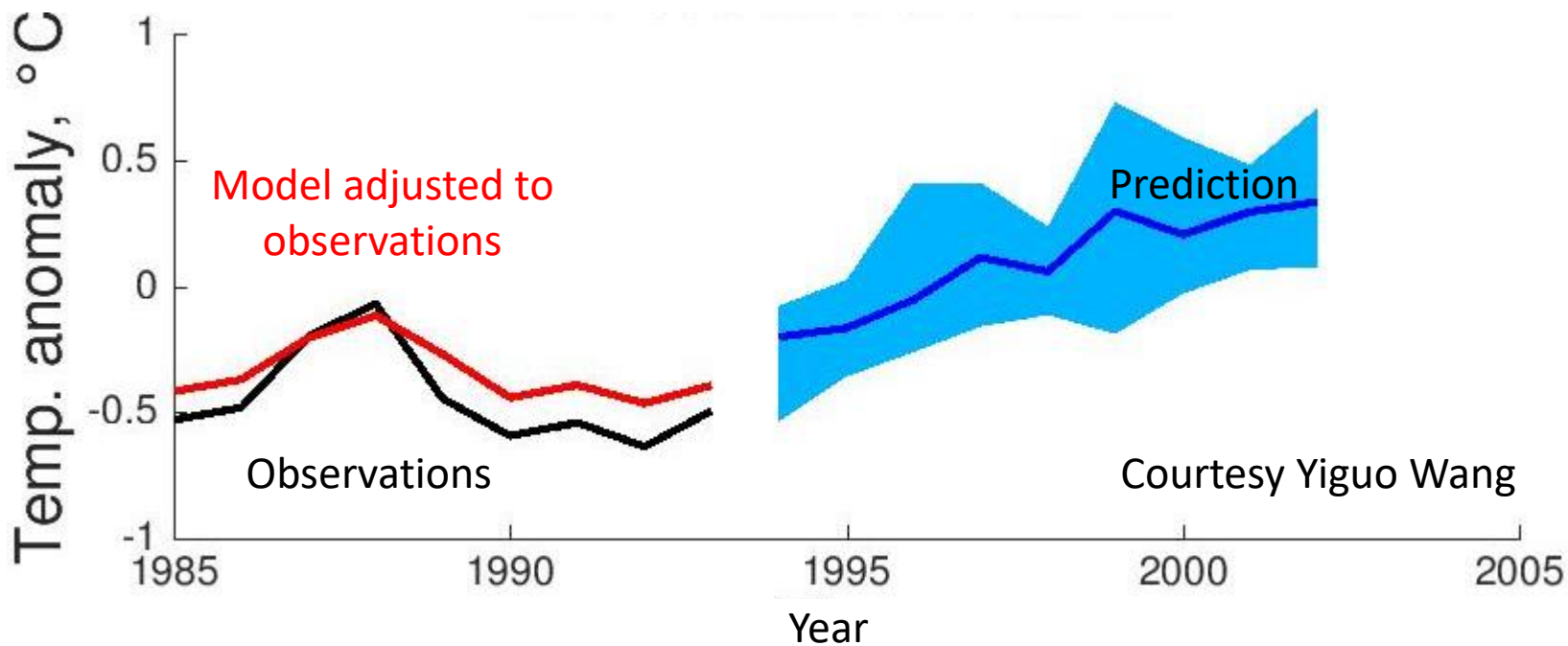


We can predict the North Atlantic

with advanced models and data assimilation techniques

Results from the Norwegian Climate Prediction Model

Prediction of North Atlantic Sea Surface Temperature, starting in October 1993



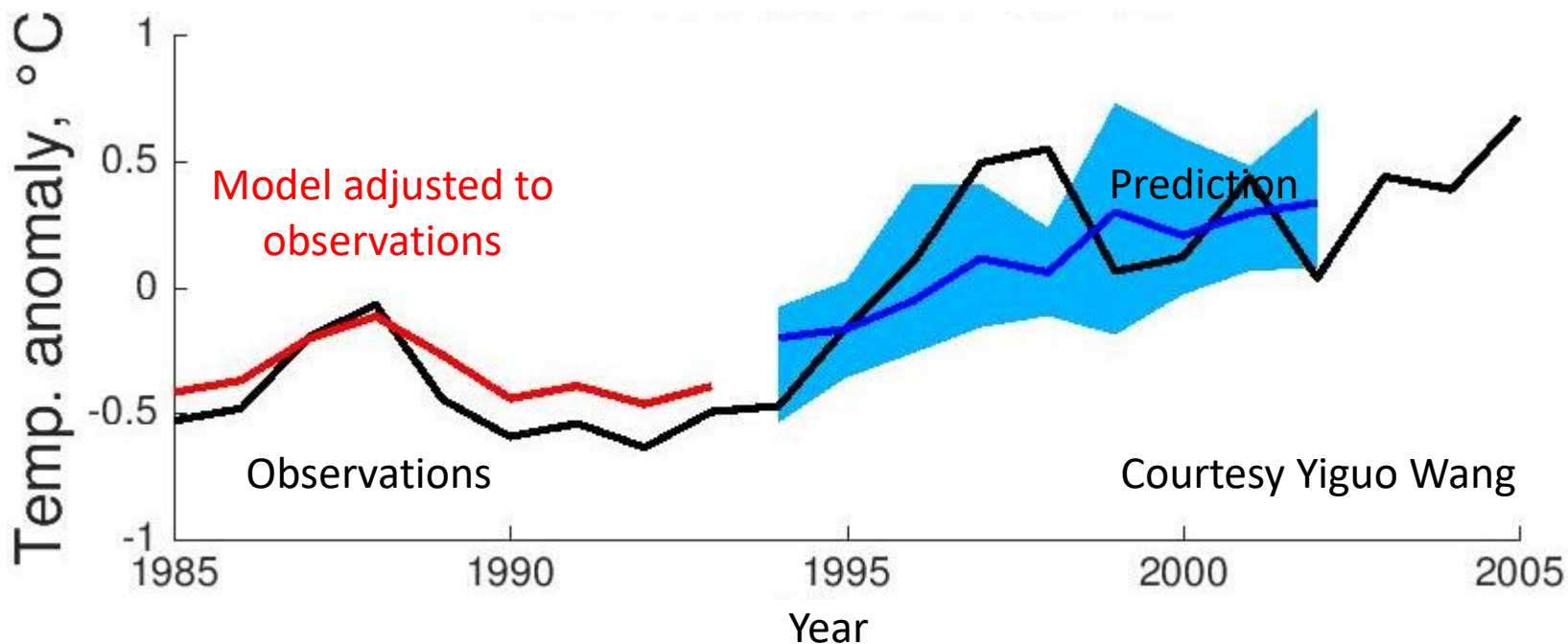
Courtesy Yiguo Wang

We can predict the North Atlantic

with advanced models and data assimilation techniques

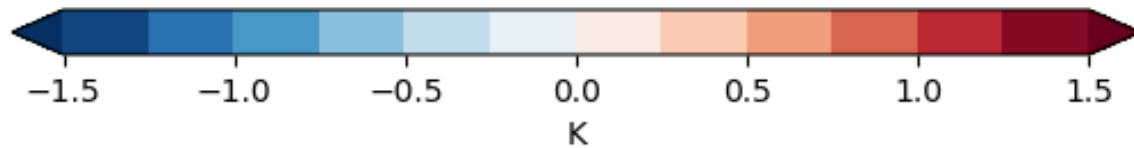
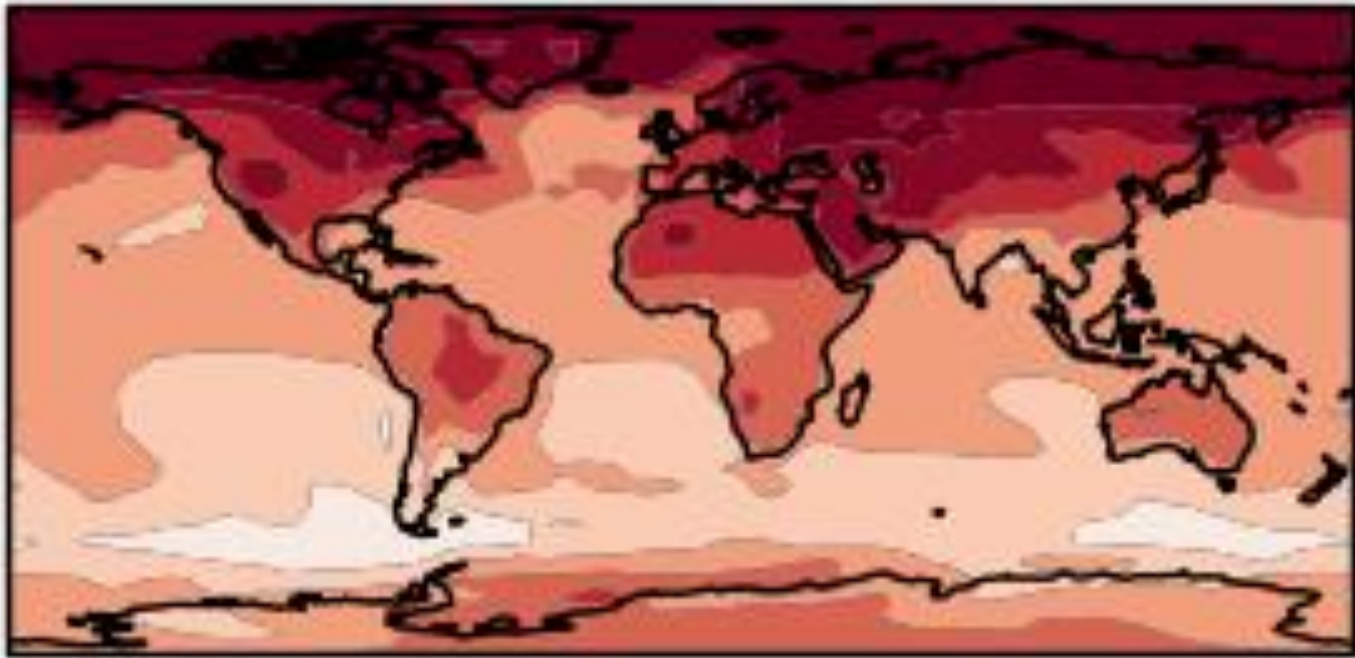
Results from the Norwegian Climate Prediction Model

Prediction of North Atlantic Sea Surface Temperature, starting in October 1993



Experimental climate predictions are available

Prediction of surface temperature for the 2019-2023



Climate Services and Fish Forecasts

Dr. Mark R. Payne

Technical University of Denmark



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Climate
Services



BLUE ACTION



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INTERNATIONALT 0 JUL 2012 19:00:03
Lagmand: Sildeboykot ka koste tusindvis af danske
...erne advarer: En fiskerikonflikt med EU kan påvirke
...abet.

y nordisk

Danmark vobde

THE WALL STREET JOURNAL.

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3 February 2013 Last updated at 18:29 GMT

Iceland goes it alone on mackerel quota

The Icelandic government has announced that it is lowering its mackerel fishing quota for 2013 by 15%.

It said the move is part of the country's commitment to the "long-term sustainability" of stocks.

The European Commission has said it "regrets" Iceland's announcement of a unilateral quota.



The European Commission said it is still seeking a multilateral agreement on mackerel

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1 of 12
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Names New Pr...

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Faroe Islands

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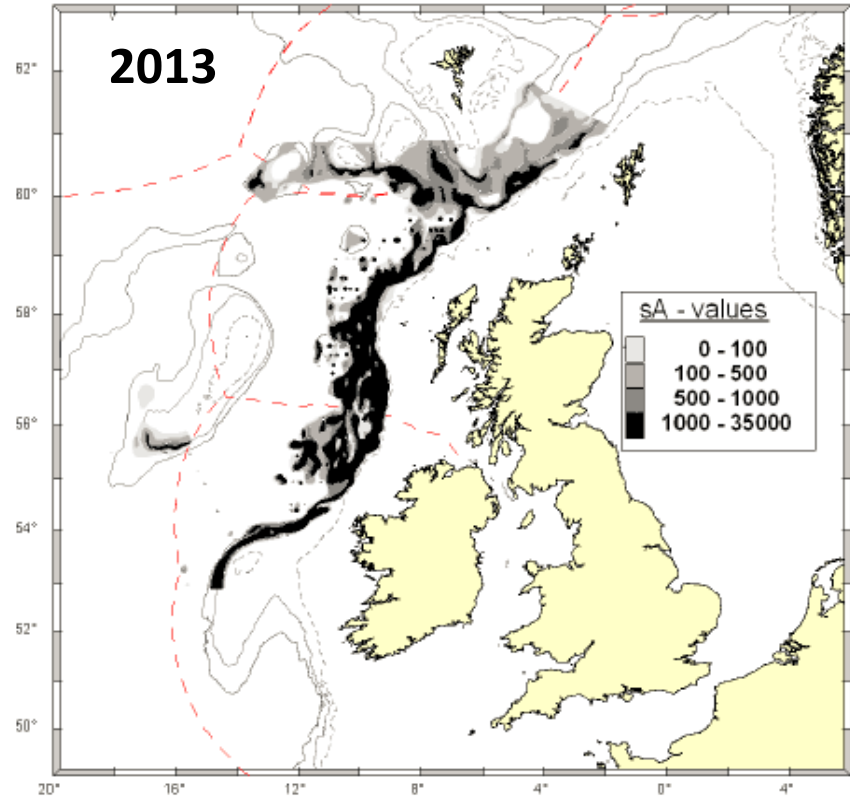
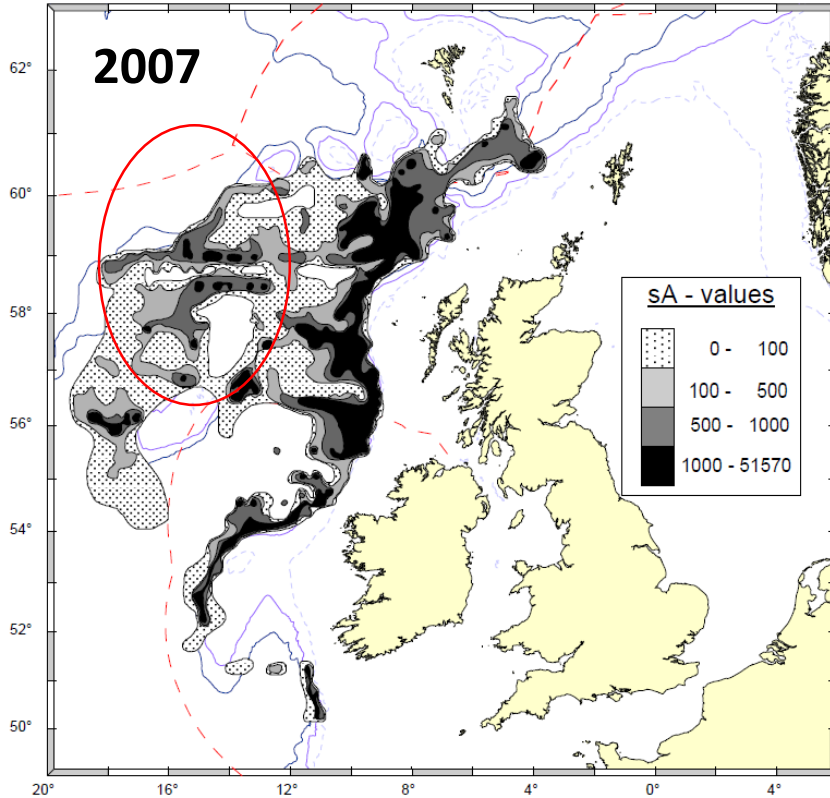
Blue whiting



Observed distribution of blue whiting

Expanded distribution

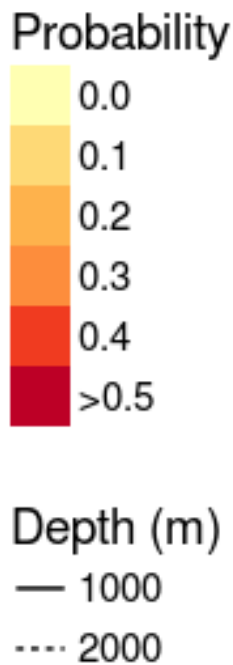
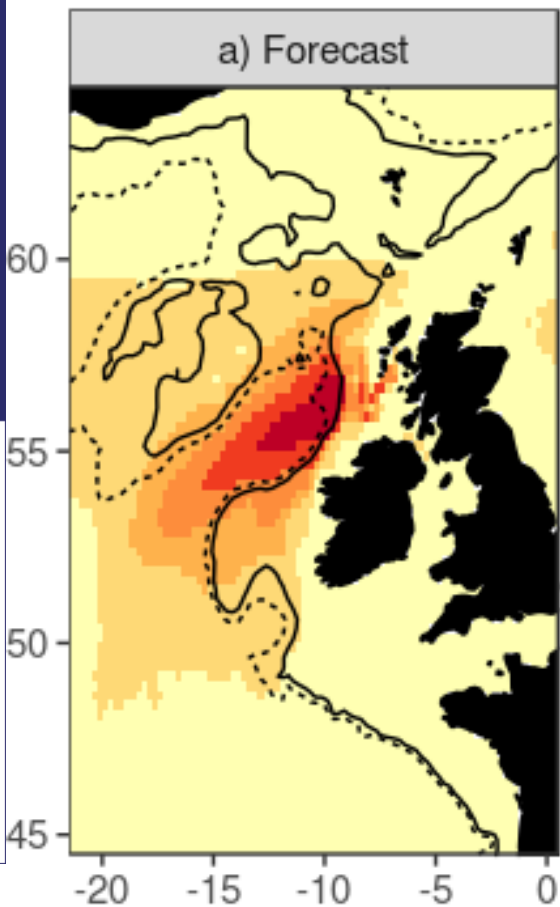
Compacted distribution



Warm & Saline

Cold & Fresh

Forecast blue whiting distribution for March 2020 (Issued Sep 2019)



Forecast Habitat, 2019

Habitat compacted against shelf edge

Little / no spawning on Rockall plateau

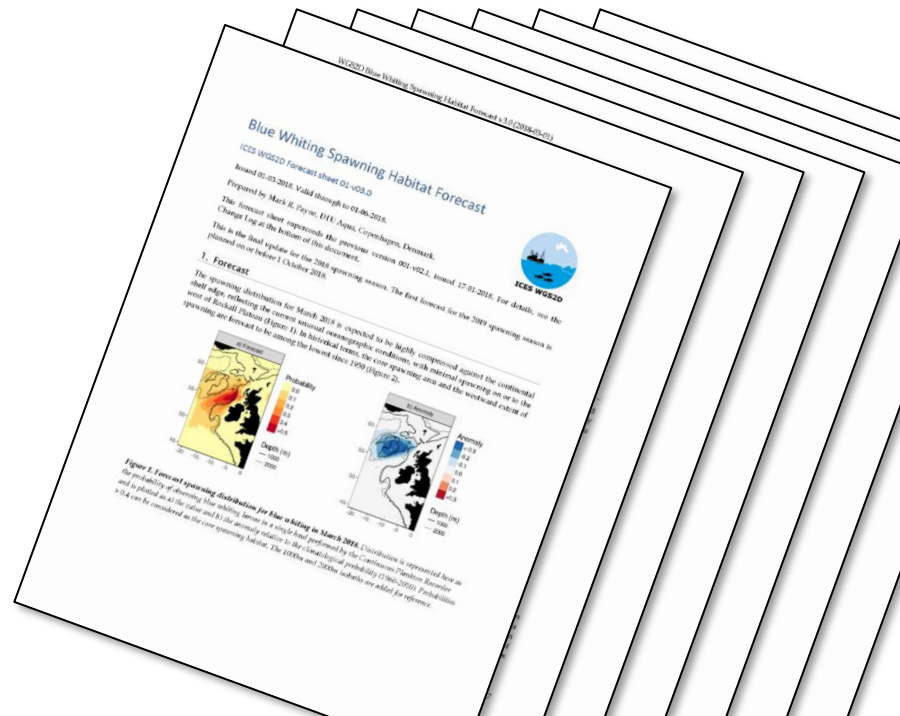
Probability

Depth (m)

Blue Whiting Forecast, 2019

Mark R Payne (@MarkPayneAtWork)

<http://fishforecasts.dtu.dk>



Take-home messages and perspectives



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The scientific community has tools to meet the challenge of the climate emergency

Long-term sustained observations are critical for understanding and monitoring the Ocean

Climate predictions provide a reliable outlook on conditions in years to come

Climate services translate these into valuable and actionable knowledge for citizens, businesses, NGOs and government





Project Coordinators: Steffen M. Olsen, Danish Meteorological Institute, smo@dmi.dk and Daniela Matei, Max Planck Institute for Meteorology, daniela.matei@mpimet.mpg.de

Project manager: Chiara Bearzotti, Danish Meteorological Institute, chb@dmi.dk

Dissemination, Communication, Engagement lead: Hannah Grist , SRSL, Hannah.Grist@srsl.com



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Questions



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