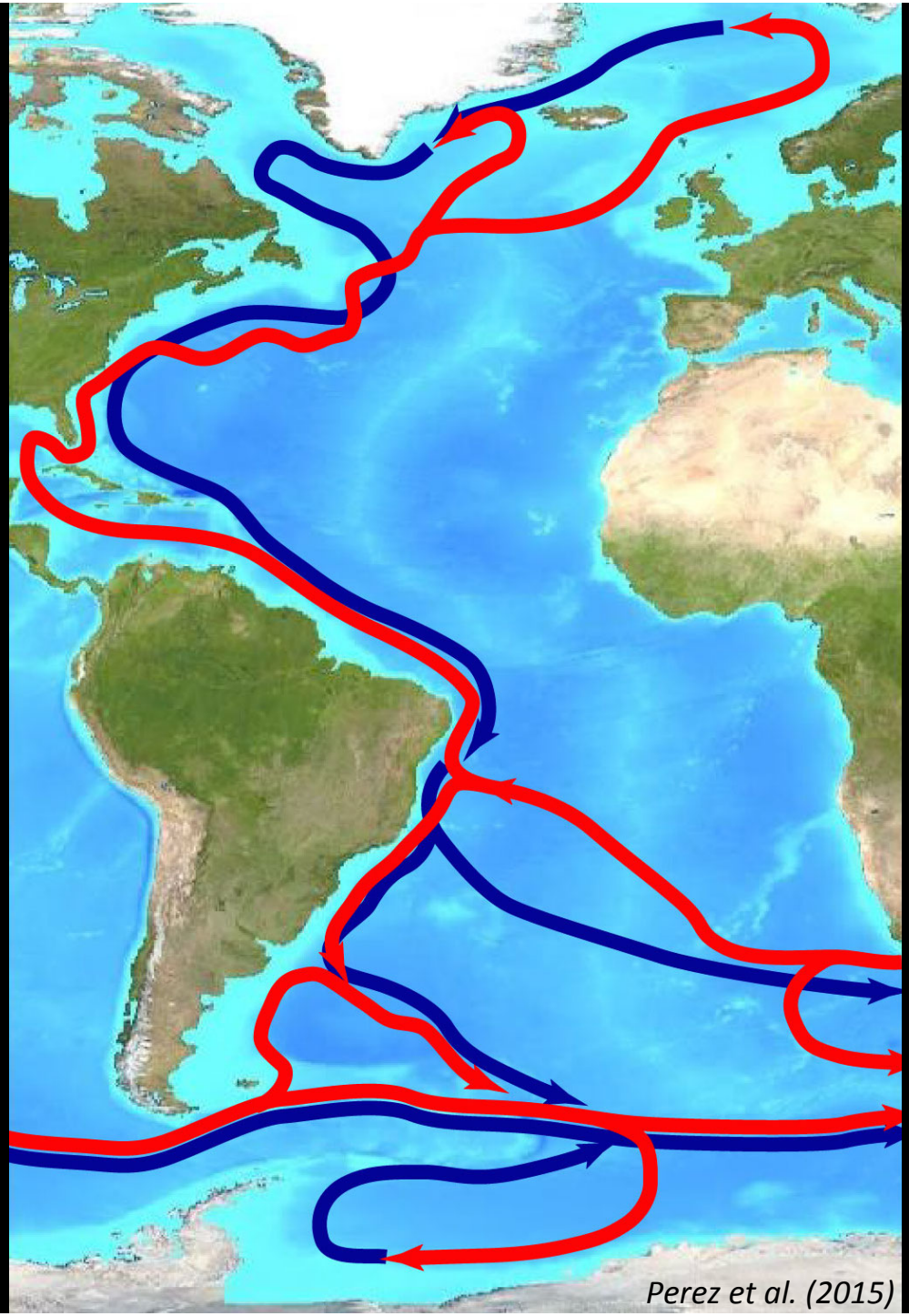
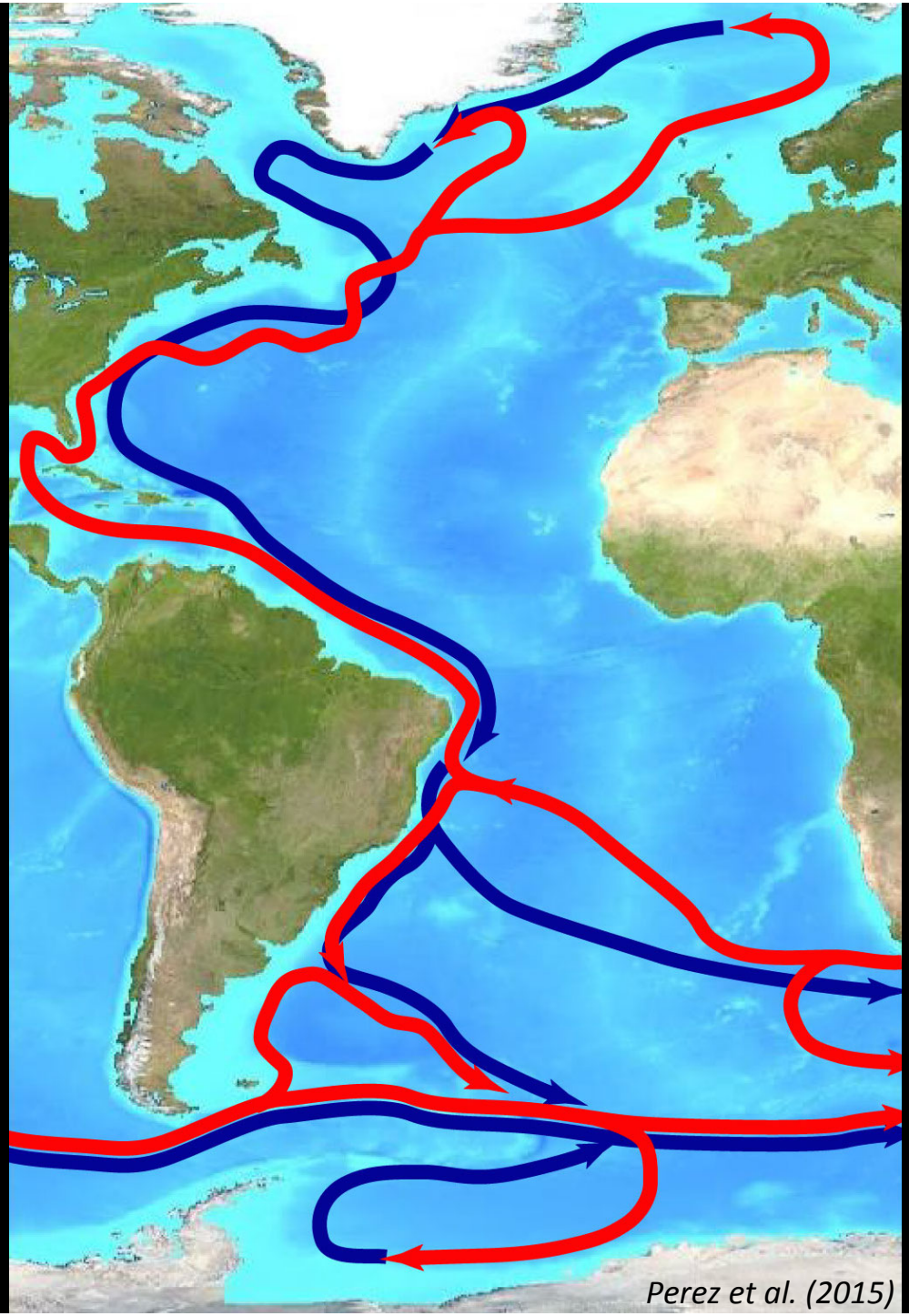


AMOC/AMO and AtlantOS Overview

Renellys C. Perez

Information/slides for this presentation obtained from G. Danabasoglu, M. Patterson, R. Weller, G. McCarthy, 2014 US AMOC Science Team Report, NCAR/UCAR Climate Data Guide



AMOC (or MOC)

Atlantic Meridional Overturning Circulation

AMO (or AMV)

Atlantic Multidecadal Oscillation

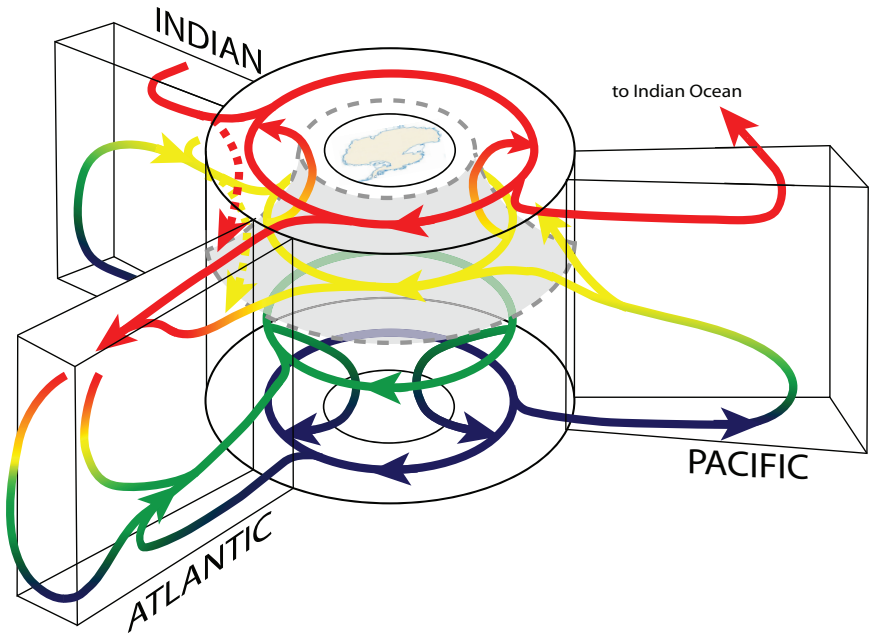
AtlantOS

Optimizing and Enhancing the Integrated Atlantic Ocean Observing System

Global MOC and AMOC

- Global MOC transfers water, heat, and salt northward and southward within individual ocean basins and between all of the ocean basins, playing a major role in global and regional heat and salt budgets.

- AMOC can be characterized as a vertical and north-south circulation cell with cold, dense water moving southward at depth and warm, light waters moving northward near the surface.



Schematic of the global MOC, showing how the large-scale motion of warm upper water (red), cooler subsurface water (yellow, green), and cold deep water (blue) connect into a global conveyor belt (*Perez et al. 2015, MTSJ, created by R. Lumpkin*).

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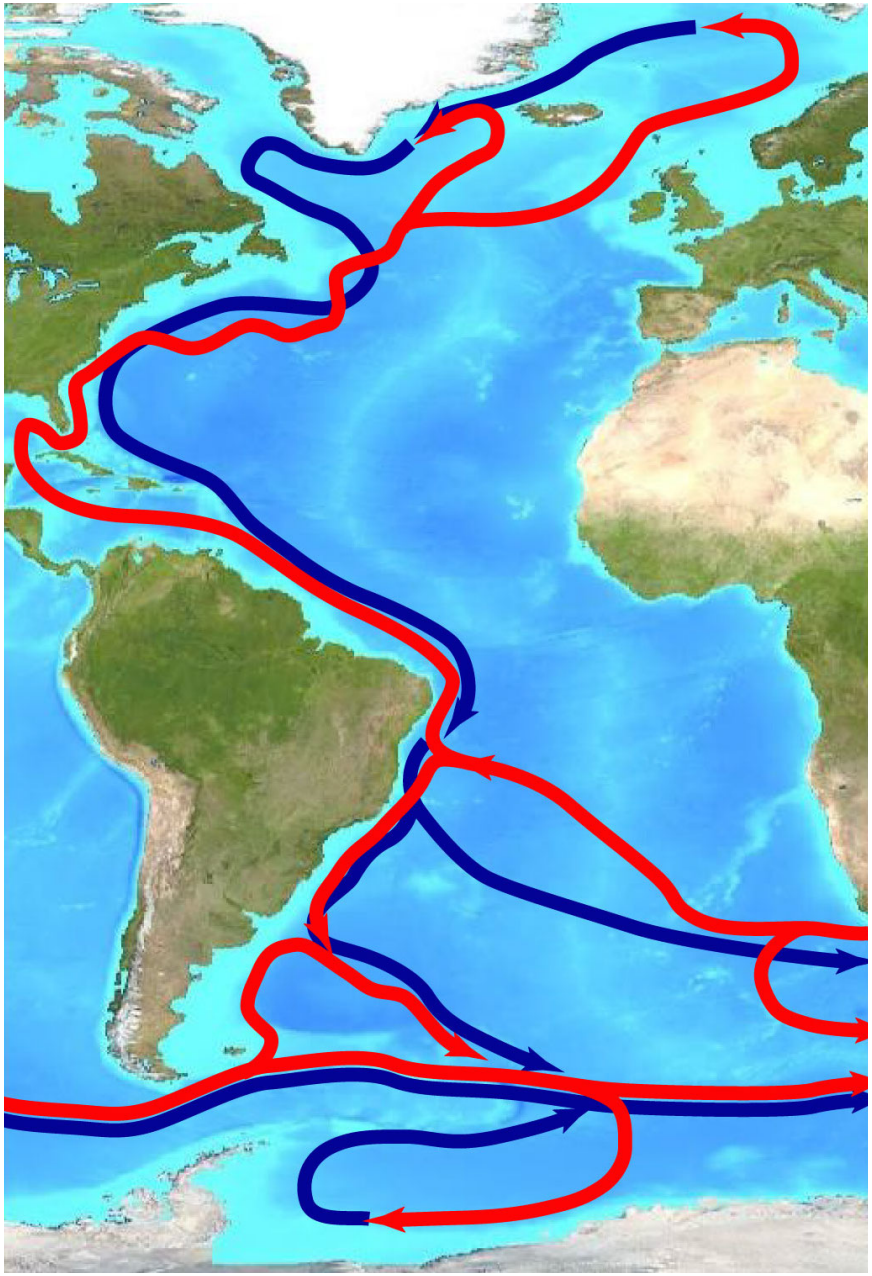

Idealized schematic of the main AMOC cell (*Perez et al. 2015, MTSJ, created by R. Lumpkin*).

Global MOC and AMOC

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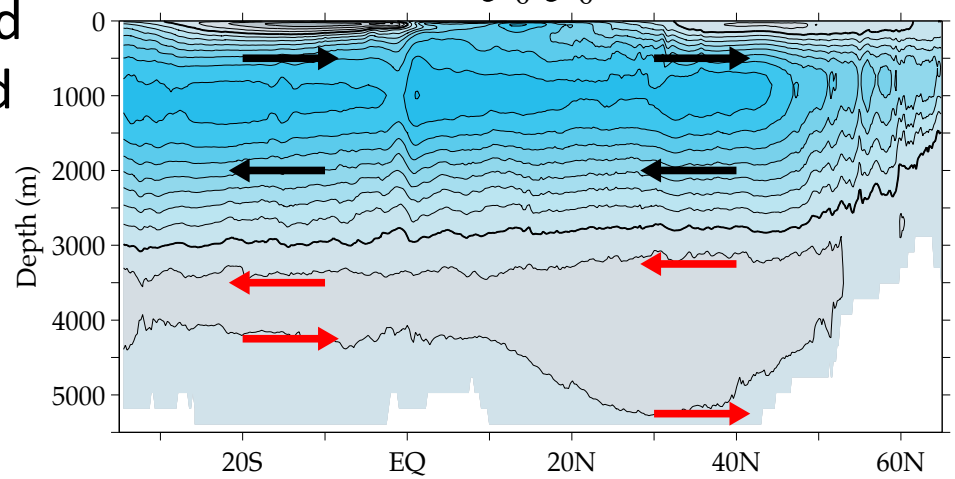
- AMOC can be characterized as a vertical and north-south circulation cell with cold, dense water moving southward at depth and warm, light waters moving northward near the surface.

$$MOC = \max \int_0^z \int_0^L \vec{v}(x,z)\,dx\,dz$$



Mean volume of water transported by the AMOC in a high-resolution NOAA/GFDL coupled climate simulation (CM2.5). Black arrows indicate the direction of the flow in the main AMOC cell (*Perez et al. 2015, MTSJ).*

AMOC: Broader impacts

- AMOC can have a pronounced impact on a variety of socially important climate phenomena, including sea level, Atlantic hurricane activity, precipitation, and air temperature variability over North America and Western Europe, and changes in African and Indian monsoon rainfall

- Quantifying and understanding how the AMOC changes over time is therefore crucial for improving our knowledge of how the climate system functions and for helping society assess future climate change.

- Achieving a more complete understanding of the behavior of the AMOC system requires a comprehensive observational network that spans the entire Atlantic Ocean.

U.S. AMOC Science Team

www.usclivar.org/amoc

An U.S. inter-agency program

Slides from Gokhan Danabasoglu's US AMOC Webinar

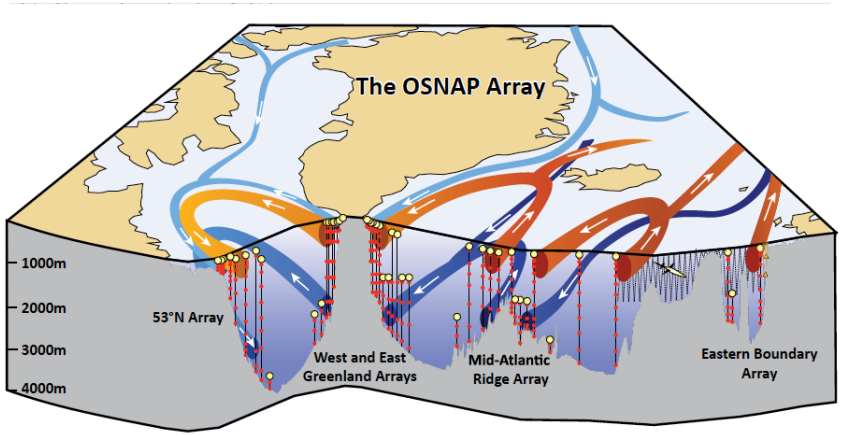
NASA Earth Science Division
Satellite data analyses, modeling and space-based observations

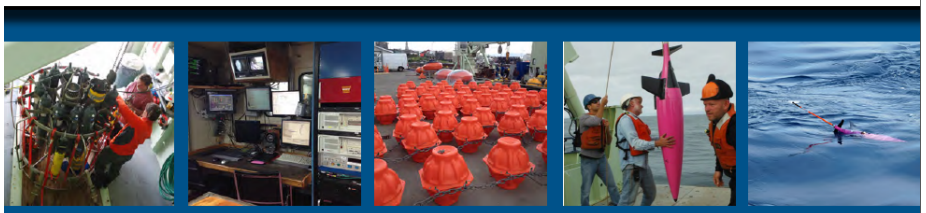
NOAA Climate Program Office
Observing systems, monitoring, climate modeling

NSF Geosciences Program
Process studies, models, and observations

U.S. Department of Energy
Climate and process modeling, climate impacts

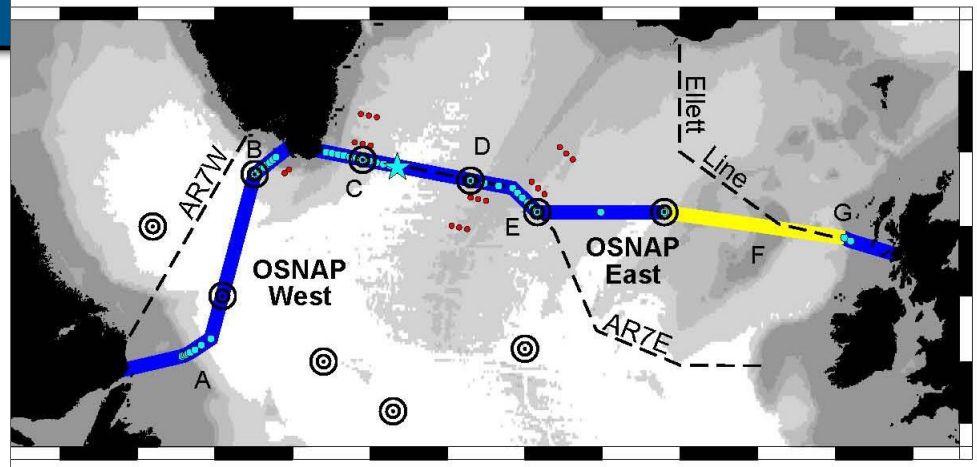
OSNAP: Overturning in the Subpolar North Atlantic





US CLIVAR Climate Variability & Predictability

2014 US AMOC SCIENCE TEAM ANNUAL REPORT ON PROGRESS AND PRIORITIES

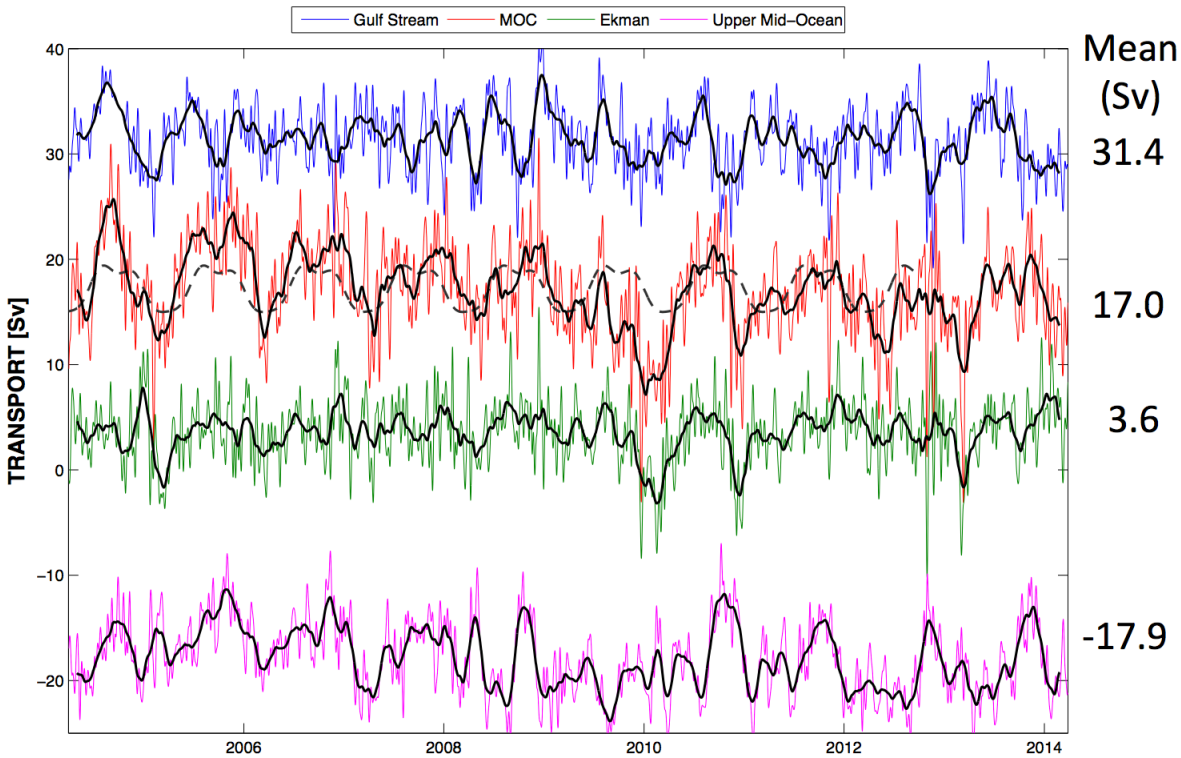


Lozier et al.

The specific OSNAP objectives are:

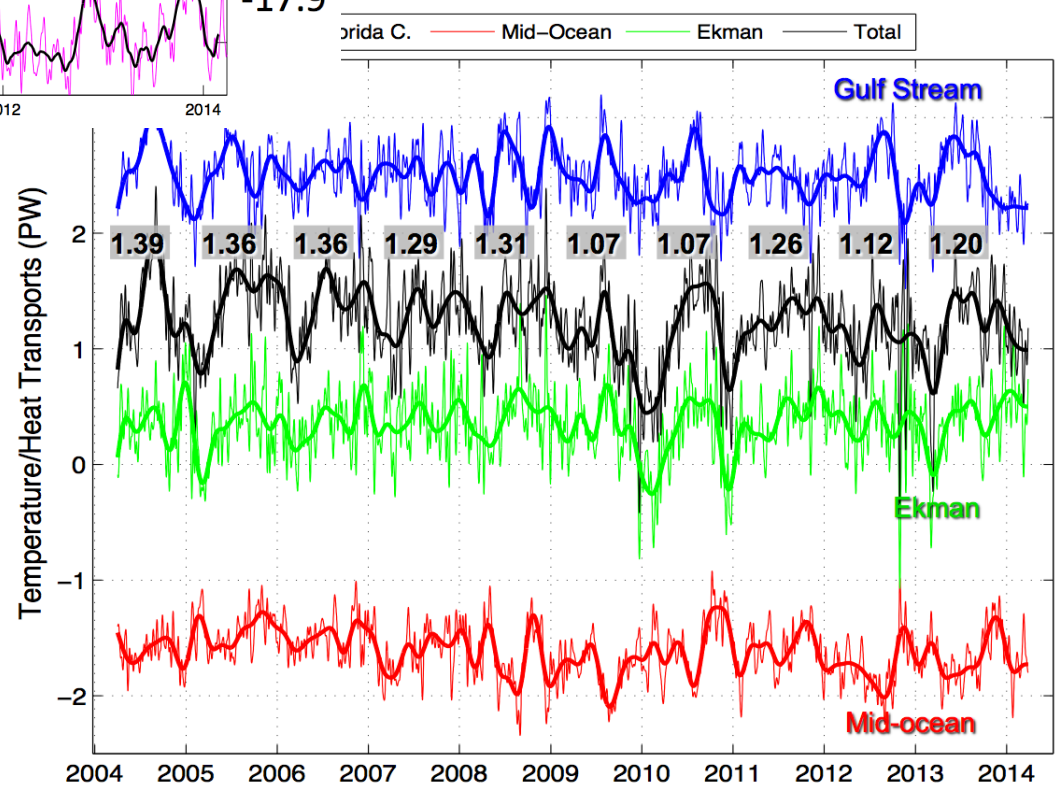
- Quantify the subpolar AMOC and its intra-seasonal to interannual variability via overturning metrics, including associated fluxes of heat and freshwater.
- Determine the pathways of overflow waters in the NASPG to investigate the connectivity of the deep boundary current system.
- Relate AMOC variability to deepwater mass variability and basin-scale wind forcing.
- Determine the nature and degree of the subpolar-subtropical AMOC connectivity.
- Determine from new OSNAP measurements the configuration of an optimally efficient long-term AMOC monitoring system in the NASPG.

The entire OSNAP observing system was deployed in summer 2014. The first data returns from the moored instrumentation are expected in summer 2015, although the data from the full array will not be recovered till summer 2016.



RAPID – MOCHA Array at 26.5°N

Smeed et al.

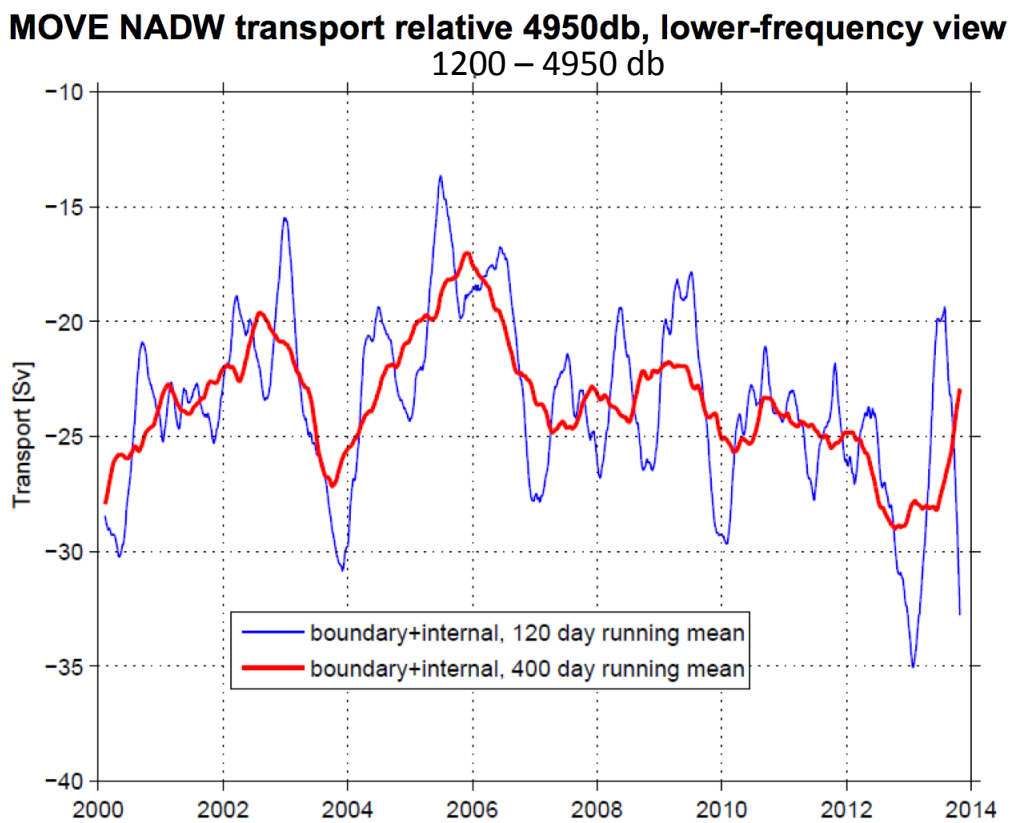


AMOC declines from 18.7 Sv (2004-2008) to 15.6 Sv (2009-2013). There is a corresponding reduction in the heat transport from 1.34 PW to 1.14 PW.

RAPID will continue at least through 2020.

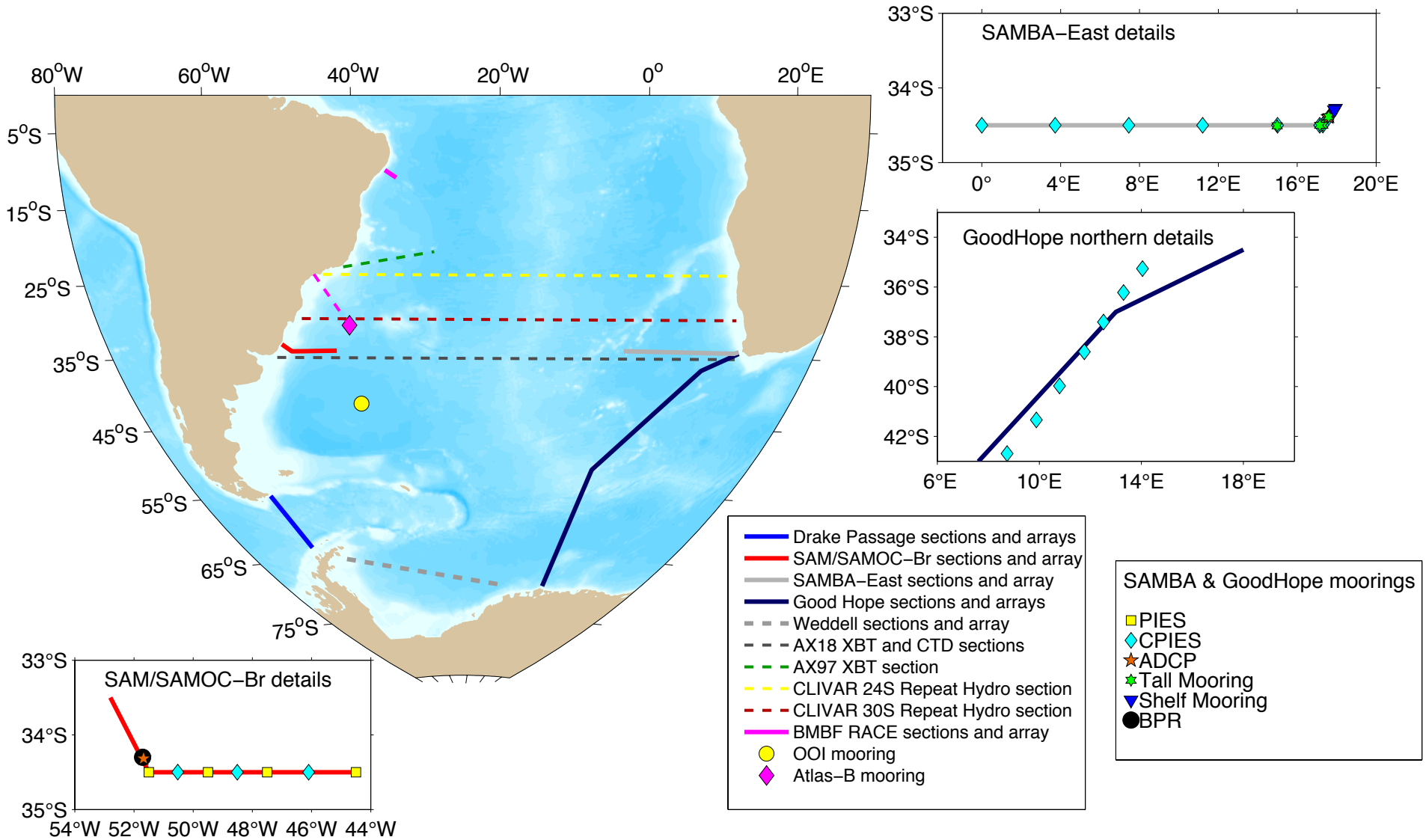
Johns et al.

MOVE: Meridional Overturning Variability Experiment (16°N)



Send et al.

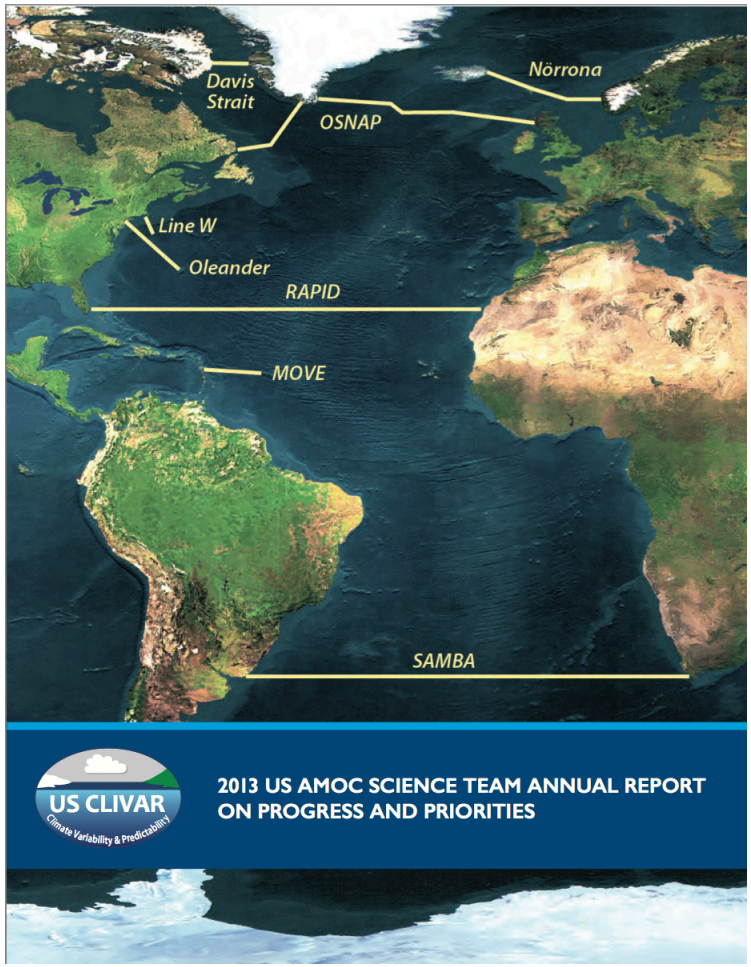
South Atlantic Meridional Overturning Circulation (SAMOC) and South Atlantic Moc Basin-wide Array (SAMBA, 34.5°S)

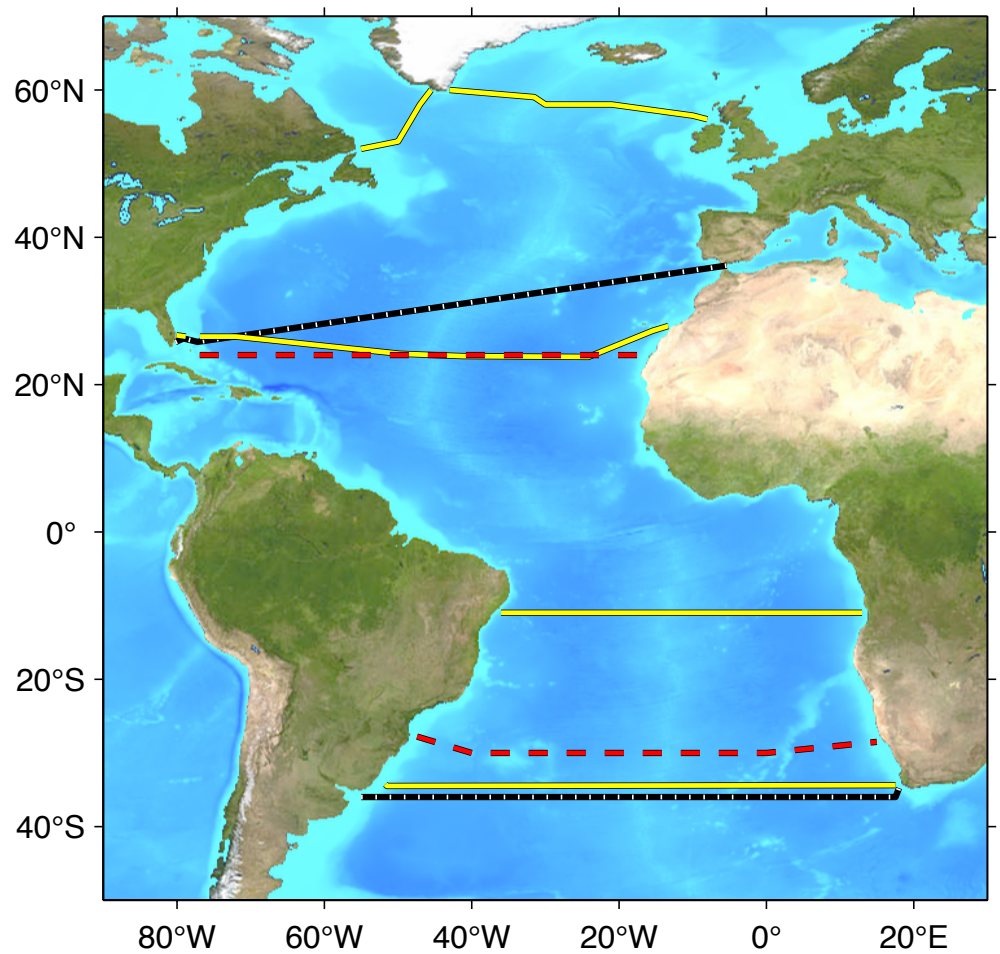


Meinen et al.

Western boundary pilot array 2009, western boundary augmented 2012-2013, Eastern boundary re-instrumented 2013-2014

AMOC observations
Several long-term (10+ years) and emerging records





Moored arrays

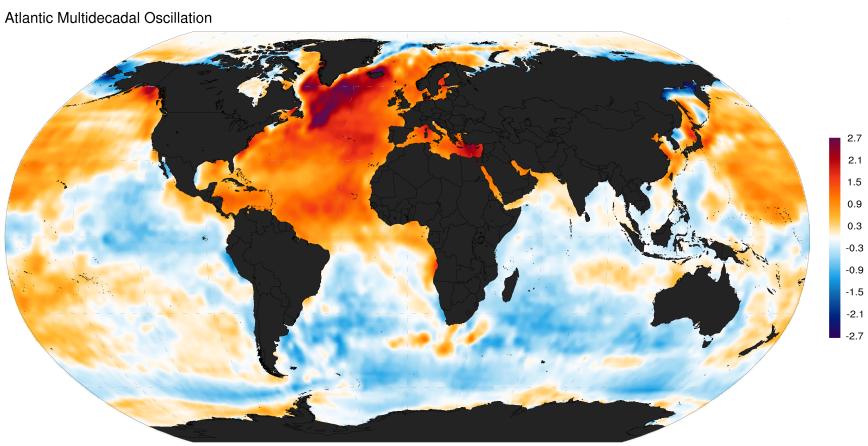
Trans-basin measurements

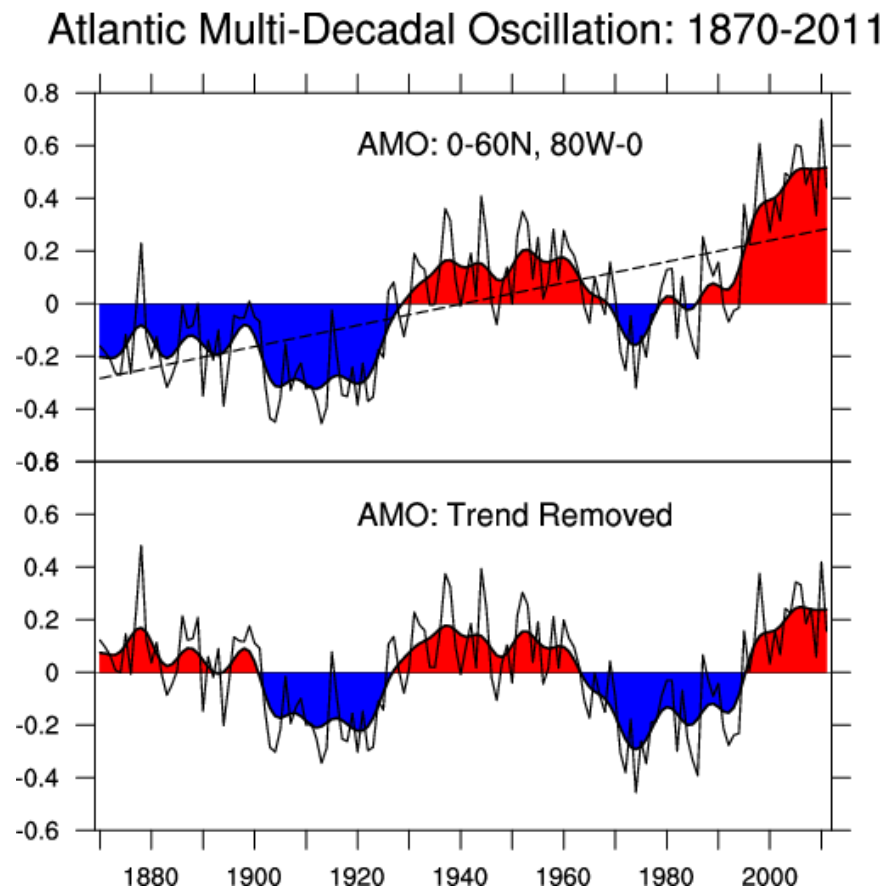
Can start to look at observed decadal variability and connection between NAO, AMO, AMOC as long-term observations become available

AMO = Atlantic Multidecadal Oscillation

- Index: Area weighted average SST over North Atlantic between 0°-60°N, 80°W-0°.

- Importance: Tracks long-duration changes in North Atlantic SST, warm and cool phases may last for 20-40 years.





AMO pattern and time series (Climate Data Guide, D. Shea).

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- Index: Area weighted average SST over North Atlantic between 0°-60°N, 80°W-0°.

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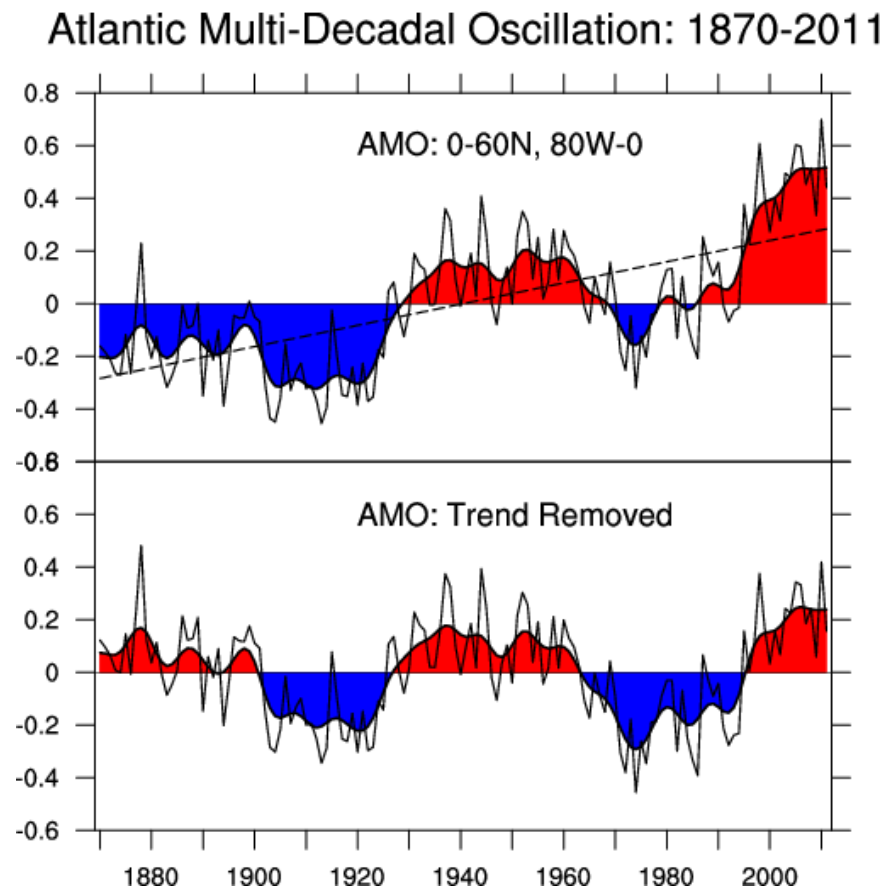
- Positive AMO: Drying over North America and Australia, wetting in the Indian monsoon region, increased Atlantic hurricane activity



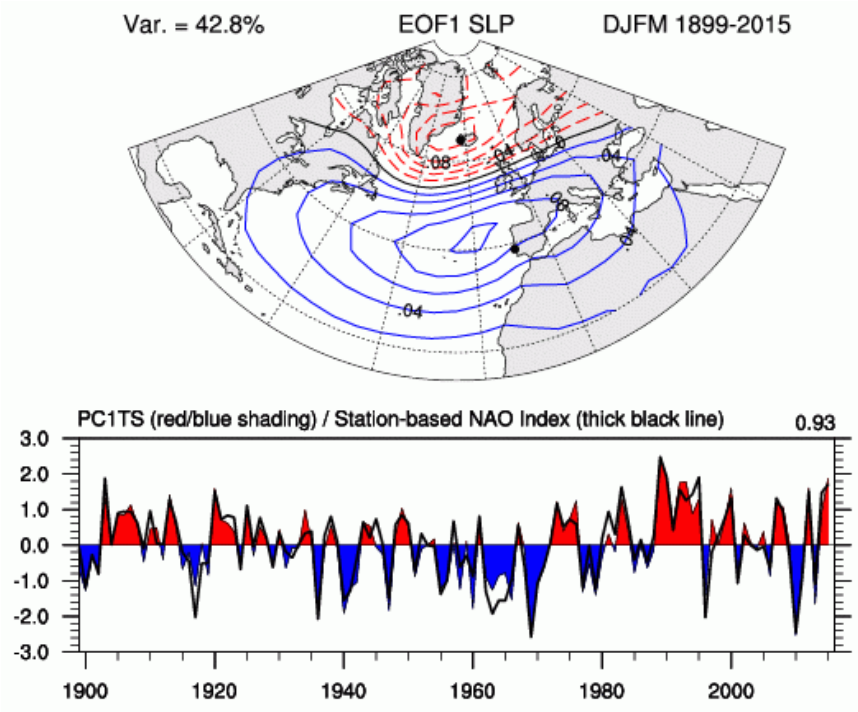
AMO pattern and time series (Climate Data Guide, D. Shea).

NAO = North Atlantic Oscillation

- Index: Hurrel Index - Principle component based index, leading EOF of sea level pressure (SLP) anomalies over North Atlantic sector 20°N-80°N, 90°W-40°E.

- Importance: Tracks year-to-year movements of Icelandic low and Azores high.

- Positive NAO = stronger than average westerlies over the middle latitudes, more intense weather and warmer temperatures over eastern US, wetter/milder weather over western Europe.



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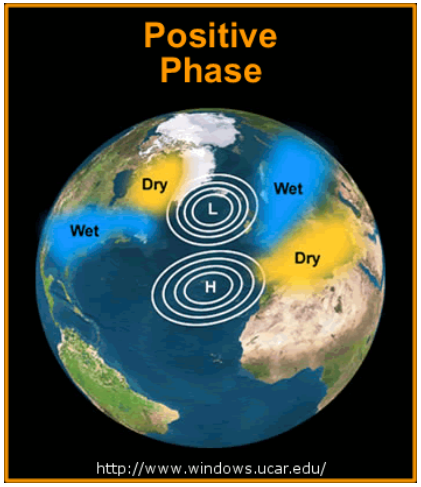
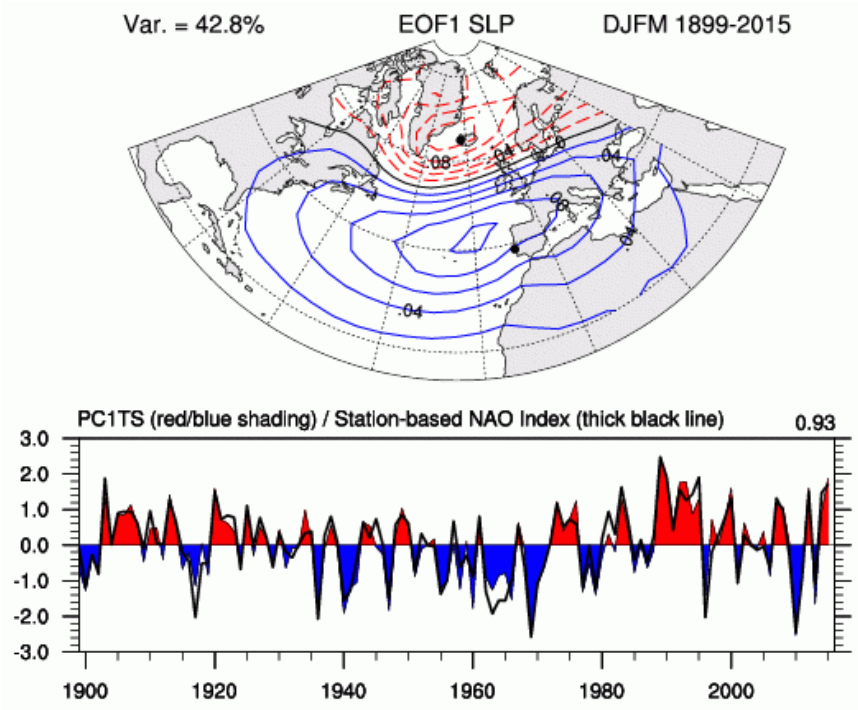


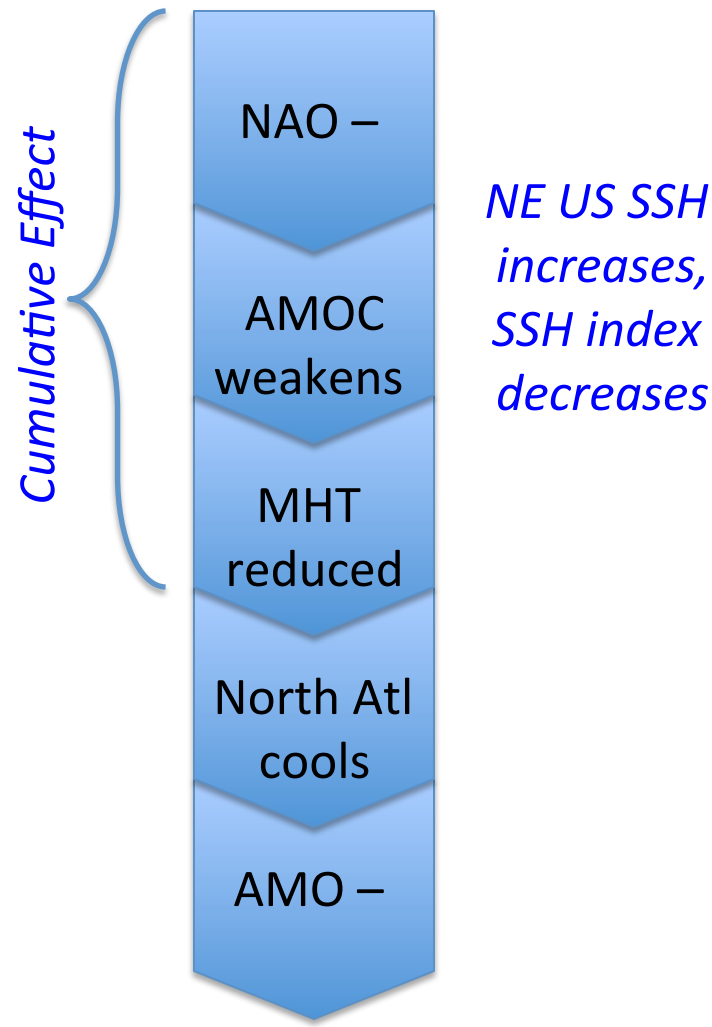


NAO pattern and time series (Climate Data Guide, A. Phillips)

AMO & NAO & AMOC?

- Model studies have suggested relationship between NAO, ocean circulation, and phase changes in AMO (e.g., Delworth and Mann, 2000)

- Recent paper uses tide gauge SSH observations to provide evidence of this link (e.g., McCarthy et al. 2015)



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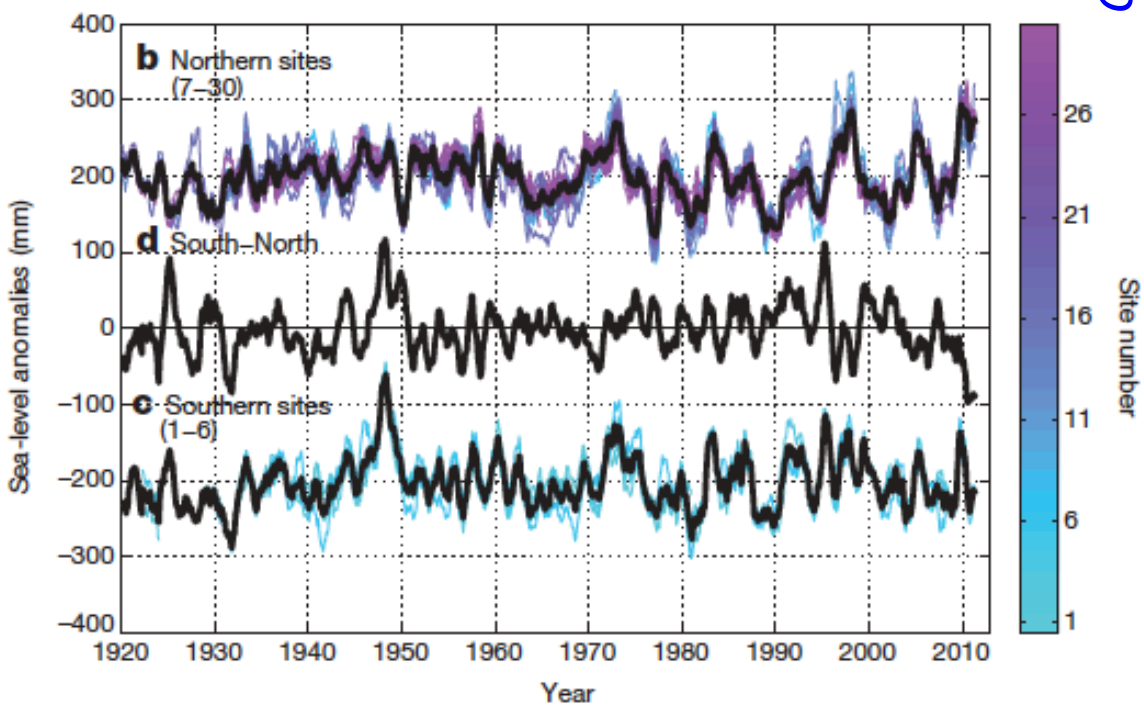
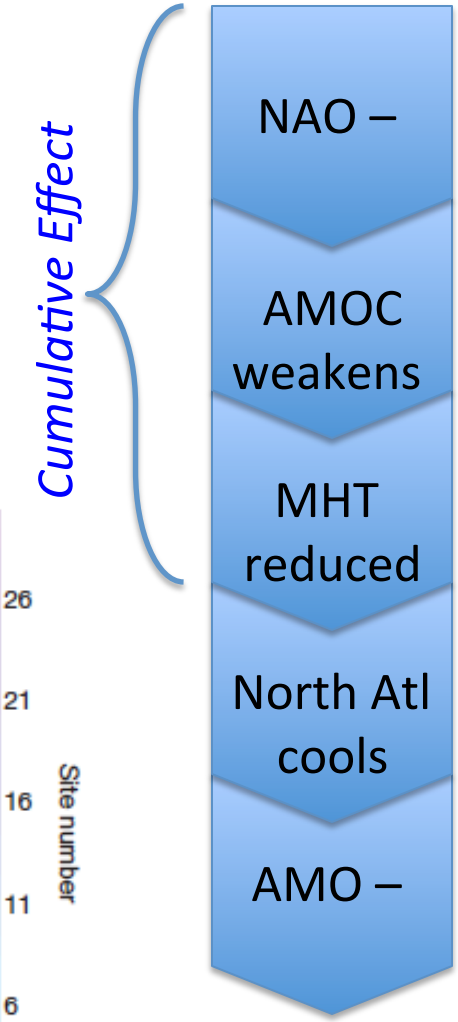
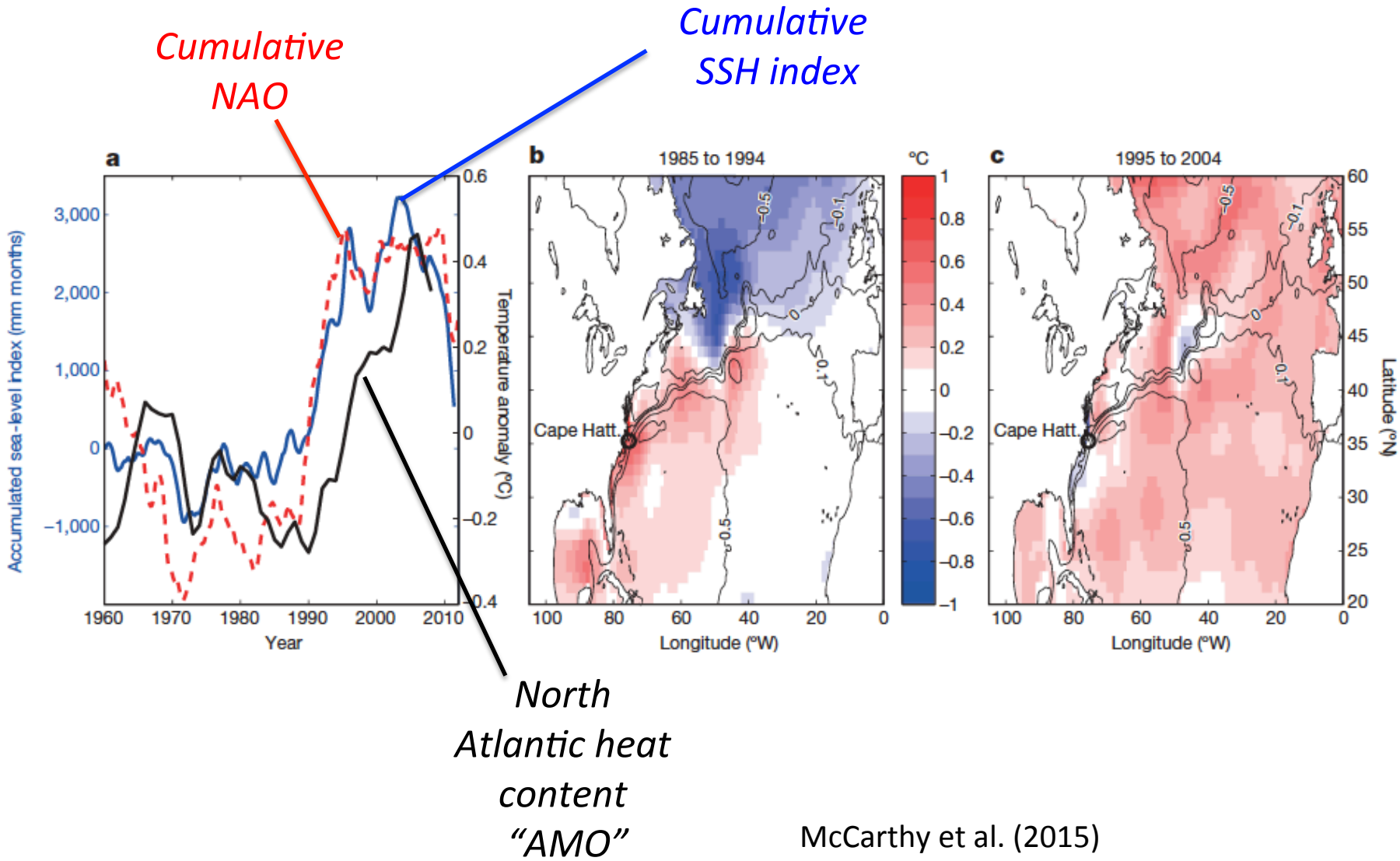




NE US SSH increases, SSH index decreases

McCarthy et al. (2015)

AMO & NAO & AMOC?



McCarthy et al. (2015)

Horizon 2020 AtlantOS Project Overview

https://www.atlantos-h2020.eu/home

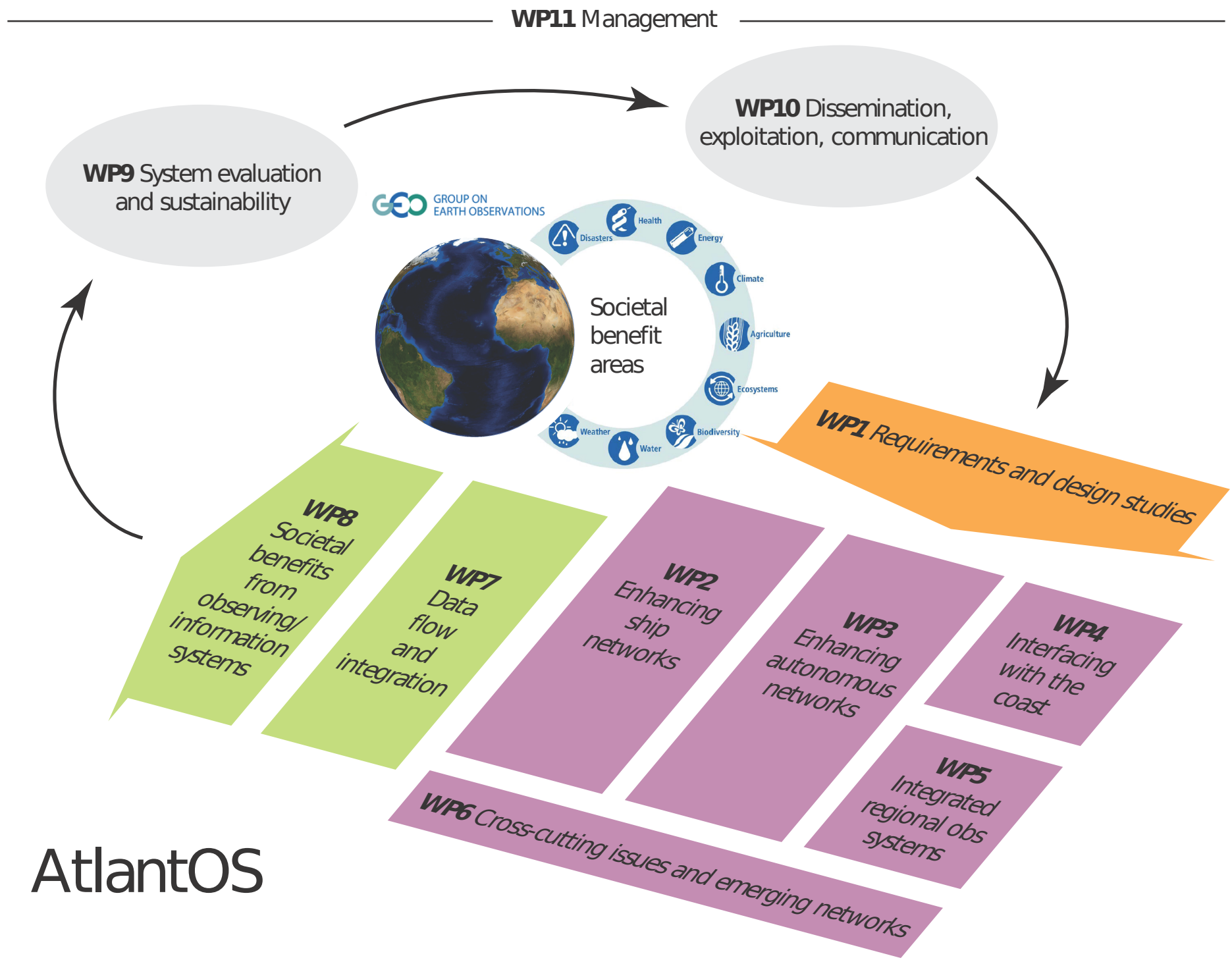
AtlantOS

- The **overarching objective** of AtlantOS is to achieve a transition from a loosely-coordinated set of existing ocean observing activities producing fragmented, often monodisciplinary data, to a sustainable, efficient, and fit-for-purpose **Integrated Atlantic Ocean Observing System (IAOOS)**.

- This will be achieved through research and innovation activities focused on:

- defining requirements and systems design (OSSEs)
- improving the readiness of observing networks and data systems
- engaging stakeholders around the Atlantic
- strengthening Europe's contribution GOOS, GEO, GEOSS, and emerging "Oceans and Society: Blue Planet" initiative.

Divided into “Work Packages”


WP11 Management
WP10 Dissemination, exploitation, communication
WP9 System evaluation and sustainability
GEO GROUP ON EARTH OBSERVATIONS
Disasters
Health
Energy
Climate
Agriculture
Ecosystems
Biodiversity
Water
Weather
Societal benefit areas
WP1 Requirements and design studies
WP8 Societal benefits from observing/ information systems
WP7 Data flow and integration
WP2 Enhancing ship networks
WP3 Enhancing autonomous networks
WP4 Interfacing with the coast
WP5 Integrated regional obs systems
WP6 Cross-cutting issues and emerging networks
AtlantOS

How can US CLIVAR get involved?

- No funding for new obs, models
- Funding for synthesis, assessments, impact studies
- AtlantOS will strive to strengthen trans-Atlantic collaborations which can benefit many US observing systems
- Goal is to establish structured dialogue with funding bodies to pave the way for integrated Atlantic Observing system
- PI's can get involved in different work packages
- US CLIVAR panels can look at how they relate to packages
- US CLIVAR panel members should get invited/attend key workshops on the timelines of relevant work package groups

https://www.atlantos-h2020.eu/home

WP1: Observing system requirements and design studies

Task 1.1 Task 1.2 Task 1.3

Short description: This work package is led by: Albert Fischer, IOC (lead) and Erik Buch, EuroGOOS (co-lead). The work will focus on defining the high level requirements [Task 1.1], analysing the gaps and costs of existing systems and planned upgrades [Task 1.2], and carrying out system design studies [Task 1.3].

Objectives: The overall objective of this Work Package is to iteratively apply the systems design processes of the *Framework for Ocean Observing* to provide a refined scientific system design for an IAOOS meeting societal objectives. Specific objectives are to:

- To define the high-level requirements of IAOOS based on the GEO societal benefits and other international initiatives, providing a direct link to societal challenges related to the Atlantic basin and the European Blue Growth strategy. These requirements will be translated into strategic recommendations about sustained monitoring of EOVs.
- To identify the gaps in existing Atlantic observing networks. This assessment will include an estimation of the cost of existing observing networks as well as the needed investments in regard to the identified gaps, and an evaluation of the readiness and feasibility of implementation of different observing technologies as guidance in systems design.
- To deliver guidance to improve existing elements and/or implement new components of the IAOOS using OSSEs and data assimilation to optimally merge in-situ and satellite observations with models.

WP2: Enhancement of ship-based observing networks

Task 2.1 Task 2.2 Task 2.3 Task 2.4 Task 2.5

Short description:

This work package is led by: Ken Drinkwater, IMR (lead) and Pascale Lherminier, Ifremer (co-lead). This work package focuses on improvement, expansion, integration and innovation of ship-based observations undertaken by existing observing networks. Ship-based hydrography still remains the only method for obtaining high-quality, high spatial and vertical resolution measurements of a suite of physical, chemical, and biological parameters over the full water column on an ocean basin scale. The GO-SHIP network [Task 2.1] and the Carbon-VOS, SOOP, and FerryBox networks [Task 2.2], using voluntary observing ships and oceanographic research vessels, will provide EOV data including temperature, salinity, currents, transient tracers and carbon parameters (pH, TA, pCO_2 and dissolved inorganic carbon (DIC)). The WP aims for better integration of the high spatiotemporal resolution in the upper ocean, especially from the three observational networks in Task 2.2. In addition, the SAHFOS will obtain plankton abundance and biomass data using the continuous plankton recorder [CPR; Task 2.3] on ships of opportunity. Fish biomass, distribution and community structure will be investigated from national surveys coordinated by ICES [Task 2.4] and sea floor mapping will be undertaken as a measure of habitat potential for biological organisms in conjunction with biologists [Task 2.5].

Objectives:

- To improve and provide consistent standards for the measurement of EOVs through establishing and maintaining high-standard protocols for sampling and processing the data
- To provide best practice and know-how on sampling techniques for less experienced operators and groups
- To increase the cost effectiveness of the ship-based observing networks by coordinating their monitoring programmes to eliminate possible duplication of effort (to be done in conjunction with autonomous observing networks)
- To provide increased spatial-temporal coverage capabilities of the EOVs, especially in the South Atlantic, which will be undertaken in cooperation with Latin American, African and other countries
- To establish best practices in order to provide consistency in the handling of the data processing
- To provide support in order to ensure speedy data delivery to the users, including the possibility of establishing a data processing service in the case of ADCP measurements
- To undertake innovative measures by testing new techniques and instruments such as an underway system for measuring total alkalinity (TA)
- To better integrate ship-based observations including physical, chemical and biological measurements to provide a wider and more complete view of the state of the ocean than presently is available

WP3: Enhancement of autonomous observing networks

Task 3.1 Task 3.2 Task 3.3 Task 3.4 Task 3.5 Task 3.6 Task 3.7

Short description: This work package is led by: Herve Claustre, UPMC) (lead) and Antje Boetius AWI (co-lead). This work package will build on existing capacities for autonomous observing networks on both sides of the Atlantic. It will improve the systematic collection of ocean observations recorded in-situ, and will enhance intersections with other observational systems, including remote sensing. Autonomous ocean observation technologies are enabling to reduce the costs of in-situ ocean observation, but so far they have to be optimized to integrate the biological dimension into observing systems. For each autonomous platform network of this work package, i.e. fixed moorings, drifters, gliders and profiling floats, the work will be organized along the key objectives, including the enhancement of the data acquisition capabilities by upgrading observatories with new sensors, by increasing the spatio-temporal coverage of the measurements, and by linking to the biological dimensions. Data streams of each network will be standardized and, where possible, appropriate real-time and delayed-mode data quality control procedures will be implemented. The autonomous observation networks will be promoted to a wider user community to enhance cross-system integration and to achieve the sustainability of such integrated networks of the future.

Objectives: As a prerequisite for the long-term sustainability of a future integrated observation system covering the entire Atlantic, several objectives will be met through the work in this work package:

- Enhancement of autonomous observation networks to promote use of the most cost-effective way to measure essential ocean variables
- Acquisition of more integrated data for a holistic understanding of variations in the Atlantic system
- Implementation of more cost-effective platforms with improved long-term capabilities
- Fill the observational gaps for certain under-sampled areas (e.g. southern Atlantic), for some periods (e.g. harsh winter conditions in sub-polar North Atlantic), and for new variables (biology including (meta)genomic, biogeochemistry)
- Provide significant innovation potentials for SMEs
- Improve the access to and usability of the data-system that will be implemented and integrated with other observation systems into a knowledge base
- Develop management and innovation procedures to yield enhanced and integrated international observation networks and a sustainable European and Transatlantic infrastructure

WP4: Interfaces with coastal ocean observing systems

Task 4.1 Task 4.2 Task 4.3 Task 4.4

Short description: This work package is led by: Kevin Horsburgh, NERC (lead) and Patrick Farcy, Ifremer (co-lead). Coastal seas occupy about 7% of the area of the world's oceans but their economic importance is significantly greater. Many of the marine hazards (e.g. sea level rise, storm surges, harmful algal blooms) have their greatest impact in coastal areas and it is important to make effective links between coastal and open ocean observing systems in order to mitigate against these. WP4 will link the ocean observing activities in AtlantOS to initiatives in coastal ocean observing both in Europe and across the wider Atlantic, in order to improve methodologies and best practice in sustained observing of the coastal ocean. We will identify observational gaps and improve the coordination of coastal observational networks in the key areas of sea level monitoring and multi-variable monitoring from autonomous vehicles (gliders), coastal profilers and Ferry boxes. This will lead to reduced observational costs and improved biological measurements (specifically considering ecological variables and also marine noise). We will thus significantly improve our understanding of both natural and anthropogenic variability in biological, chemical and physical properties. Such data are needed to better inform policy as well as science.

Objectives:

- To conduct a detailed gap analysis for (a) the connection between continental shelf observing and deep ocean networks, and (b) sensors and technology required to more effectively monitor shelf seas (e.g. marine mammals, low oxygen zones)
- To explore the feasibility of integrating existing coastal observing systems and introducing coastal profilers to partially fill the gaps
- To explore the feasibility of optimising shelf sampling: (a) with ocean gliders to a scale where there is overlap with current shelf edge activity; (b) with FerryBox in one line implemented in WP2 to validate the physical and biogeochemical continuity between coastal and open seas; (c) with profilers using Argo floats for the open seas and ARVOR-CM for the coastal sea
- To strengthen access to sea level data networks for the Atlantic region and produce a comprehensive sea level observing site catalogue to document and benchmark information
- To increase the number of coastal systems and observations contributing to EMODnet and the Copernicus Marine Service
- To build long-term linkages between AtlantOS and transatlantic partnerships in order to transfer knowledge and optimize the coastal observing system in the Atlantic

WP5: Integrated regional observing systems

Task 5.1 Task 5.2 Task 5.3

Short description: This work package is led by: Sabrina Speich, CNRS (lead) and Johannes Karstensen GEOMAR (co-lead). WP5 objectives will be addressed on a regional scale to take advantage of existing independent ongoing observing programmes. We will focus on two particular regions of the Atlantic Ocean, one on each hemisphere - the subpolar North Atlantic and the subtropical South Atlantic Ocean, where multiple observational efforts are operational initiated by national, European, and international partnerships. The WP will be organized to focus on two overarching research and monitoring topics: climate change and ecosystems evolution. Ecosystem research is active in many European and international countries embedded in sustained national fishery observing strategies and associated with well-designed observing capabilities and international bodies such as FAO (and subgroups), NAFO, ICES, and OSPAR which monitor and advise these efforts. Not only for fisheries but other socioeconomic relevant topics (e.g. acidification, hydrological cycle, carbon sequestration) climate observing programmes are operational since decades and advanced through the WCRP core project CLIVAR. However, the integration of activities beyond the local scale and beyond the scientific core questions is in general missing. Therefore, this requires an enhancement of integration and further consolidation that entails a basin/large-scale networking of systems, the need for an opportunistic development of the observing systems (e.g. guest sensor, sampling, accuracy), the improvement of data utilization and the data availability. This WP is designed to fulfil these objectives around three main axes: (1) a baseline study on ocean observing, (2) the applications of climate and ecosystem related observing analysis techniques to the two selected Atlantic Ocean subregions in order to prepare for basin scale and later global scale assessments, and (3) the optimization of ocean observing by means of OSSEs and process models.

Objectives:

- To innovatively optimize the regional observing systems by making use of a number of recently launched international observing initiatives in the regions, in combination with the enhancement of observing networks in WP2/WP3 and including new ocean observation technologies (WP6)
- To integrate, on a regional basis, the fragmented observations and build-on an international partnership on both sides and both hemispheres of the Atlantic Ocean
- To build on an international network and its potential evolution, and basin scale consolidation
- To identify key ocean observations addressing regional societal needs and determine their optimal observation
- To integrate observational data (in-situ and satellite) for exploratory product generation on a regional scale and related to climate and ecosystems
- To narrow existing *in-situ* observing system gaps and provide a more efficient observing strategy based on the specific characteristics of the regional ocean dynamics and ecosystems
- To use the regional systems as a "showcase" for implementing a pioneering framework of ocean observation, more cost effective and user driven in order to prepare for basin scale and later global scale assessments

WP6: Cross-cutting issues and emerging networks

Task 6.1 Task 6.2 Task 6.3 Task 6.4 Task 6.5

Short description: This work package is led by: Matthew Mowlem, NERC (lead) and Eric Delory, PLOCAN and Jay Pearlman, IEEE (co-leads). The tasks in WP6 are focused on key capability gaps, and opportunities for improved efficiency and cost reduction for current observing system technologies and practices. It specifically targets sensors and instrumentation as these are key (and currently limiting) in enabling widespread biogeochemical and biological observations using existing ocean platforms (vehicles / infrastructure). We will create roadmaps for optimal sensor development and integration into observing systems. We specifically focus on a key gap to scale up remote and autonomous sampling and processing of biological samples to further enhance widespread biological and (meta)genomic observations. To ensure improvement in data standards and reliability, we will develop existing centres of gravity to introduce common metrology techniques and best practice (including standards) for measurement of priority EOVs. These include all aspects of the ocean environment – physical, biological and biogeochemical. To aid IAOOS efficiency and to reduce cost, we address opportunities for networks and nations to share or combine resources and infrastructure in construction, operation and maintenance of Atlantic observing capability. To maximize international collaboration and dissemination of best practice, we will establish an international community for IAOOS with close connection to existing initiatives (e.g. POGO fellows) and structures in GEO (e.g. communities of practice), and GOOS (OCEATLAN, IOCARIBE, GOOS-Africa, US IOOS and EuroGOOS in particular). We will also coordinate the development of new networks to address numerous gaps particularly (but not limited to) in biogeochemical and biological observations.

Objectives: This work package develops technology and observing system practices that enable multiple observing networks to produce more data that are better targeted at stakeholder, user and customer requirements whilst reducing overall cost. To further improve efficiency and impact it coordinates engagement of international expertise and dissemination of best practice. The specific objectives are:

- to create a step change in the number of sensors and instruments addressing priority EOVs that are proven on ocean observing systems and hence impact both the gaps in data and cost of collection
- to create a roadmap for the development of priority sensors and instrumentation and for their integration and inclusion in IAOOS
- to develop the role of European industry in ocean sensors and instrumentation markets
- to lead the development of metrology standards and best practice for ocean observing
- to reduce the cost of IAOOS by efficiency gains delivered through networks and nations sharing resources and infrastructure during the creation, operation and maintenance of IAOOS
- to include international expertise in the design and development, operation and maintenance of IAOOS and to disseminate this best practice
- to address the chronic under-sampling of biogeochemical and biological variables (including (meta)genomics) and to address other observational / coordination gaps by supporting existing activities and the creation of new networks, observation technologies and programmes

WP7: Data flow and data integration

Task 7.1 Task 7.2 Task 7.3 Task 7.4 Task 7.5

Short description: This work package is led by: Sylvie Pouliquen, Ifremer (lead) and Christoph Waldmann, UniHB (co-lead). WP7 will ensure that the data sets from the different and diverse WP2 and WP3 in-situ observing systems will be made readily and freely available to the wider, international ocean science community and other stakeholders in this field. This will be achieved by harmonizing work flows, data processing and distribution (Task 7.1) and by integrating WP2 –WP3 observations in existing European and other contributing international data infrastructures (Task 7.2 -7.3). Existing, international standards will be implemented and innovative methods like cloud concepts will be studied to explore the feasibility of an efficient handling and distribution of observational data and information in particular real-time data. Further, we will assess the impact of AtlantOS observations in models through Copernicus (Task 7.4) and develop and deliver ocean products derived from these observations both for research and for applications (task 7.5).

Objectives:

- Provide leadership for Europe in implementing GEOSS
- Integrate standardised in-situ key marine observations
- Improve modelling outputs and reduce cost of data collection in support of ocean-related industrial and societal activities
- Contribute to make better informed decisions and documented processes within key sectors
- Improve the implementation of European maritime and environmental policies
- Enhance the knowledge base necessary to cope with global challenges

WP8: Societal benefits from observing/information systems

Task 8.1 Task 8.2 Task 8.3 Task 8.4 Task 8.5 Task 8.6 Task 8.7 Task 8.8

Short description: This work package is led by: Nadia Pinardi, UNIBO (lead) and Glenn Nolan, MI (co-lead). The ambition is to deliver a suite of products that are targeted at issues of societal concern in European Member States. These products will enhance the safety of coastal communities and promote economic development in key emerging marine and maritime sectors through better decision support tools (flooding, maritime safety, HAB) and resource assessment (offshore aquaculture). Reanalysis products will assist Member States in reporting under the MSFD and to international entities such as ICES. Integration of marine data from combined sources has been a challenge within this community for several decades. These pilot actions are tangible outputs from the integration of Earth observation, in-situ data systems and model analyses, reanalysis and forecasts to form a usable product in five key GEOSS societal benefit areas. These end-user focused products will be a contribution to the forthcoming EMODnet Atlantic Checkpoint Portal in terms of development of the algorithms and basic tools to evaluate fitness for purpose of the monitoring system.

Objectives:

- To provide leadership for Europe in the implementation of GEOSS in the Atlantic in five areas of societal benefits, such as climate, disasters, ecosystems, health and water
- To demonstrate the value and societal benefit of the existing observing system in the Atlantic through seven pilot actions: HABs mapping, coastal hazards early warning, safe ship routing, oil spill hazards, MSFD reporting, site selection for mariculture
- To integrate data from the Copernicus Marine Service and EMODnet in the Atlantic basin, augmented by new AtlantOS data, to produce decision support tools for a variety of marine environmental and economic sectors
- To produce a Data Adequacy Report from each different pilot actions documenting the observational and model data accuracy, accessibility and fitness for purpose

WP9: System evaluation and sustainability

Task 9.1 Task 9.2 Task 9.3

Short description: This work package is led by: Pierre-Yves Le Traon, Ifremer (lead) and Martin Visbeck, GEOMAR (co-lead). This work package will establish procedures that allow for a timely and comprehensive monitoring and evaluation of the Atlantic observing system and will address 'EOVs' monitoring gaps and provide a summary on issues that impact the sustainability of the observing systems. Firstly, we will develop and implement a monitoring system that is able to track the status of the various observing systems (Task 9.1). The system will build on the JCOMMOPS (JCOMM Observations Programme Support Centre) monitoring system set up by IOC for the global ocean and will be extended to eventually cover all in-situ observing networks of the IAOOS. Secondly, we will assess the adequacy of the current state of IAOOS in the context of information product delivery requirements (Task 9.2). We will also try to assess how well the EOVs agreed by the sponsors (see WP1) are addressed and if the space/time resolution, timeliness and expected accuracy of the information is delivered. Finally, national plans for long-term funding of observing systems in the Atlantic will be documented and proposals for IAOOS sustainability will be formulated (Task 9.3 in close cooperation with WP10). At a European level the work will be embedded to an overall umbrella of a sustained European Ocean Observing System that brings together national, regional and European infrastructures (ESFRI roadmap, EuroGOOS/ROOS, EMODnet, Copernicus). The work will be carried out at an international level in collaboration with the non-EU partners engaged in the project.

Objectives:

- to provide quantitative and near real-time information of the state of the in-situ Atlantic Observing System with defined key performance indicators to be monitored.
- to analyse and properly document for each EOV the adequacy of the current observing and information system, where the observation capability for a given EOV is being addressed by a complementary set of in-situ networks and satellite missions.
- to develop a long-term sustainability plan for IAOOS based on existing plans of international partners, European Member States as well as key European initiatives
- to develop commitments for long-term funding of IAOOS by funding agencies engaged in ocean observations for research, monitoring and operational purposes

WP10: Engagement, Dissemination and Communication

Task 10.1 Task 10.2 Task 10.3 Task 10.4 Task 10.5 Task 10.6 Task 10.7 Task 10.8

Short description: This work package is led by: Jan-Stefan Fritz, KDM (lead) and Kate Larkin EMB-ESF (co-lead).

Objectives:

- Engage implement a structured dialogue with the users of marine data and information from observatories
- Encourage interested actors to consider the future of observatories and their place in the Atlantic area in order to cultivate and further develop a dynamic 'ecosystem' of actors and activities around a IAOOS
- Take a proactive role to structure the exchange between the observatory communities in Europe, the US and Canada as well as other user groups
- Disseminate the concrete results of work completed in WP1-9 as well as actively engage the potential users of data and information from observatories in both commercial and public sectors
- Implement communication activities

WP11: Management and Exploitation

Task 11.1 Task 11.2

Short description: This work package is lead by Martin Visbeck, GEOMAR.

Objectives:

- Provide top level management of the project to ensure aims of the project are efficiently and effectively met, on time and with the resources budgeted and that knowledge and innovation are properly managed
- Provide effective reporting and communication within the project, between partners and stakeholders and between the consortium and the European Commission (EC)

Tentative Science Team Meetings Schedule and Plans
(moving to a 18-month meeting cycle)

2016: NO US AMOC Science Team Meeting ... Instead take advantage of
Connecting paleo and modern oceanographic data to understand AMOC over decades to centuries
23-25 May 2016, Boulder, CO
Hali Kilbourne (chair), A. Schmittner, D. Oppo, R. Zhang, and P. Heimbach

2017: Spring / Early Summer
US AMOC ST Meeting

2018: Summer / Early Fall
US AMOC / UK RAPID International Science Meeting
Somewhere, USA

2019: OceanObs'19

2020: US AMOC Science Team Sunset
Final Report, Possible Special Issue of Review Articles with UK RAPID collaboration