

Marine Core Service for the Arctic

The GMES **MyOcean** Marine Core Service

Pierre BAHUREL
Mercator Ocean
MyOcean coordinator

SPACE AND THE ARCTIC, 20-21 oct 2009, Stockholm, Sweden

CONTRIBUTORS, MyOcean partners

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Space observations

☐ Lars Anders Breivik, met.no

In Situ observations

☐ Helge Sagen, IMR

☐ Sylvie Pouliquen, Ifremer

Models, monitoring and forecasting

Assessment systems

☐ Johnny Johannessen, NERSC

☐ Laurent Bertino, NERSC

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☐ Gilles Garric, Mercator Océan

☐ Einar Svendsen, IMR

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1 WHAT IS THE GMES MyOcean
MARINE CORE SERVICE ?

2 WHAT CAN DO THE GMES
MyOcean MARINE CORE
SERVICE FOR ARCTIC ?

3 WHAT CAN DO THE GMES
MyOcean MARINE CORE
SERVICE FOR SWEDEN ?

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MyOcean, a GMES Marine Core Service

What is MyOcean ?

Its mission and its organization ?

MY OCEAN

Marine
Core
Service



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The mission

MY OCEAN

Marine
Core
Service



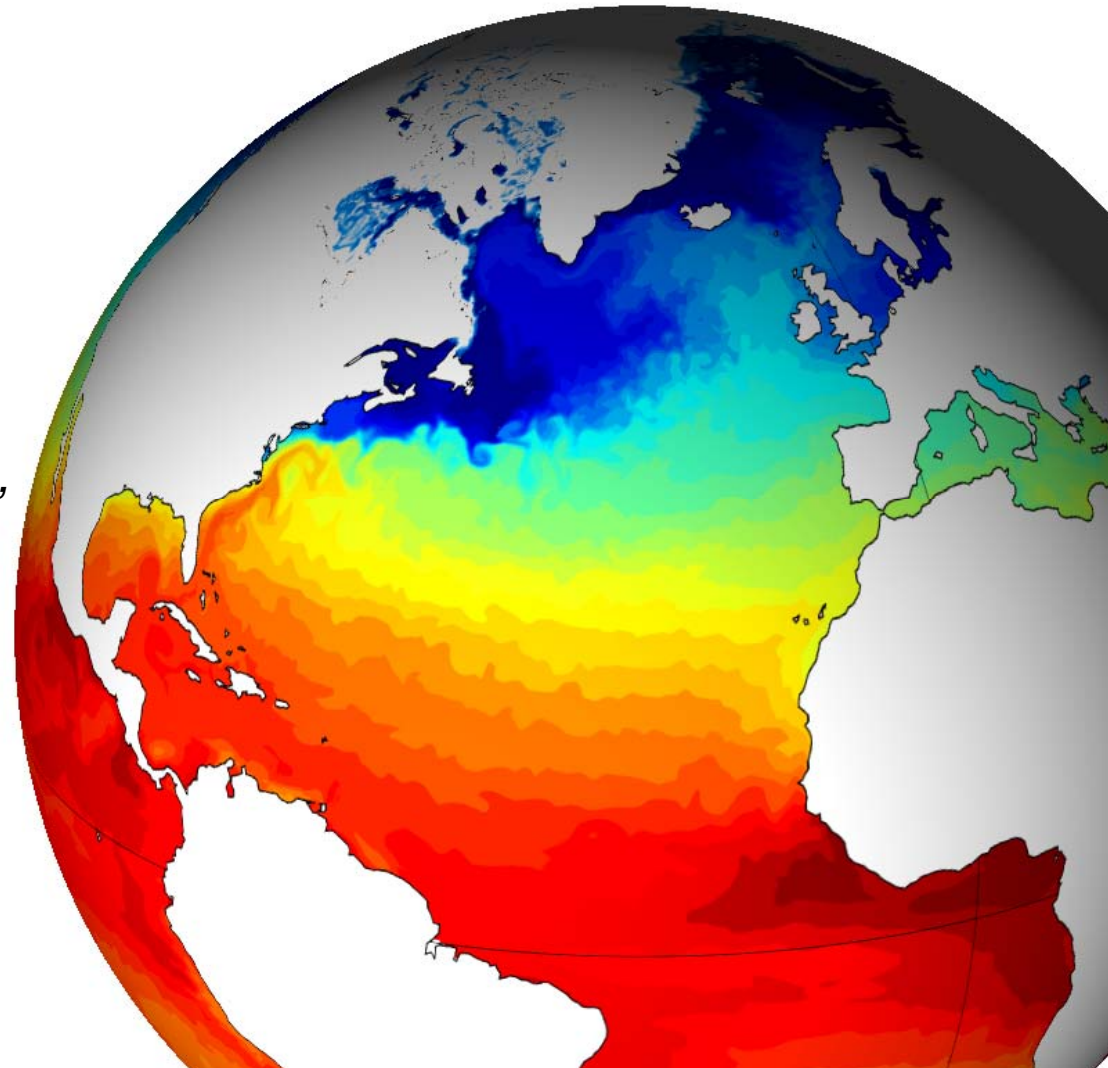
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MyOcean, the mission

- **Mission**: « improving the **value** of and the **access** to a **core** information on the **ocean** »

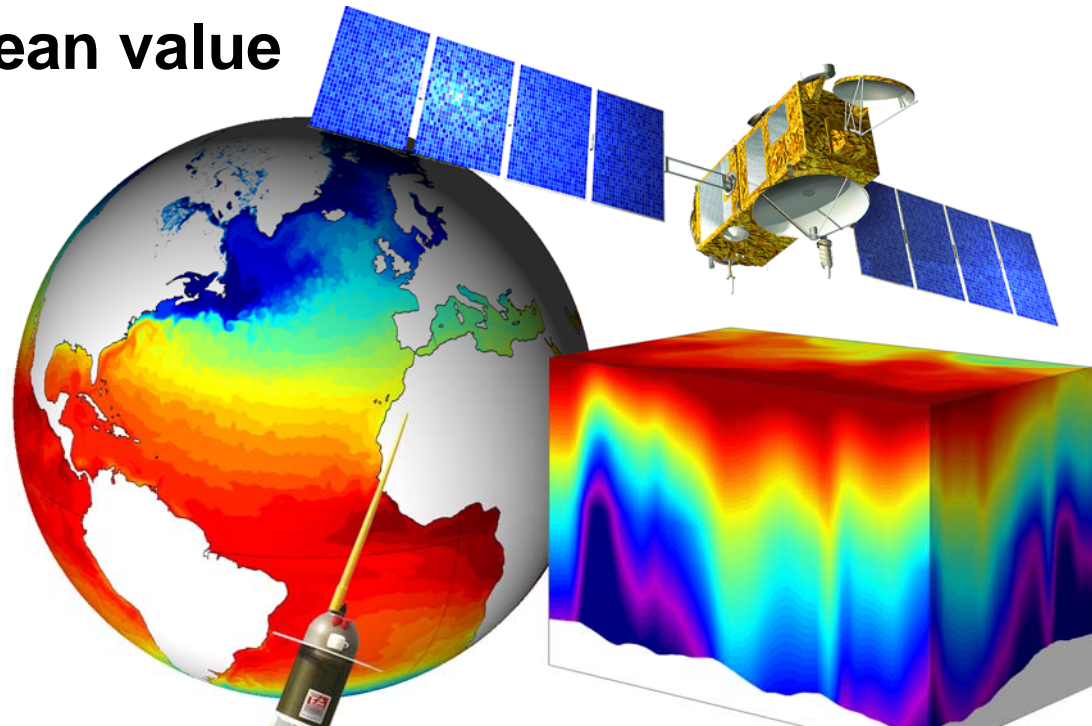
- **Information**: *ocean currents, temperature, salinity, sea level, primary ecosystems, **ice** coverage and thickness ...*

- **Added value**:
*Data combination and assimilative **models**,
Continuity and **consistency**,
Expertise on the ocean,
Information **service***



MyOcean, initial principles

- **Space** data, **In Situ** Data and **Models** : an integrated approach
- Based on **existing** capacities: the European network
- Focus on the **European value**
- **Open and free** information
- **Operational**



MyOcean in a nutshell

- A Core Service
- A European Team
- A GMES EC Project



	Belgium
	Bulgaria
	Canada
	Cyprus
	Denmark
	Estonia
	Finland
	France
	Germany
	Greece
	Ireland
	Israel
	Italy
	Latvia
	Lithuania
	Malta
	Morocco
	Netherlands
	Norway
	Poland
	Portugal
	Romania
	Russian
	Slovenia
	Spain
	Sweden
	Turkey
	Ukraine
	United Kingdom

**61 PARTNERS
FROM 29 COUNTRIES**
are involved in the project

MyOcean in a nutshell

■ MyOcean is a **SERVICE**

- The main component of the « **GMES** » Marine Core Service
- Global & Regional Ocean monitoring and forecasting
- Information based on Data Combination and assimilative Models
- Currents, Temperature, Salinity, Sea level, Ice,

- **Marine Core Service**

■ MyOcean is a **TEAM** of European partners

- 61 partners out of 29 countries ; ~350 people involved ; ~150 FTE
- 20 core partners committed for operations; european best monitoring and forecasting systems

- **Pan-European team**

■ MyOcean is a **PROJECT**

- An EC/FP7 project, the GMES « Marine Fast Track » project
- 3 years ; has started on 1st April 2009, will end 31 March 2012
- Budget 18 M€/year, with 11 M€/year EC funding

- **2009 – 2010 – 2011 – 2012**



**61 PARTNERS
FROM 29 COUNTRIES**
are involved in the project



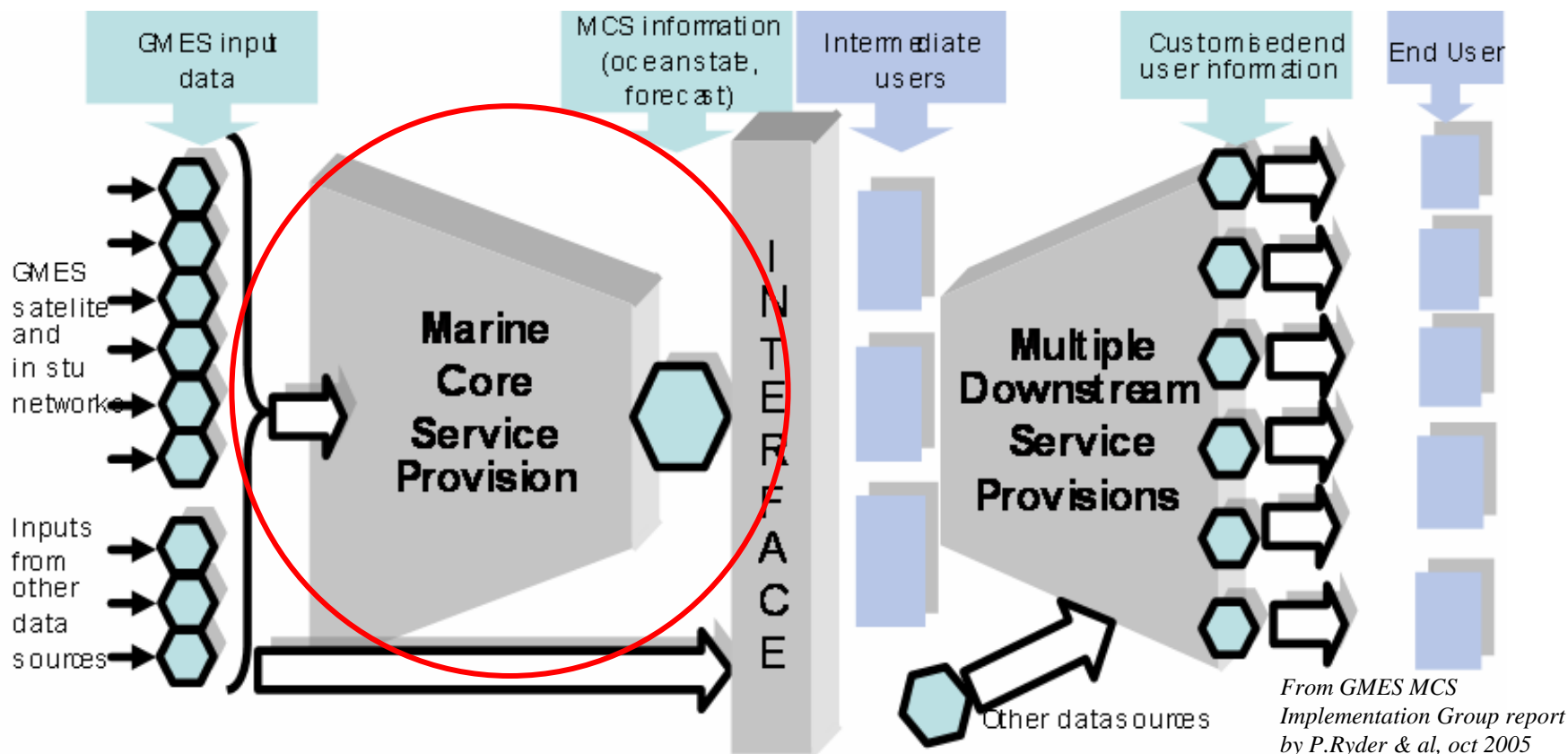
The Users

MY OCEAN

Marine
Core
Service

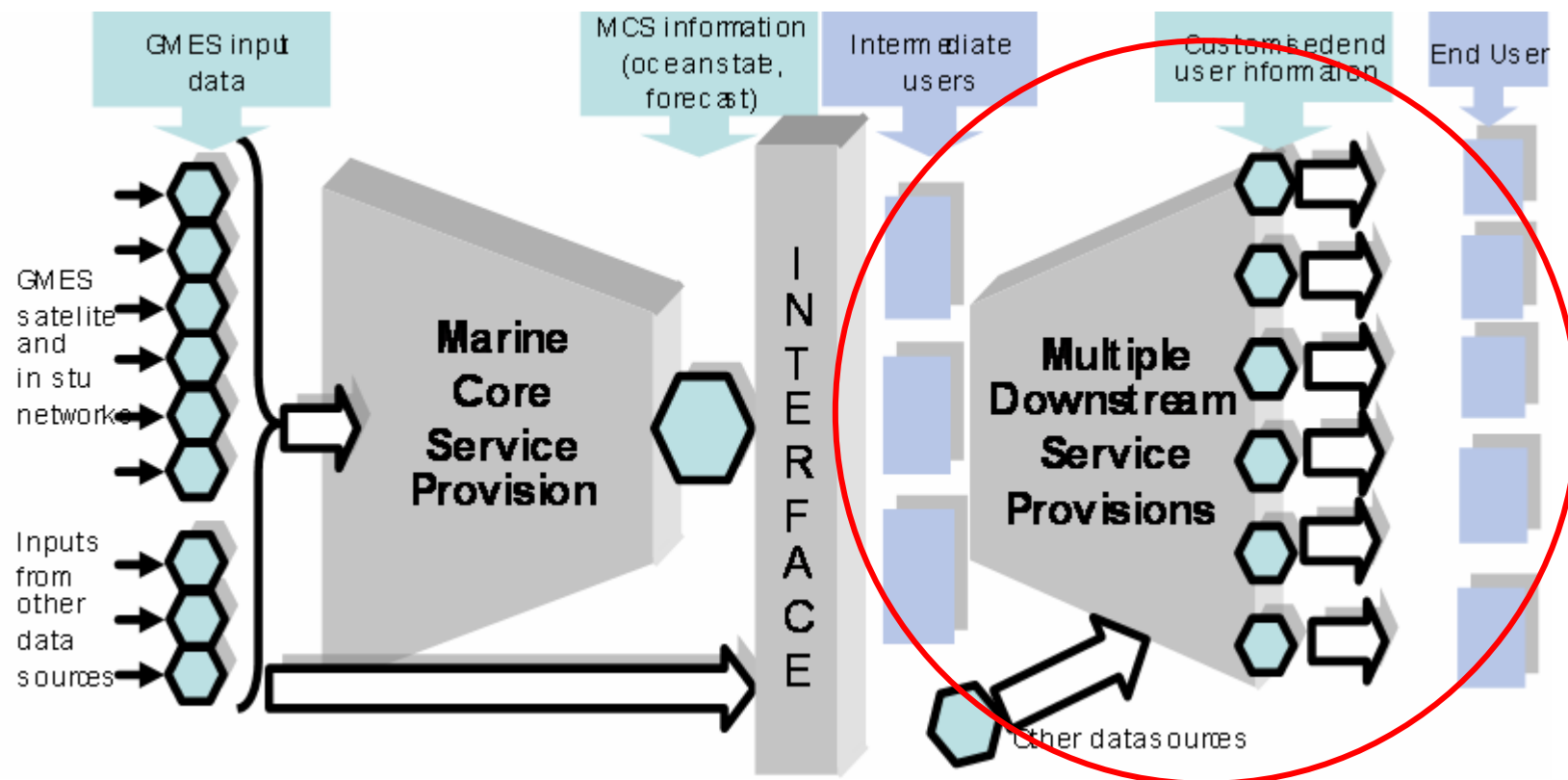


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- In 3 years, create the maximum “core” value by providing on a reliable basis *“the common denominator data for **all users in the marine sector**, in other words the information for existing & new downstream services.”*

... which users are specialized Service providers

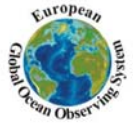


Users of the MyOcean core service are specialized service providers of the downstream sector.

A network organization ... to market user's needs

- A **network of partners** all around Europe
- A privileged link with **first-rank users**

- EU Member States
- Ocean Nat. Centres



EuroGOOS

- EU agencies



EEA



- Conventions and policies
 - HELCOM, OSPAR, UNEP/MAP, ICES, ...



A MyOcean network involving **all European maritime countries**
Partners networking 29 countries for user's requirements

- A MyOcean « **core user group** »
- A MyOcean **User Requirement** database

The 4 areas of benefit driving the MyOcean service definition

- The users, their requirements, their assessment

Area 1

« MARINE SAFETY »

(marine operations,
oil spill drift, ship routing,
defense, search & rescue, ...)

Area 3

« MARINE AND COASTAL ENVIRONMENT »

(water quality, pollution,
coastal activities, ...)

Area 2

« MARINE RESSOURCES »

(fish stock management,
ICES, FAO, ...)

Area 4

« CLIMATE & SEASONAL FORECASTING »

(climate monitoring, IPY,
seasonal forecasting, ..)

Application to the Arctic

- The users, their requirements, their assessment

Area 1 « MARINE SAFETY »

(marine operations, oil spill drift, ship defense, search & rescue)



Area 3 « MARINE AND COASTAL ENVIRONMENT »

(water quality, pollution, coastal activities)



Area 2 « MARINE RESOURCES »

(fish stock management, ICES, FAO, ...)



Area 4 « CLIMATE & SEASONAL FORECASTING »

(climate monitoring, IPY, seasonal forecasts)





The service, the offer

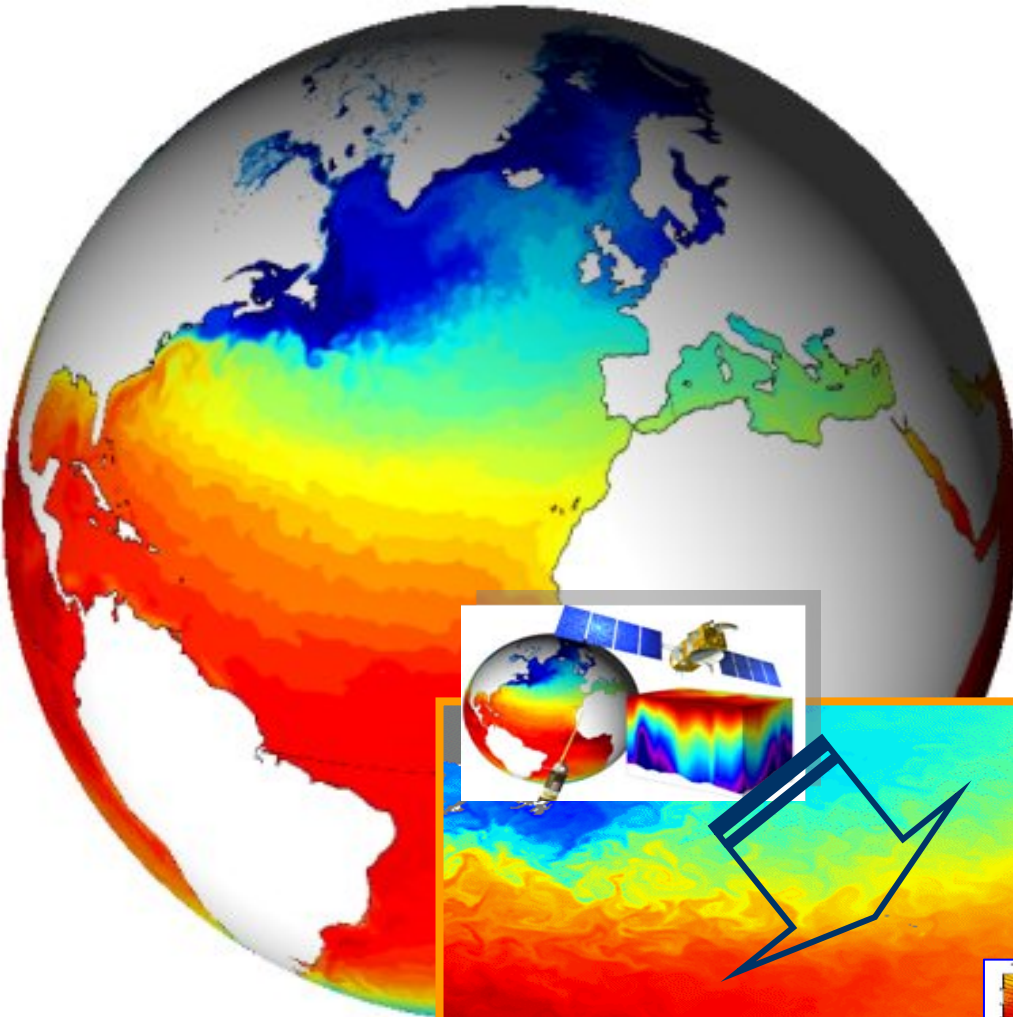
MY OCEAN

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Service

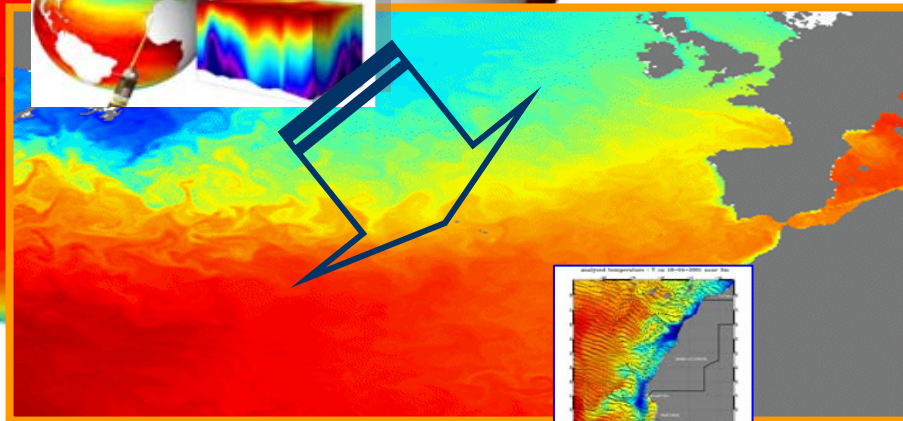
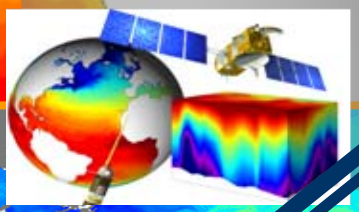


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The MyOcean offer: A core information on the ocean

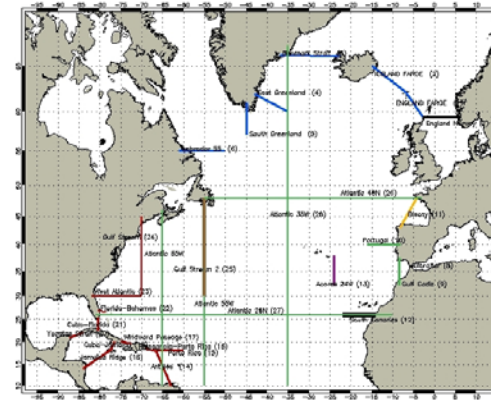
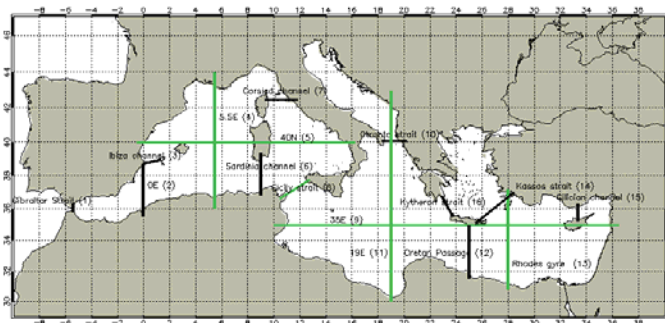


- Physical state of the ocean, primary ecosystem
- Global ocean, and main European basins and seas
- Large and basin scale, mesoscale physics
- Hindcast, Nowcast, Forecast
- Data, Assimilation and Models
- Information and Quality Assessment



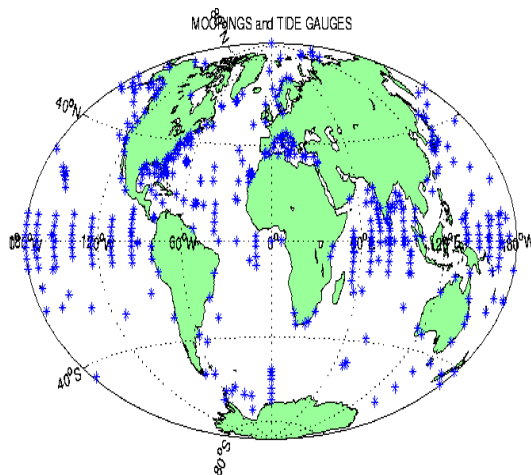
... with quality assessment through standardized metrics

International Quality Assessment Metrics : Sections, moorings, transports etc....

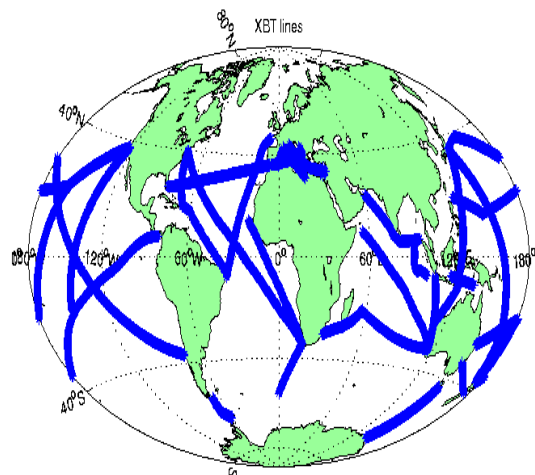


Comparisons Model / Observations and Model / Model

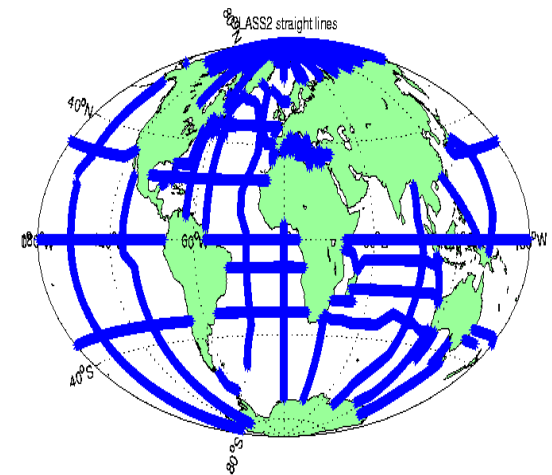
moorings



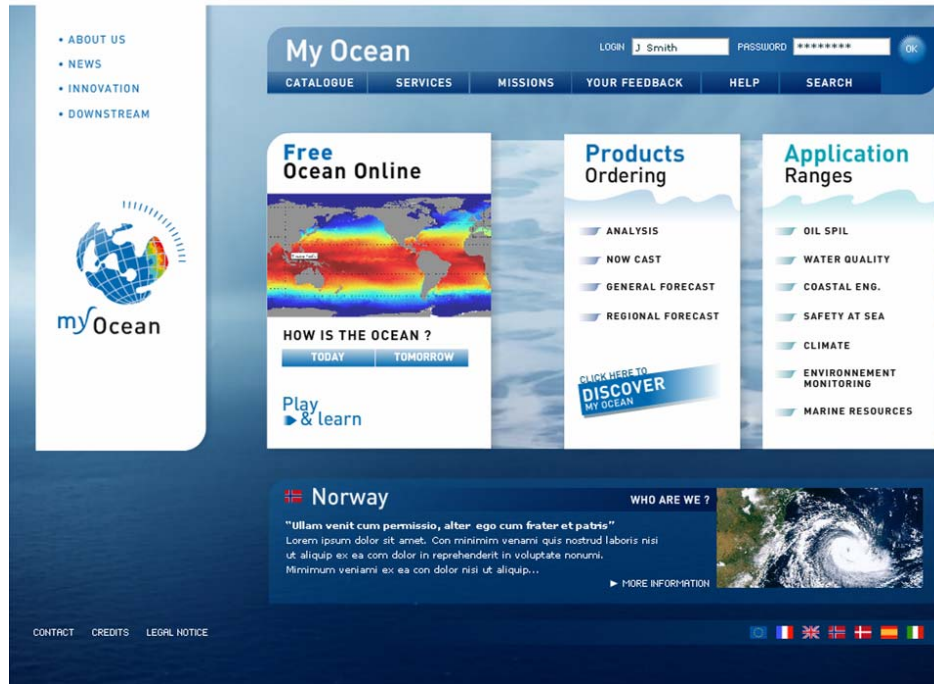
XBT lines



Sections (WOCE)



A single service desk ... easy access to users




- One **single** service desk
- One entry point to the MyOcean pan-european information
- Connected to all production units in Europe

- Open and free **data policy**
- **Open** access, **Free** access


- Commitments through **Service Level Agreements (SLA)**



A preliminary service in place: <http://www.myocean.eu>



Marine Core Service



myOcean

- Project
- Products & Services
- User's Feedback


MyOcean Pro

SERVICE ONLINE CATALOGUE


MYOCEAN INTERACTIVE CATALOGUE


Search mode: multi-criteria

SELECT AN AREA



CONTACT CREDITS LEGAL NOTICE

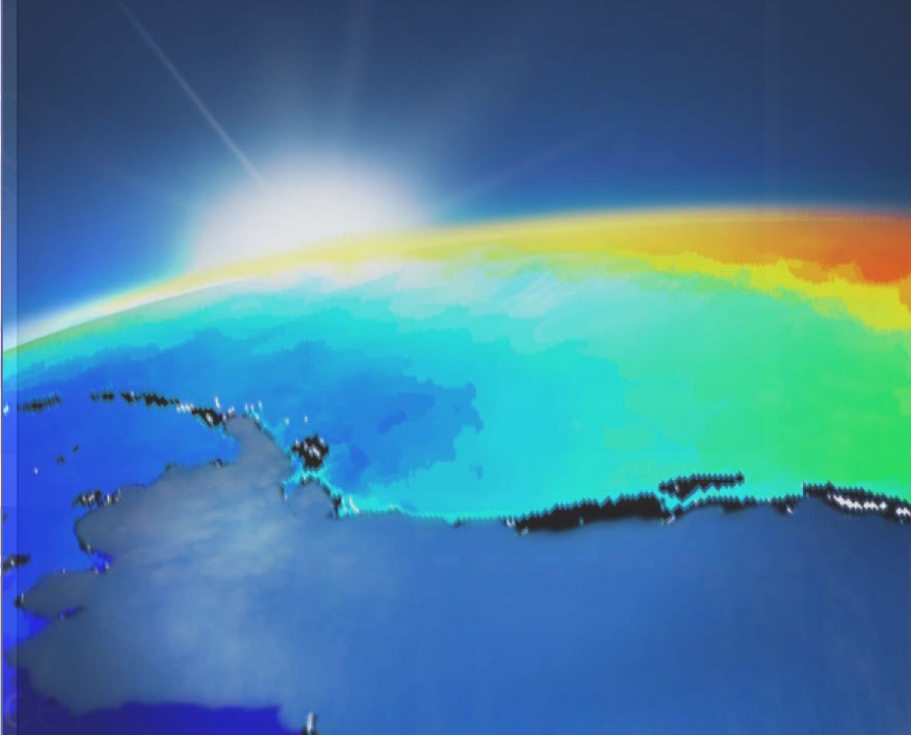




myOcean

CATALOGUE V.0

THE OCEAN IN ONE CLICK



myOcean project : www.myocean.eu.org



A preliminary service in place

[Project](#)[Products & Services](#)[User's Feedback](#)

MyOcean Products & Services

[SERVICE](#)[ONLINE CATALOGUE](#)[SERVICE DESK](#)[DATA POLICY](#)

MYOCEAN INTERACTIVE CATALOGUE

Search mode: multi-criteria or full catalogue

[Full Catalog](#)[GO >>](#)

SELECT AN AREA

SELECT A PHYSICAL PARAMETER

SELECT A PRODUCT



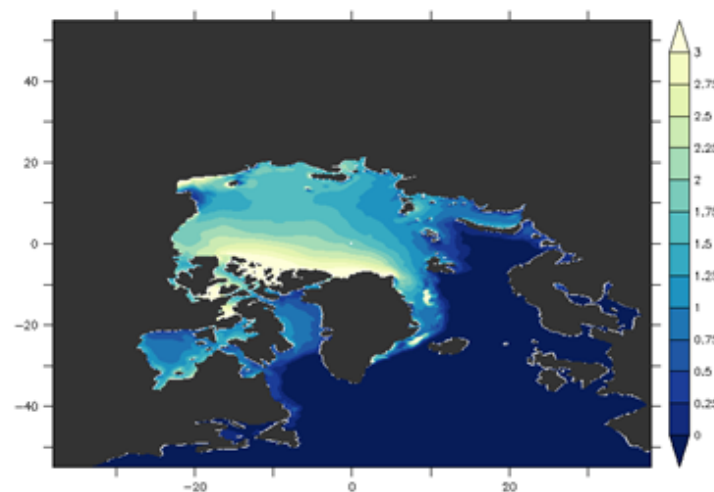
- Step 2: SELECT A PHYSICAL PARAMETER
- ☐ Temperature
 - ☐ Wind
 - ☒ Sea ice
 - ☐ Salinity
 - ☐ Current

Step 3: SELECT A PRODUCT

☐ Observation



Ice Thickness (Arctic)



01/04/2009, Ice thickness

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A preliminary service in place: <http://www.myocean.eu>

Improvement line: Version0 now ; Version1 end of 2010; Version2 end of project



The production

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The Consortium



The Production Units



TAC

- Sea Level
- Ocean Color
- Sea Ice & Wind
- In situ
- Sea Surface Temperature

MFC

- MFC Global
- Artic
- Baltic
- NW Shelves
- IBI
- Med Sea
- Black Sea

The Production Units

5 Thematic Assembly Centres

Observations

Sea Level

Ocean Color

Sea Surface Temp.

Sea Ice & Wind

In Situ

7 Monitoring and Forecasting Centres

Models

Global Ocean

Arctic Ocean

Baltic Sea

Atlantic NWS

Atlantic IBI

Mediterranean Sea

Black Sea

Service Desk

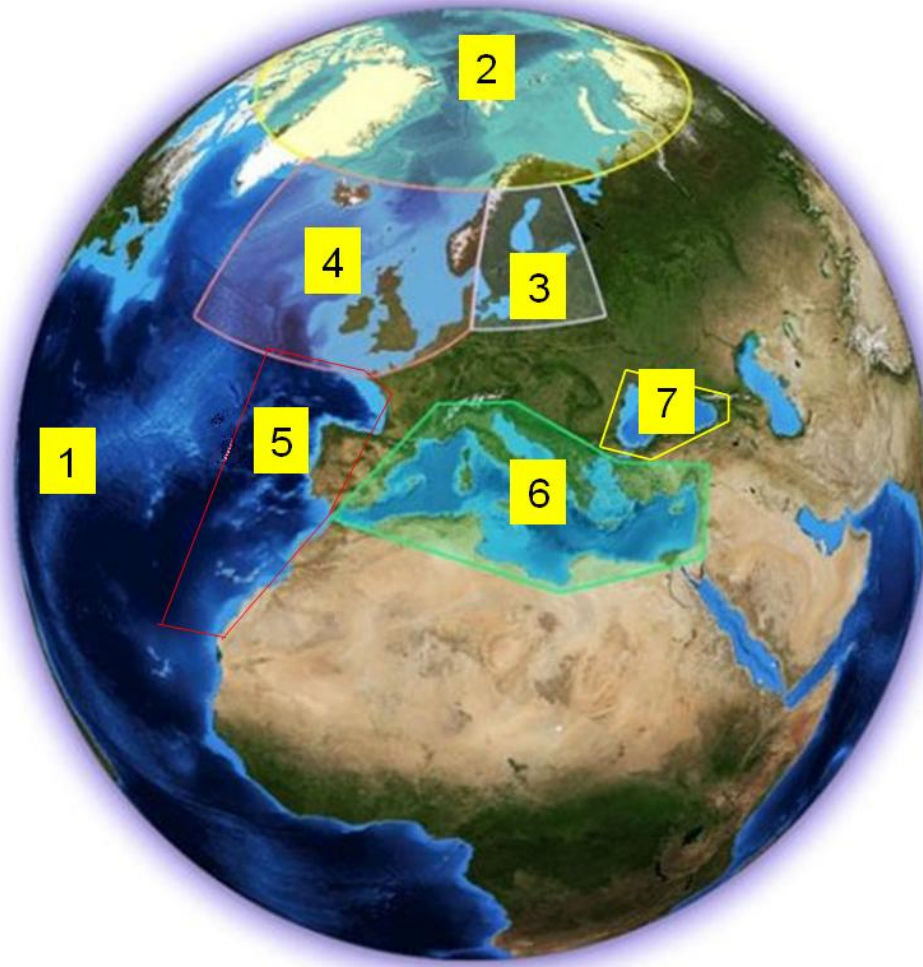
TAC

- Sea Level
- Ocean Color
- Sea Ice & Wind
- In situ
- Sea Surface Temperature

MFC

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The MyOcean areas **The Global Ocean + 6 European Seas**



- **(1) Global Ocean**
- **(2) Arctic Ocean**
- **(3) Baltic Sea**
- **(4) Atlantic North-West Shelves (NWS)**
- **(5) Atlantic Irish-Biscay-Iberic (IBI) area**
- **(6) Mediterranean Sea**
- **(7) Black Sea**

The Production Units

5 Thematic Assembly Centres

Observations

Sea Level

Ocean Color

A Centre means a partnership on

- Management
- R&D
- Implementation
- Operations
- Validation

committed to produce the expected core information

7 Monitoring and Forecasting Centres

Models

Global Ocean

Arctic Ocean

Baltic Sea

Atlantic NWS

Atlantic IBI

Mediterranean Sea

Black Sea

Service Desk

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MyOcean for the Arctic

*The GMES Marine Core Service
offer in the Arctic*

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OBSERVATIONS



The MyOcean Sea Ice Thematic Assembly Centre ... *for the Arctic*

Lars Anders Breivik, met.no



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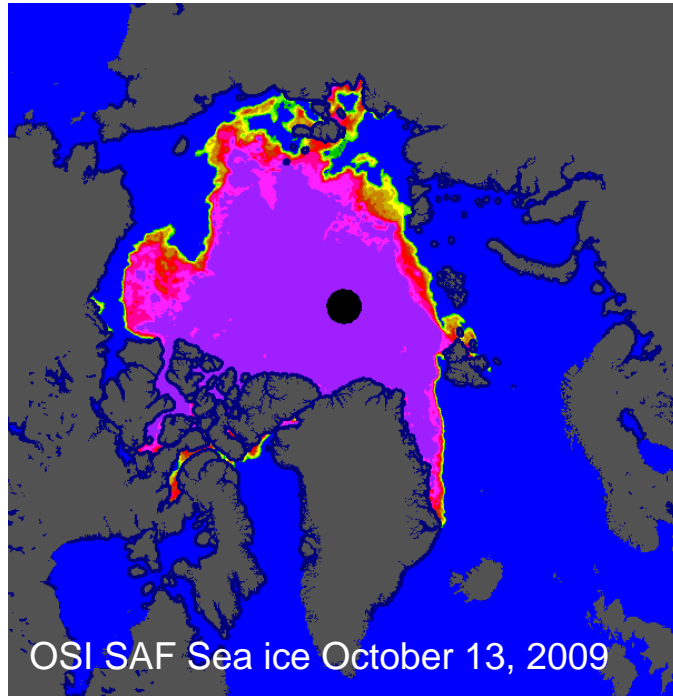
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Sea Ice & Wind TAC

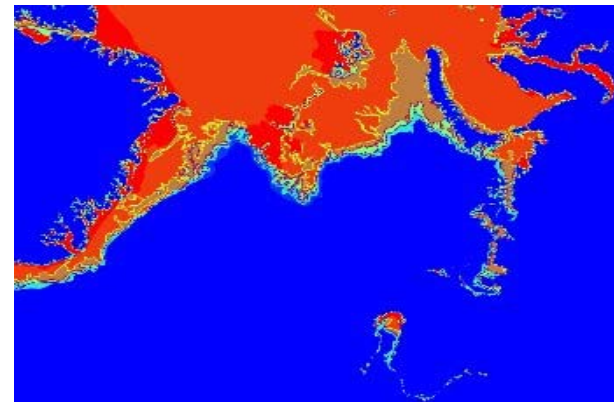
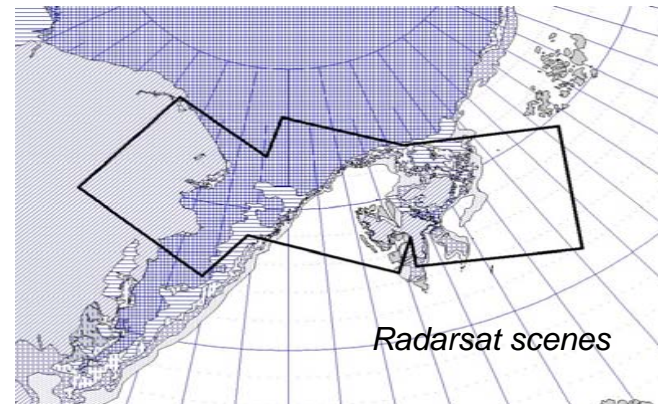
- The SIW TAC is a single **entry point for** satellite derived gridded sea ice data for use in operational ocean and ice analysis and forecast.
- The **main users** will be the Monitoring and Forecasting Centers: Arctic, Baltic and Global.
- The **main use** will be in assimilation and validation of operational ocean and sea ice models.
- Data will also be available to **outside users** through MyOcean service desk.

SIW TAC sea ice V0 products

Marine Core Service



Daily global products

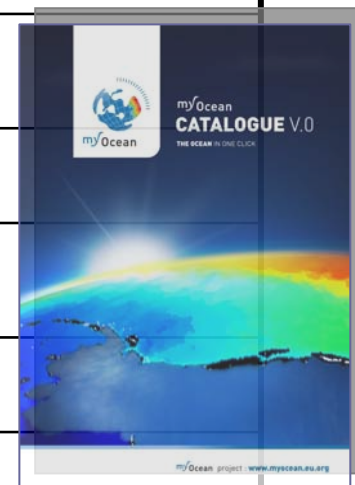


Regional products from national ice services, based on high resolution satellite data.

SIW TAC product portfolio

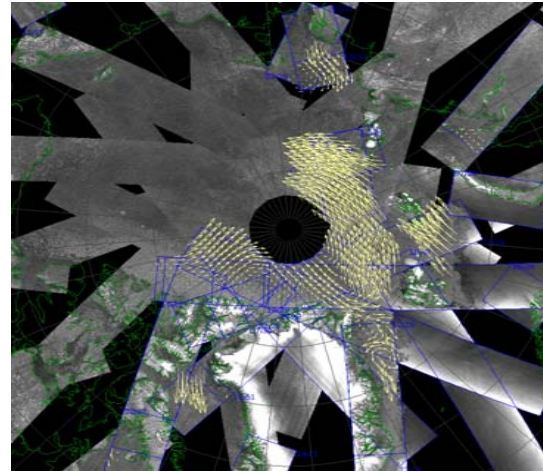
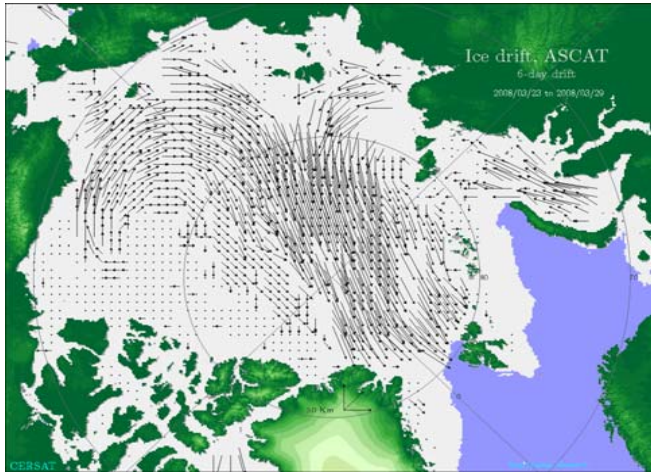
Marine Core Service

<i>Products</i>	<i>Input satellite data</i>	<i>Responsible</i>
Global Sea Ice conc	SSMI, AMSR	met.no / OSI SAF
Global Sea Ice edge	SSMI, scatterometer	met.no / OSI SAF
Global Sea Ice type	SSMI, scatterometer	met.no / OSI SAF
Regional Sea Ice products	SAR, AVHRR (+)	FMI, DMI, Met.no
Global Sea Ice drift	SAR	DTU
Sea Ice temperature	AVHRR, VIRS, Sentinel	DMI
Antarctic products	SAR	BAS
High resolution ice edge	SAR	NERSC
ice berg detection	SAR	DMI
Time series, climate (cons and drift)	SSM/I, scatterometer	IFREMER, OSI SAF

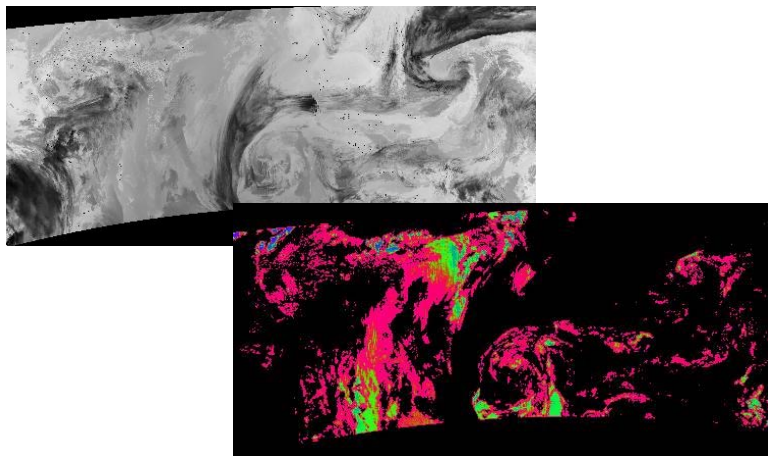


SIW TAC, V1 product examples

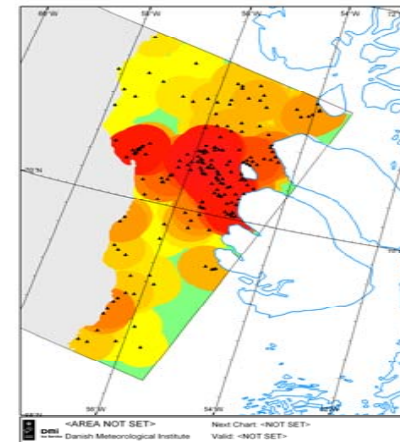
Marine Core Service



Large scale Ice drift (ASCAT, SSM/I), and high resolution ice drift from SAR



Ice Surface Temperature (AVHRR)



Ice berg density product (SAR)

OBSERVATIONS



The MyOcean In Situ Thematic Assembly Centre ... *for the Arctic*

Helge Sagen, IMR
Sylvie Pouliquen, Ifremer

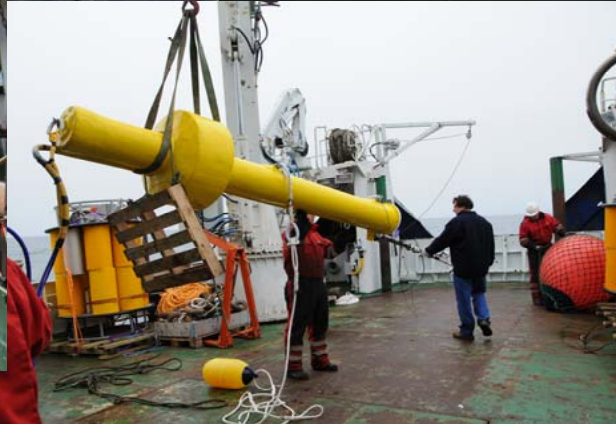


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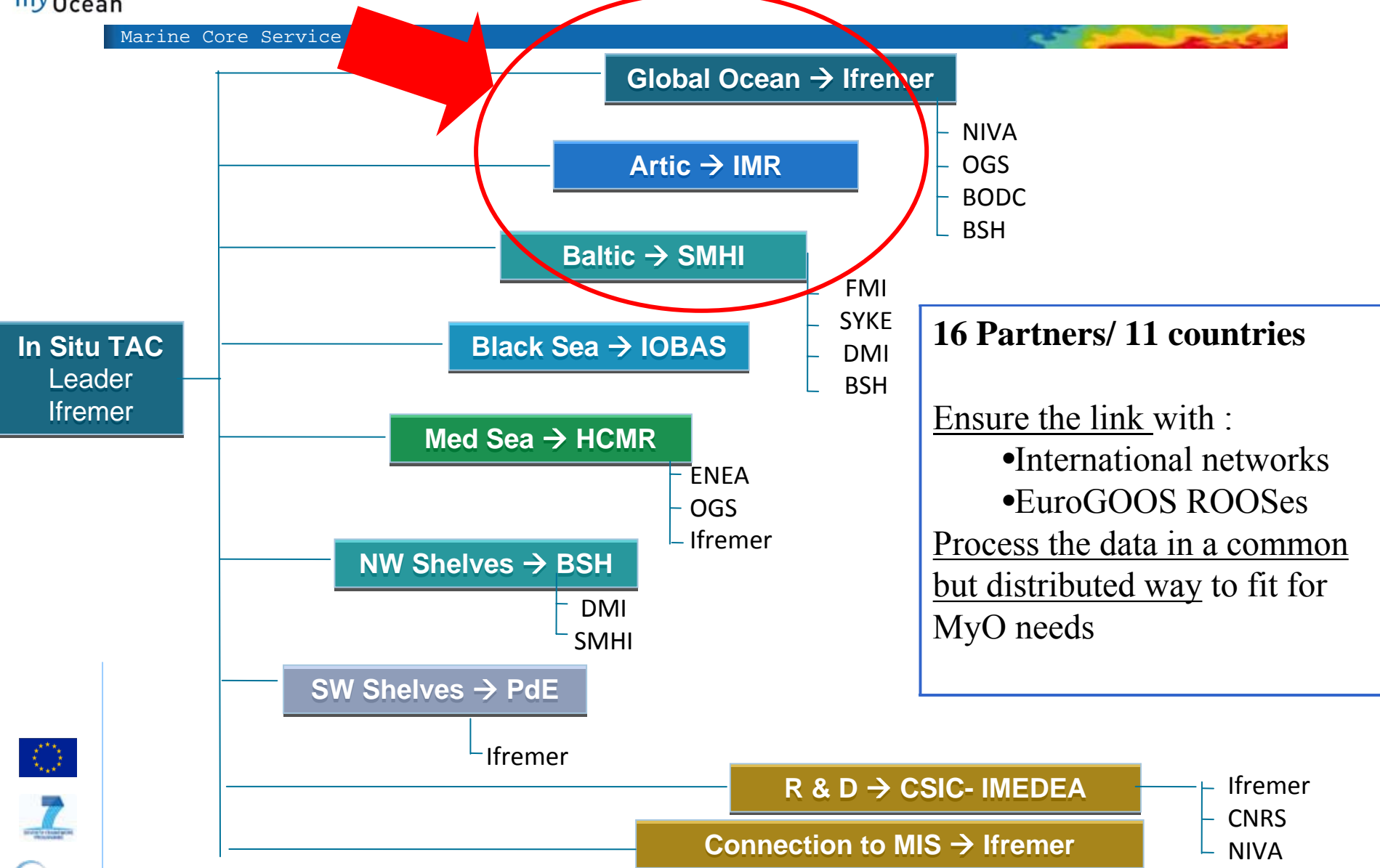


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Arctic in-situ TAC organization

Marine Core Service



16 Partners/ 11 countries

Ensure the link with :

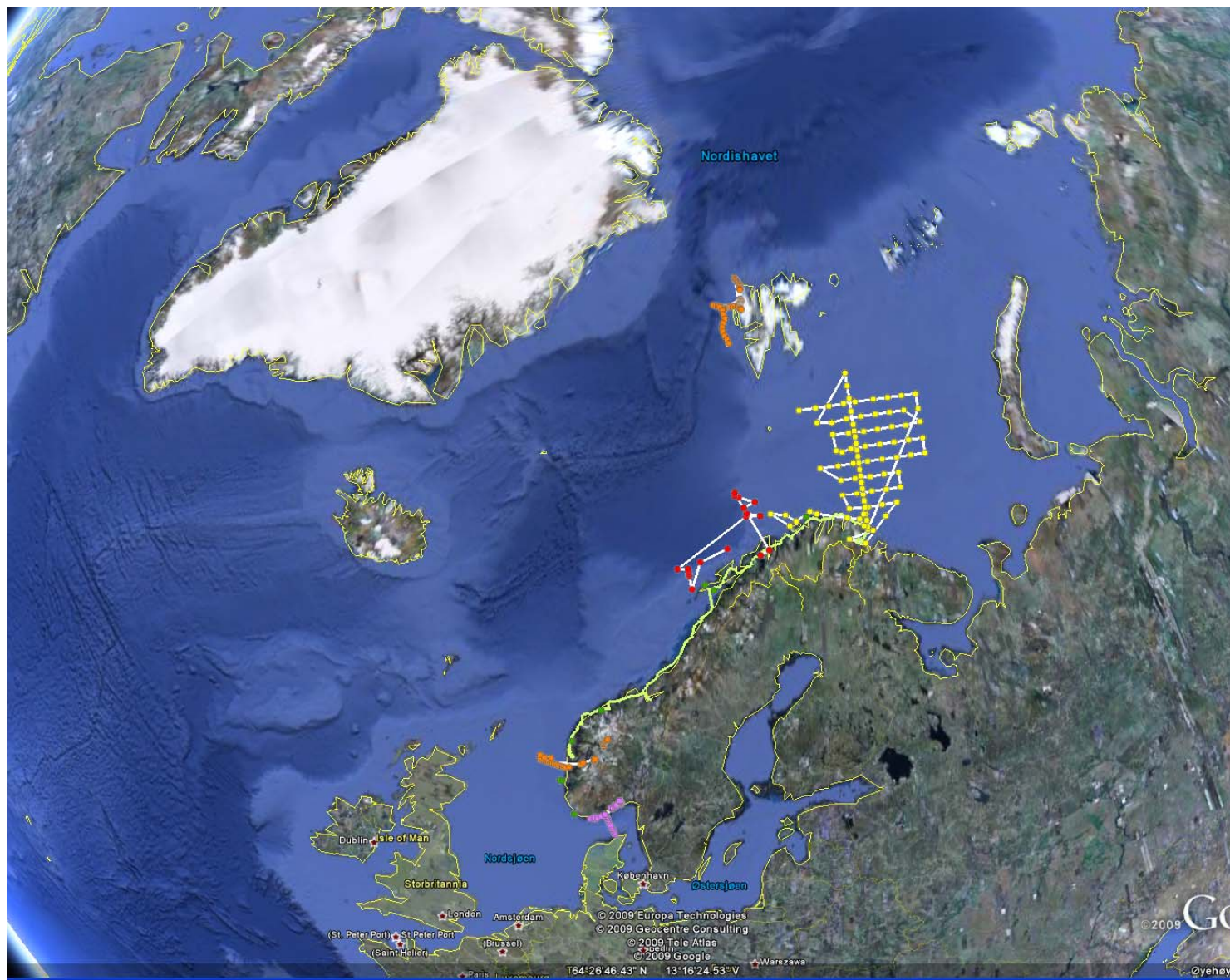
- International networks
- EuroGOOS ROOSes

Process the data in a common but distributed way to fit for MyO needs

In-situ data latest month from Arctic

fixed stations, ferrybox, research vessels

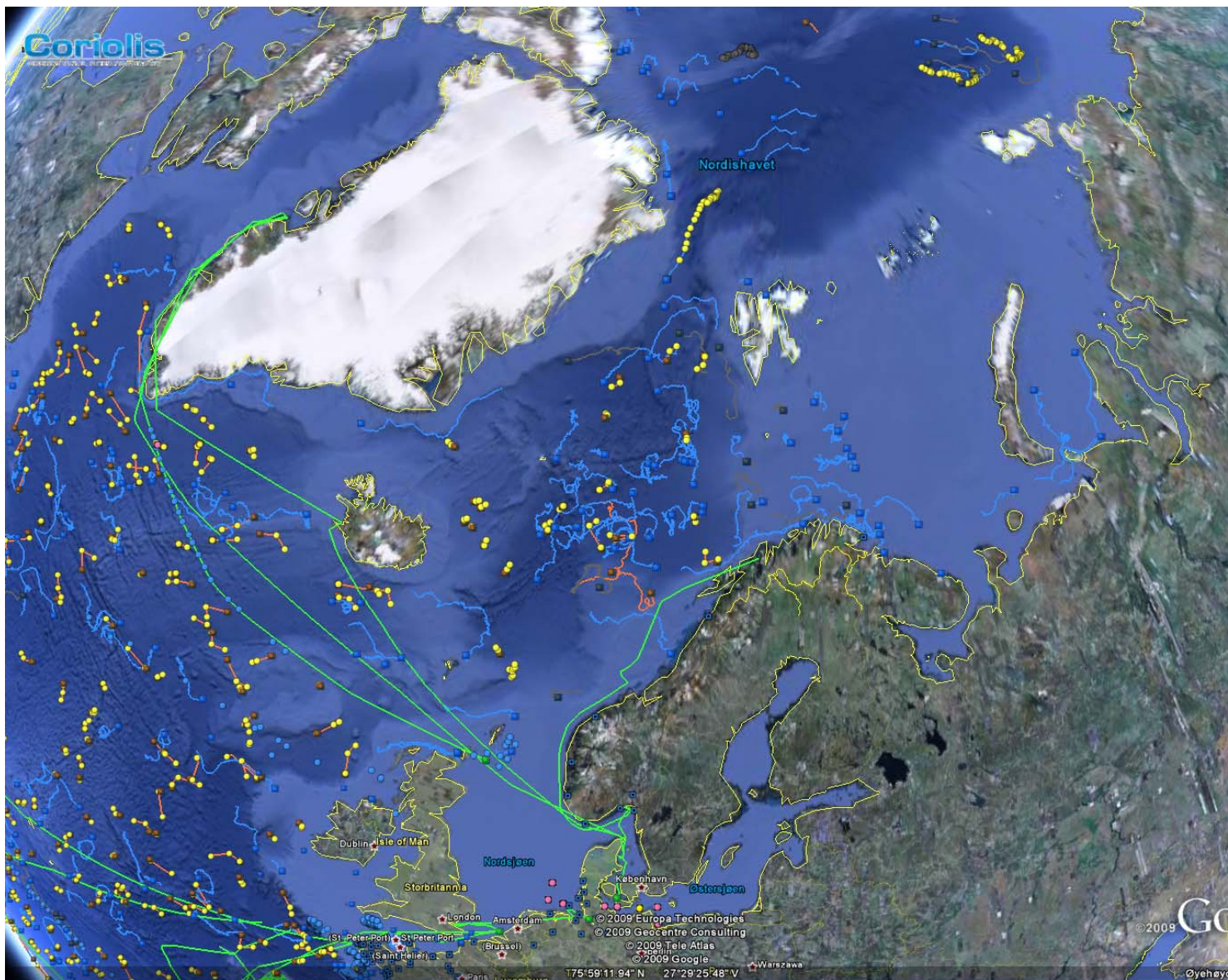
Marine Core Service



IMR

In-situ data latest month from Global

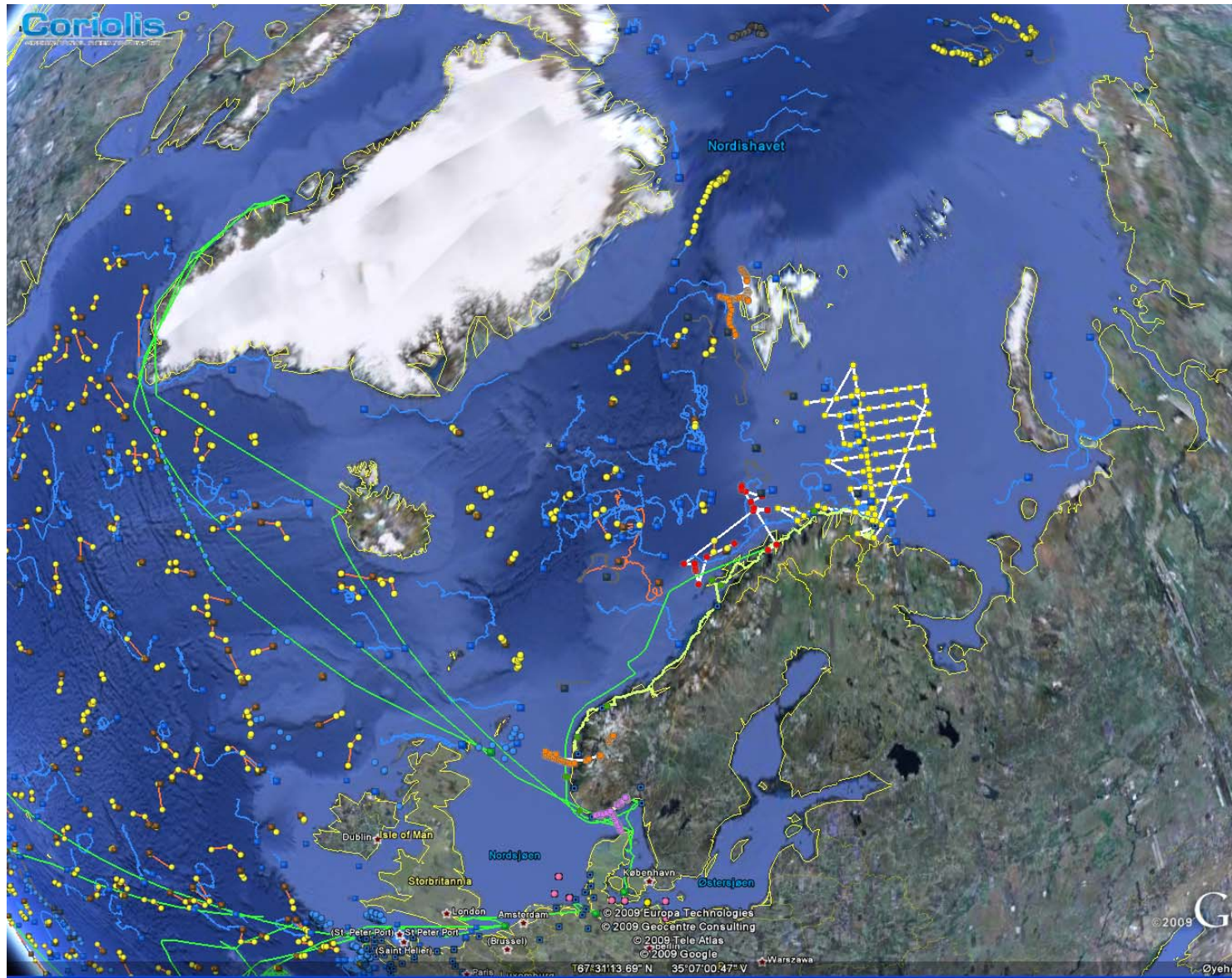
Marine Core Service



IFREMER

In-situ data Arctic MyOcean latest month

Marine Core Service



MyOcean

MODEL



The MyOcean Global Monitoring and Forecasting Centre ... *for the Arctic*

Gilles Garric, Mercator Ocean



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myOcean

Marine Core Service

Global Ocean
Horiz. Resol. $1/12^\circ$
50 vertical levels
U,V, T,S, ice

Under development
=> Real time Data
assimilation: 2010

Today: Global $1/4^\circ$
Operational
Real Time assimilation
of altimetry, SST, in
situ T&S vertical profile

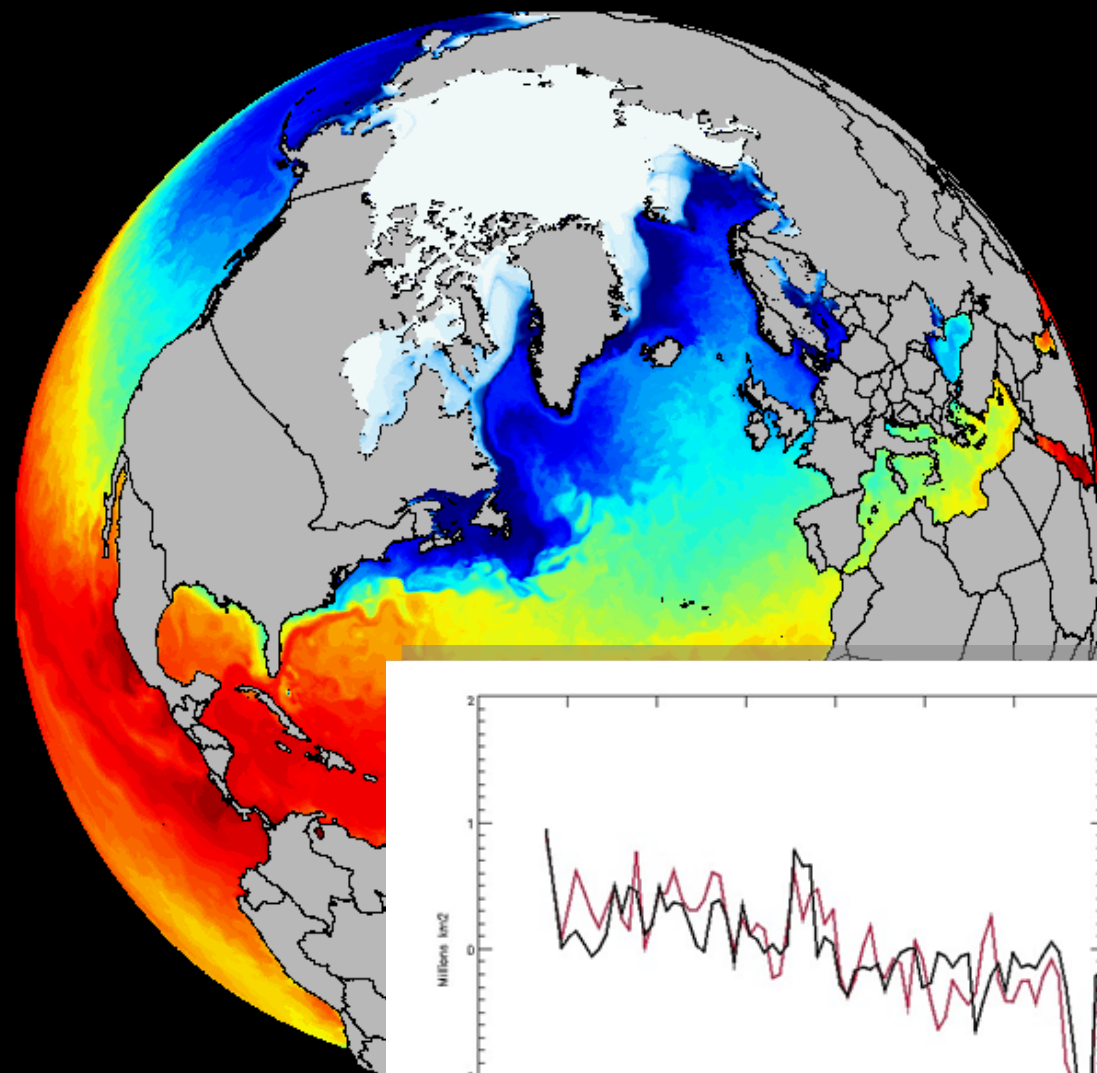
Mercator Ocean



Gmes

Global $1/12^\circ$

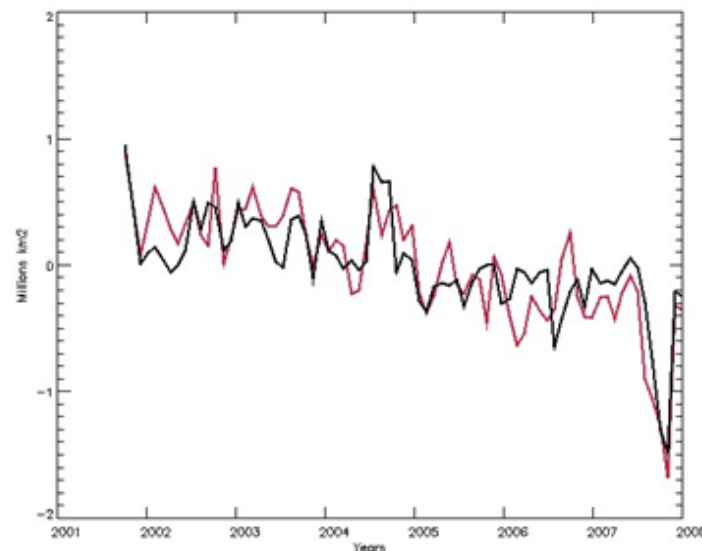
2003 January



Temperature ($^\circ\text{C}$) &



0. 2. 4. 6. 8. 10



MODEL



The MyOcean Arctic Monitoring and Forecasting Centre ... *for the Arctic*

Johnny Johannessen, NERSC, Board
Laurent Bertino, NERSC, Lead
Einar Svendsen, IMR, ecosystems



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Arctic MFC products

■ Model

- HYCOM – EVP coupled model
- 12-16 km horizontal resolution

■ Data Assimilation (EnKF, 100 members)

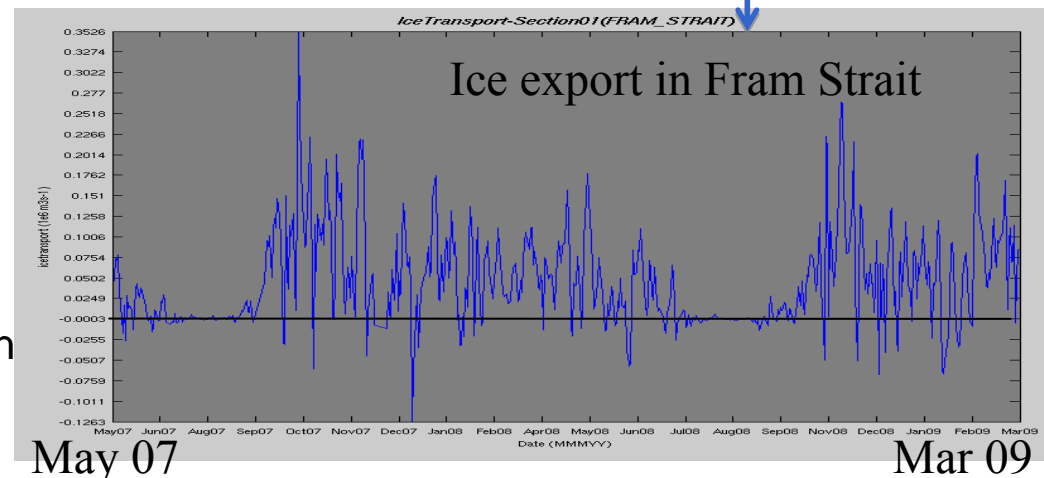
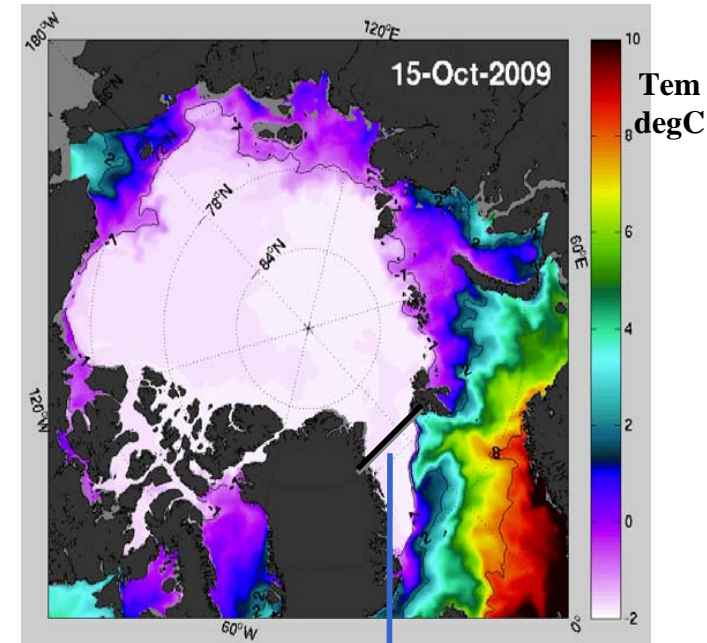
- Altimeter SLA maps (merged, CLS)
- SST (AVHRR, NOAA)
- Sea-ice concentrations (AMSR-E)
- Sea-ice drift (AMSR-E, Ifremer)
- Argo T&S profiles

■ Analyses and Forecasts

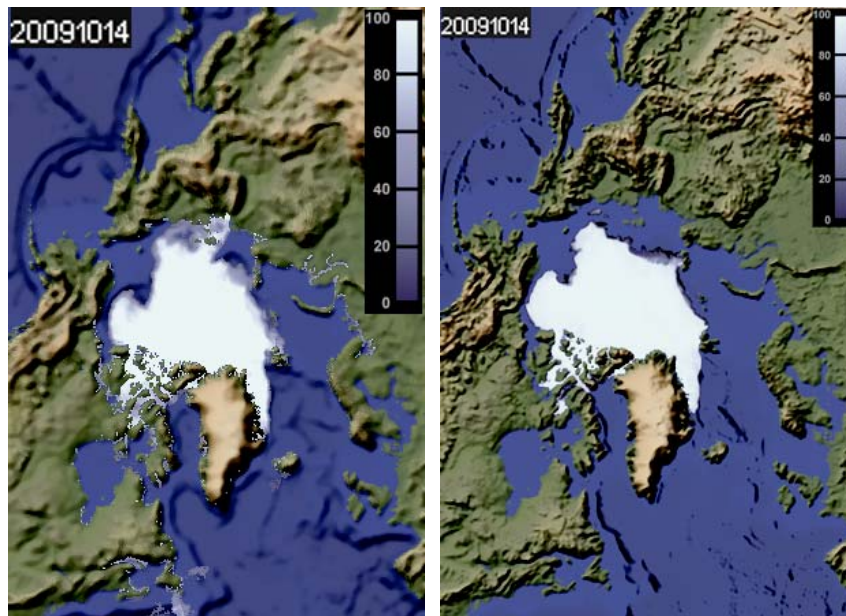
- Weekly runs,
- Updated Thursdays
- 10 days forecasts
- Exploited at met.no

■ Key products

- 3D Currents, S&T
- Ice conc. and edge location
- Ice drift and export
- Long time Trends



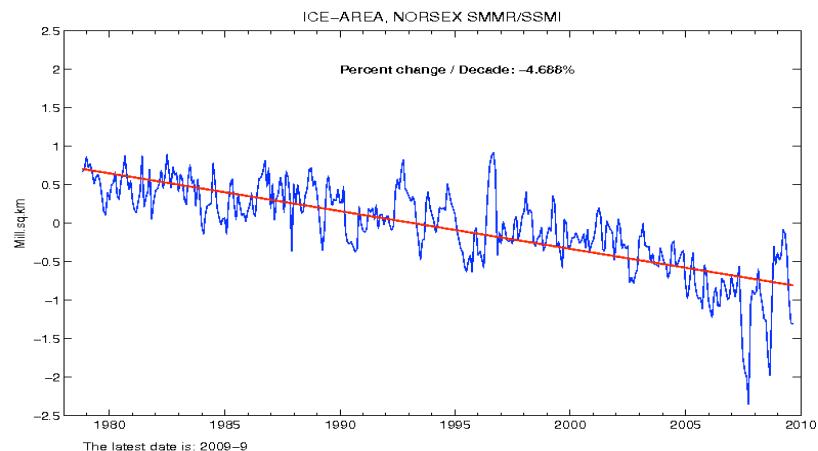
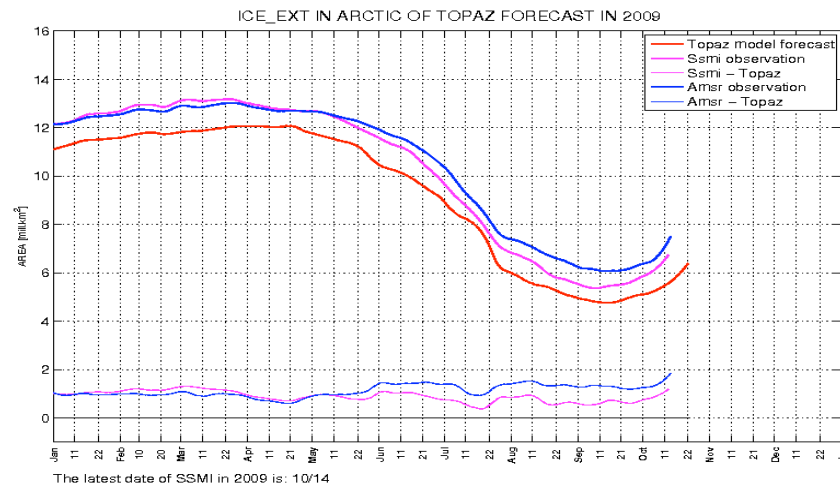
Arctic Sea Ice Trend and Forecasts



Observed
14 October 2009

Model Forecast
14 October 2009

Comparison Model Forecast to Observations

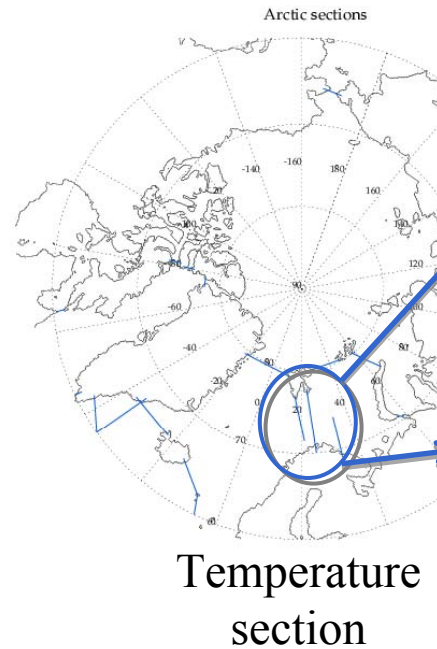


<http://www.artic-roos.org>
with link to MyOcean

Quality assessment

Arctic metrics

- Consistency
- Accuracy
- Performance

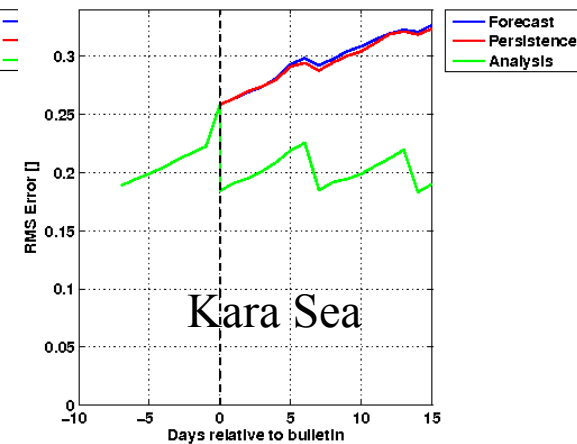
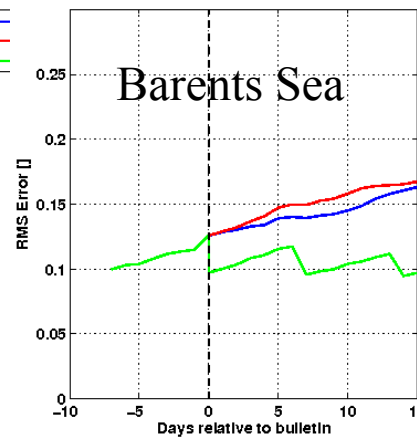
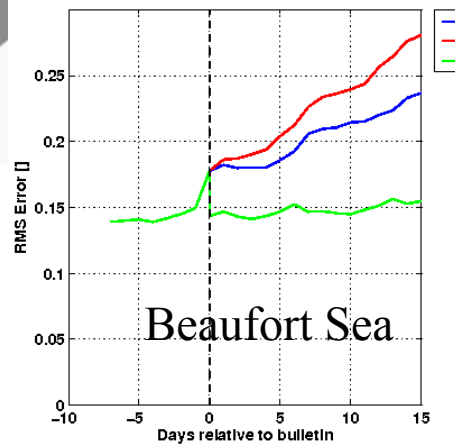
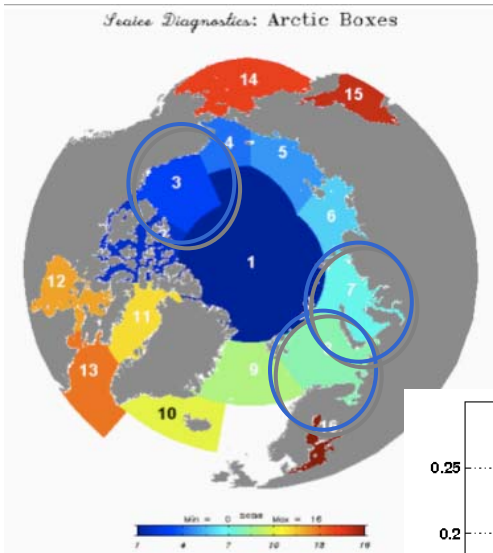


MODEL

OBS

Jun 07

Aug 07



Sea-ice
forecast skills

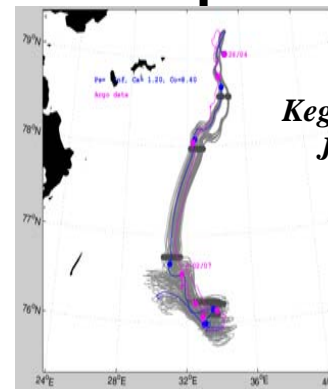
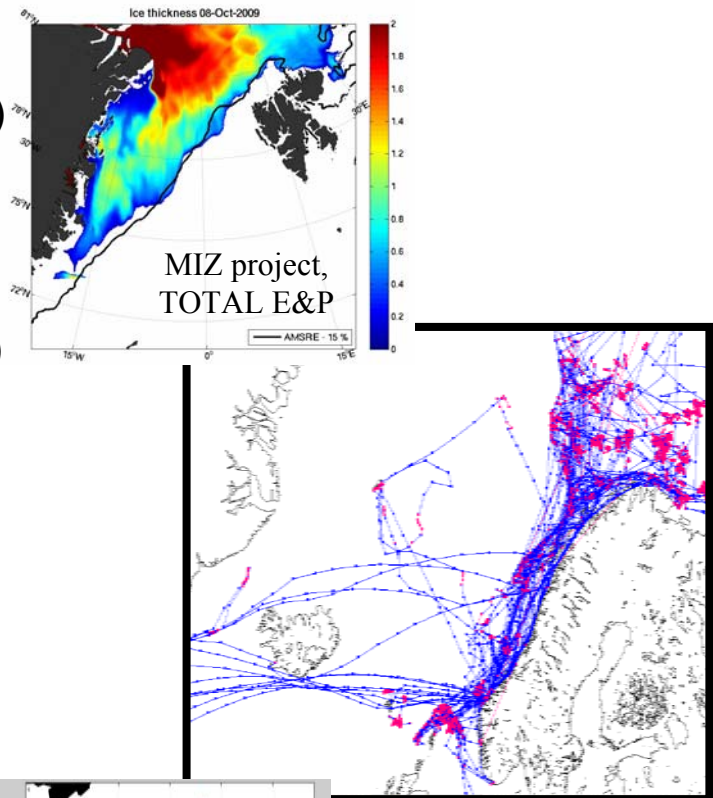
Products and Users

■ Core products

- Surface current for wave forecasts (ECMWF)
- **3D fields to reference fishing fleet** (IMR)
- 3D fields to acoustic tomography experiment (DAMOCLES FP7 project)
- Forecasts of the Marginal Ice Zone (NERSC)
- MCS to industry (TOTAL, Shtokman)

■ Downstream products

- **Iceberg ensemble forecasting** (NERSC)
- Fish larvae transport (IMR)
- Sea Ice fields (met.no)
- Ship routing (Russian Ice breaker fleet)



*Keghouche et al.,
JAOT, 2009*

MODEL



The MyOcean **Atl. North West Shelf** Monitoring and Forecasting Centre *...for the Arctic*

John Siddorn, The Met Office



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Marine
Core
Service



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NWS connections to ice influenced waters

Exchange with Arctic waters

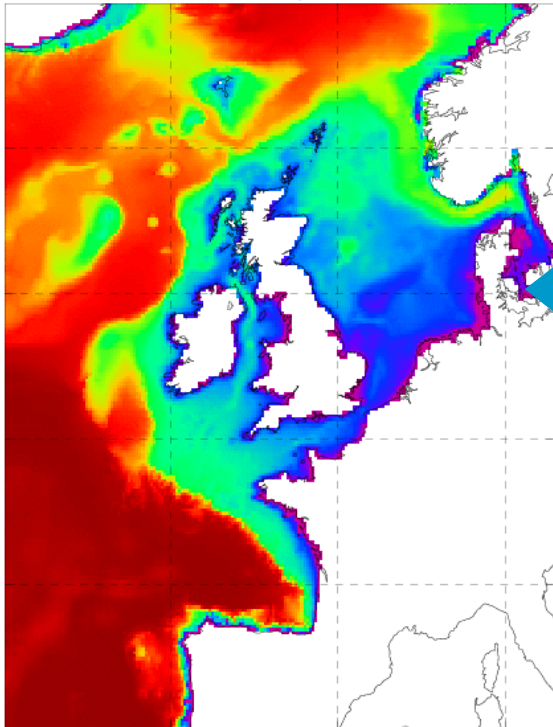
- Met Office deep ocean models including ice (FOAM) provide **boundary condition for the Arctic region**
- Includes assimilation in FOAM model of OSI-SAF ice data, including thickness and velocity

Exchange with Baltic

- R&D to investigate the potential for **improved boundaries at Baltic interface** as part of Myocean
- SMHI (lead), DMI and BSH
- Real-time model data input from Baltic will be trialled alongside new model-based climatologies

Output of boundary information

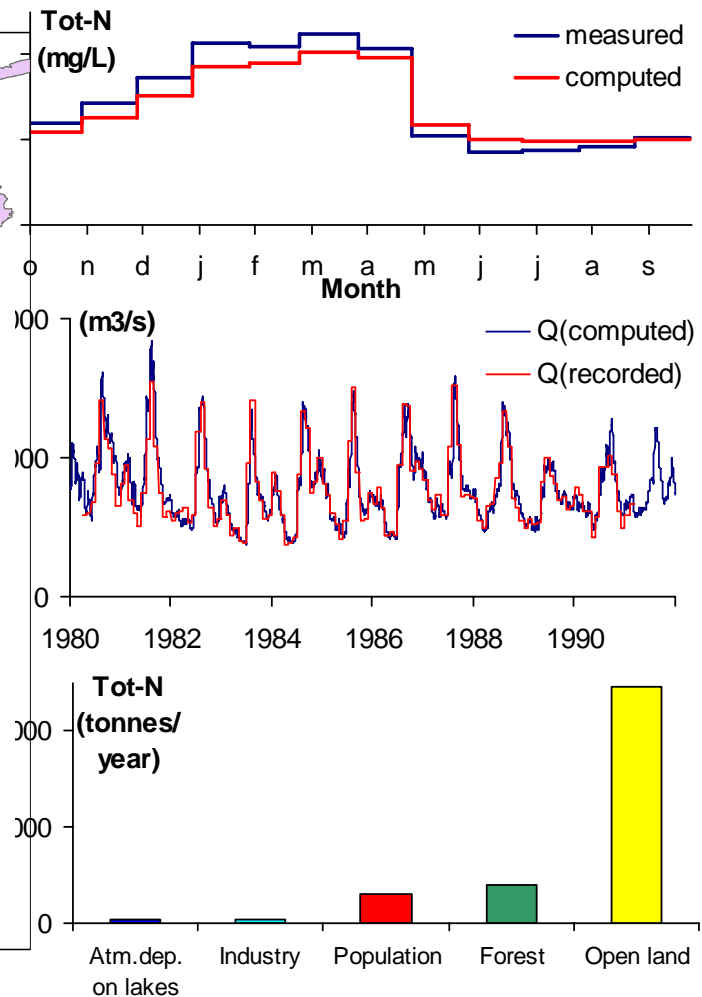
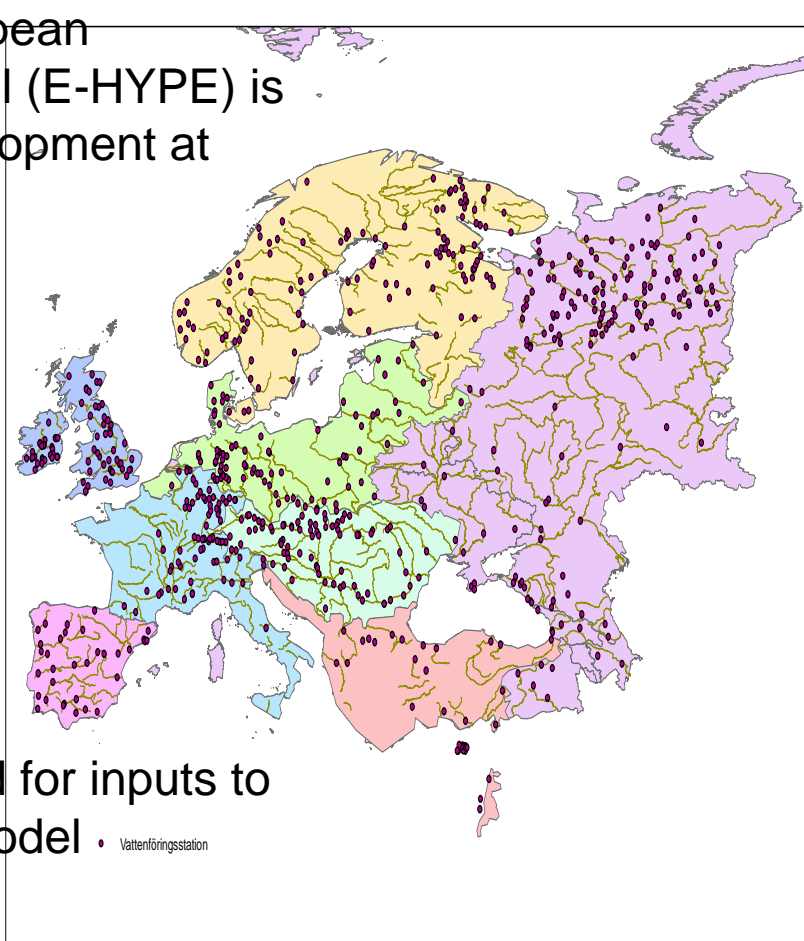
- The NWS model (tides, no ice) is available as a boundary condition for SMHI and others to provide **inputs to the Baltic/Arctic regions (ice, v little tide)**



Met office operational 3D tidal and baroclinic forecasting model for the NWS

SMHI lead R&D - Evaluating the potential for real-time river inputs using E-HYPE

A pan-european runoff model (E-HYPE) is under development at SMHI



Will be used for inputs to the NWS model • Vattenföringsstation



Baltic Operational
Oceanographic System



The MyOcean Marine Core Service Added Value in the Baltic

Bertil Håkansson, SMHI

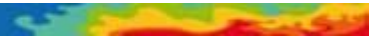


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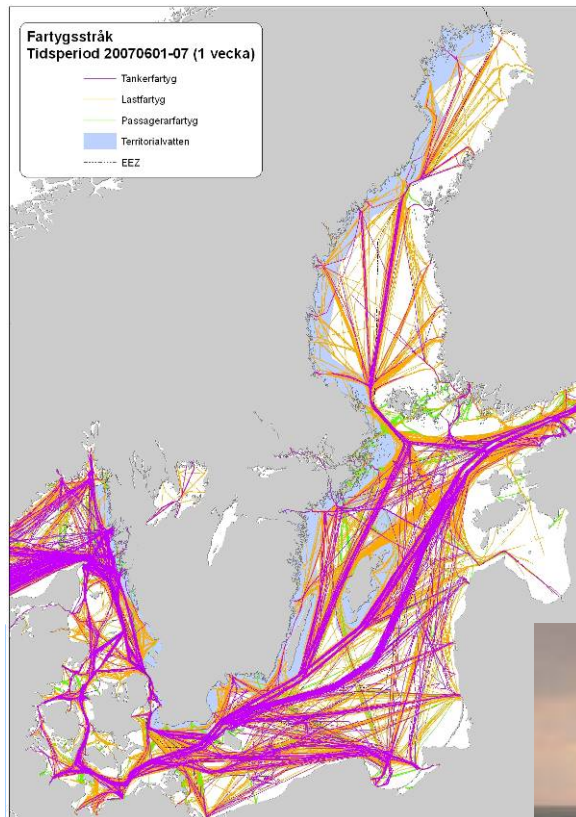


- Improve model hindcasts, forecasts and satellite data access supporting
 - Oil spill drift and backtracking service for **Swedish Coast Guard** and for **HELCOM** member state agencies - STW
 - Search and Rescue service for **Swedish Maritime Agency**
 - Sea ice service for ship traffic and **Sea Ice management**
- Development and Evaluation of **ecosystem** hind- and forecasts
- Improve the regional operational oceanographic service BOOS



Intensive ship traffic

AIS information on ship traffic during one week. Around 2,000 sizeable ships are normally at sea at any time in the Baltic



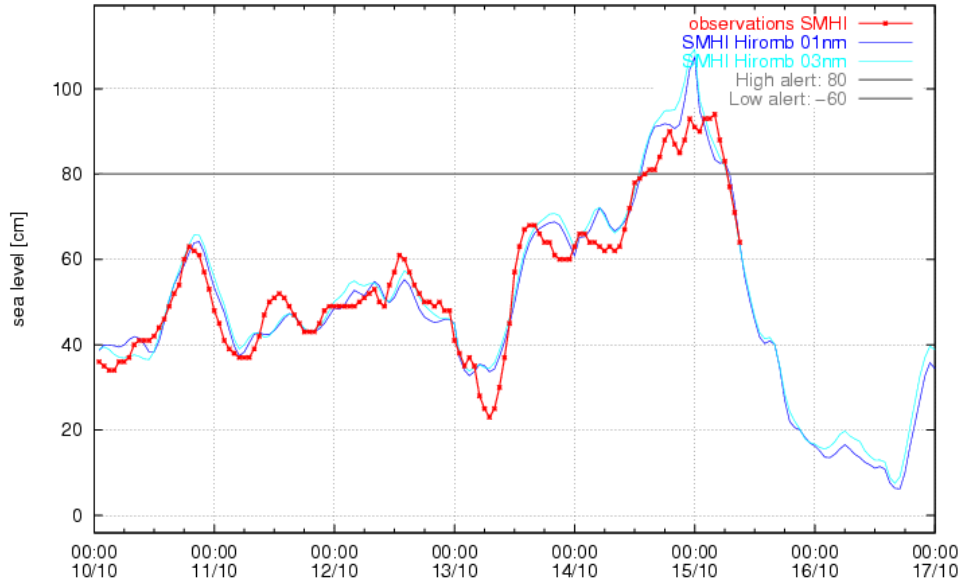
Strong need for
Search & Rescue
Oil spill detection and combat
Information on
sea ice, currents, waves, temperature and salinity



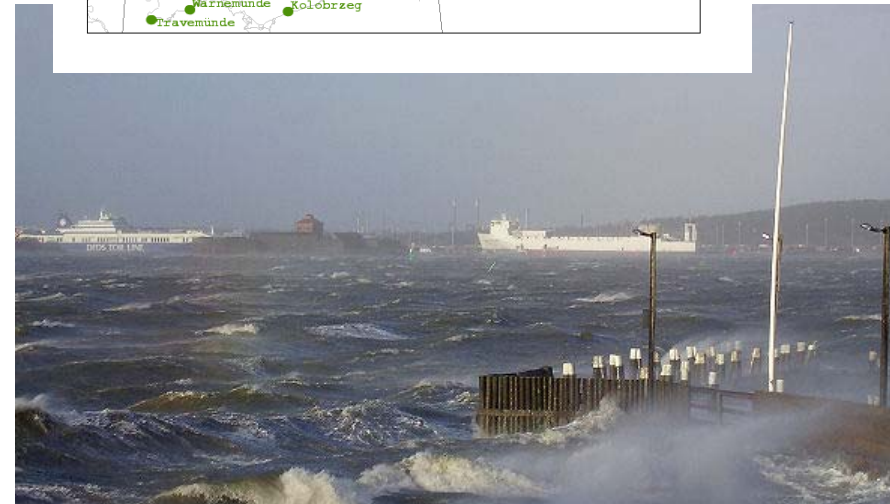
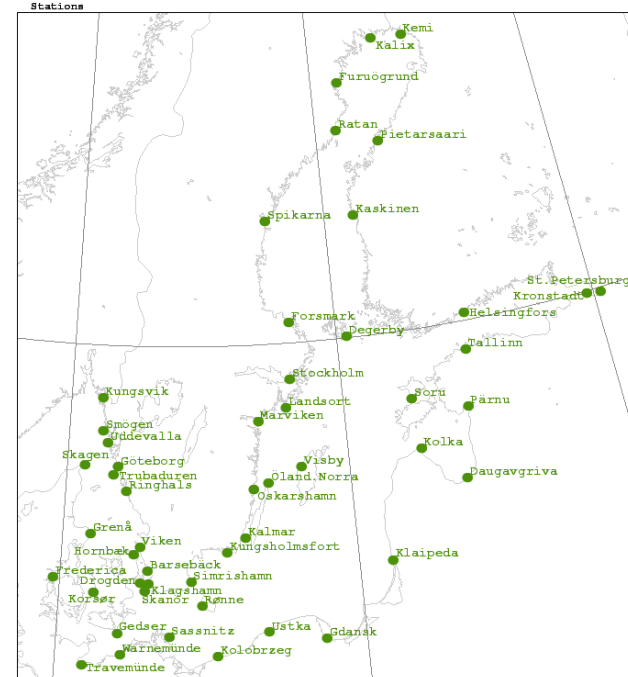
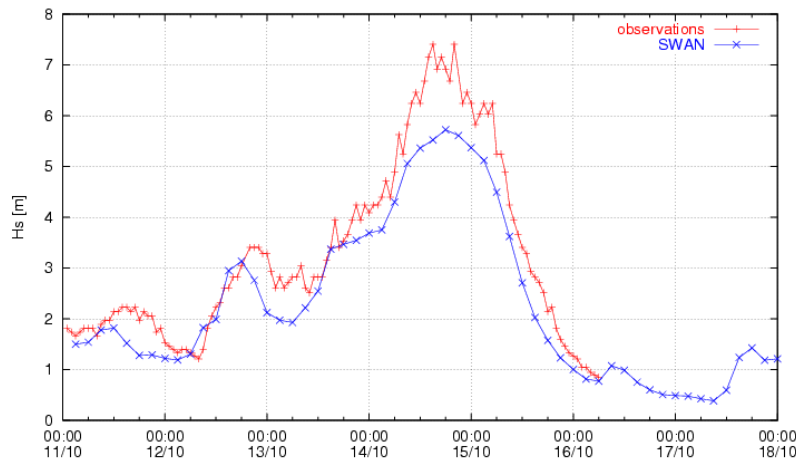
Sea level and wave warnings for ships and coastal flooding

Marine Core Service

Sea level Skanör



Significant waveheight Southern Baltic, 2009–10–16 06:00
Forecast from 2009–10–16 00:00





Conclusions

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- MyOcean is implementing the European GMES **Marine Core Service**
- It aims at providing a reference and assessed « **core information** » on the ocean, based on space data, in situ data and models
- Access to the GMES Marine Core Service information is **open and free**
- 3 years to implement a pan-European service, first mock-up at <http://www.myocean.eu.org>
- **Arctic** is one of the important area for MyOcean, and the core service is defined to provide a reference monitoring and forecasting information to reference stakeholders
- As a European service, MyOcean serves **Member States** key service providers



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