

Marine Monitoring

# COPERNICUS MARINE SERVICE AND POLAR REGIONS G. Garric (R&D) L. Crosnier & L. Bertino



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Monitoring

# COPERNICUS MARINE SERVICE

<http://www.marine.copernicus.eu>

**COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE**  
Providing PRODUCTS and SERVICES for all marine applications

ABOUT US | MARKETS & BENEFITS | NEWS | SCIENCE & MONITORING | TRAINING & EDUCATION | SERVICES PORTFOLIO

**ACCESS YOUR OCEAN INFORMATION**

GETTING STARTED →

**OCEAN PRODUCTS**  
Ocean product catalogue, to download or visualize data across more than 10 variables, including historic, current and forecasted data.  
DATA →

**OCEAN MONITORING INDICATORS**  
Essential variables monitoring the health of the ocean  
TRENDS →

**OCEAN STATE REPORT**  
Extensive annual analysis on the state of the ocean over nearly 20 years and severe/notable annual events  
EXPERTISE →

**SHORT-CUT TO SERVICES**

- REGISTER NOW!
- SCIENTIFIC QUALITY
- ONLINE TUTORIALS
- COLLABORATIVE FORUM

**LATEST NEWS FLASH**  
CMEMS-7324-A  
New Service Release on 22 March 2018 - Status on updates  
INFORMATION  
ALL NEWS FLASH

**28 March** EVENTS AGENDA

**PARTNERS AND STAKEHOLDERS**

**FOCUS ON**

**TRAINING**

**COPERNICUS MARINE SERVICE AND OCEAN ENERGY EUROPE PARTNERSHIP KICK-OFF IN BRUSSELS**

Mercator Ocean and Ocean Energy Europe (OEE) are pleased to invite you to a reception cocktail to kick off a partnership signed between the two entities in the context of supporting ocean renewable energy through the Copernicus Marine Service.

READ MORE

**Copernicus Marine Service and Ocean Energy Europe Partnership Kick-Off in Brussels**

**SAVE THE DATE: April 23, 2018**

- One Single Portal
- MARINE PRODUCTS
- **OPEN&FREE**





# Ocean Data & Information

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## OCEAN PRODUCTS

Ocean product catalogue, to download or visualize data across more than 10 variables, including historic, current and forecasted data.

DATA



ONLINE CATALOGUE

YOUR SEARCH

Found 151 ocean products matching your criteria.

GLOBAL\_ANALYSIS\_FORECAST\_PHY\_001\_024

GLOBAL OCEAN 1/2° PHYSICS ANALYSIS AND FORECAST UPDATED DAILY

MODEL: GLO

T bottomT S SSH UN MLD SIC SIT SILV

0.003 degree x 0.003 degree (50 depth levels)

From 2006-12-27 to Present

monthly-mean, daily-mean, hourly-mean

weekly-mean

GLOBAL\_ANALYSIS\_FORECAST\_BIO\_001\_014

GLOBAL OCEAN BIOGEOCHEMISTRY ANALYSIS AND WEEKLY FORECAST

MODEL: GLO

CHL PHYC O2 NO3 PO4 SI FE PP

0.5 degree x 0.5 degree (50 depth levels)

From 2012-01-01 to Present

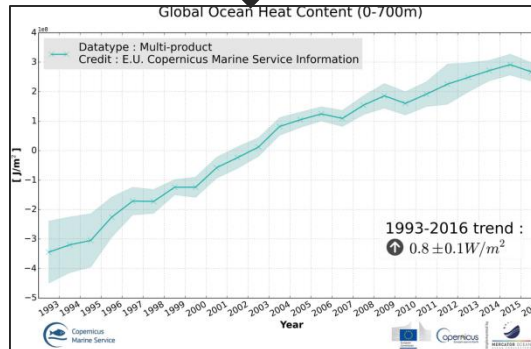
weekly-mean

More info Add to cart WMS Sub-setting

## OCEAN MONITORING INDICATORS

Essential variables monitoring the health of the ocean

TRENDS



## OCEAN STATE REPORT

Extensive annual analysis on the state of the ocean over nearly 20 years and severe/notable annual events

EXPERTISE



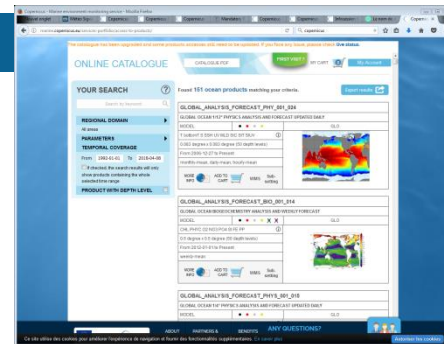


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marine.copernicus.eu

## ACCESS TO DATA & INFORMATION

Free and open access  
to worldwide Ocean information  
[marine.copernicus.eu](https://marine.copernicus.eu)



• SEARCH  
& BROWSE



• DISCOVER  
& VISUALISE



• REGISTER



• DOWNLOAD



• COMPUTE



• JOIN UP



Copernicus  
Europe's eyes on Earth

Implemented by  
**MERCATOR  
OCEAN**  
INTERNATIONAL





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# GLOBAL OCEAN AND EUROPEAN REGIONAL SEAS



- 1. Global
- 2. Arctic
- 3. Baltic
- 4. NWS
- 5. IBI
- 6. Med Sea
- 7. Black Sea



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# OCEAN DATA, A PUBLIC GOOD

**REANALYSES**  
~25 years



**REAL-TIME**  
Daily, hourly



**FORECAST**  
5 to 10 days

**ESSENTIAL  
OCEAN  
VARIABLES**



- 1 Global
- 2 Arctic
- 3 Baltic
- 4 NWS
- 5 IBI
- 6 Med Sea
- 7 Black Sea

**157 products**



See catalog : <http://marine.copernicus.eu/services-portfolio/access-to-products/>



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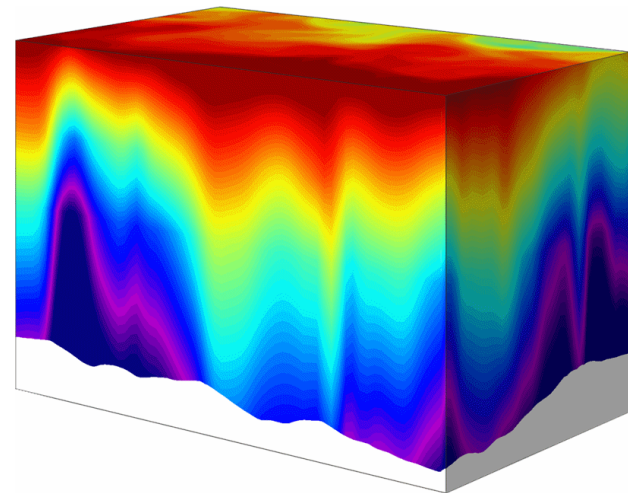
PORTFOLIO GATHERS DATA FROM 3 SOURCES



**SATELLITE  
OBSERVATION**



**IN SITU  
OBSERVATION**



**OCEAN MODEL  
COMPUTATION**





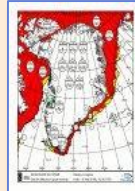
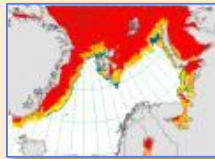
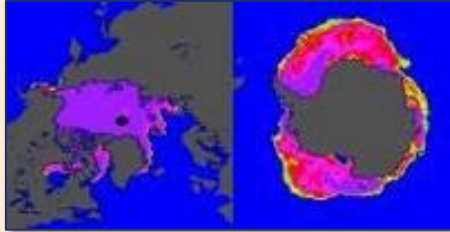


# (Arctic) Ice products in CMEMS

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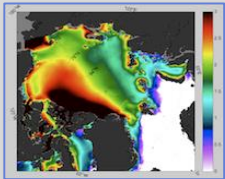
## Sea Ice Concentration

Analysis and forecasts, reanalysis, global/Arctic  $1/12^\circ$  &  $1/4^\circ$ ; NRT and reprocessed satellite data (1979-present); Charts (1km)



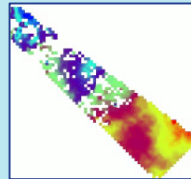
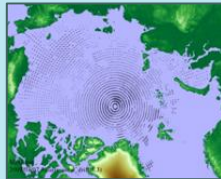
## Sea Ice Thickness

Analysis and forecasts, reanalysis, Arctic/Global  $1/12^\circ$  &  $1/4^\circ$ .



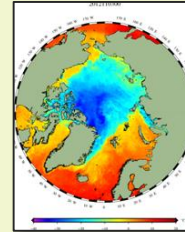
## Sea Ice Drift

Analysis and forecasts, reanalysis, Arctic/Global  $1/12^\circ$  &  $1/4^\circ$ ; Satellite data (L3 & L4) reprocessed and NRT 60km, 10km



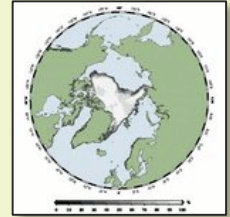
## Ice surface temperature

Satellite data  $1/20^\circ$



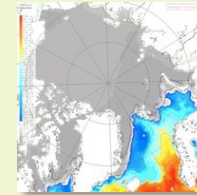
## Sea Ice Edge & Type

NRT and reprocessed satellite data (1979-present)



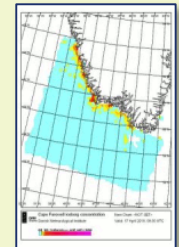
## Snow Thickness & Sea Ice albedo

Analysis and forecasts, reanalysis, Arctic  $1/12^\circ$



## Density of icebergs

Satellite data, 10km.



See catalog : <http://marine.copernicus.eu/services-portfolio/access-to-products/>







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## OUR USER' APPLICATIONS ARE ABOUT:

MARITIME  
SAFETY



Copernicus Marine Service supports safety at sea and pollution response

COASTAL  
& MARINE  
ENVIRONMENT



Copernicus Marine Service contributes to coastal management and environmental impact assessment

MARINE  
RESOURCES



Copernicus Marine Service contributes to the sustainable management of marine resources

WEATHER,  
CLIMATE  
& SEASONAL  
FORECASTING



The Copernicus Marine Service synthesizes the ocean state and health for the preceding 20 years and helps improve seasonal forecasting

**POLICY-MAKERS**

**SCIENCE**

**NGOs**

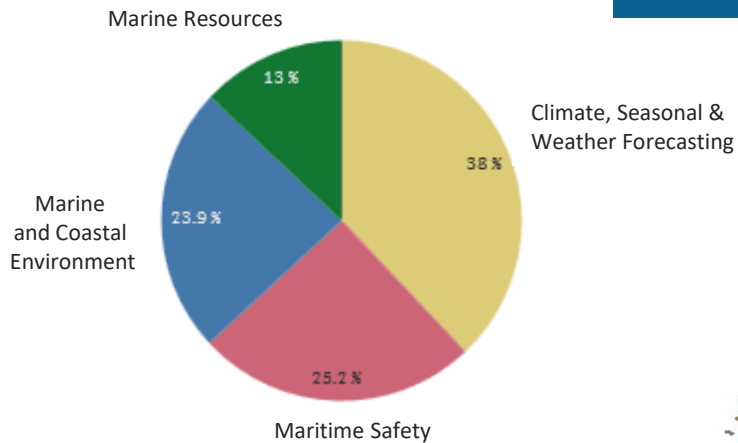
**GENERAL PUBLIC**

**BUSINESS**

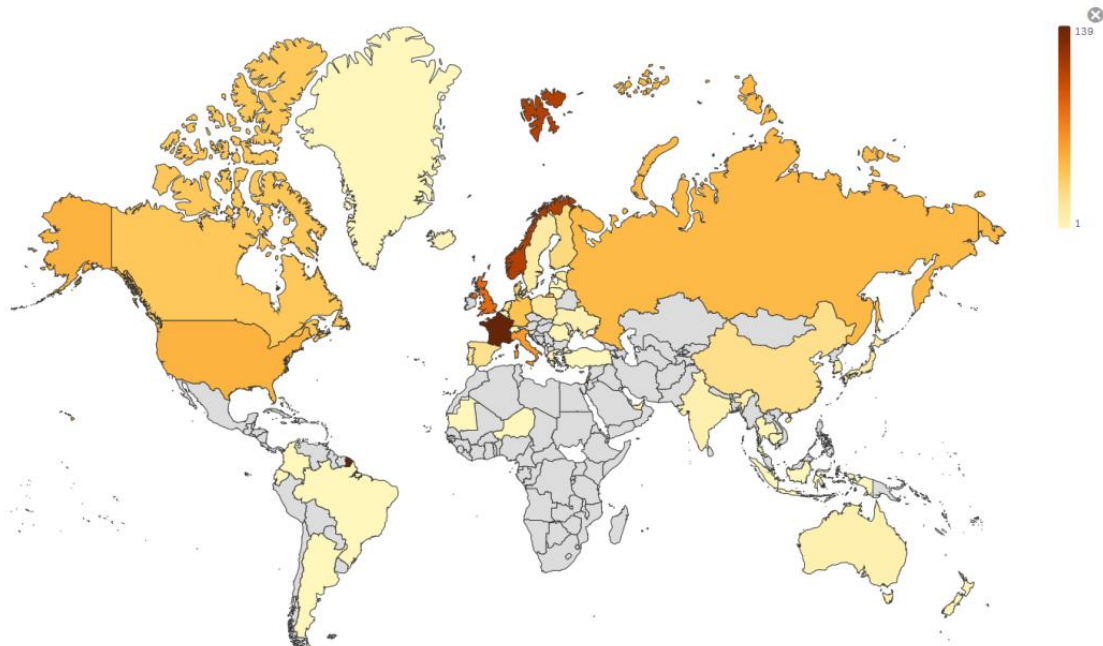
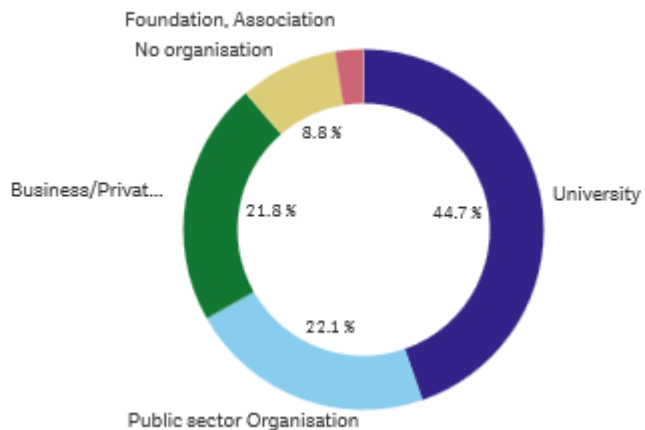
**PUBLIC  
AUTHORITIES**

~ **15 000 subscribers worldwide**

## Areas of benefits



## Organisation details

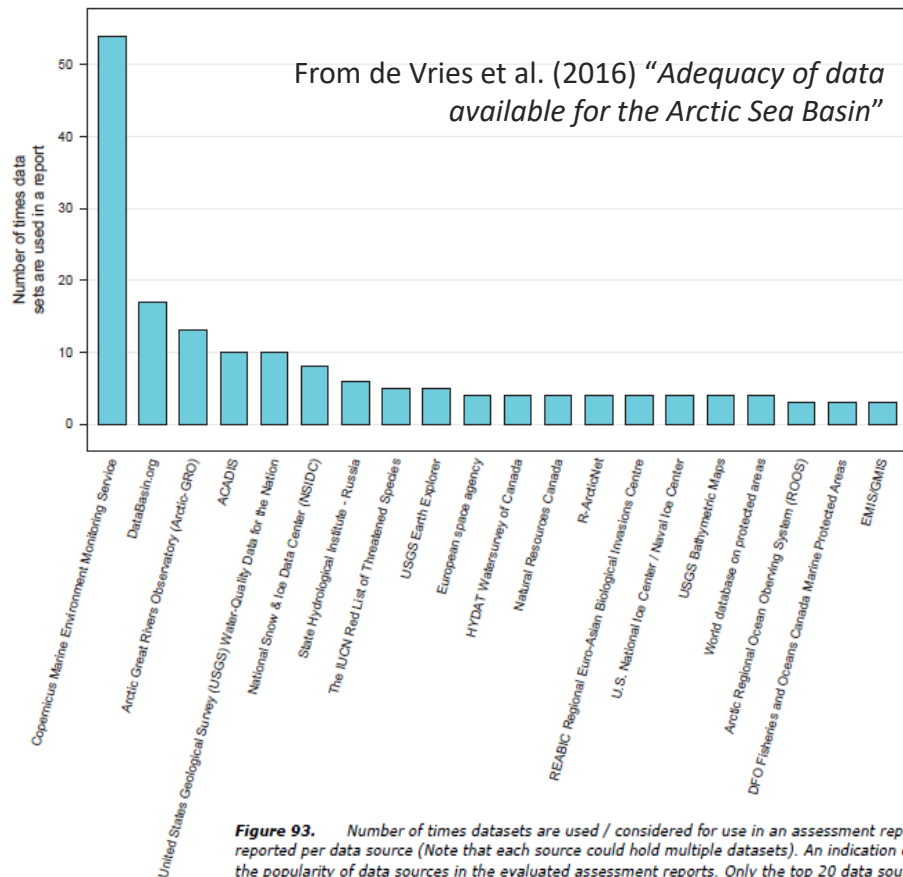


**734 users** for all Sea Ice and Arctic products (Oct2018)



# Adequacy of data available for Arctic

- Type of reports : *technical reports or peer reviewed publications*
- Complementarity of CMEMS' portfolio ? (Satellite and in situ data, analysis and forecasts, for Blue/White/Green oceans).
- Report, made in 2016, doesn't take into account recent releases of new data.

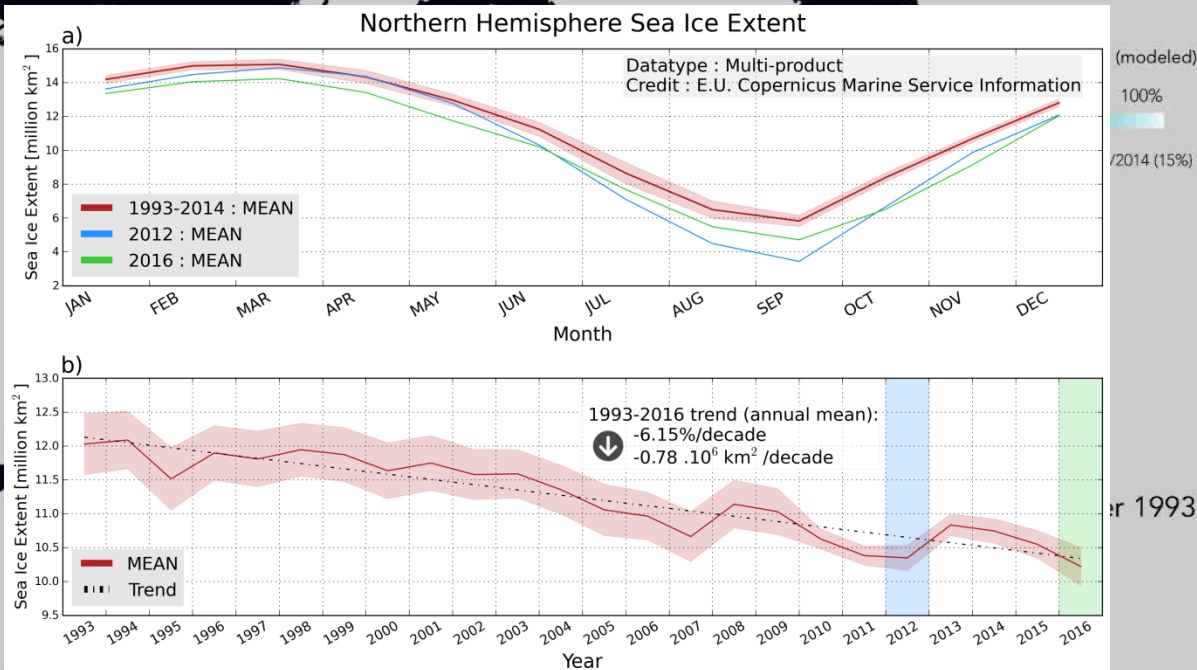




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# Sea Ice Fraction Evolution 1993-2017

## Reference: Mean 1993-2014



Sea Ice monitoring Indicator







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## EXAMPLES OF USE FOR POLAR REGIONS

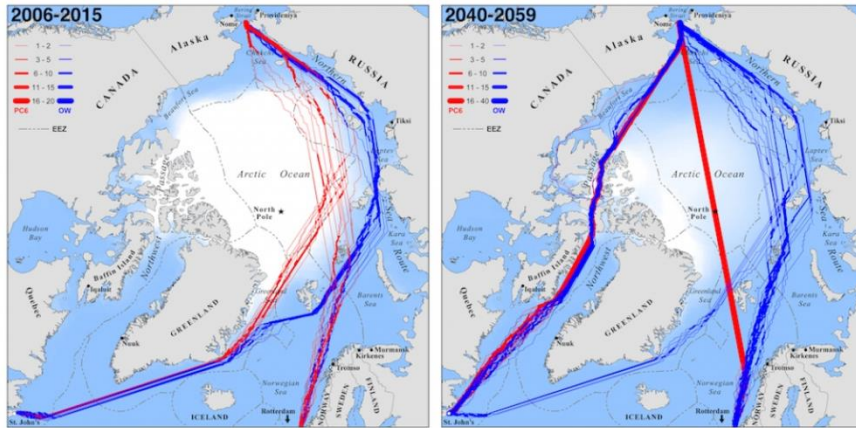
- AUTOMATED SEA ICE MAPS FOR CARGO SHIPS SAFETY
- NAVIGATION AND SCIENTIFIC PLANNING  
ONBOARD RESEARCH VESSEL
- SHIP ROUTING IN ICE COVERED AREAS: THE  
NAVTOR AS SERVICES
- ARCTIVITIES: RISK INDICATORS  
FOR SAFER COASTAL ACTIVITIES IN THE ARCTIC OCEAN





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# AUTOMATED SEA ICE MAPS FOR CARGO SHIPS SAFETY



This service provides a new ice map service in the Arctic Ocean to allow faster and safer passage through or around the ice, and serve the recent increase of shipping, resource extraction and tourism activities in the Polar regions. Typical users are cargo ships, service ice breakers, expedition cruise ships and research or exploration vessels. This service uses products from the Copernicus Marine Service in the Arctic Ocean (sea ice forecast model and satellite observation).



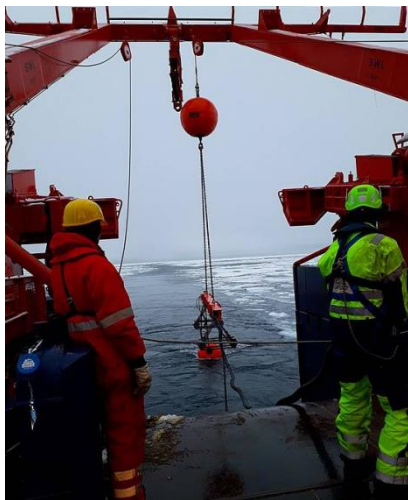
**DRIFT+NOISE**  
Polar Services





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# NAVIGATION AND SCIENTIFIC PLANNING ONBOARD RESEARCH VESSEL



RV Polarstern is a German research icebreaker of the Alfred Wegener Institute for Polar and Marine Research (AWI) in Bremerhaven. To aid navigation and scientific planning in sea ice covered areas, a new charting system was developed using among other data the Copernicus Marine Service sea ice forecast model.

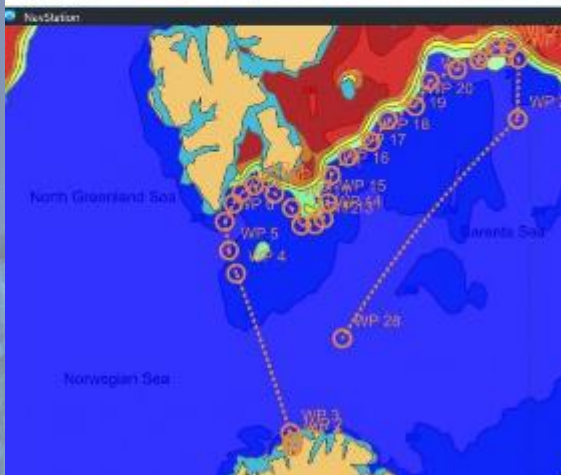


ALFRED-WEGENER-INSTITUT  
HELMHOLTZ-ZENTRUM FÜR POLAR-  
UND MEERESFORSCHUNG



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# SHIP ROUTING IN ICE COVERED AREAS: THE NAVTOR AS SERVICES



The shipping service company NAVTOR AS develops software solutions for various planning and e-navigation services. NAVTOR AS serves around 3000 vessels world-wide. Avoiding rough weather and having the best possible advance route planning can minimise boat damage and mean more precise arrival times. Choosing the optimum route also lays the foundation for reducing fuel consumption. This service uses products from the Copernicus Marine Service in the Arctic Ocean (sea ice forecast model).

**NAVTOR**   
*e-navigation made easy*

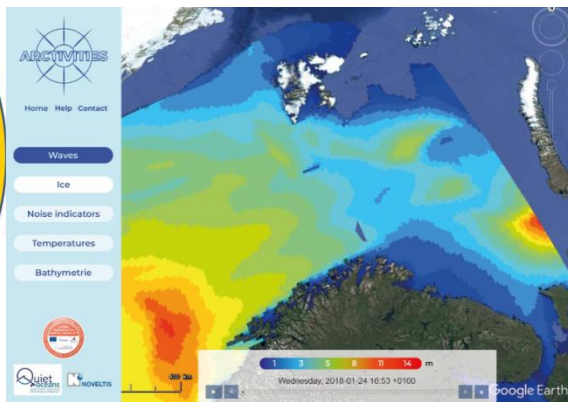
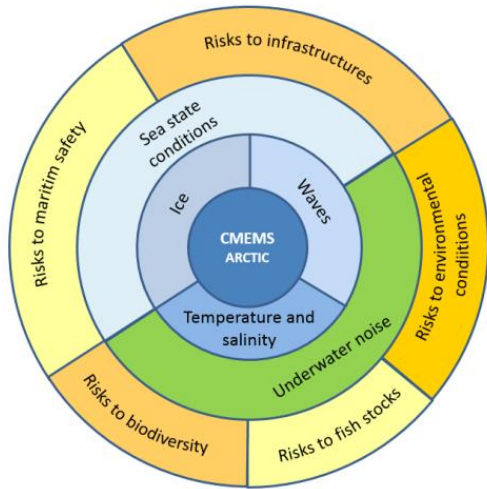




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# ARCTIVITIES: RISK INDICATORS FOR SAFER COASTAL ACTIVITIES IN THE ARCTIC OCEAN

This service will provides with risk indicators such as **wave** and **ice** conditions to all local coastal activities in the Arctic Ocean including tourism, fisheries and aquaculture, transport (local ship navigation) and oil & gas platform. This service uses products from the Copernicus Marine Service in the Arctic Ocean (waves and sea ice forecast model).





# GREENLAND COMMUNITY ICE INFORMATION SERVICE

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This service provides the Greenland community Inuit hunters, tourism operators, local communities, and search and rescue operators with Earth Observation-based information that helps them to navigate safely over the sea ice in coastal waters. This service uses products from the Copernicus Marine Service in the Arctic Ocean (sea ice forecast model and satellite observation).





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# CONTACT US

## JOIN THE COPERNICUS MARINE SERVICE COMMUNITY



### Web portal

[marine.copernicus.eu](http://marine.copernicus.eu)

### Service Desk's email

[servicedesk.cmems@mercator-ocean.eu](mailto:servicedesk.cmems@mercator-ocean.eu)

### Collaborative Forum

<http://forum.marine.copernicus.eu/>



### Mercator Océan

@MercatorOcean

### Copernicus EU

@CMEMS\_EU



### MercatorOcean



### Linkedin CMEMS partnership Meeting place

<https://www.linkedin.com/groups/8243515>



### Tutorials on CMEMS YouTube channel

Copernicus Marine Service





Thank You!

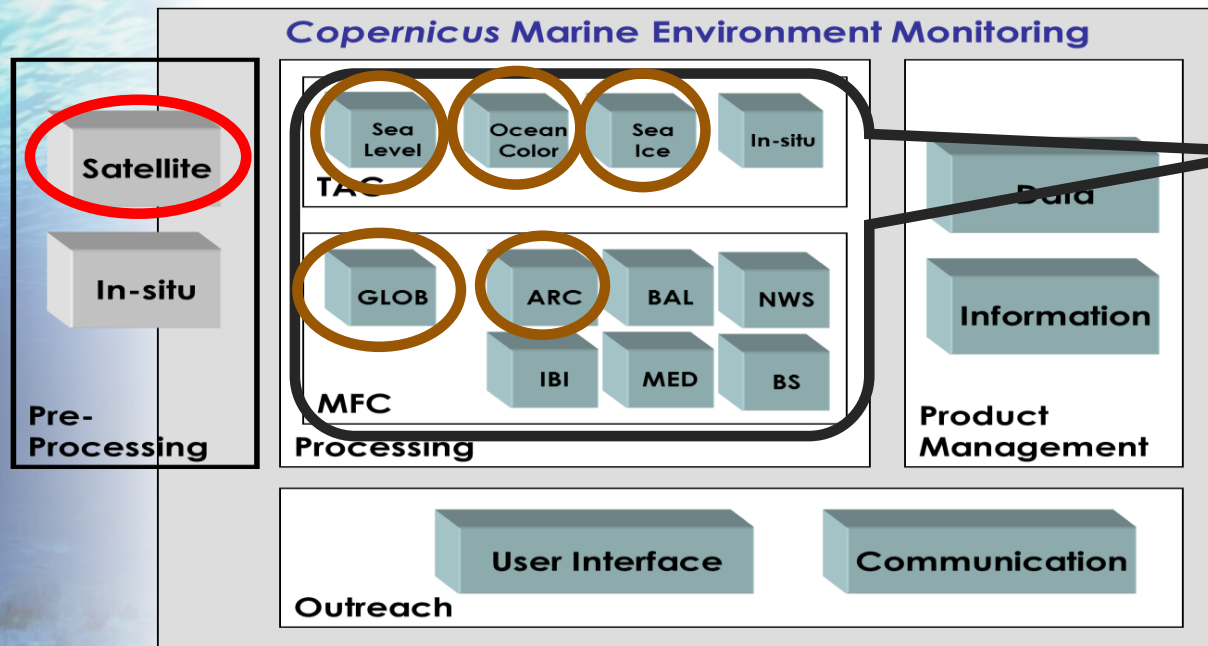






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# CMEMS Technical « Internal » Framework Building Blocks



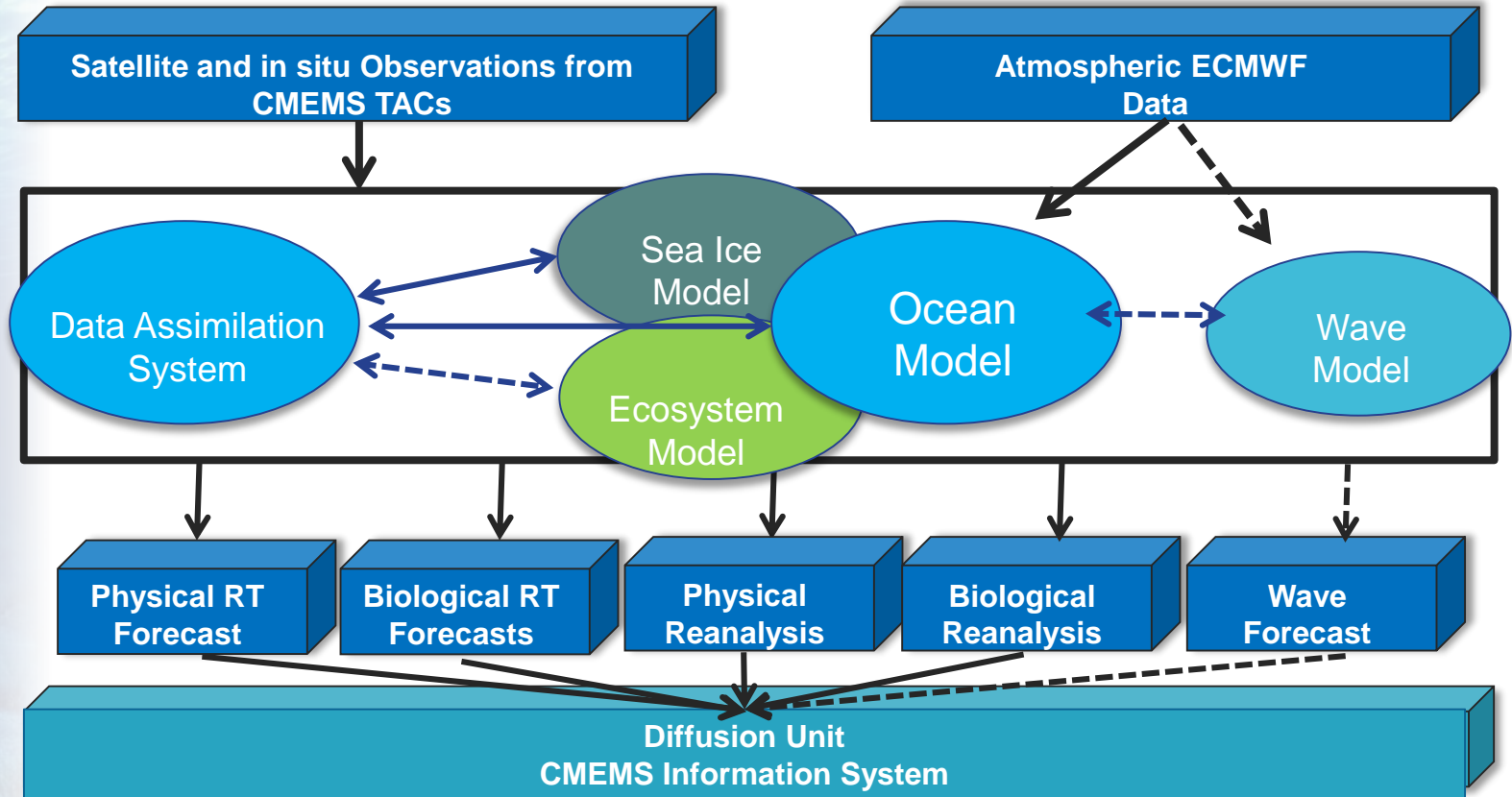
*Satellite derived  
Polar (Sea Ice)  
Products*

The Copernicus Marine Environment Monitoring Service (CMEMS) provides regular and systematic reference information on the physical state, variability and dynamics of the ocean and marine ecosystems for the global ocean and the European regional seas with a free open access to the datasets.



# ARCTIC and GLOBAL Monitoring Forecasting Center

2018





## Satellite observations used today by CMEMS

Multi-frequency Passive microwave Radiometry	Low-resolution (~25 km) sea ice concentration, area and extent, sea ice types, and sea ice drift. Sea surface temperature, near surface wind speed.
L-band passive microwaves*	Thin sea ice with thickness less than 0.5 m Sea surface salinity but with questionable sensitivity in cold water regions.
SAR	High-resolution for iceberg, sea ice deformation, drift, sea ice roughness, leads and ridges.
Scatterometry	Medium-resolution (~10 km) sea ice concentration, area and extent, sea ice types, and sea ice drift. Wind vector in ice free waters.
Altimetry*	Sea ice freeboard height and snow depth. Open ocean sea level and sea surface height and hence dynamic topography and surface geostrophic current.
IR radiometry	High-resolution sea and ice surface temperature
Spectrometry	Chlorophyll a concentration and distribution. Used for estimation of phytoplankton concentration.

\* Note that the sea ice thickness presently derived from Cryosat 2 and SMOS is not yet in the list of CMEMS satellite high level products. However, the data are used for model validation and data assimilation tests are underway. It is likely that a near real time sea ice thickness product will be added in the OSI TAC portfolio for CMEMS Phase II (2018-2021).