International projects and missions

Per Knudsen and Karsten Engsager

GOCINA

ESEAS

Perspectives

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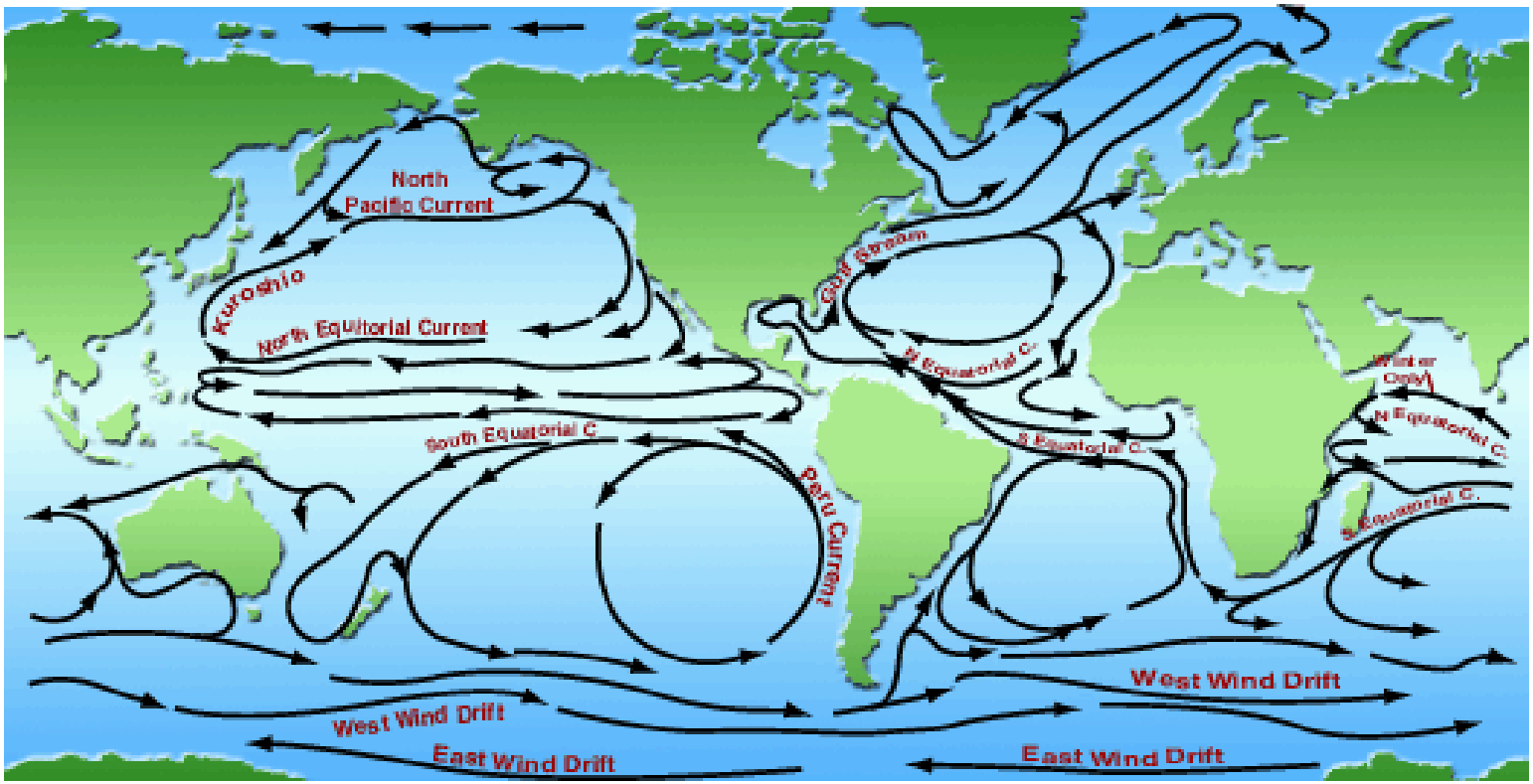
GOCINA – Motivation

The global circulation in the oceans and its transport of heat plays an important role in the Earth climate.



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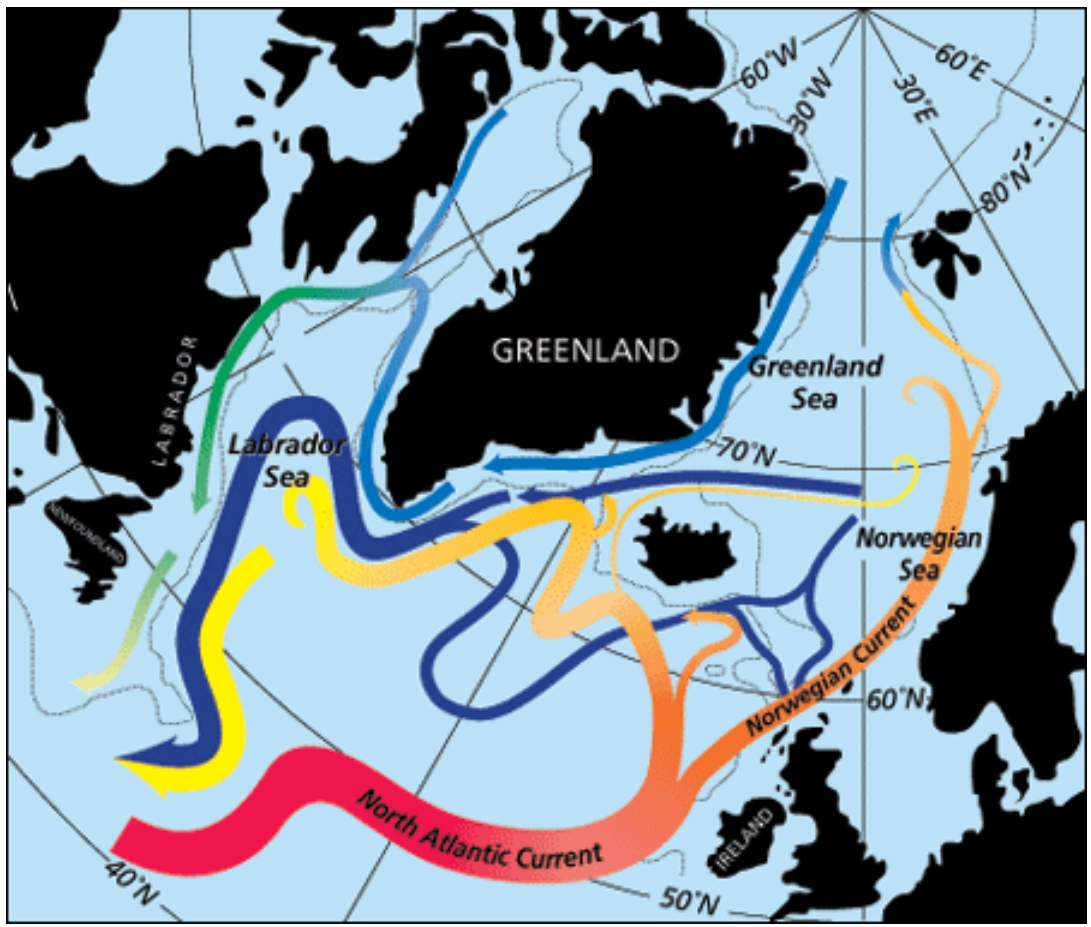
GOCINA – Motivation

The ocean transport through the straits between Greenland and the UK is known to play an important role in the global circulation as for the North European climate.



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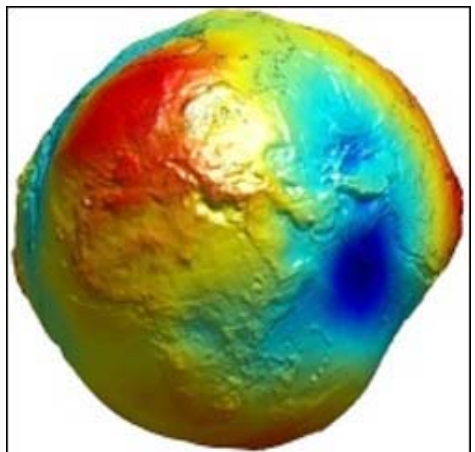
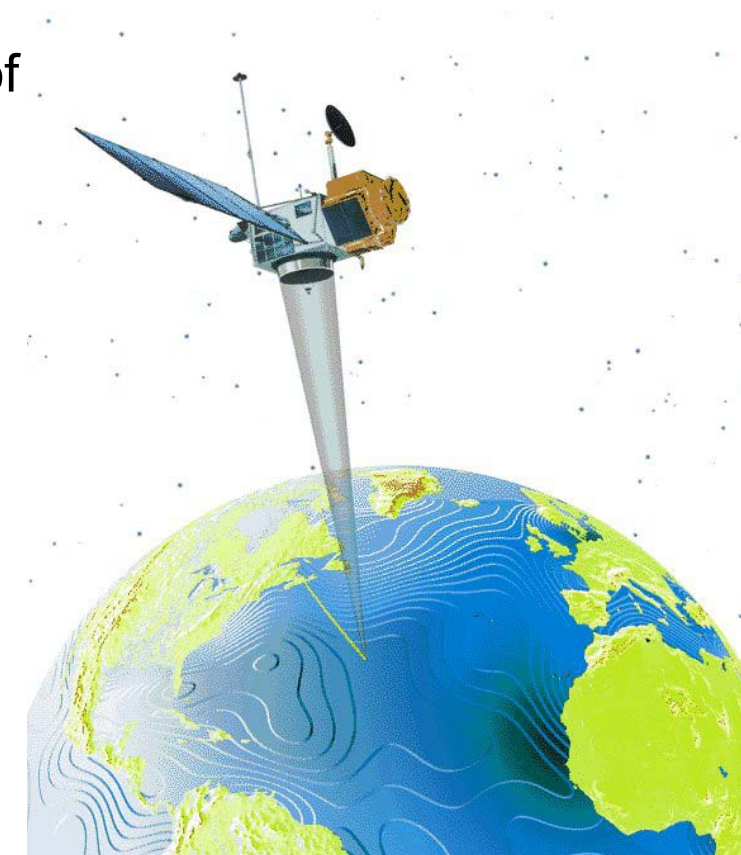
GOCINA - Motivation

The European investment in Earth observing satellites has been significant. It is therefore of great importance that the value and utilization of this extensive provision of space borne data can be properly demonstrated in the context of ocean monitoring.

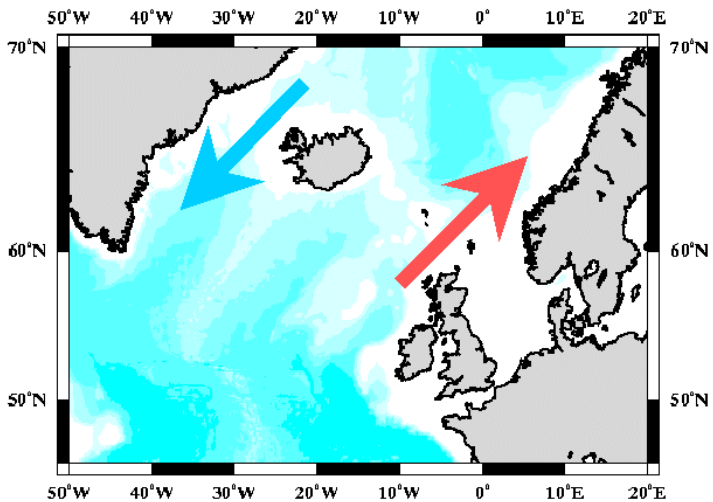
GOCE





GOCINA

Geoid and Ocean Circulation In the North Atlantic



GOCINA is an EU FP5 project:

Determination of

- Geoid
- Mean Sea Surface
- Mean Dynamic Topography

For joint exploitation of ENVISAT and GOCE in ocean circulation studies:

- Climate modeling
- Operational assimilation

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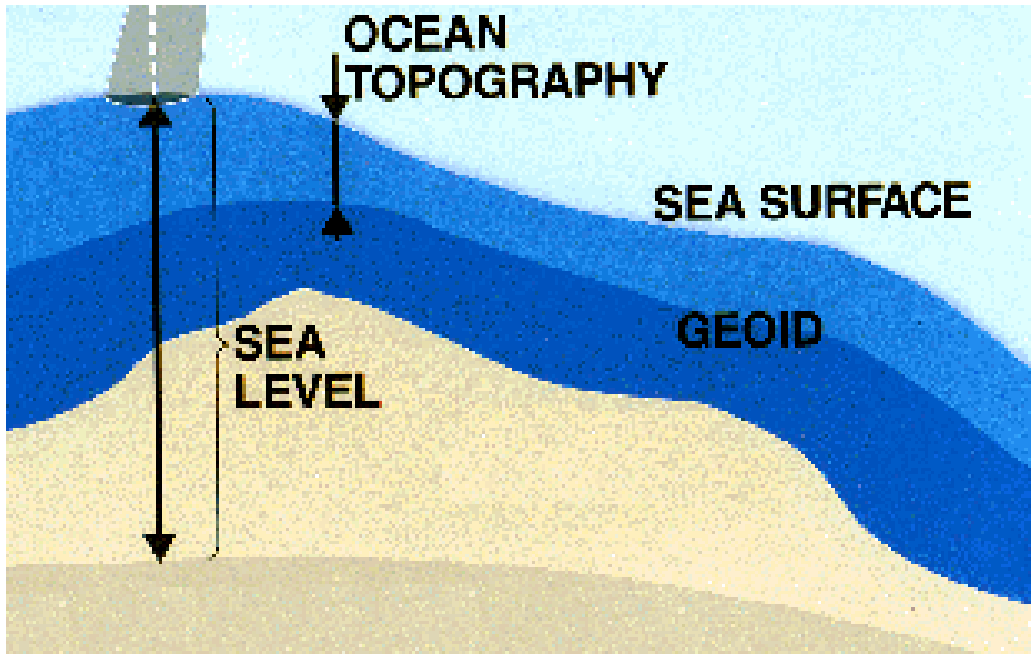
Results – Individual Components

The components:

1. MSS
2. MDT
3. Geoid

have been improved.



Direct	Source	Space
MSS	Altimetry	ENVISAT+
MDT	Ocean Models	
Geoid	Gravity data	GOCE

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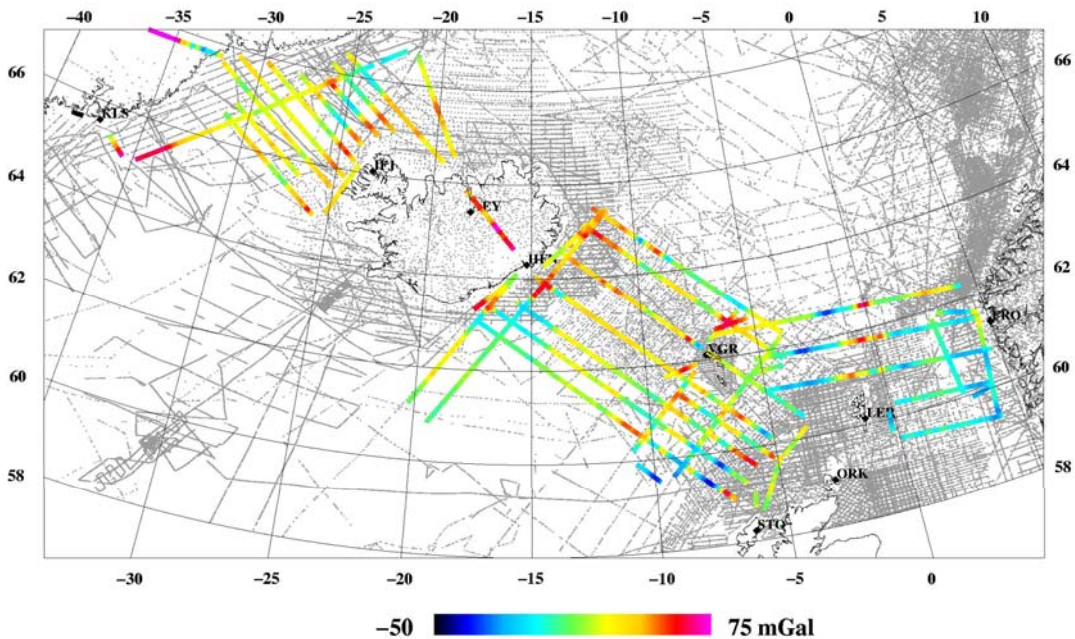
The nat04 geoid

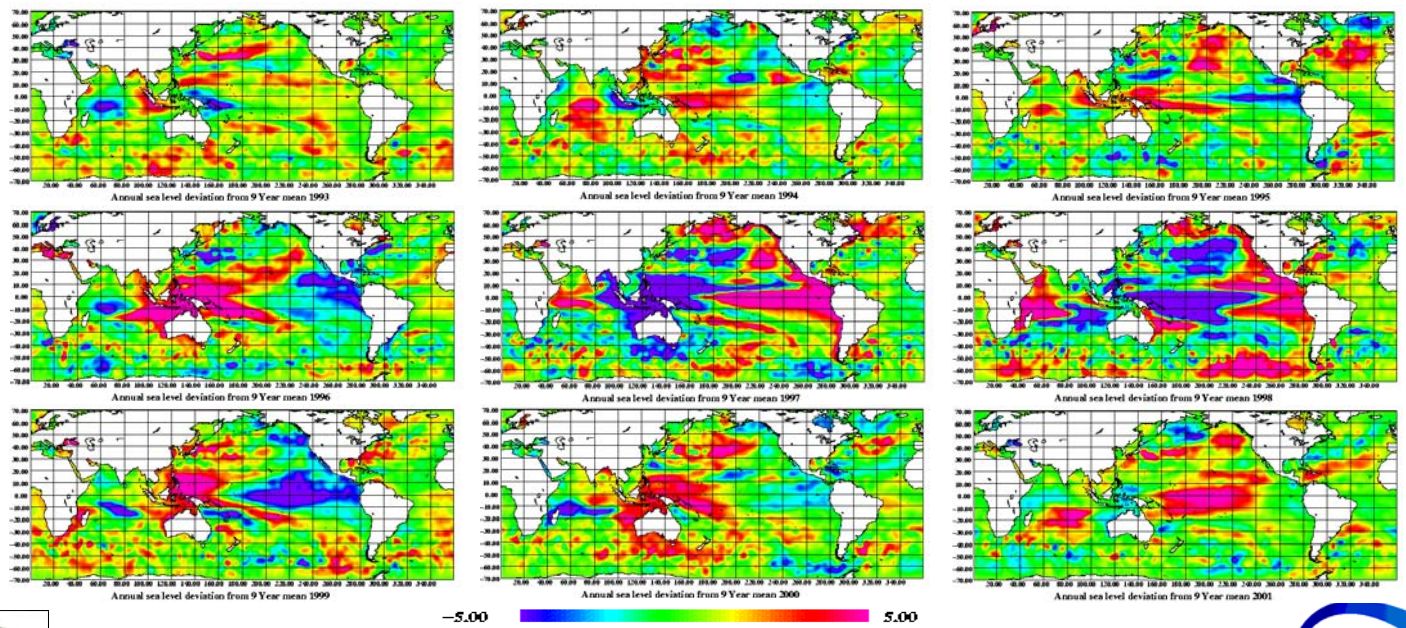
The geoid covers the Nordic Area and Greenland seas

- Using both ship and airborne data updated with new airborne data
- KMS02 altimetric gravity in data voids
- JPL GRACE field (120) as reference



The KMS04 Mean Sea Surface

- Global !
- Derived from T/P, T/P TDM, ERS1 ERM+GM, ERS2 ERM, Geosat GM, and GFO data
- Based on 9 years of data using T/P as reference
- High resolution, 5 km, 1-2 min grid



Annual anomalies

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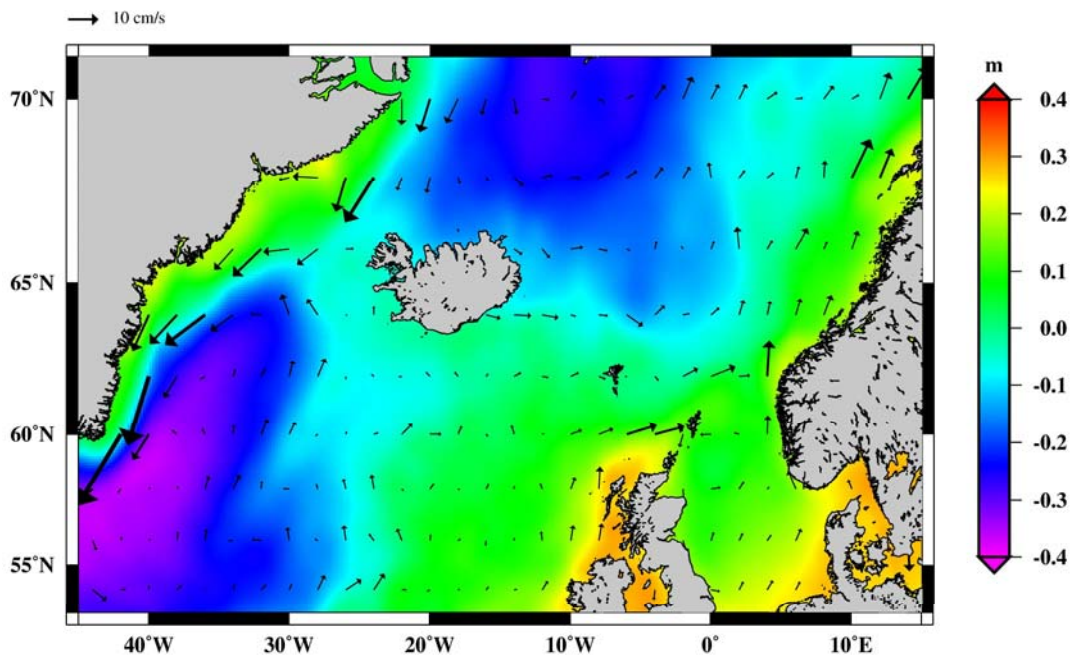
The Composite Mean Dynamic Topography

MDT	Time period
CLS v1	1993-1999
CLS v2	1993-1999
ECCO	1992-2001
ECMWF	1993-1995
FOAM	05-02-05-03
OCCAM v1	1993-1995
OCCAM v2	1993-1995

”Ensemble” mean & st. dev.



Bingham & Haines

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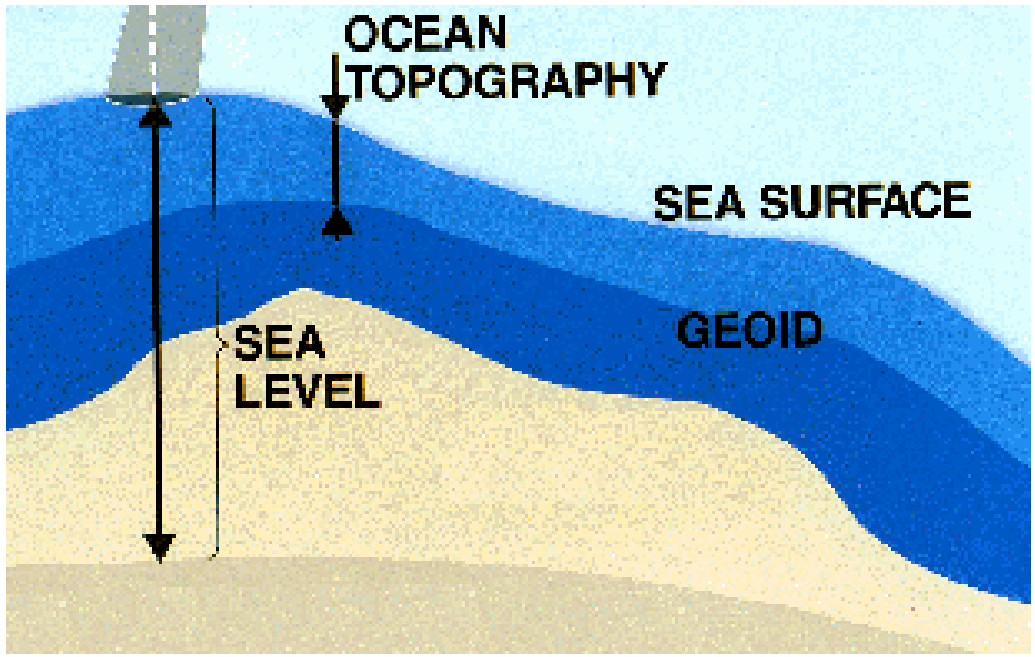
Develop techniques

The ongoing process:

1. Comparing direct and synthetic models
2. Learning
3. Combining gravimetry, altimetry and ocean models



Direct	Source	Synthetic
MSS	Altimetry	Geoid+MDT
MDT	Ocean Models	MSS-Geoid
Geoid	Gravity data	MSS-MDT

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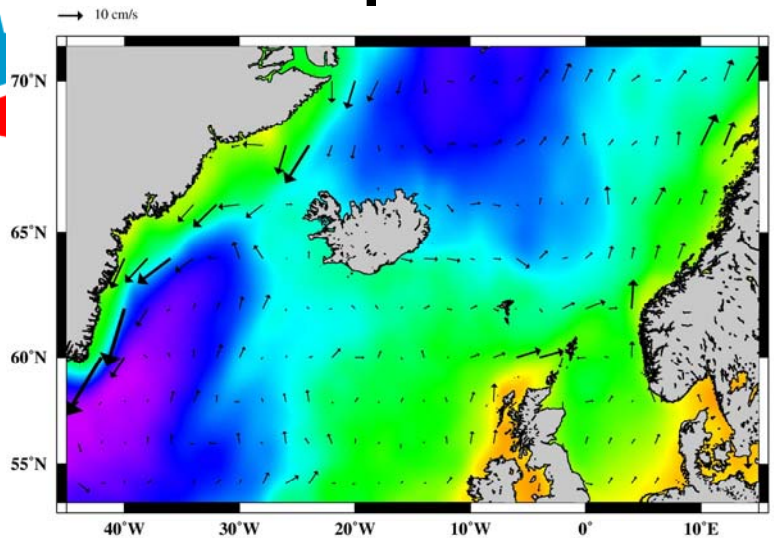
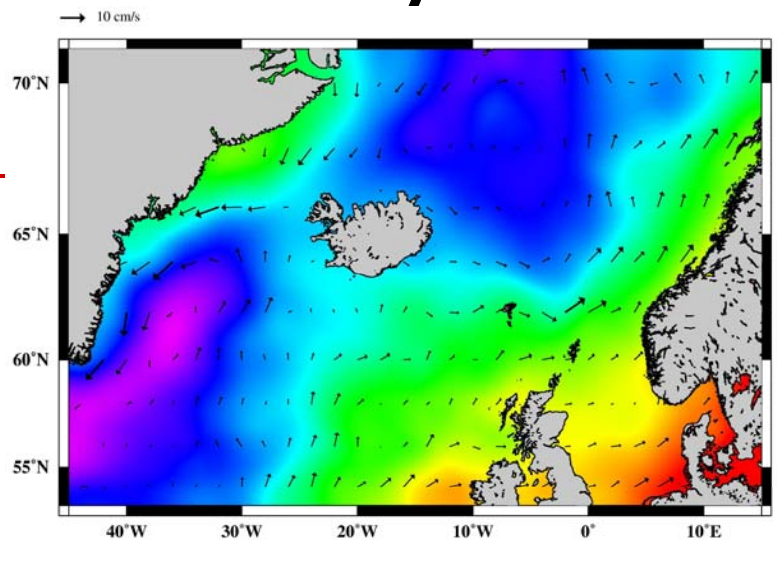
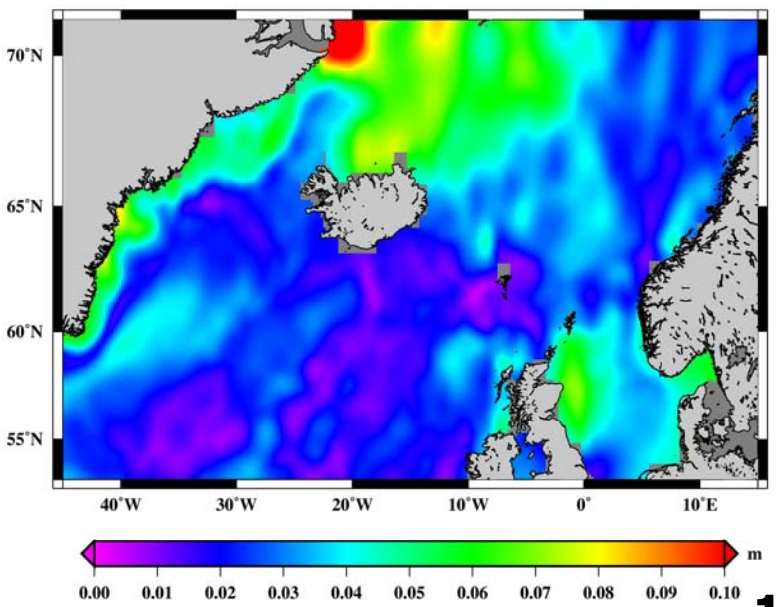
Composite MDT



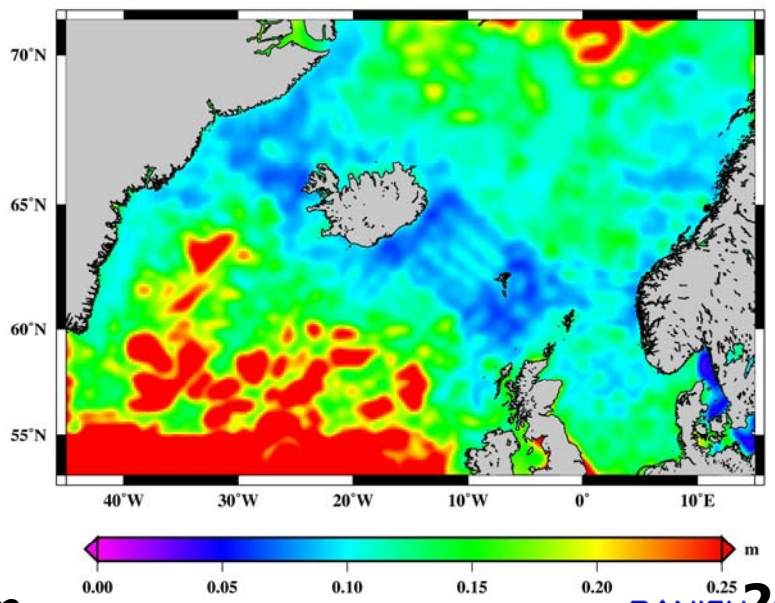
GOCINA Synt. MDT



Error fields



10 cm



25 cm

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Perspectives

- Satellite altimetry provide mean sea surface heights in a global, geocentric reference frame
- Satellite gravimetry provide geoid undulations in a global, geocentric reference frame
- (MSS-geoid) – combined with MDT from ocean models – may define the height datum
- The geoid – shifted to fit the MSS in the near-coast off-shore region - may define the regional height reference surface in a global, geocentric reference frame.

ESEAS Objectives

ESEAS – The European Sea-level Service - main objective is to provide a standardised access to quality-assured sea level data and information in Europe to a broad range of scientific and non-scientific users and is based on

- national sea-level monitoring activities and data
- quality-assured high-level products derived from the ESEAS tide gauges, GPS and satellite altimetry

ESEAS was formed in 2001 – based on COST action 40 – Central Bureau at the Norwegian Mapping Authority (H-P Plag > B.L. Bye)

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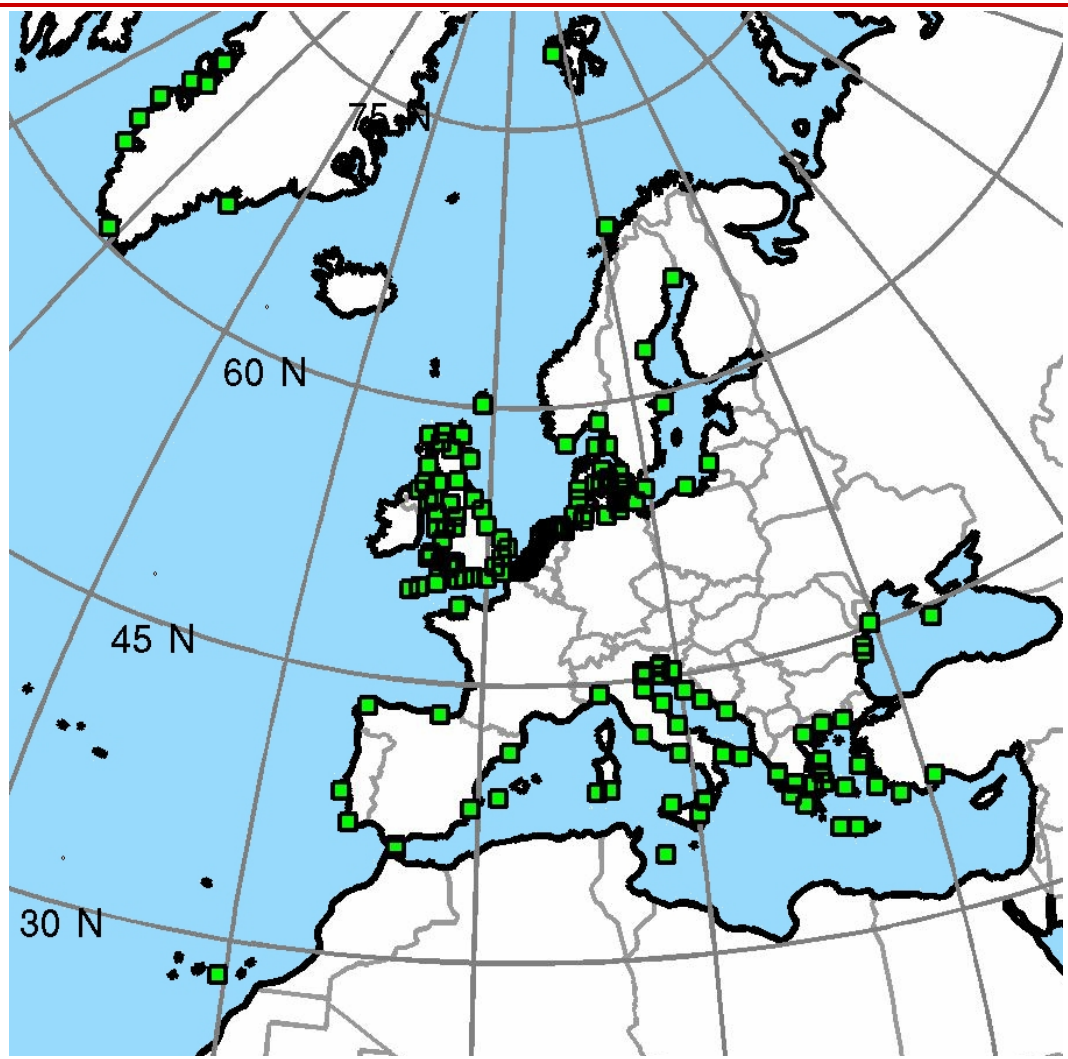
ESEAS Tide Gauge network:



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ESEAS institutional network:

Main components:

1. Governing Board (representatives from the 36 institutions from 21 countries) and corresponding members (IAPSO, IAG, EuroGOOS, EUREF..)
2. Central Bureau
3. Technical Committee
4. Working groups

Members:

- Hydrography / Oceanography and Geodesy
- Operation and Research
- In-situ and Space
- Old and New EU member countries

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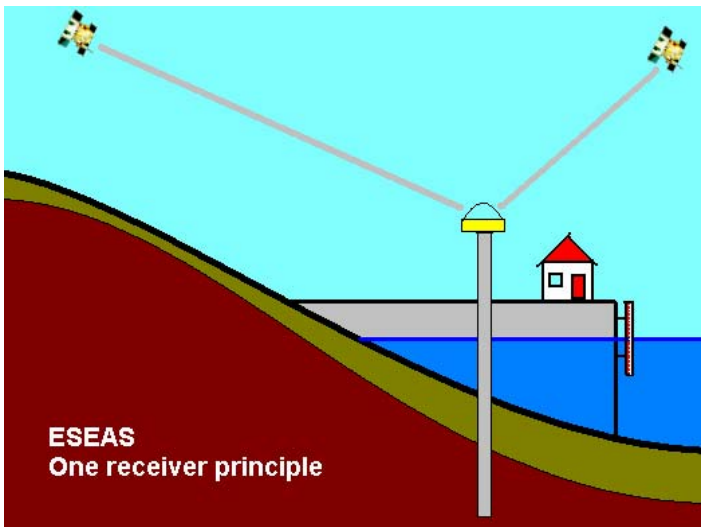
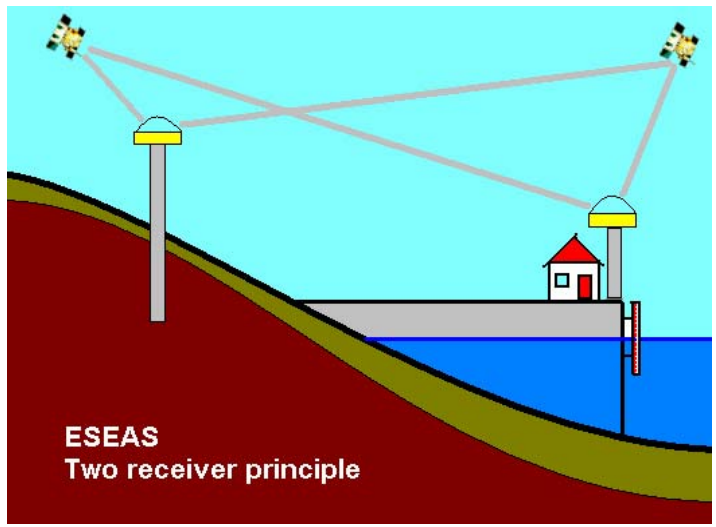
ESEAS Developments

ESEAS aim at developing the network by collocating Tide Gauges and GPS





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ESEAS Developments

ESEAS aim at developing the network by collocating Tide Gauges and GPS, so that:

Mean sea level and sea level changes can be represented in a common, global, geocentric reference frame.

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Perspectives

- Earth Observing satellite missions provide reference surfaces (mean sea surface and geoid) in a global, geocentric reference frame
- GNSS et al. form the basis of the infrastructure
- Earth Observation is linked to this infrastructure
- .