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DTU13MDT – a Global GOCE Derived Mean Dynamic Topography

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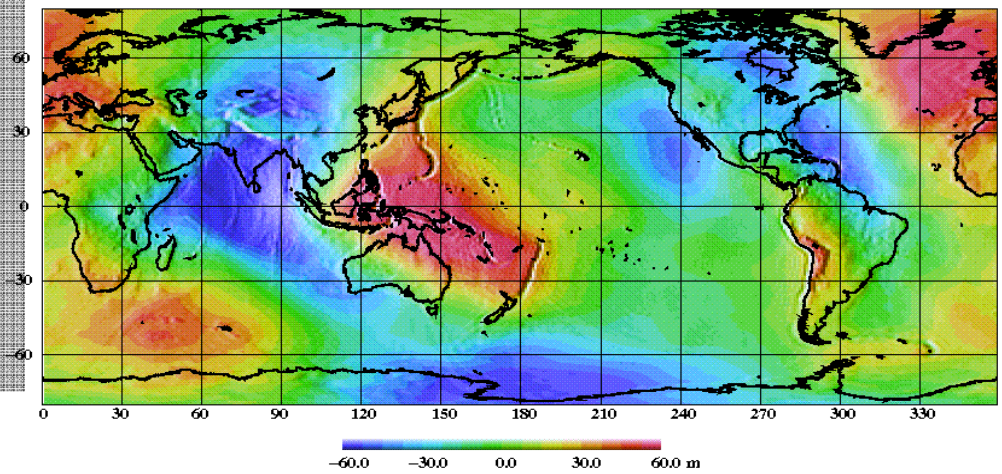
The Gravity field and steady-state Ocean Circulation Explorer (GOCE)

Its objectives are to improve understanding of:

- global ocean circulation and transfer of heat
- physics of the Earth's interior (lithosphere & mantle)
- topographic processes, ice sheets and sea level change



GOCE

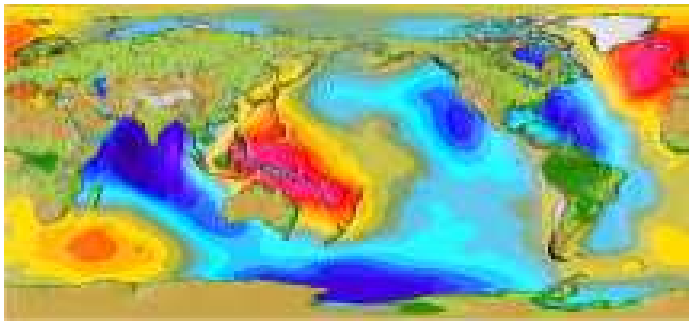
Computation of a MDT

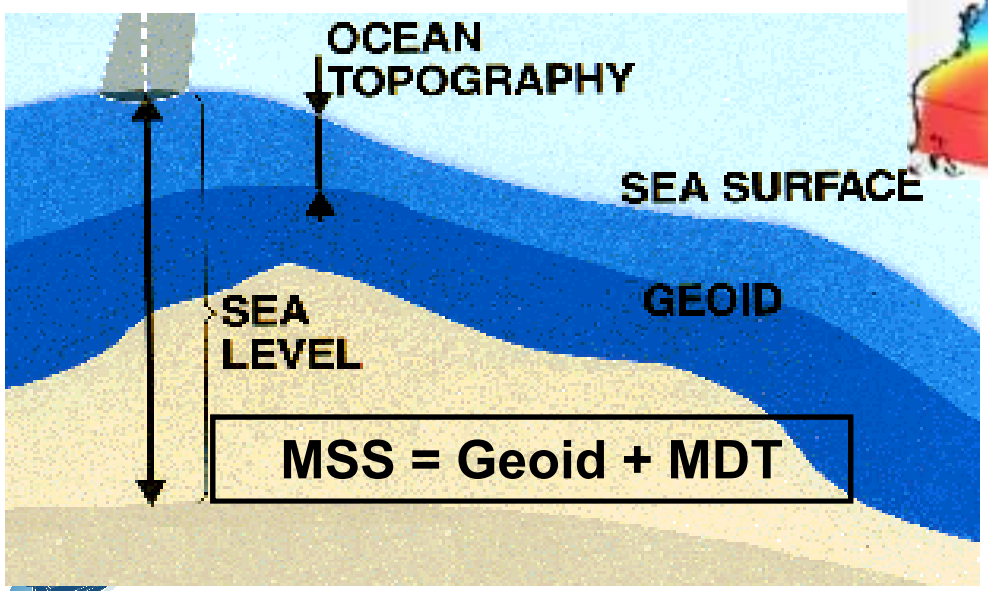
Basically, the Mean Dynamic Topography is obtained through:

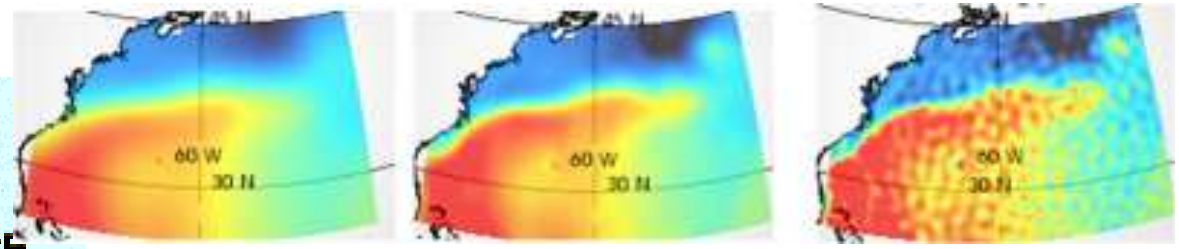
1. Subtracting a MSS and a GOCE geoid

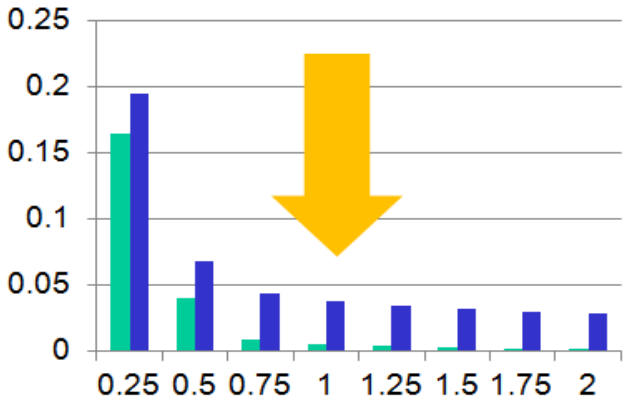
MDT = MSS – Geoid

2. Filtering to remove unmodeled parts of the geoid



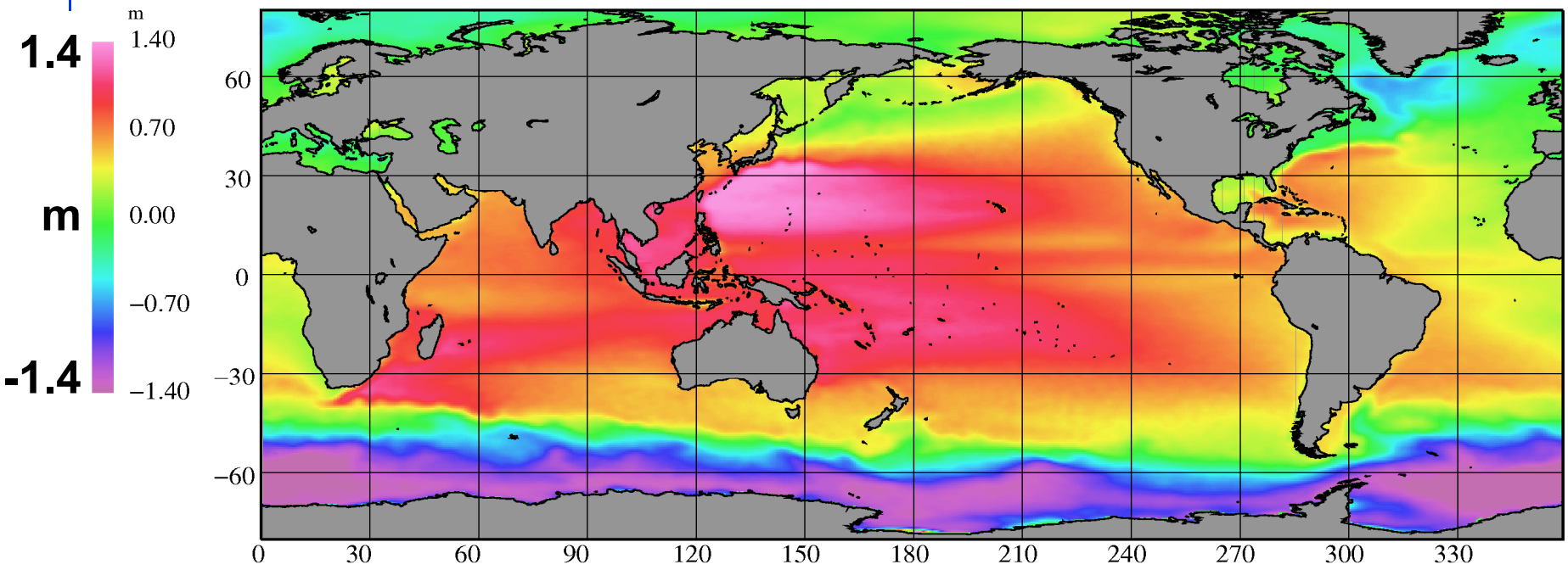






GOCE

Results - MDT:



The GOCE MDT (r.1 DIR) display the well-known features with enhanced resolution and sharpened boundaries.

Compute surface geostrophic currents (*u,v*) to enjoy details

Ref.: Knudsen, P., R. Bingham, O. Andersen, M.-H. Rio, Enhanced Mean Dynamic Topography and Ocean Circulation Estimation using GOCE Preliminary Models, J. of Geodesy, 2011, DOI 10.1007/s00190-011-0485-8.

MSS – Geoid comparisons

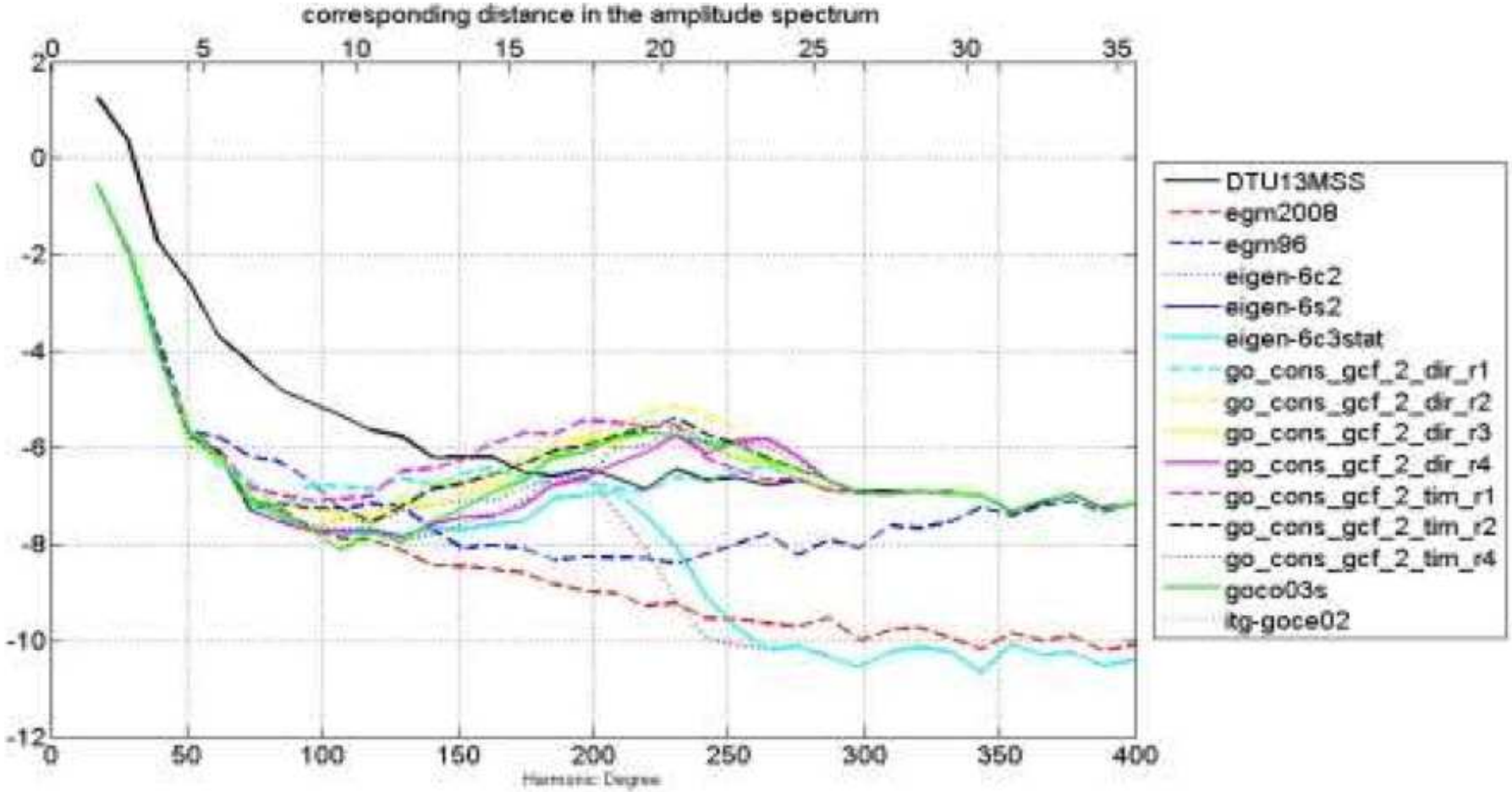


Figure 2: Isotropic mean for the differences between various EGMs and DTU13MSS

Johanna Honecker, TU Munich

New model - DTU13MDT:

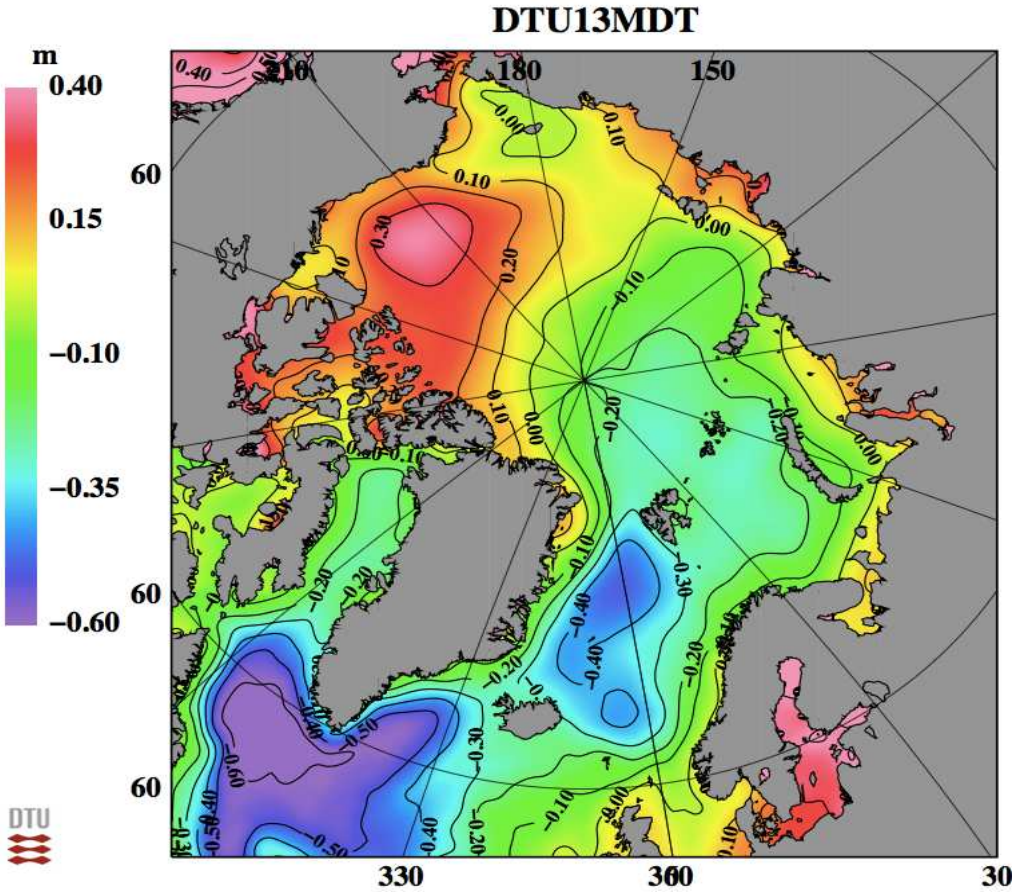
Similar to DTU12MDT updated with

- DTU13MSS
- Eigen-6C3

Improved mainly in the Arctic and in the equatorial region..

20 year reference period

Consistent with the new AVISO altimetry reference period.



Geostrophic Currents (DTU13MDT):

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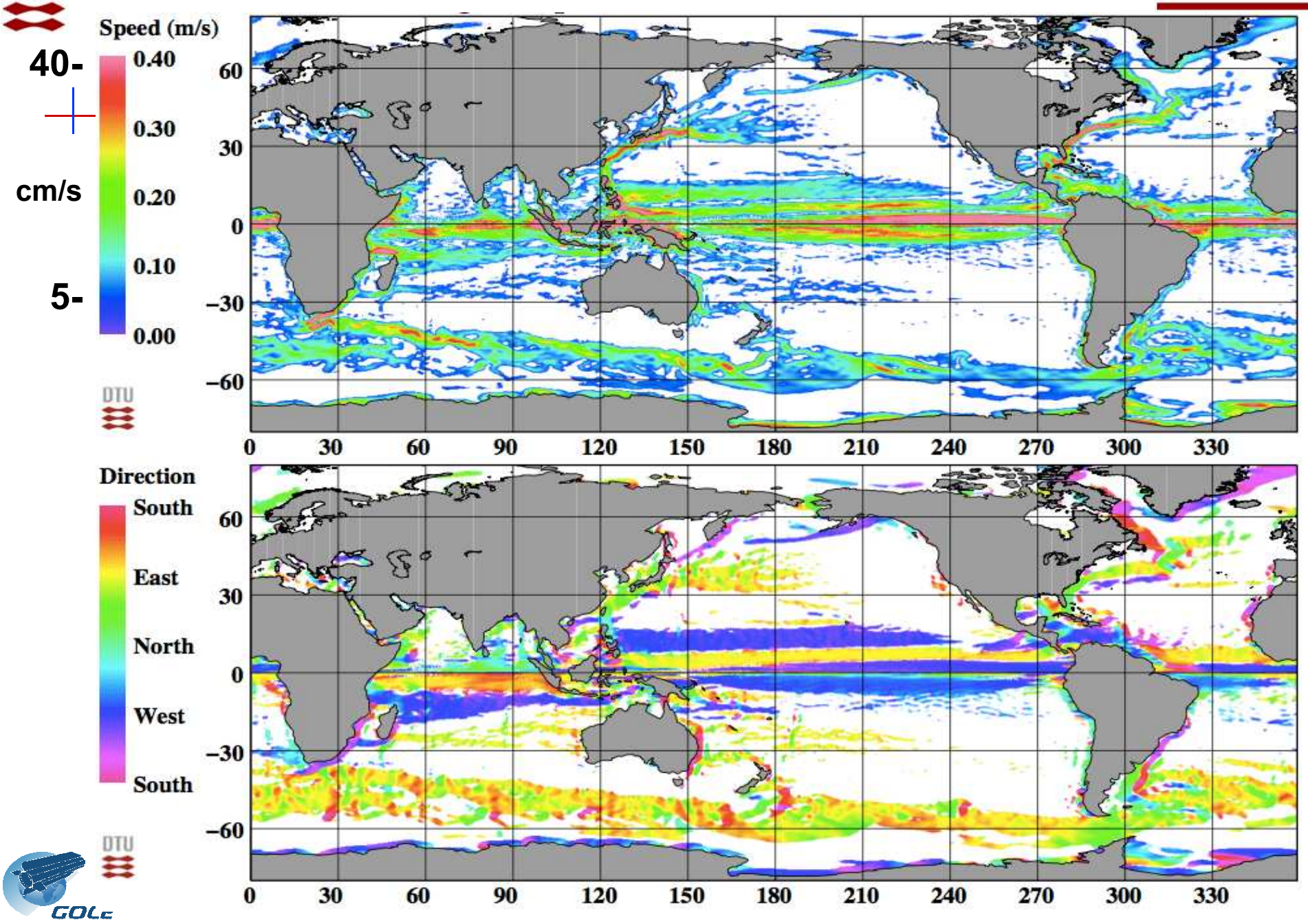

GV Speeds (DTU13MDT vs Maximenko):

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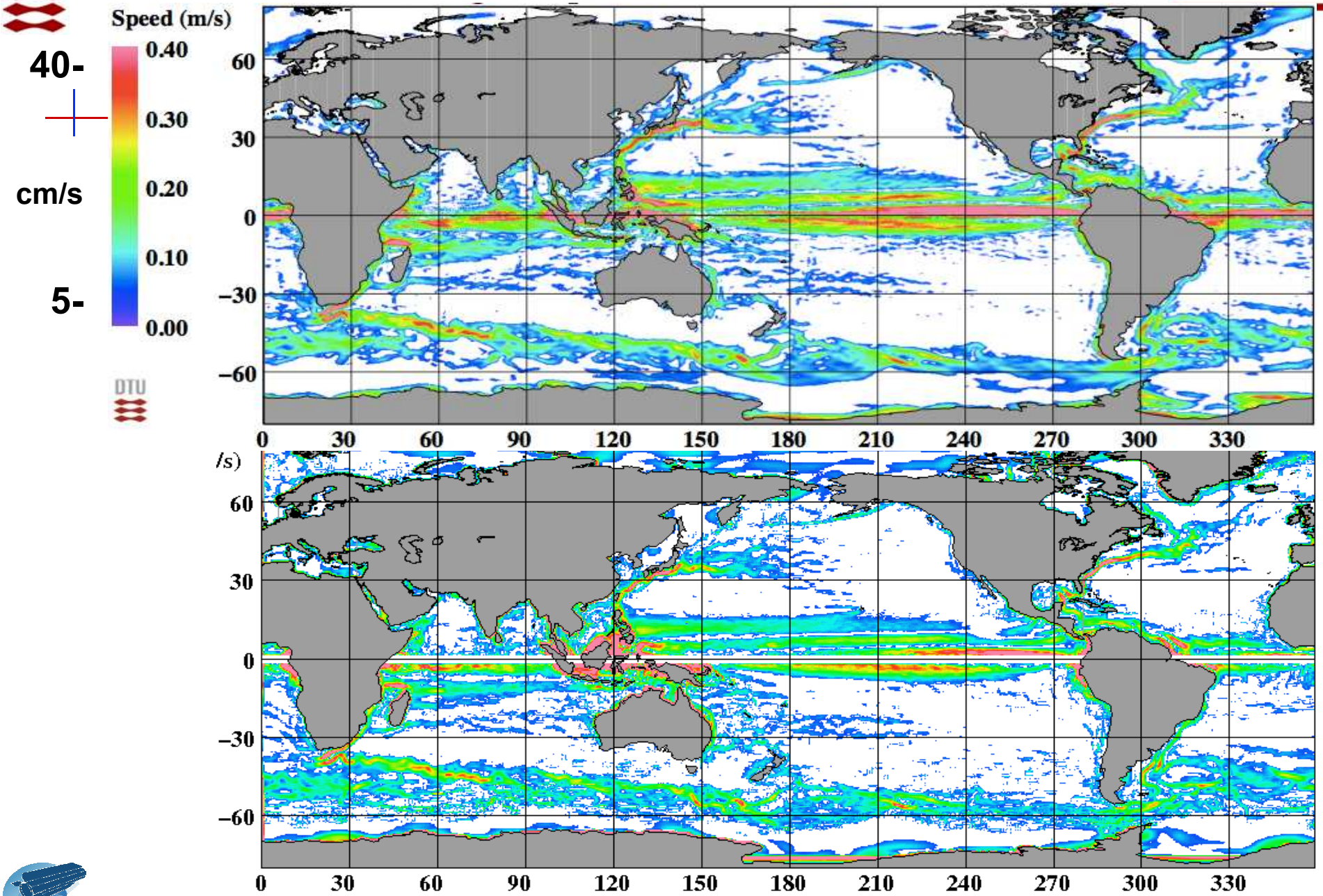

GOCE

GV Directions (DTU13MDT vs Maximenko):

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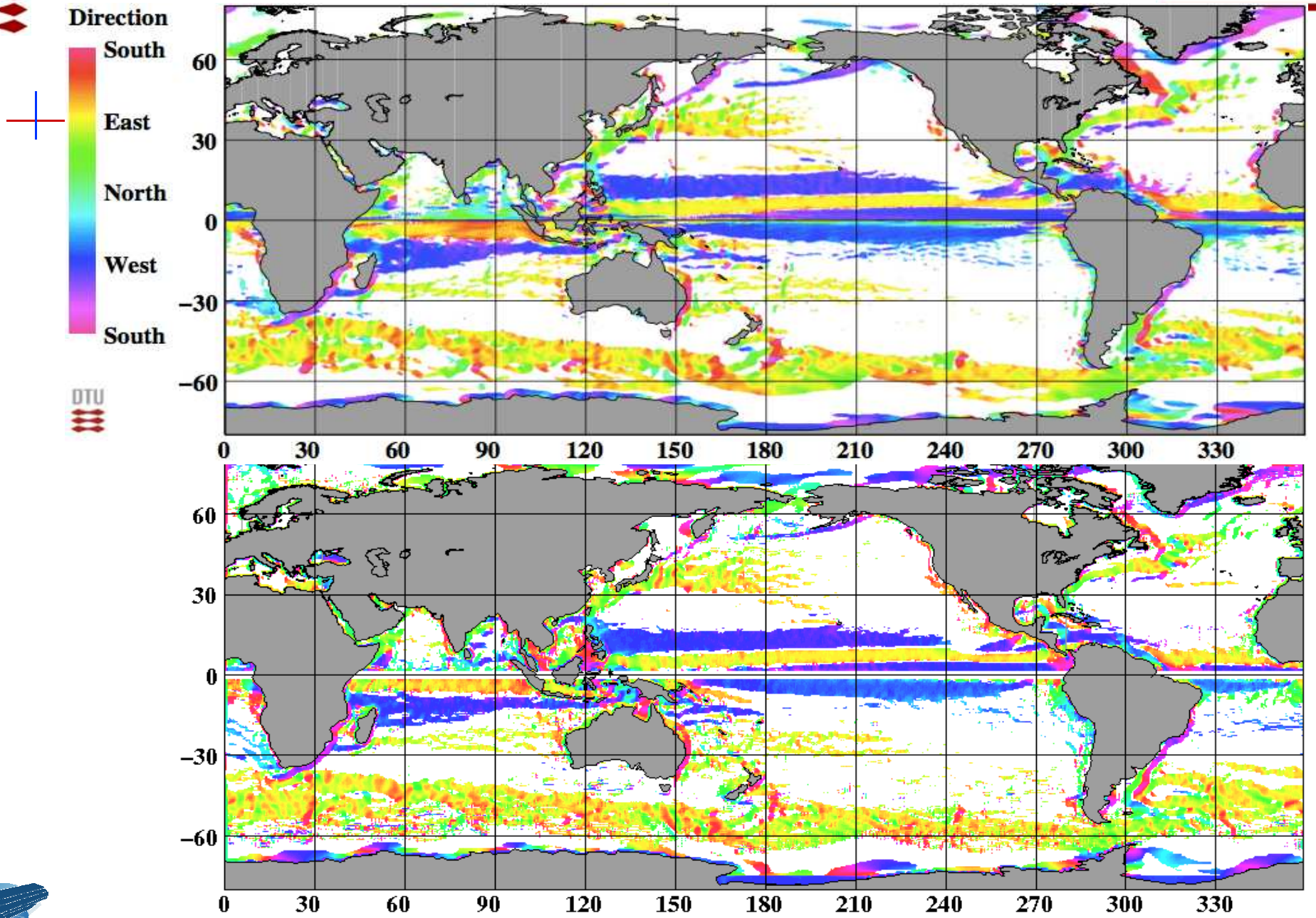
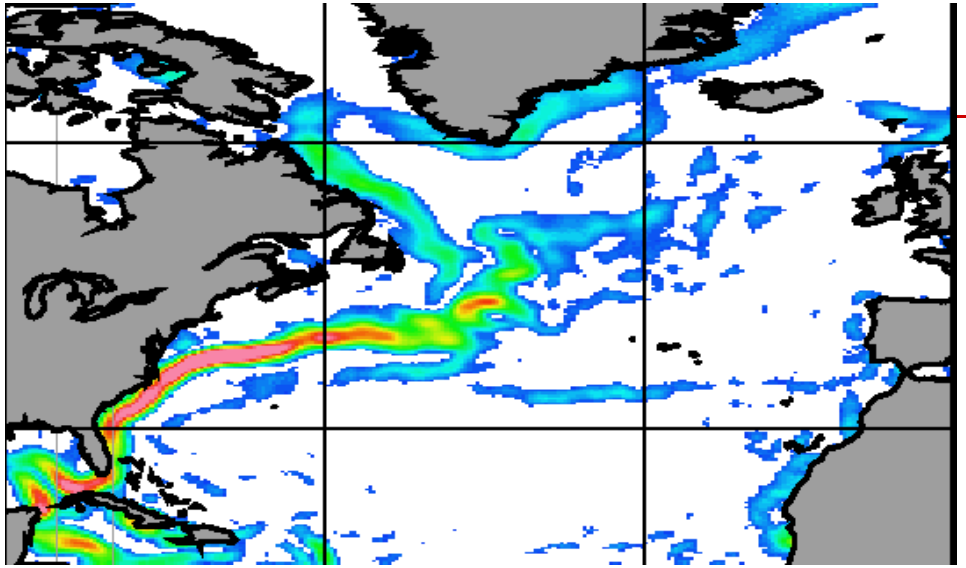
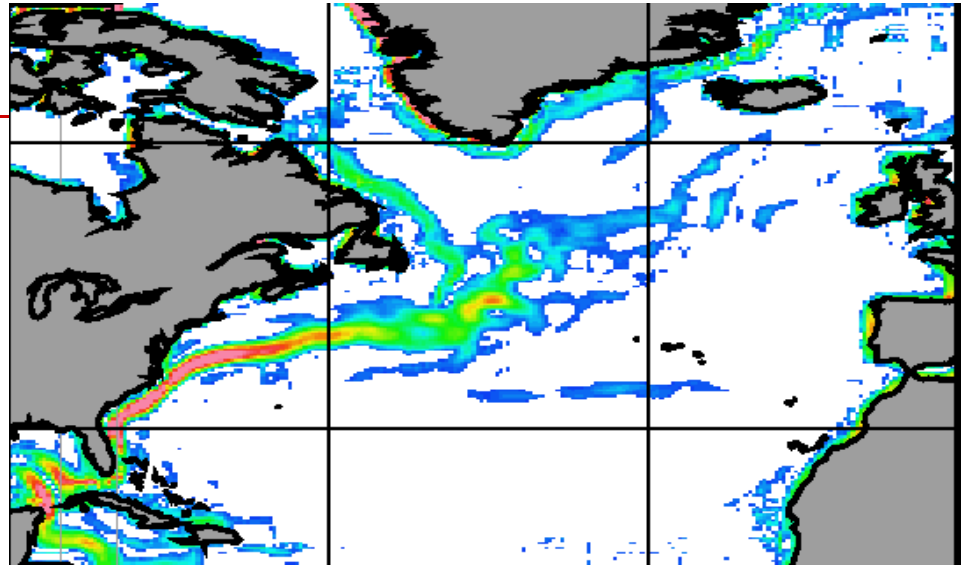
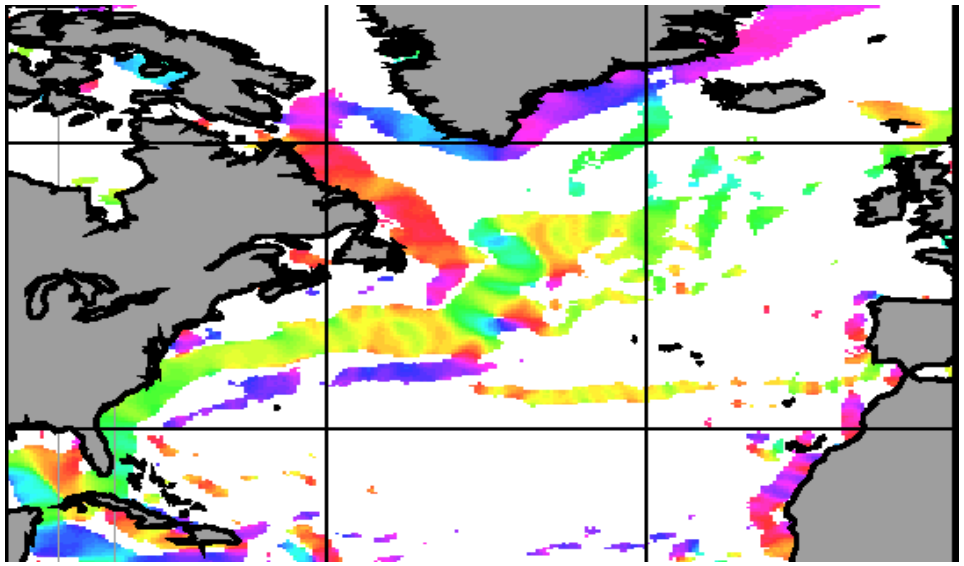
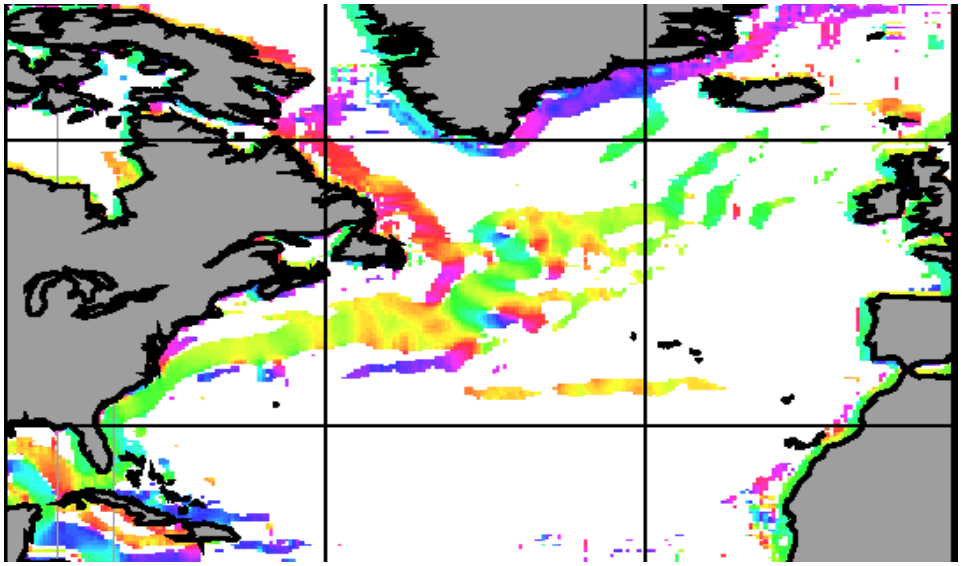


North Atlantic Ocean:





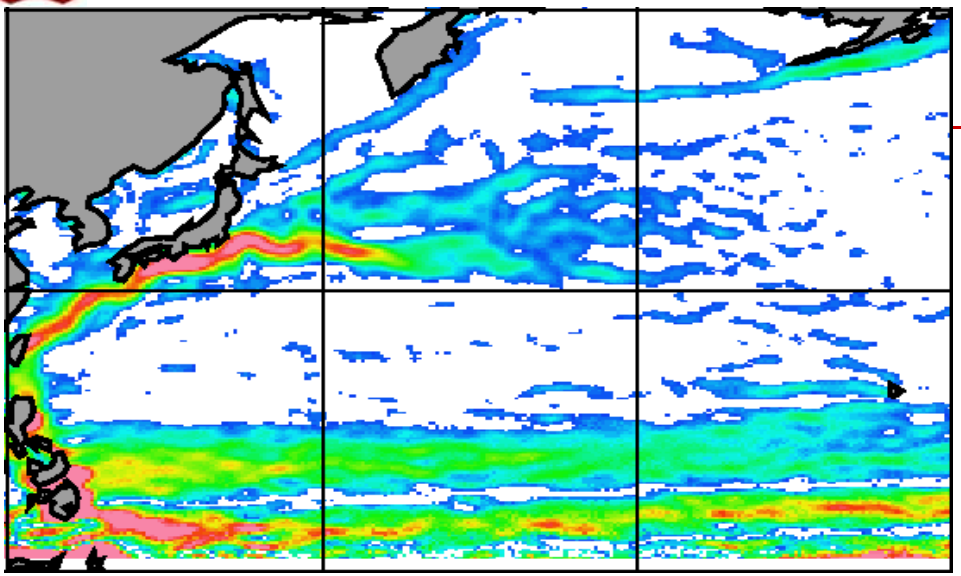


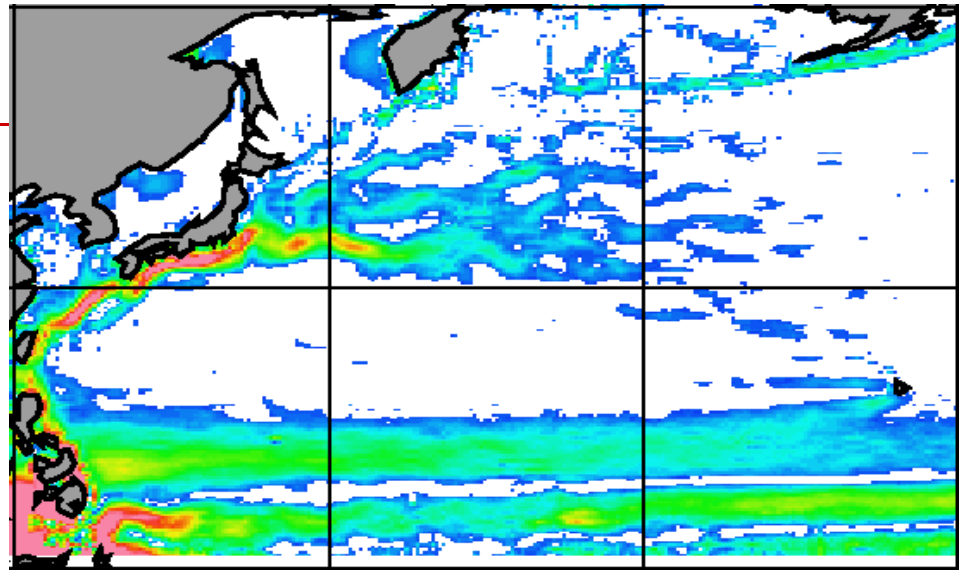


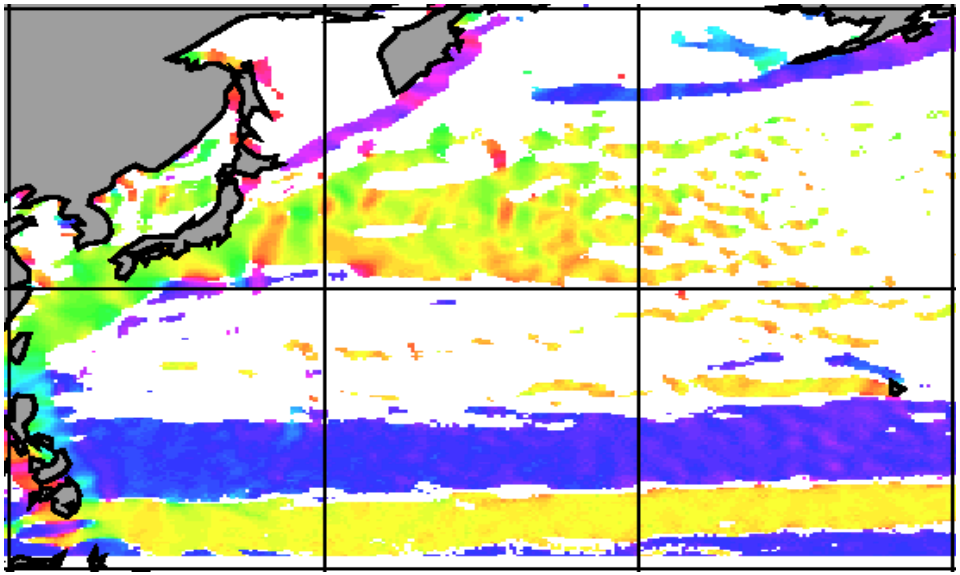
DTU_EGU13_MDT

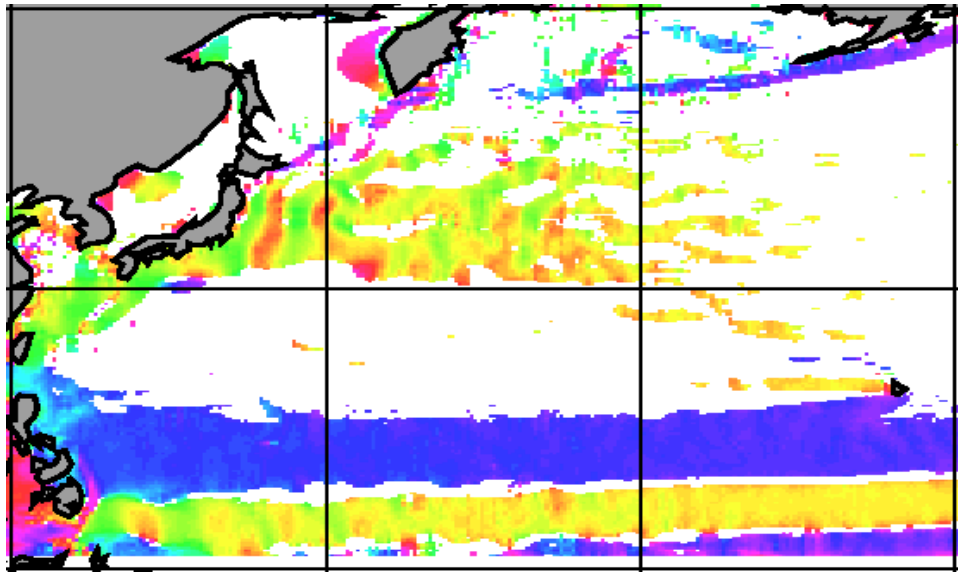
Maximenko

North Pacific Ocean:









DTU_EGU13_MDT

Maximenko

Status:

The results confirm the potential of the GOCE mission in ocean modelling:

- the resolution of the MDT has been improved
- the estimated surface current speeds have been increased - also minor currents and fronts are shown

Issues:

- improve filtering – full ECV matrix,
- optimal combination of GOCE and MSS,
- both...
- include other data for regional enhancement
  - surface gravity
  - drifter velocities, etc.