The OGMOC MDT and the combined mean dynamic topography model – DTU17cMDT first results.

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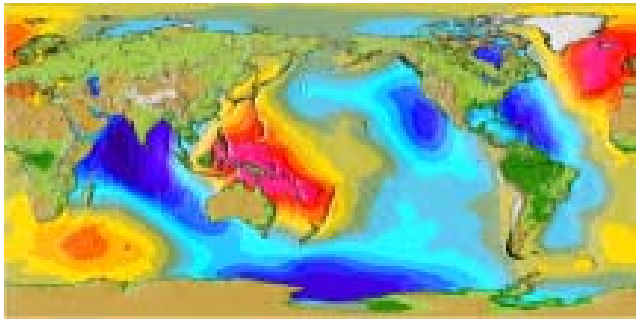
Computation of a MDT

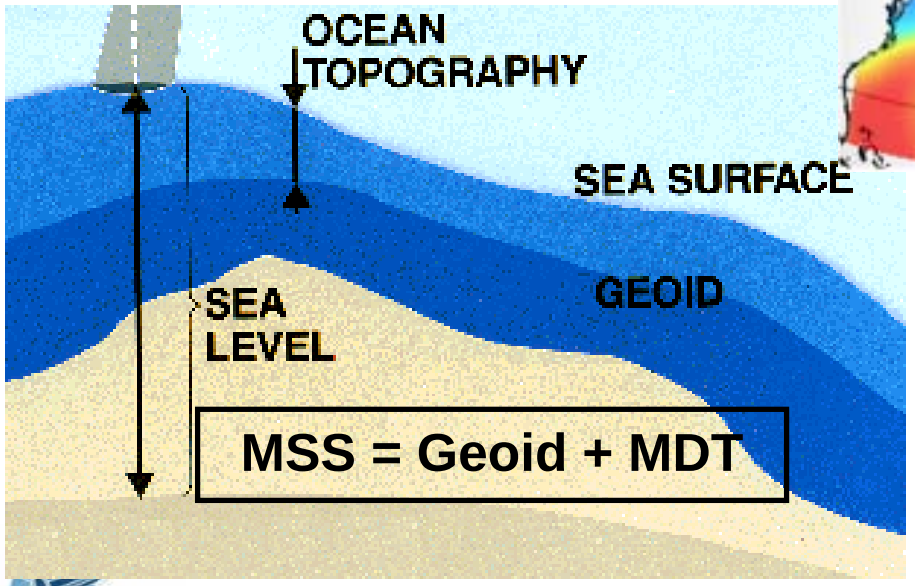
Basically, the Mean Dynamic Topography is obtained through:

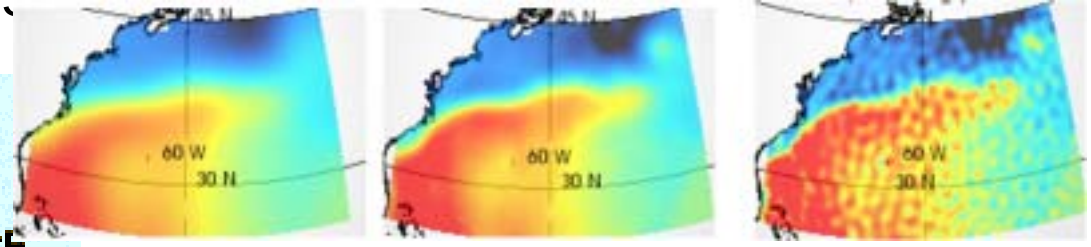
1. Subtracting a MSS and a GOCE geoid

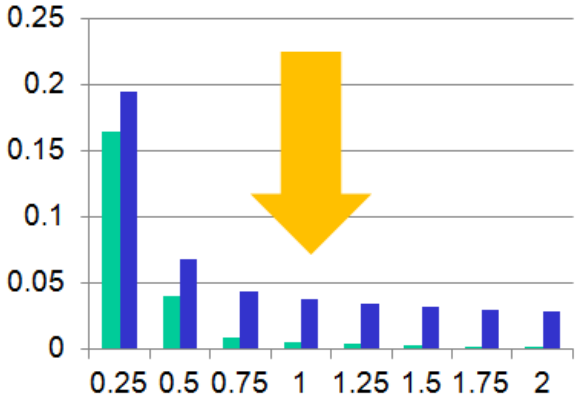
MDT = MSS – Geoid

2. Filtering to remove unmodeled/erroneous parts of the geoid and/or MSS









DTU17MDT (based on OGMOC geoid):

DTU17MDT is (still to be) a purely geodetic MDT.

Update models – all GOCE data – DTU15MSS.

Assessment of geoid models over the oceans:

- Quantify the quality of various models,
- Extract inhomogeneous/anisotropic features,
- Resolve resolution capacities wrt geostrophic currents.

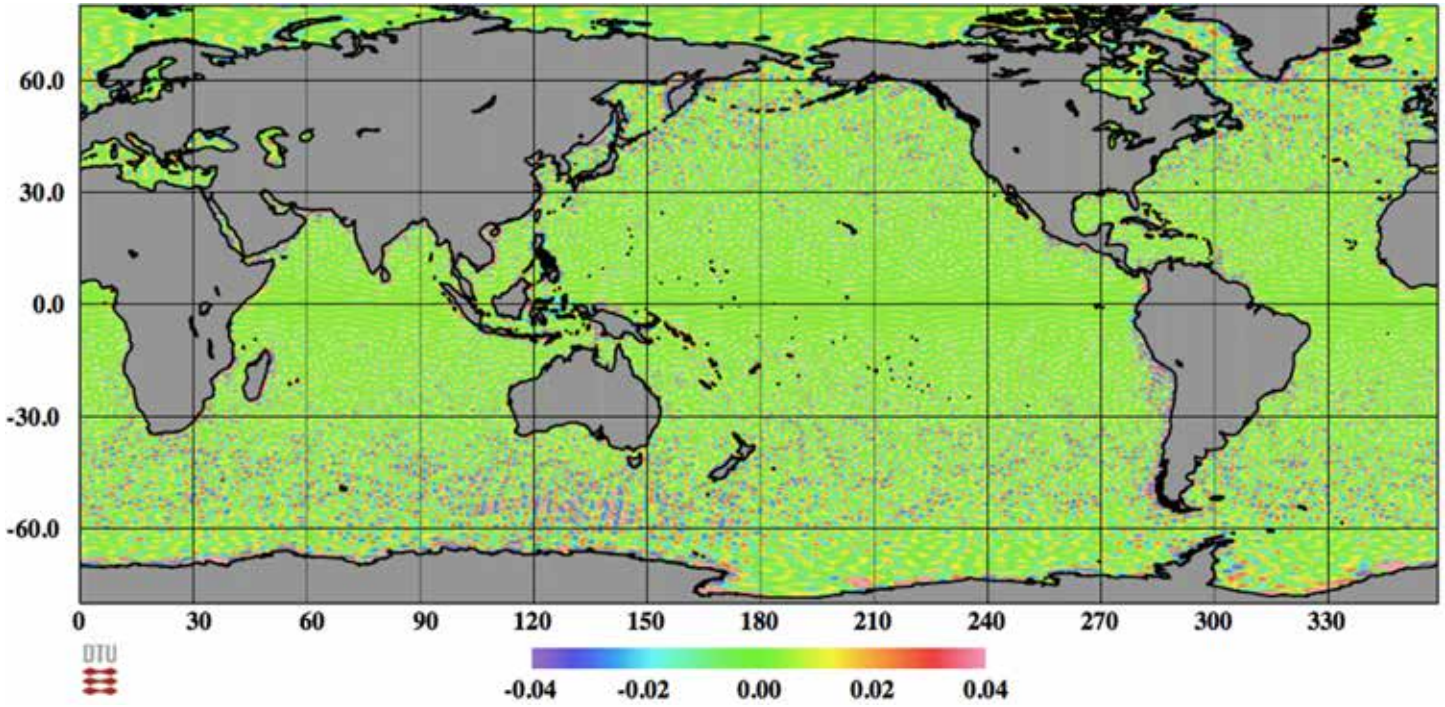
Improvement of filtering:

- Fine tune ½-width and anisotropy

OGMOC is an just completed ESA sponsored study
For Optimal Geoid for Modelling Ocean Circulation

Geoid model differences

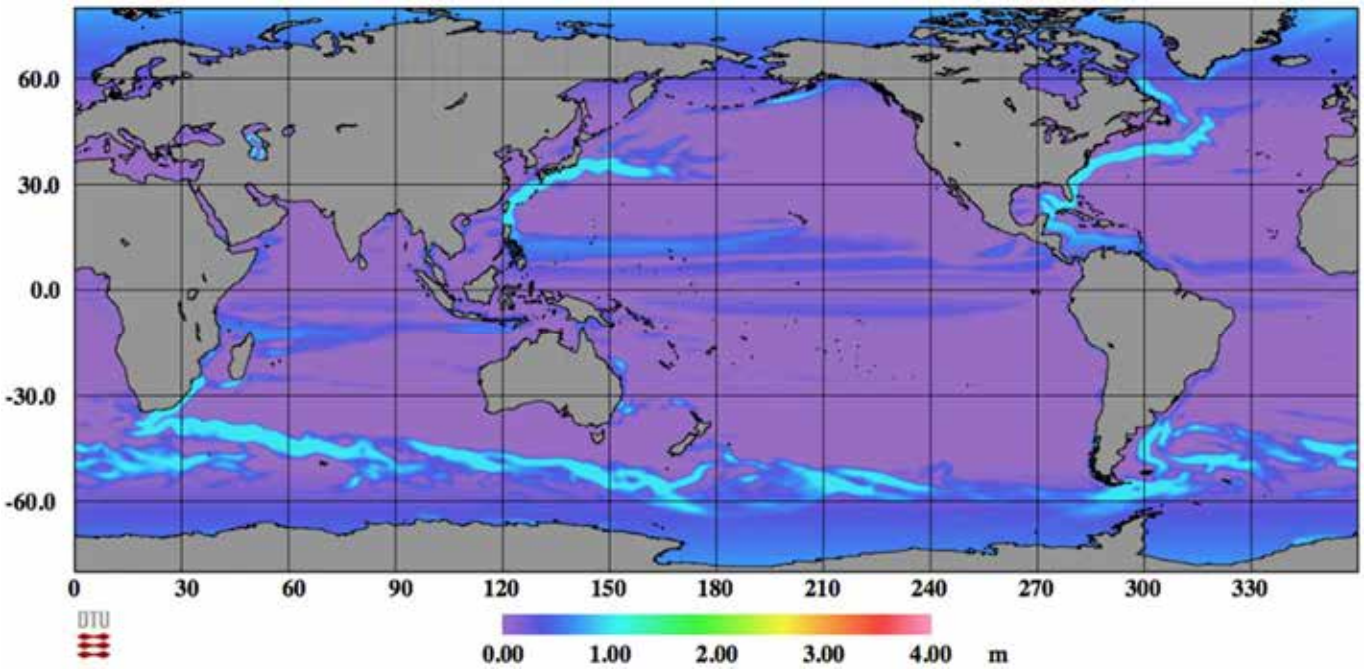
Differences Eigen6c4 - GOCO05c d/o 150 – 250.



Improving the filtering:

Filtering varies geographically (½-width and anisotropy)

- More smoothing towards the poles,
- More anisotropy towards the Equator,
- More details in energetic areas using the mask below.



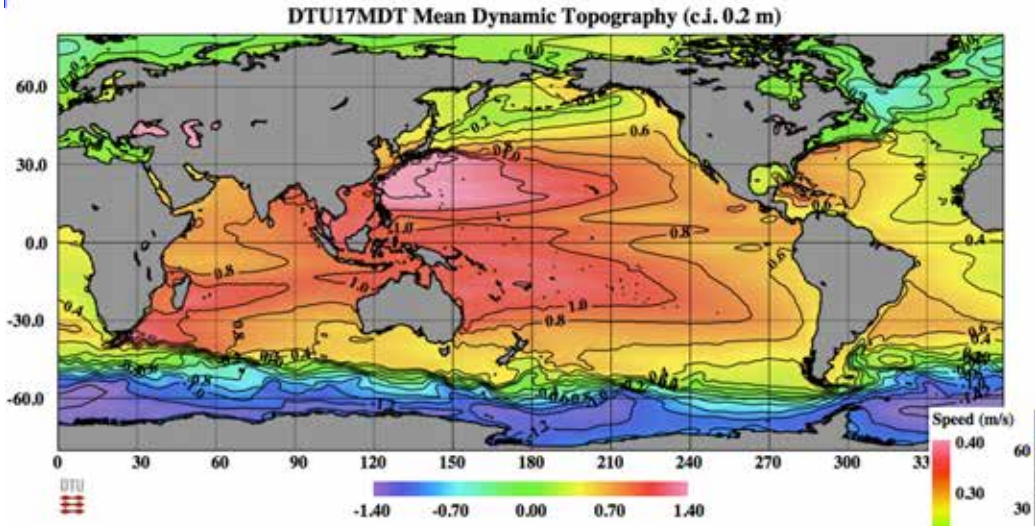
DTU17MDT – Step 1:

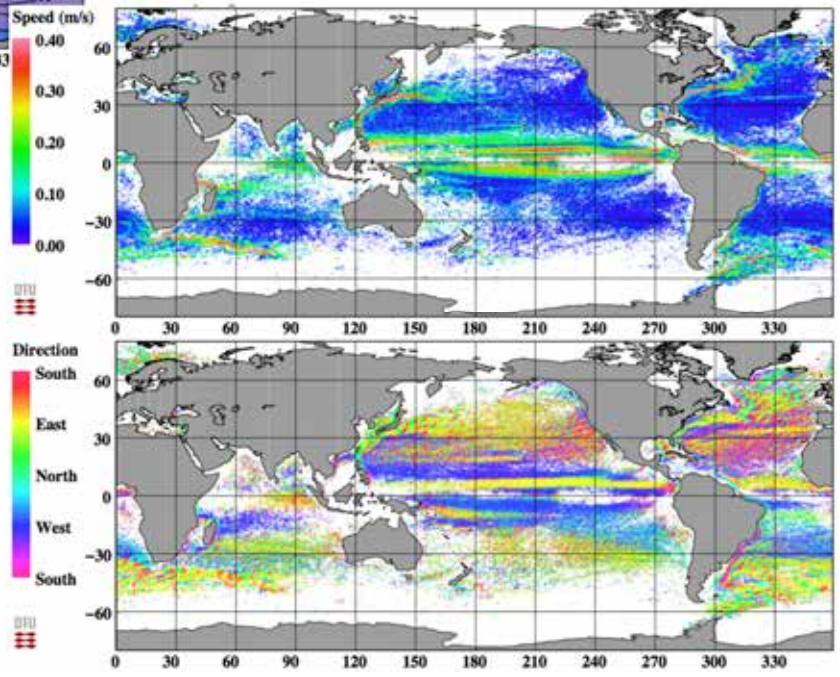
Update models:

	P hdq#Vhd#Vxuidfh	J hrlg

- New Mean Sea Surface DTU15MSS (mainly Cryosat-2 in Polar regions)
- Geoid models complete to d/o 2160.
- Filter (non-isotropic) at an average ½ degree or 45 km

DTU17MDT





Comparison with drifter means

- Stats: [cm/s]

10 30		30 50	

DTU17cMDT:

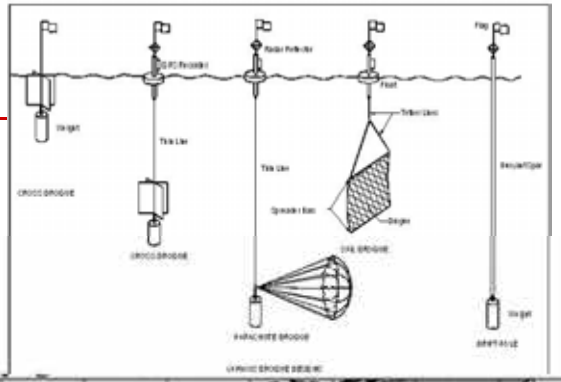
Build on DTU17MDT

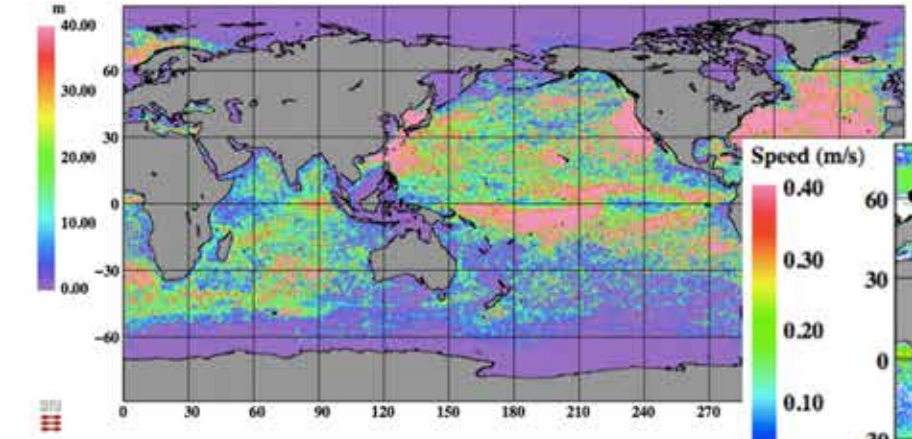
Integration with mean drifter velocities:

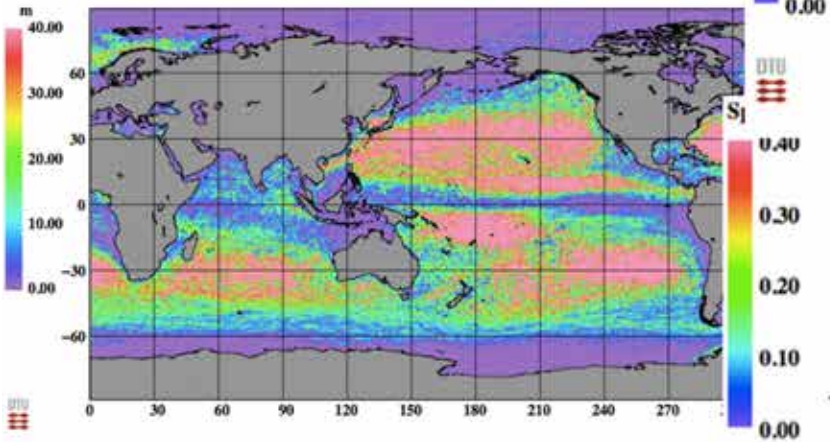
- Processing of drifter velocities (Ekman + Aviso GCA (20y)),
- Comparisons and error assessment (MDT and mean velocities),
- Model set-up and inversion (Smoothing).

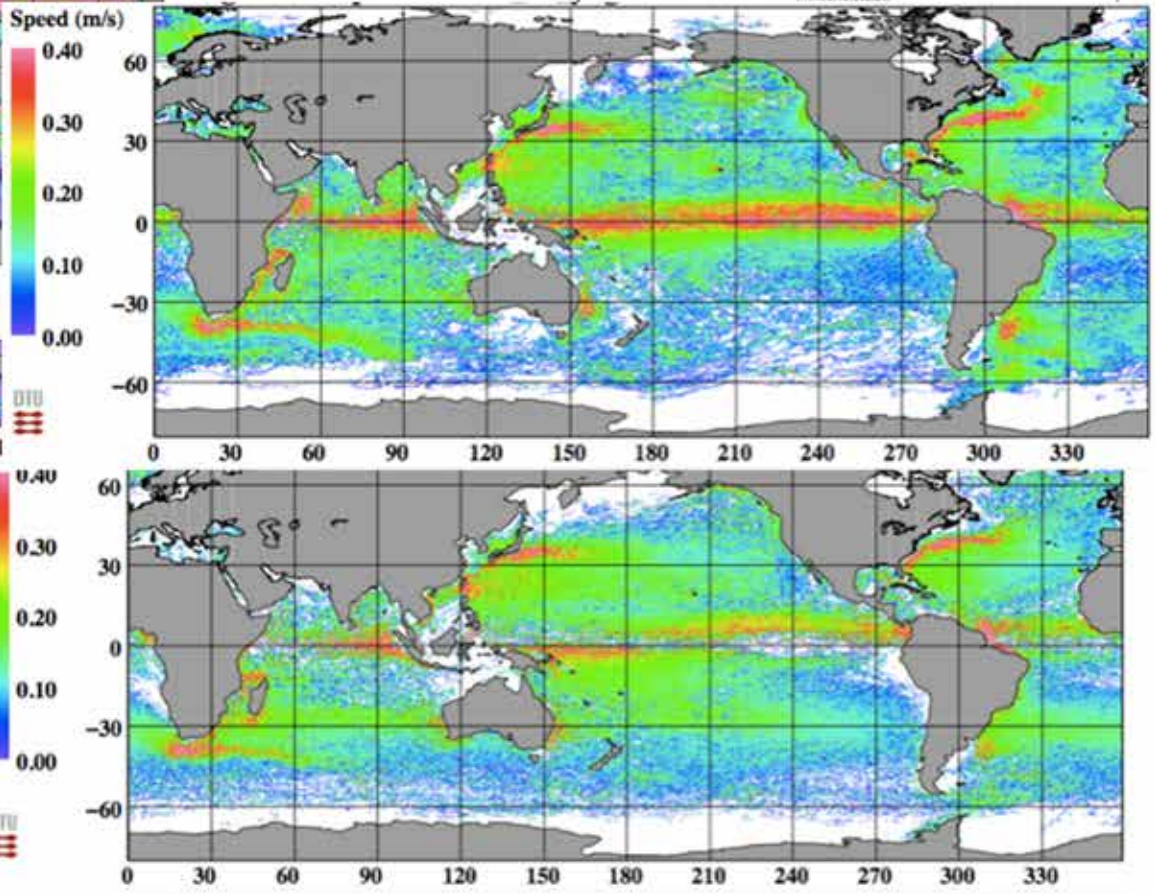
Processing of drifters

Drogued and un-drogued drifters.

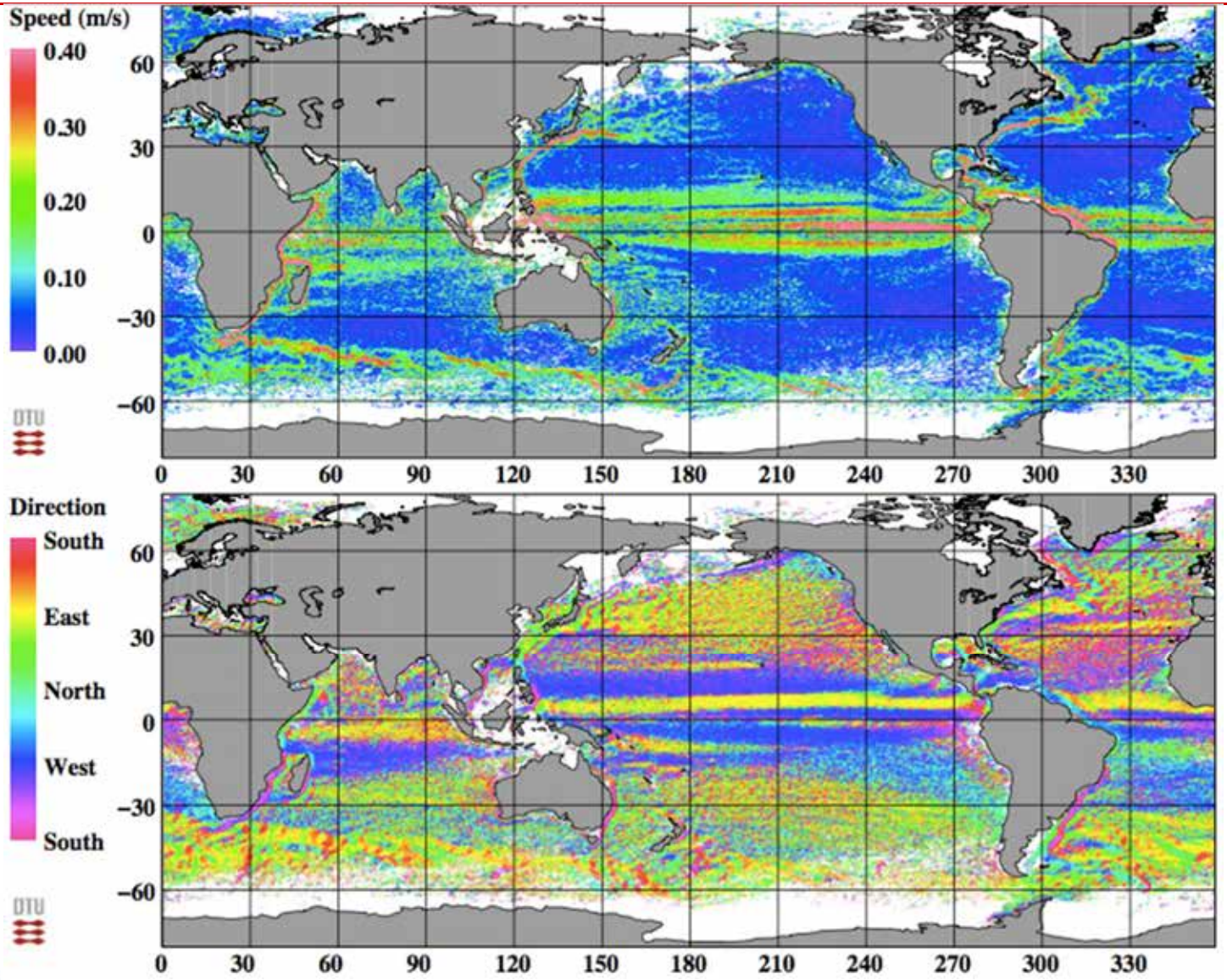








Merged set of mean drifter velocities



Inversion

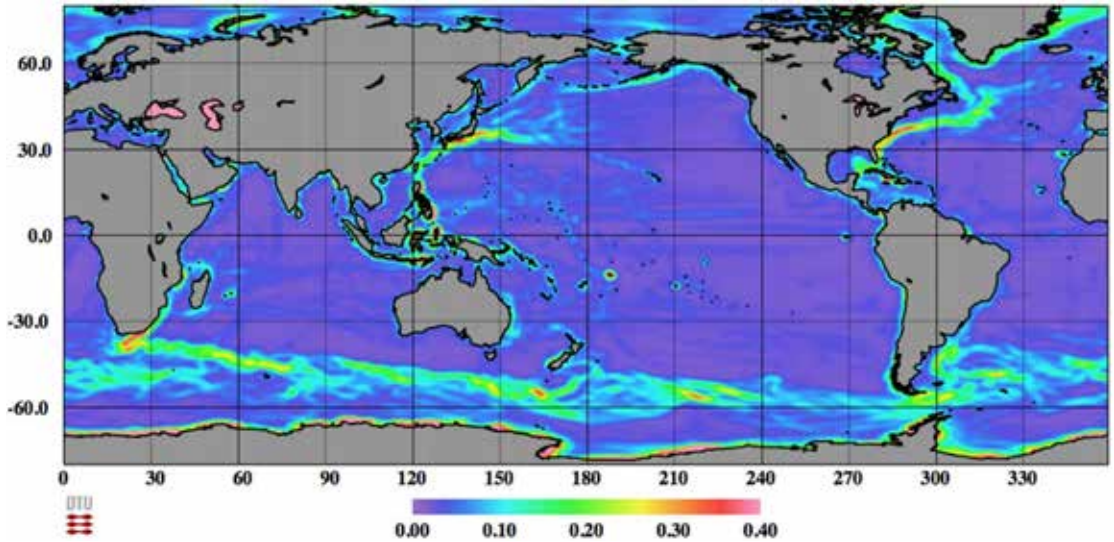
Model: MDT heights at nodes of a regular ¼ by ¼ deg grid.

Minimizing the cost function:

$$F = \sum(MDT - MDT_{geodetic})^2 + C_{gradient} \cdot \sum(\nabla MDT - \nabla MDT_{oceanographic})^2 + C_{smoothness} \cdot \sum(\Delta MDT)^2$$

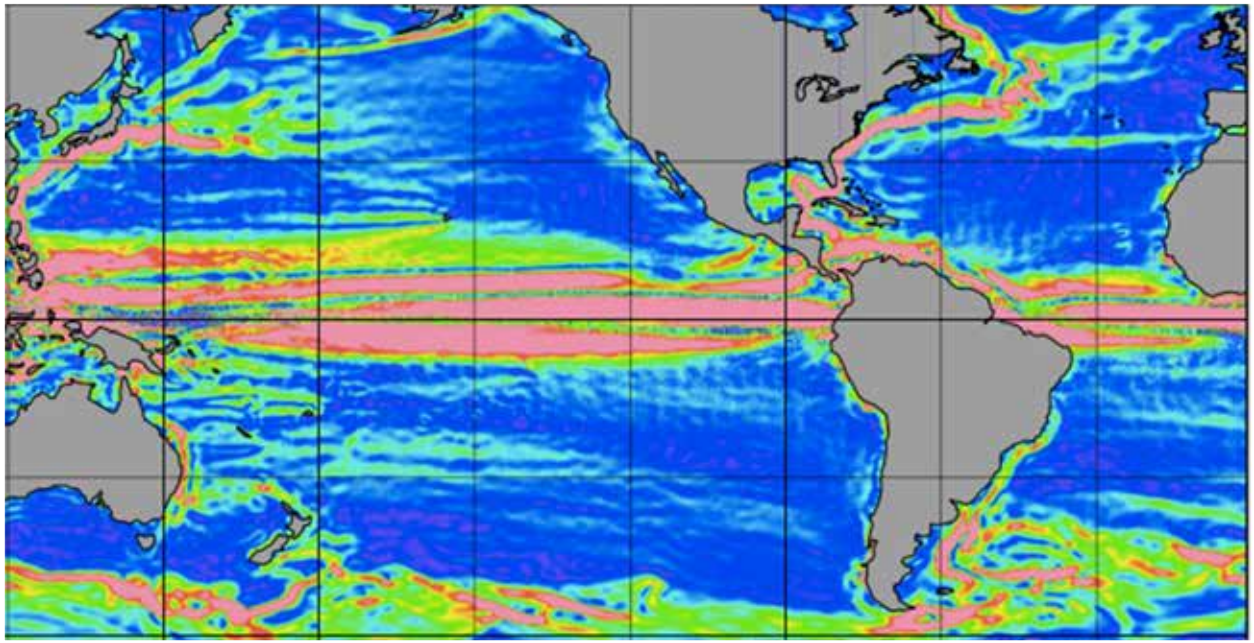
Consider errors

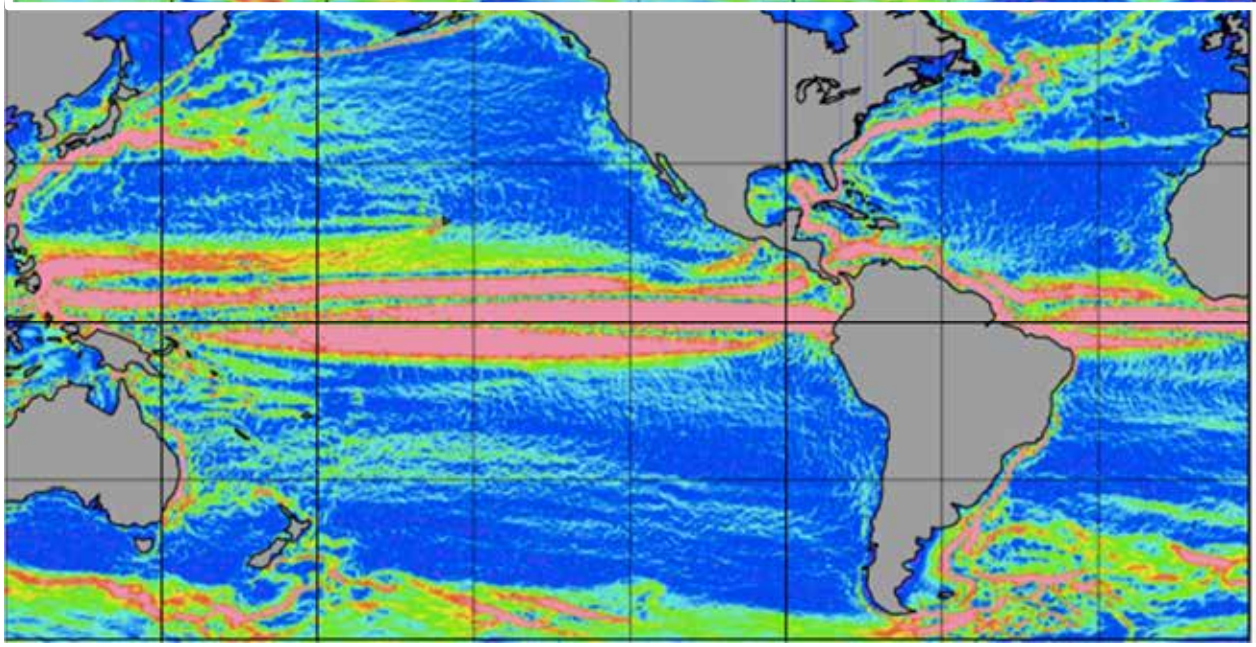
- Mean drifter velocities: e ~ 1/sqrt(n)
- MDT error:

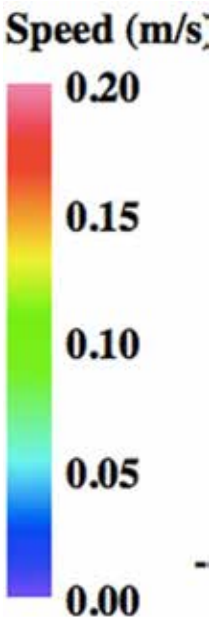


Results

DTU17MDT >
OGMOC





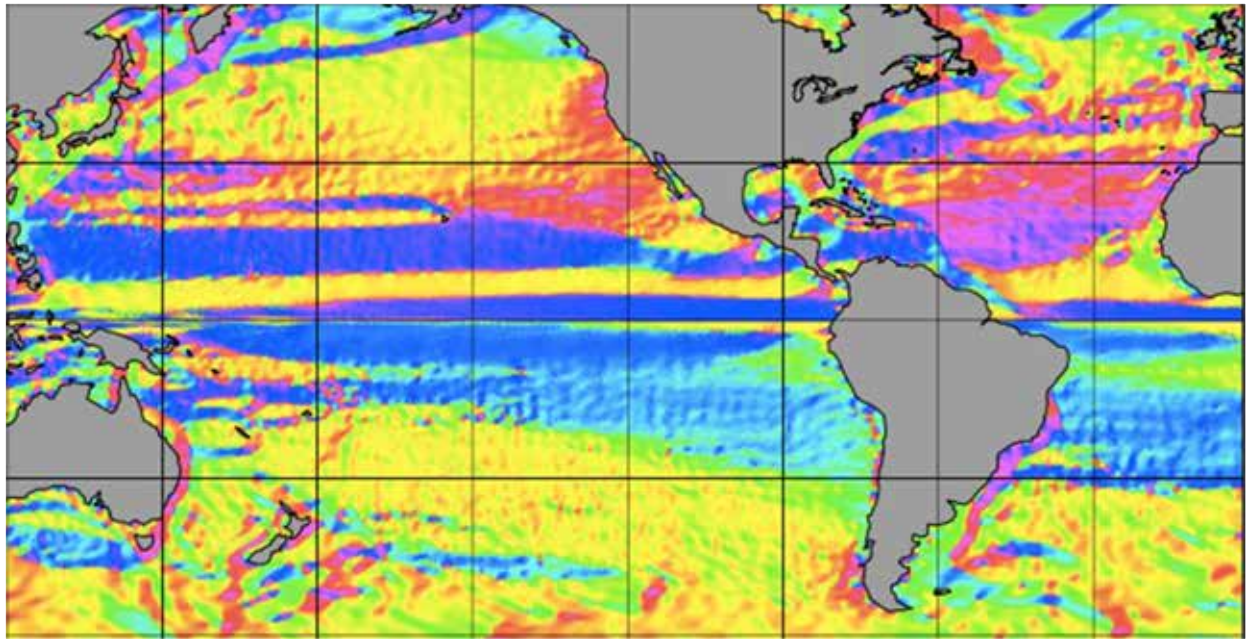


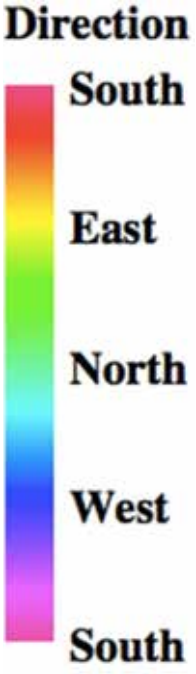
DTU17cMDT >

DTU Space
National Space Institute

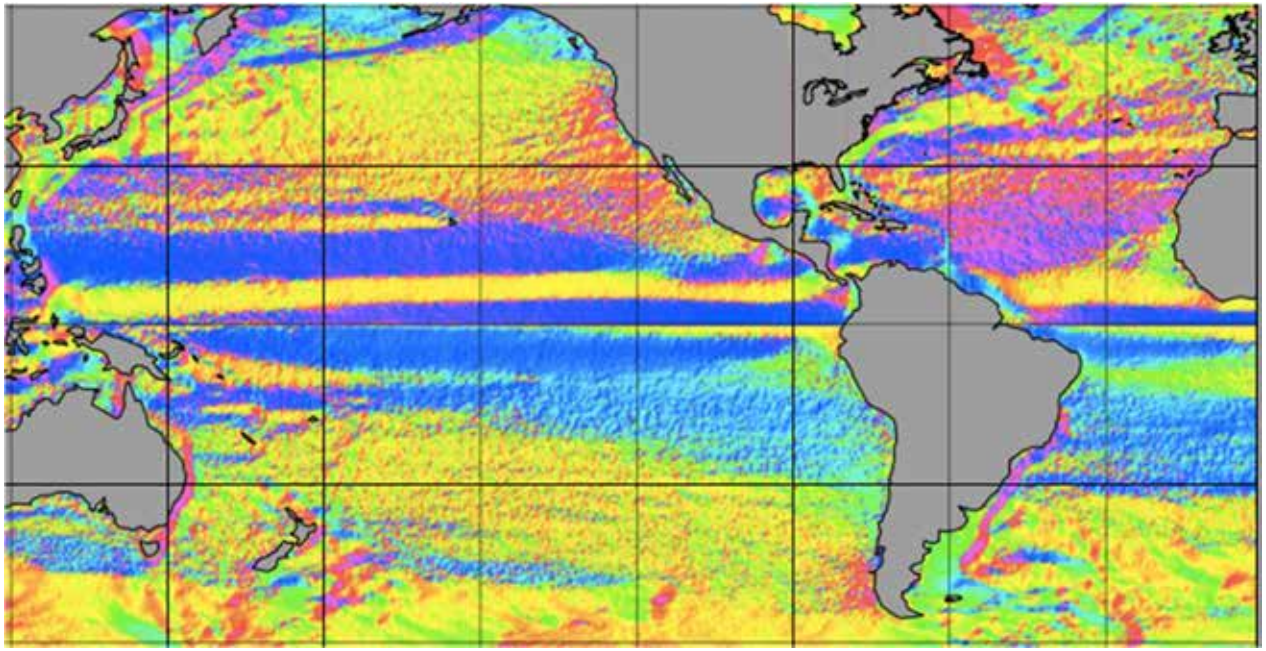
Results

DTU17MDT >





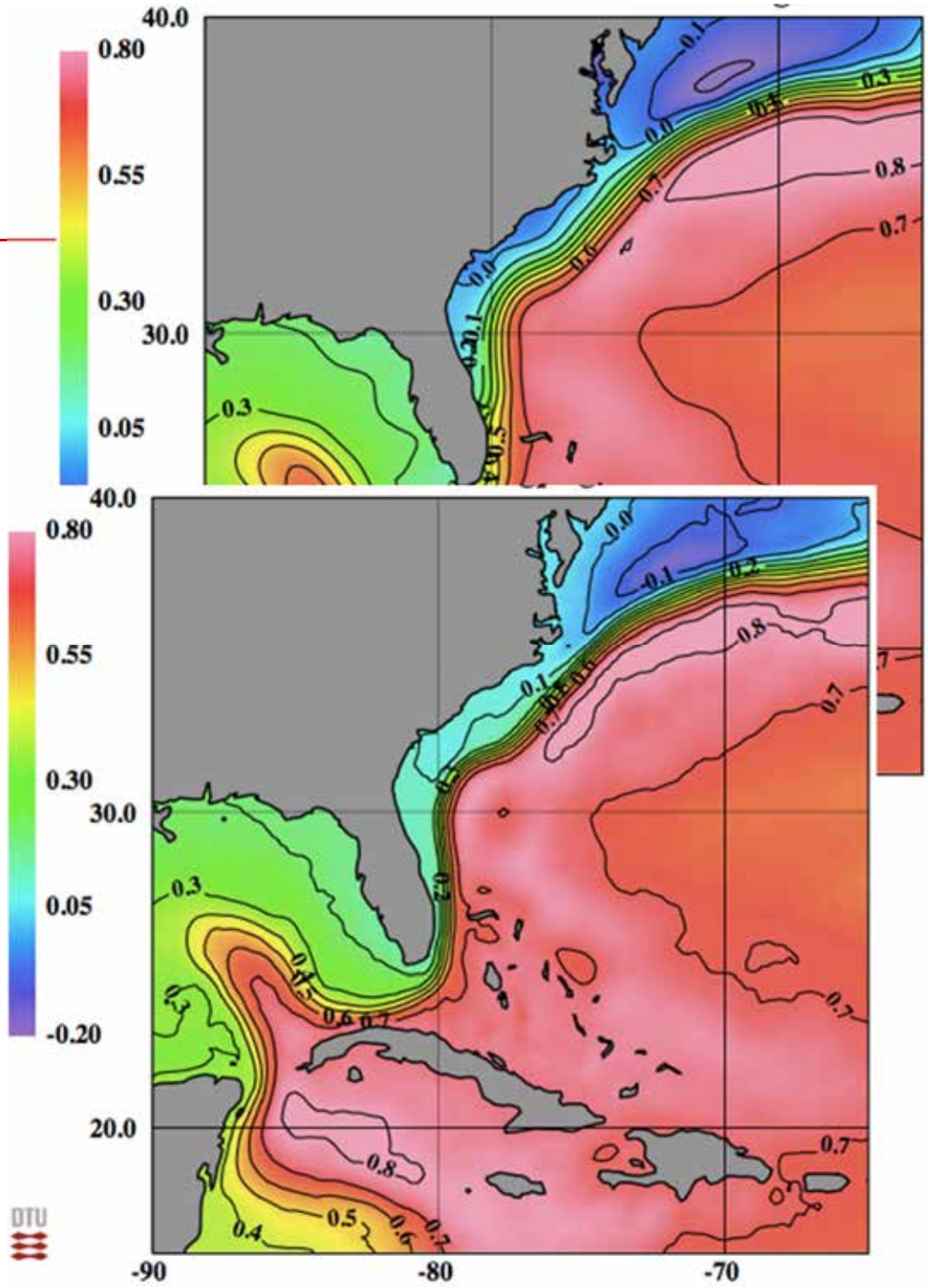
DTU17cMDT
Combination >



Results

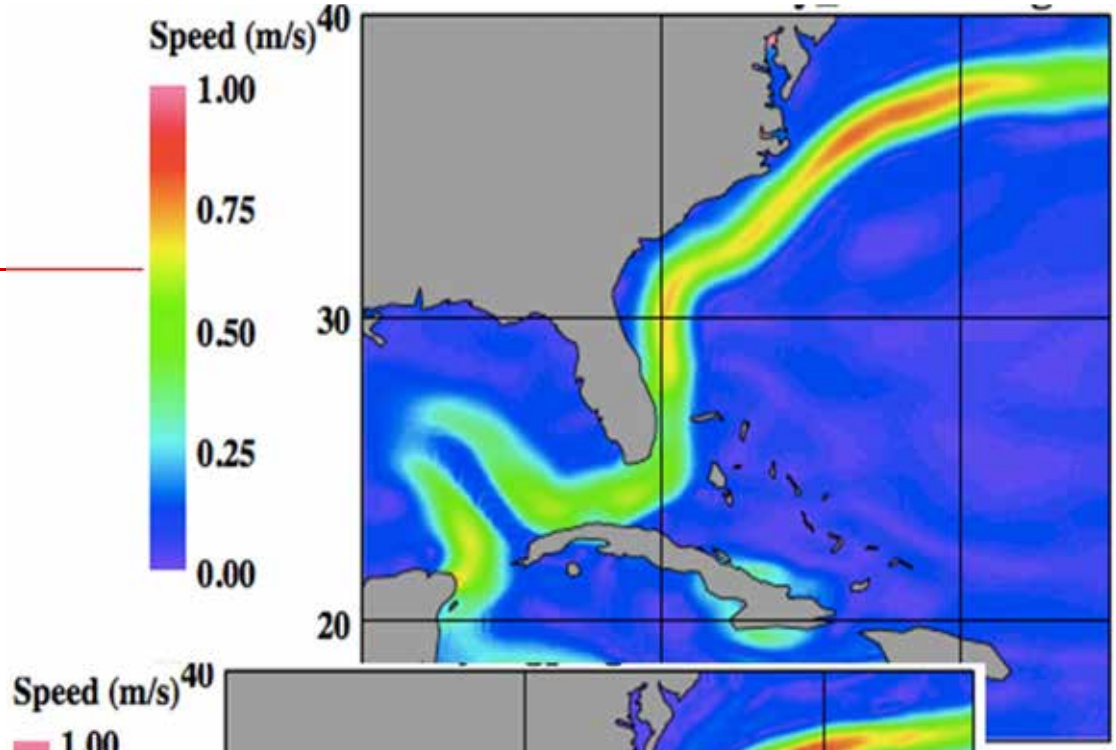
DTU17MDT >

DTU17cMDT
Combination >

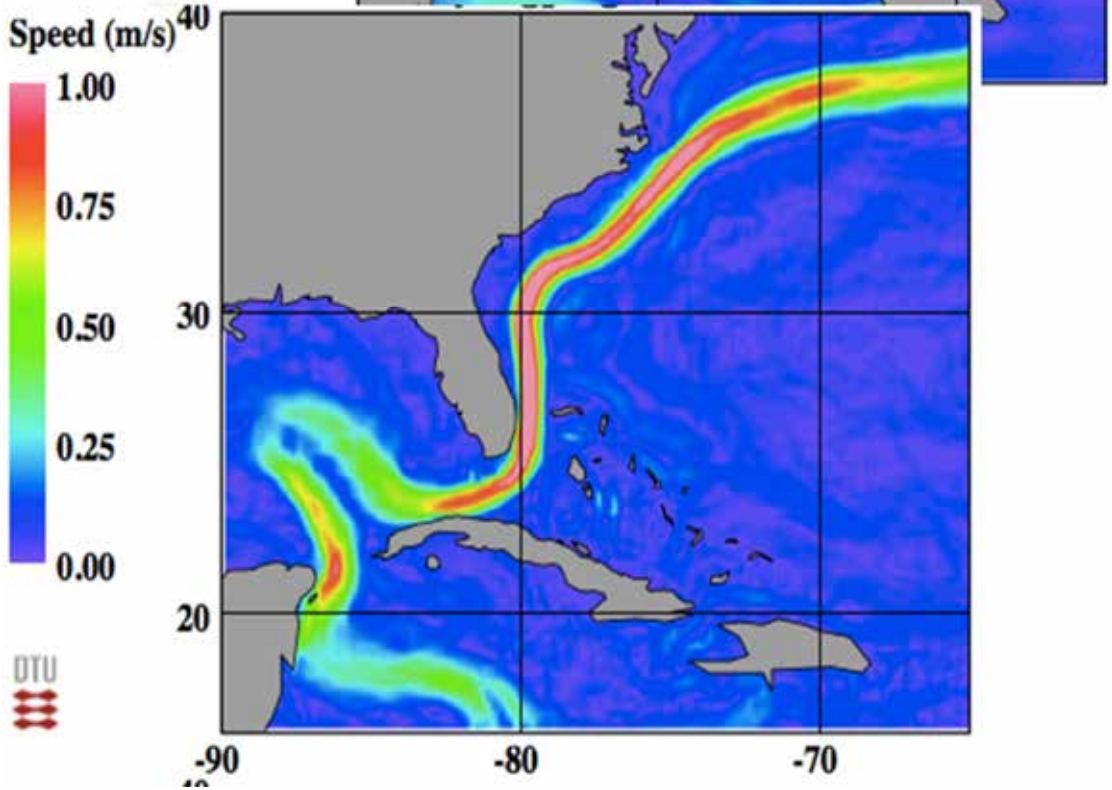


Results

DTU17MDT >



DTU17cMDT
Combination >

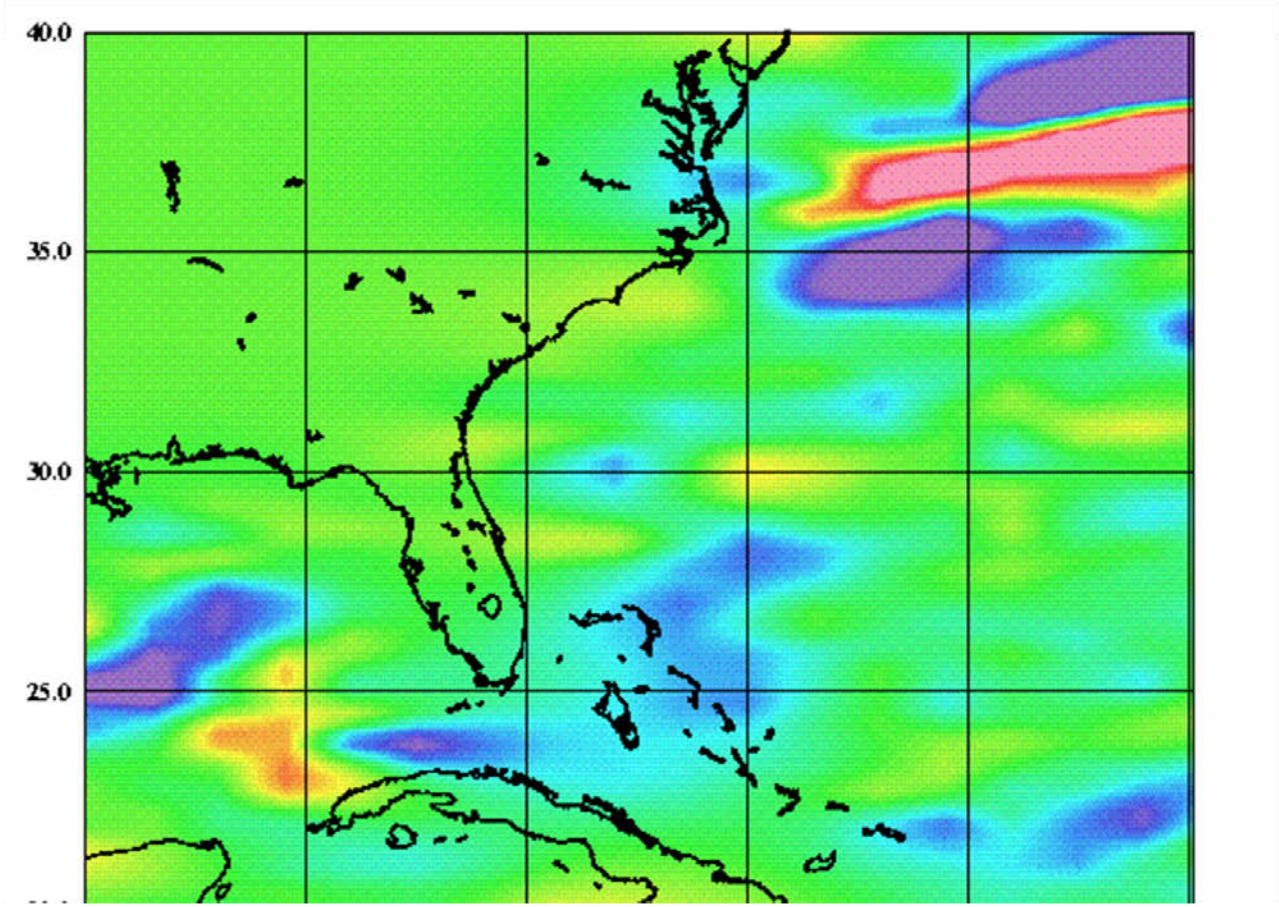


Next steps

- Further assess errors
- Adjust / fine tune weights and regularization

-> Update to DTU18MDT by integrate with DTU18 MSS.

DTU18-15 MSS



Summary

First version of DTU17cMDT being a MDT combining the geodetic DTU17MDT with drifter mean velocities.

Still need to:

- Assess errors,
- Adjust weights and regularization/smoothing

DTU17cMDT and DTU17MDT is available upon request to pk@space.dtu.dk or oa@space.dtu.dk