

The DTU10 mean sea surface and mean dynamic topography –

Improvements in the Arctic and coastal zone

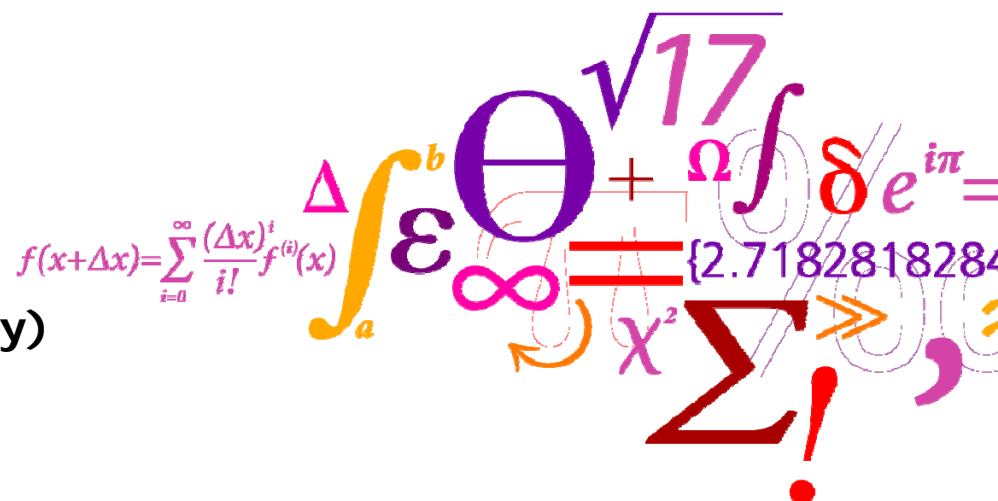
Ole B. Andersen and Per Knudsen

Acknowledge

NGA (Kenyon et al.)

De Montford University (P. A. M Berry)

DTU Space
National Space Institute



From DNSC 08 -> DTU 10

- **Problems in the Arctic**
 - **Data Editing (ERS and ENVISAT) Existing ERM data**
 - **Corrections (updating / difference)**
- **Coastal**
- **Accuracy**
- **MDT – With GOCE geoid.**

Outlook

- **DTU 11/12 – Full Retracking of the ERS2+ENVISAT ERM.**

DTU10MSS

- Extending timeseries from 12 years to 17 years (8->13 years in the Arctic)
- Updating range and geophysical Corrections (State of the art AVISO/RADS)
- Take advantage of Climate Change (Ice-retreat – More ENVISAT data)
- Extended ICESat coverage from 4 to 17 cycles/month
- Improved Arctic editing (using MSS criterion)
- Improved filtering maintaining more short wavelength features (from gravity)
- Introduced a coastal MSS correction

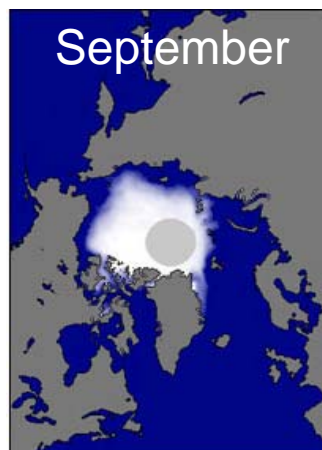
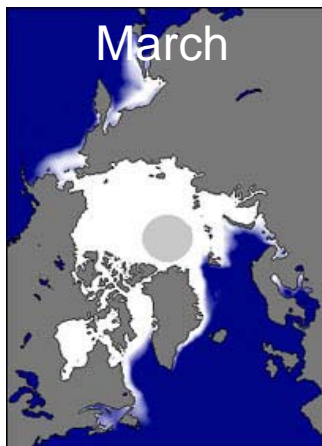


Total sea ice retreat

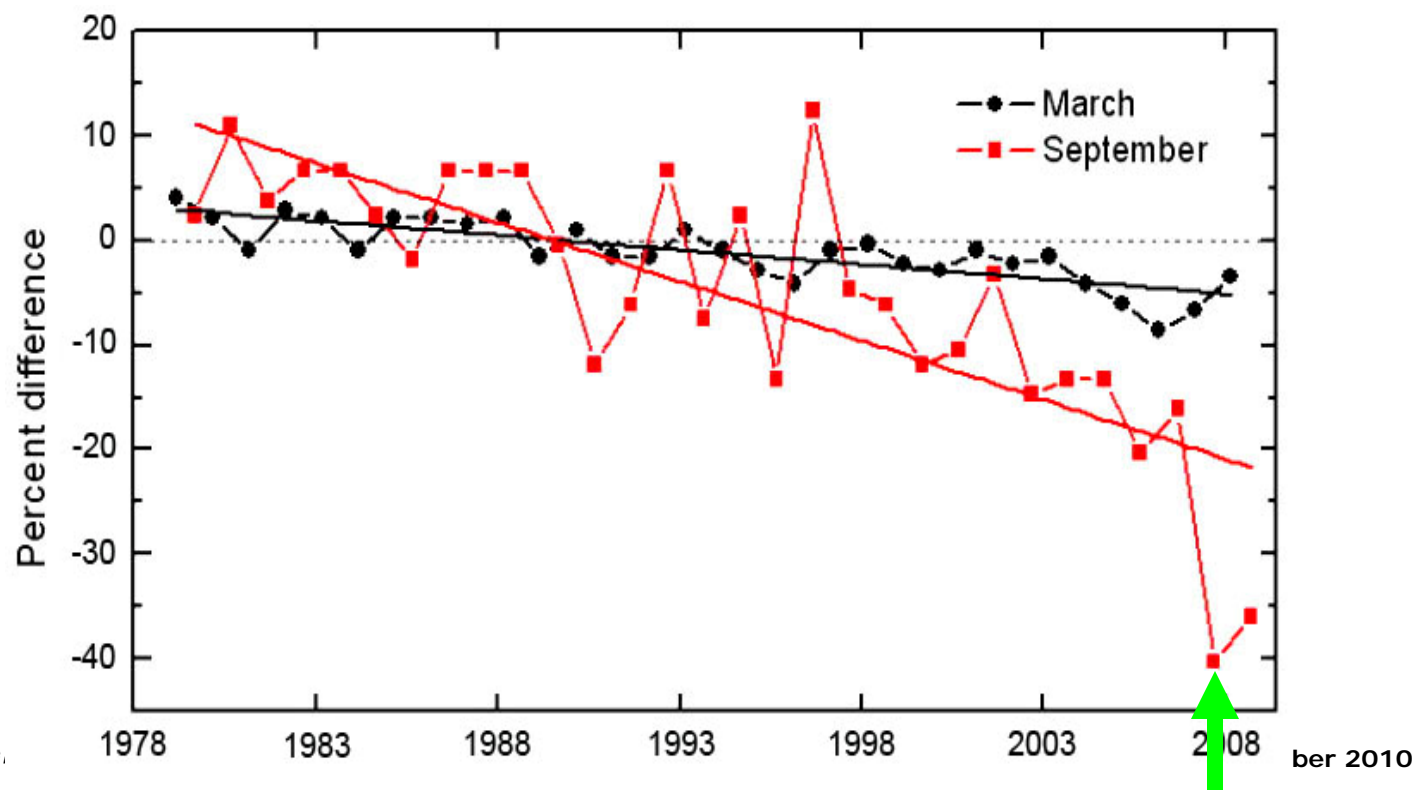
Decrease in total sea ice extent:

September: 11.1 % per decade

March: 2.8 % per decade

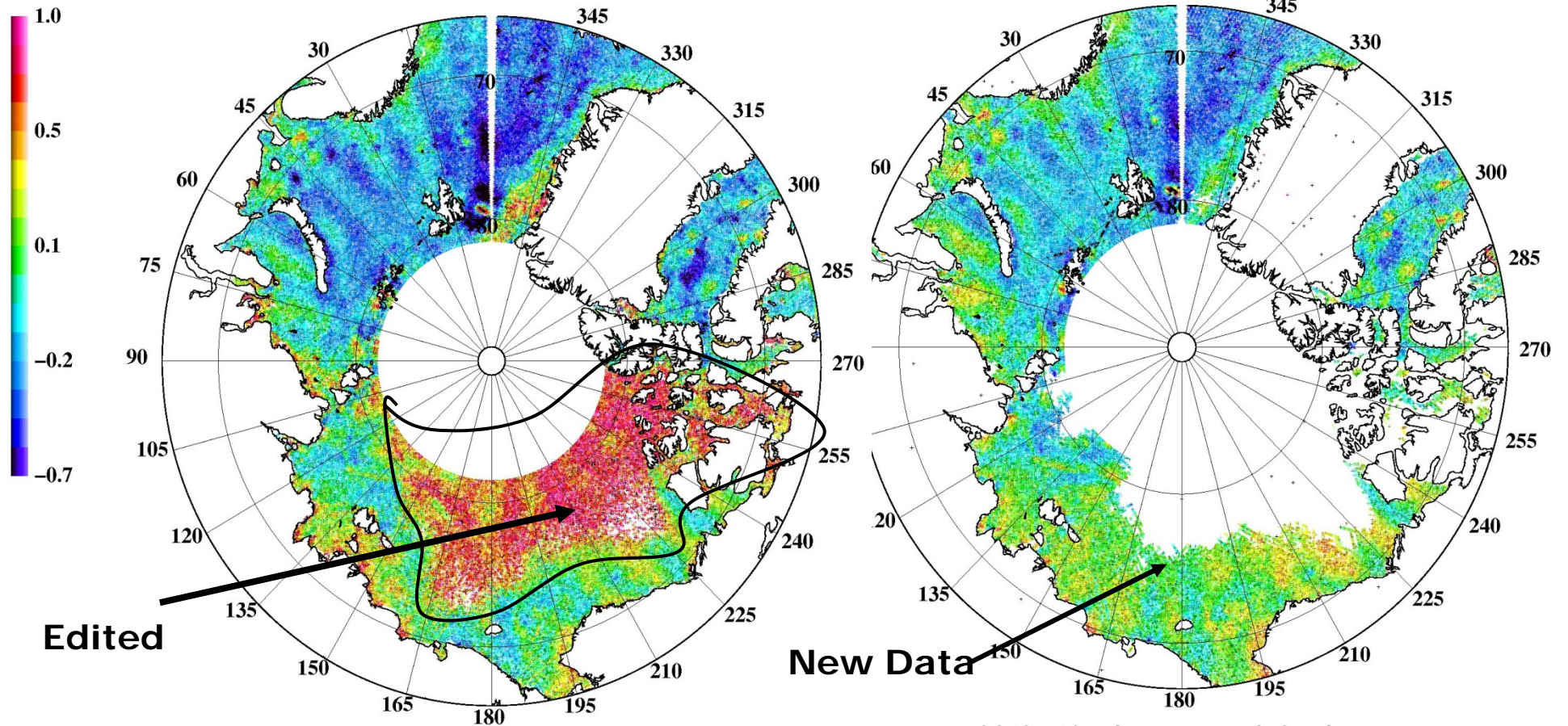


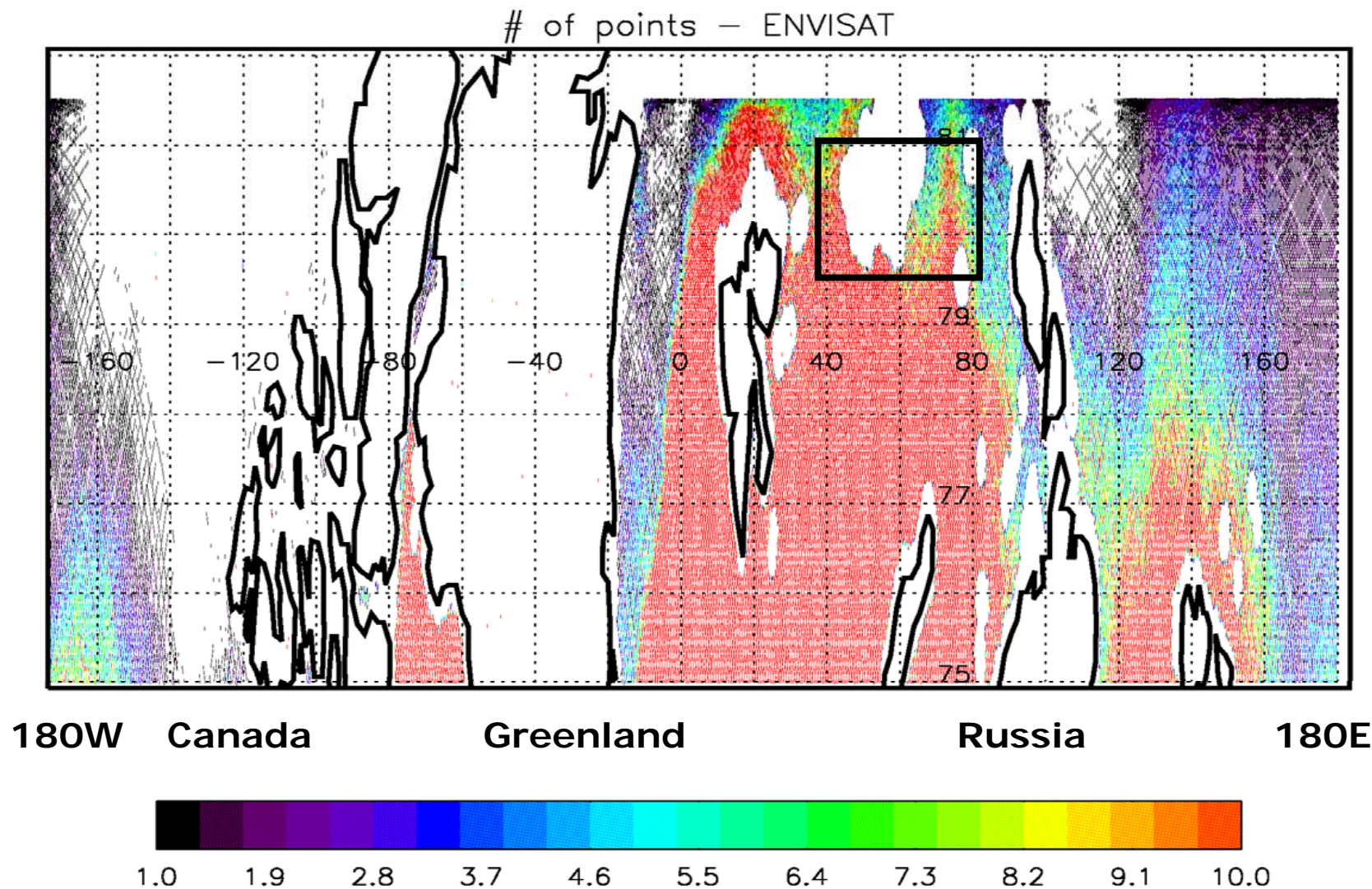
Richter-Menge et al, 2008



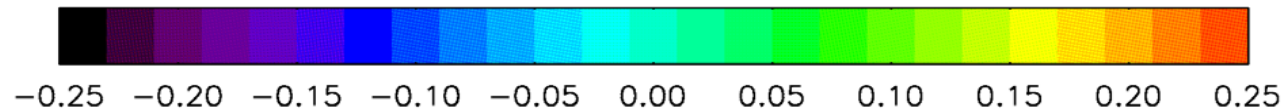
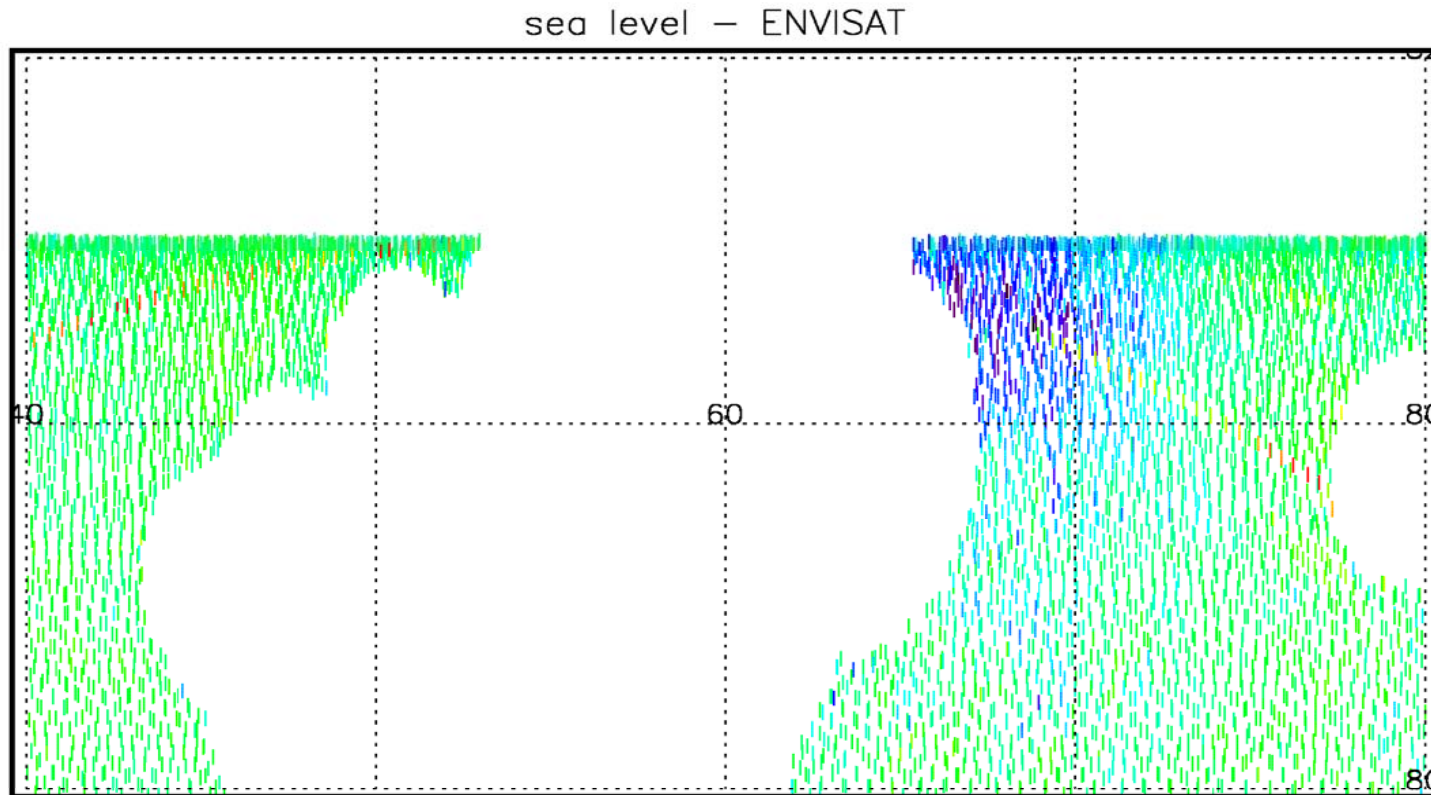
Height rel to PGM04 : ERS-2 (ALL 9Y)

ENVISAT (ALL 7Y)





Editing problems – Wrong land mask (affected by ice?) is being applied ??



Changing to ignore landmask on data.

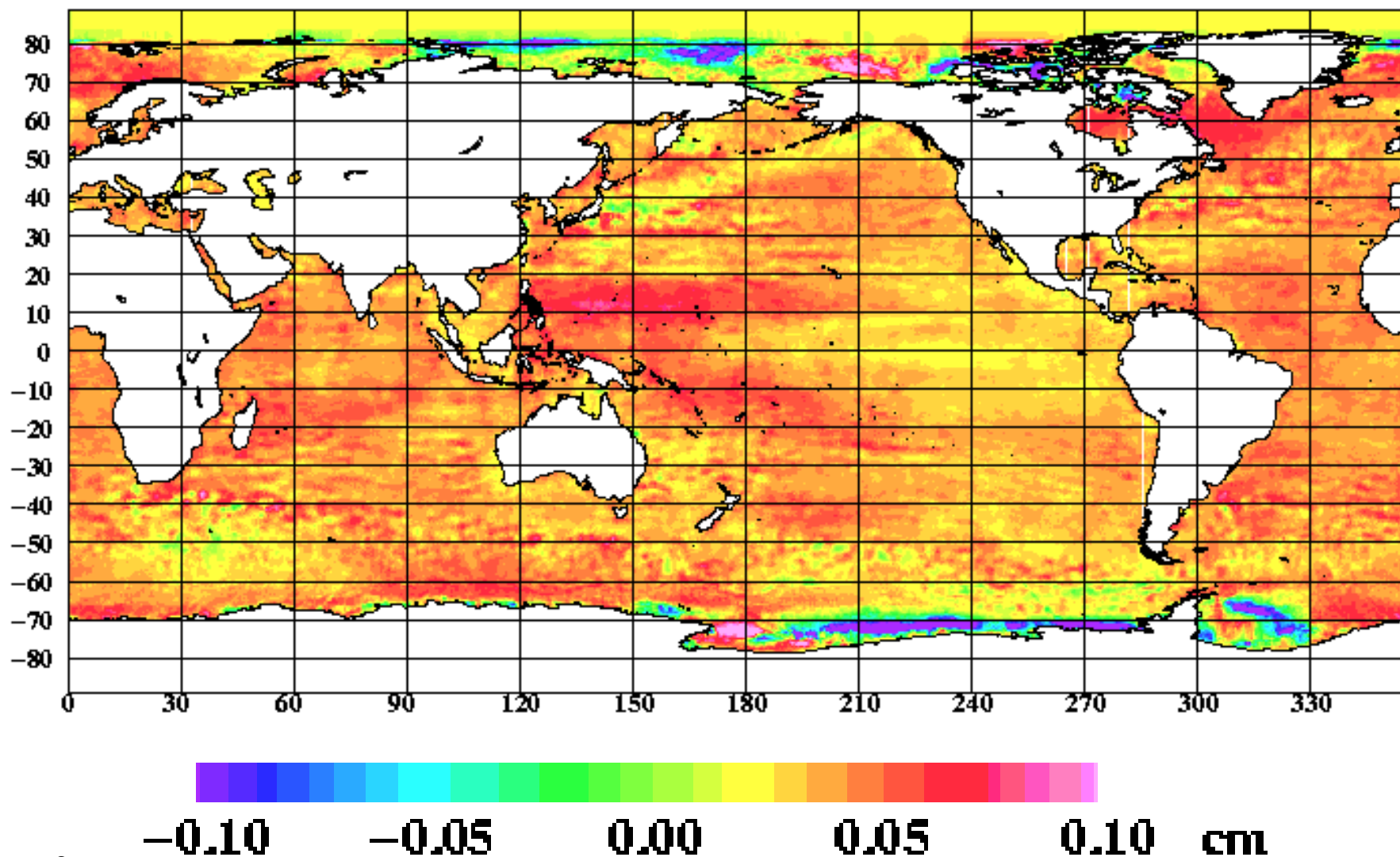
Update Range + Geophys Corrections

Standards	CLS01	DNESC08MSS	DTU 10
Reference period	1993-1999	1993-2004	1993-2009
Orbit	ORB_POE_N	GGM02/ITRF2000	EIGEN-GL04C
Dry troposphere	ECMWF	ECMWF	ECMWF
Wet troposphere	Radiometer	ECMWF	Radiometer
Ionosphere	Altimeter	Altimeter	Altimeter
Dynamic Atmosphere	IB (1011 mbar)	IB (1013 mbar)	DAC (IB+HF var)
Ocean tides	GOT 99	GOT 00.2	GOT 00.2
Sea State Bias	BM4	BM4	Non-PARAM

Basically this makes DTU10 consistent with the 2010 "State of the art" Corrections applied by i.e. AVISO and RADS.

DAC (1011.4 mbar mean pressure) introduces 1.6 cm mean difference

DTU10MSS – DNSC08MSS (3 cm average difference)

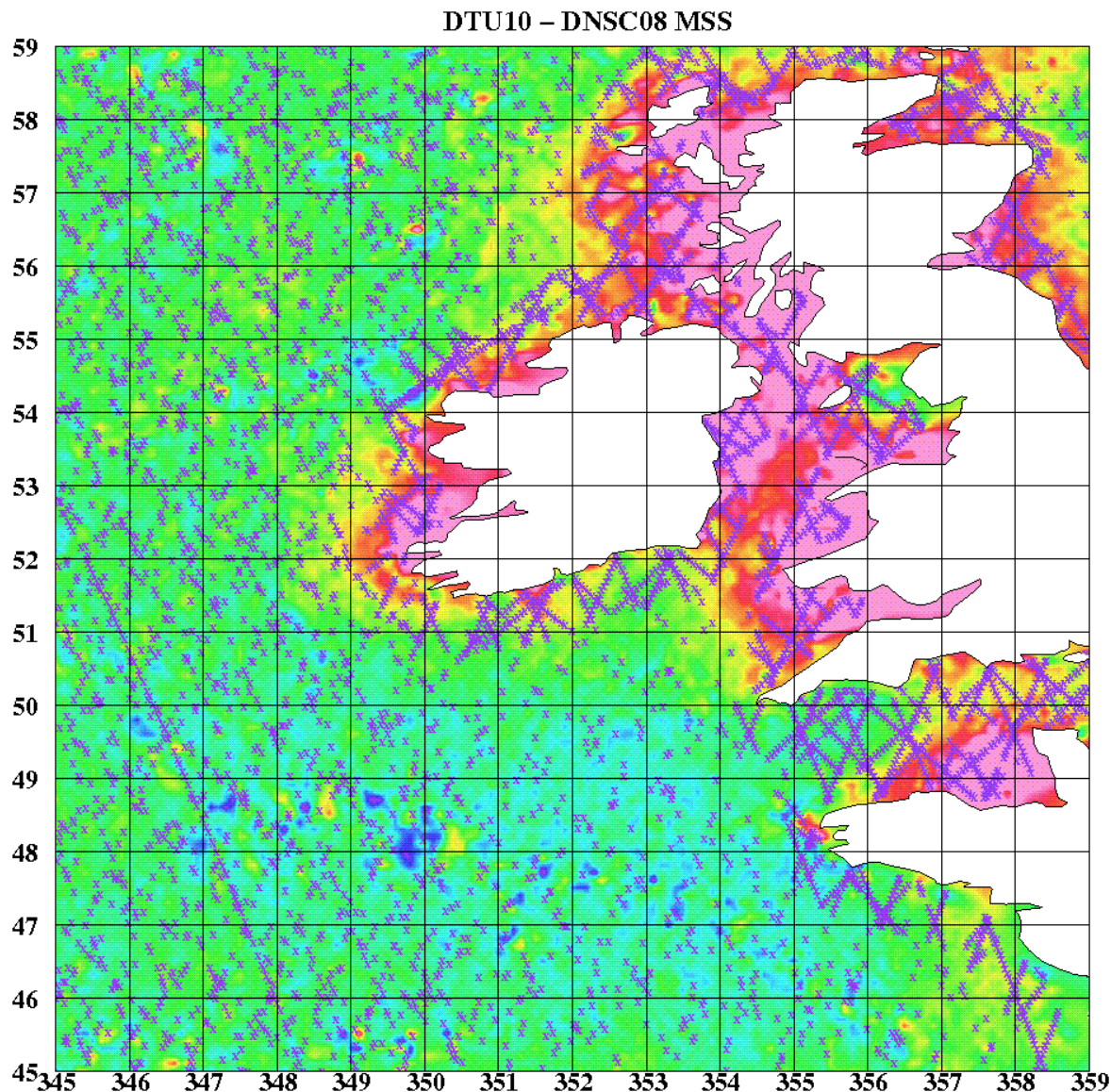
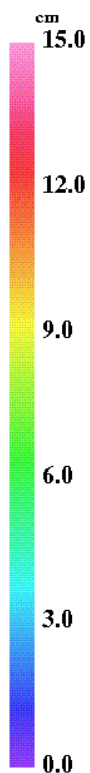


Mean tracks 17 y

Coastal "holes"

Coastal correction
To steer interpolation

Minimum 4 years.
Fitted to Longwave
over 800 km



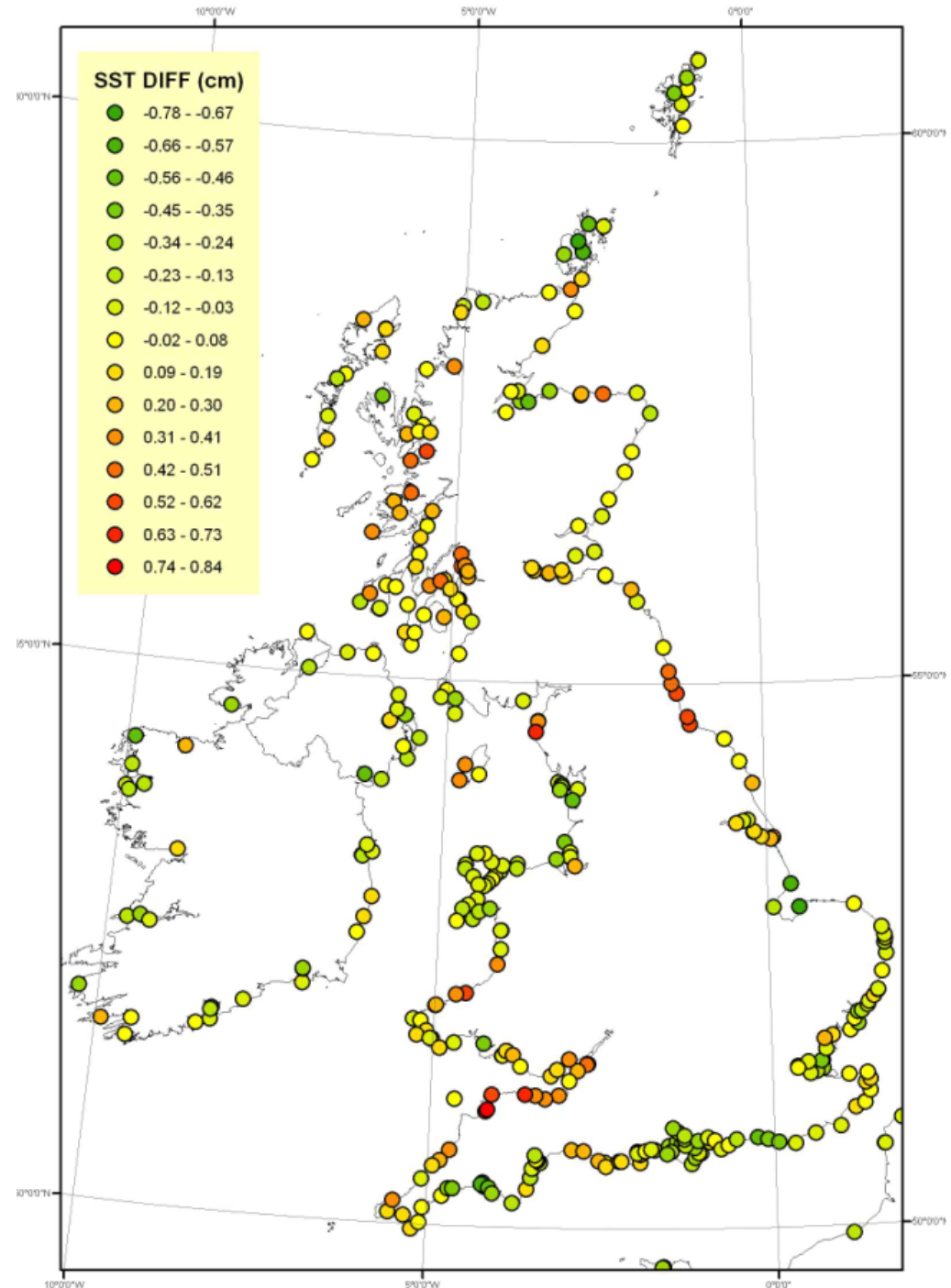
Evaluation

320 GPS measured Tide Gauges
Around Britain

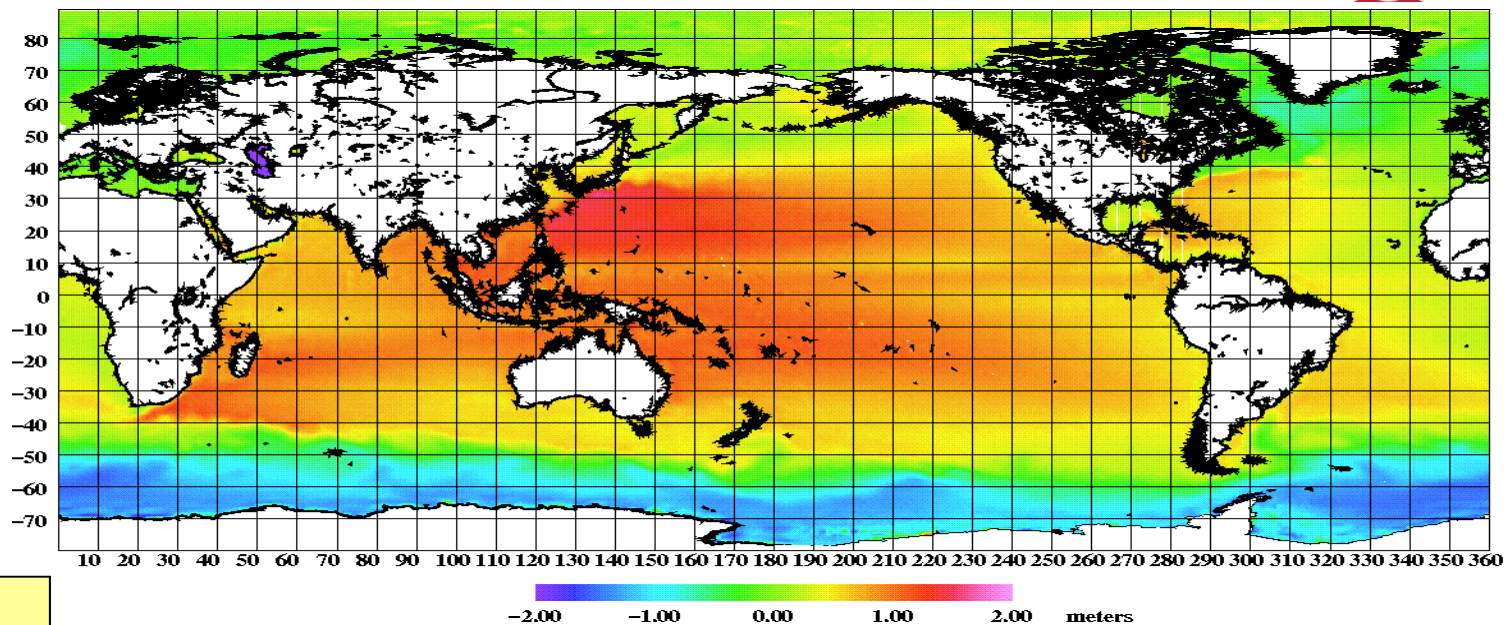
TG – DNSC08MSS
Mean = 1.24 cm,
Std = 6.8 cm

DTU10 is roughly 3 cm higher.

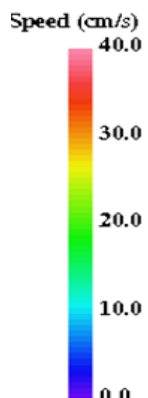
Comparison by
Marek Ziebart, UCL London,



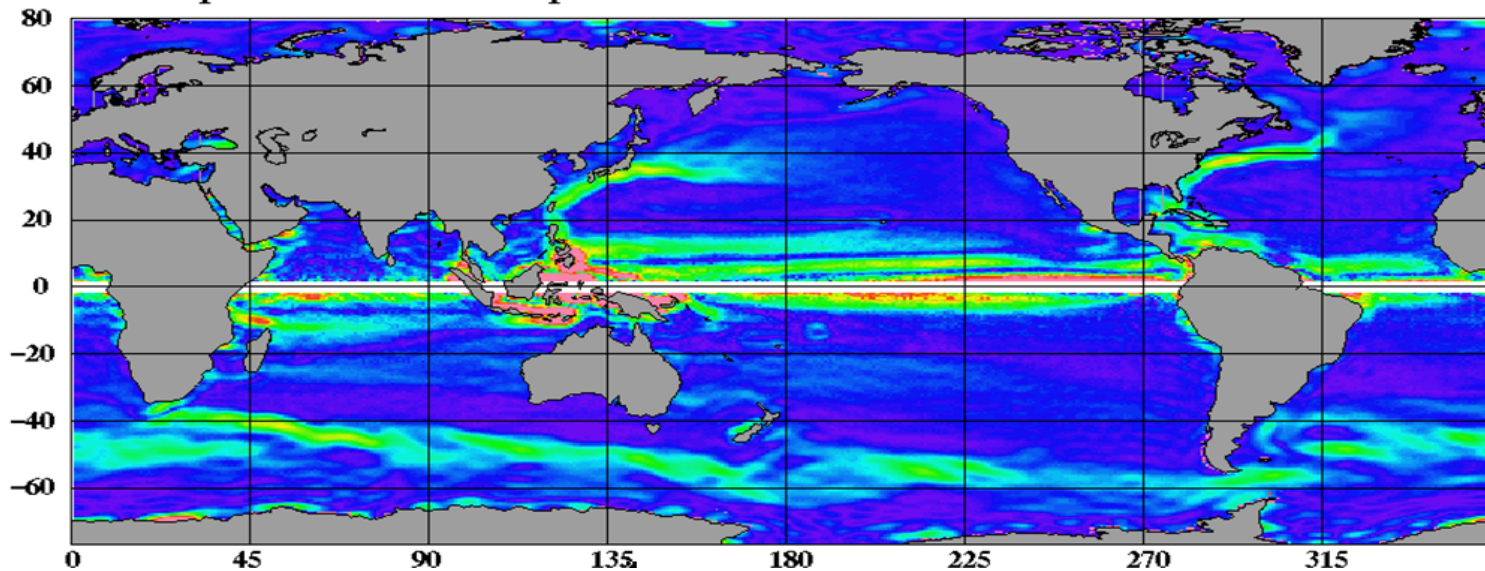
DNOSC08MDT
DNOSC08MSS-
EGM2008
Filter: 75 km



GUT TOOLBOX

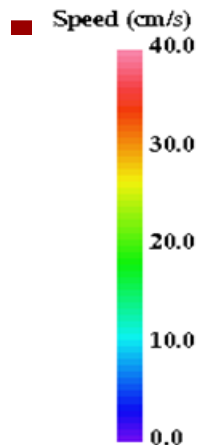


Geostrophic surface current speed and direction from EIGEN GL4S MDT

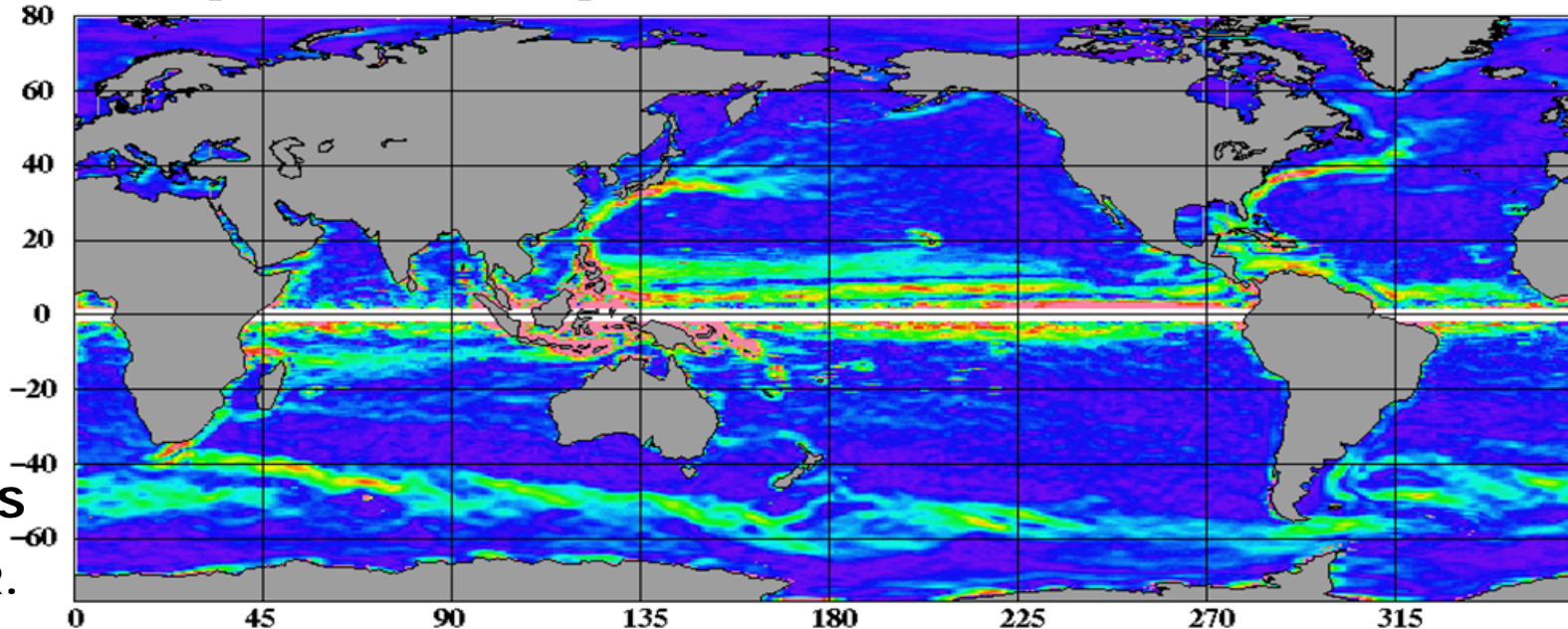


DNOSC08MSS-
EIGEN GL4S
Filter: 1 deg.

N



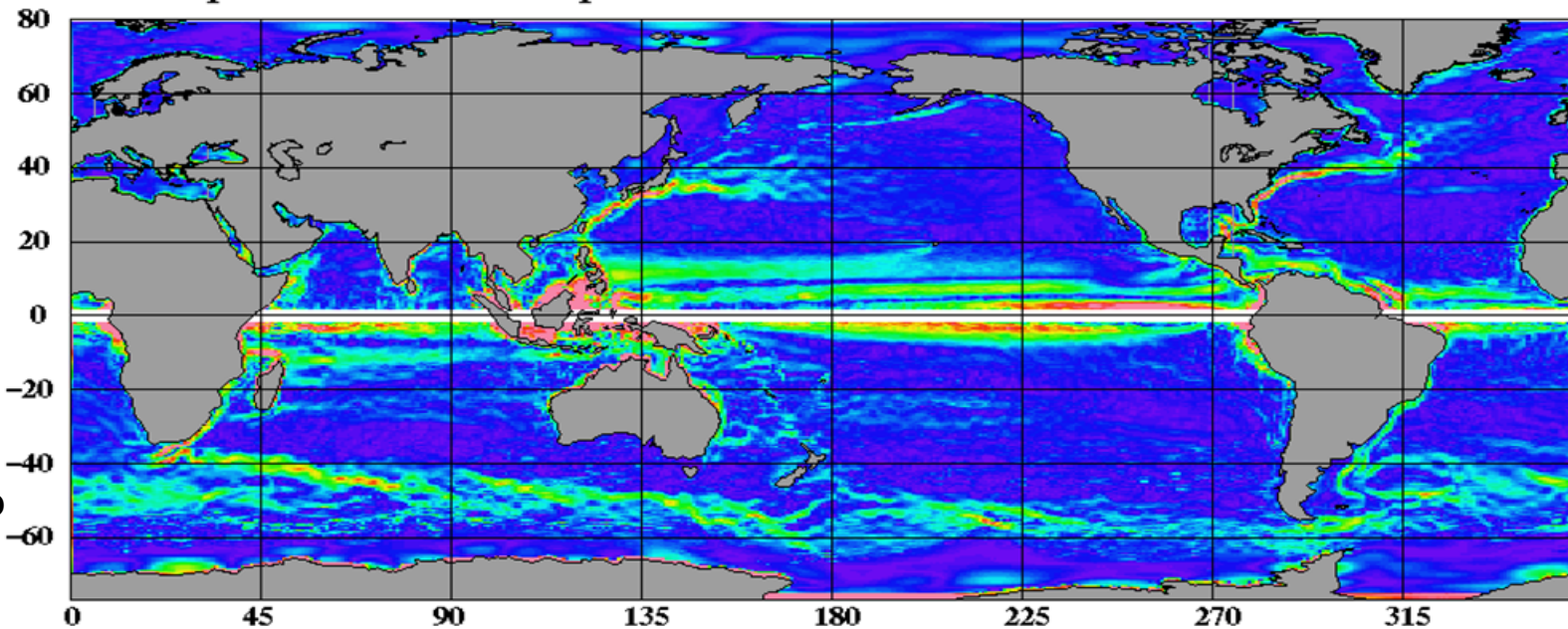
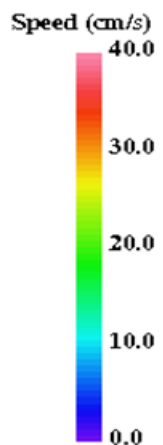
Geostrophic surface current speed and direction from GOCE DIR MDT



DNOSC08MSS

- GOCE DIR.

Geostrophic surface current speed and direction from Maximenko MDT



Maximenko

MDT

DTU10MSS.

Improved particularly Coastal and Arctic regions

Extended temporal coverage from 12 to 17 years

Available from <ftp.space.dtu.dk/pub/DTU10> as 1 or 2 minute files

Next:

DTU11/12 Models (Further improving the MSS at high latitudes):

**Retracking ALL ERS-2 & ENVISAT ERM at high latitudes
to have 15 years time-series.**

First Arctic retracking presented at COAST-ALT (P. Berry)