

Update to the DTU15 global marine gravity field and new DTU15 bathymetry

Ole B. Andersen, Per Knudsen and A. Abulaitijang

Simon Holmes (SGT-inc)
John Factor (NGA)

DTU Space
National Space Institute

$$f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^i}{i!} f^{(i)}(x)$$
$$\int_a^b \Theta^{\sqrt{17}} + \Omega \int \delta e^{i\pi} =$$
$$\infty = \{2.7182818284$$
$$\times^2 \Sigma!$$

Outline

Summary of DTU15 gravity improvement

Spatial filtering.

Arctic: New Cryosat-2 Altimetry

Evaluating the DTU15 global marine gravity field.

- Global & Arctic Evaluation vrt Marine data

Preparing for DTU16/DTU17 (still improving)

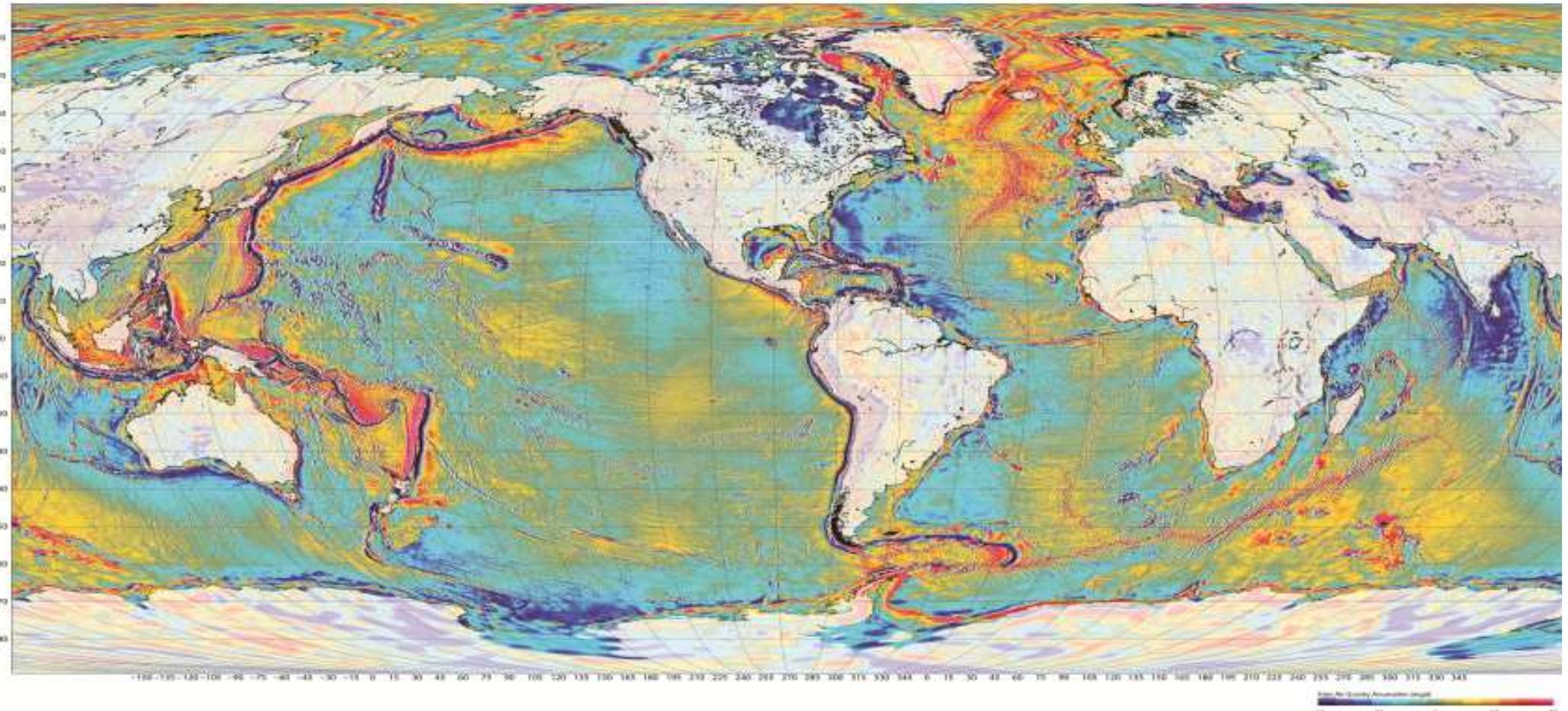
Near Coastal improvements:

Implementing terrain correction for coastal regions

Preparing for SARAL/AltiKA GM

Improving SAR-in

DTU15 Global Free air gravity improvements.



DTU15 data

Used 4.5 years of Cryosat-2

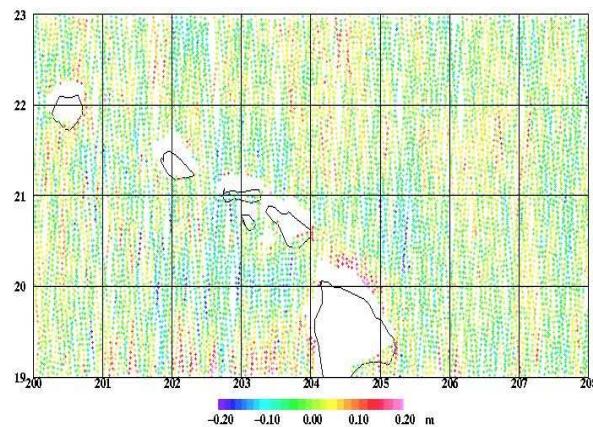
Used 1 year of Jason-1

Geosat GM retired (signal to noise)

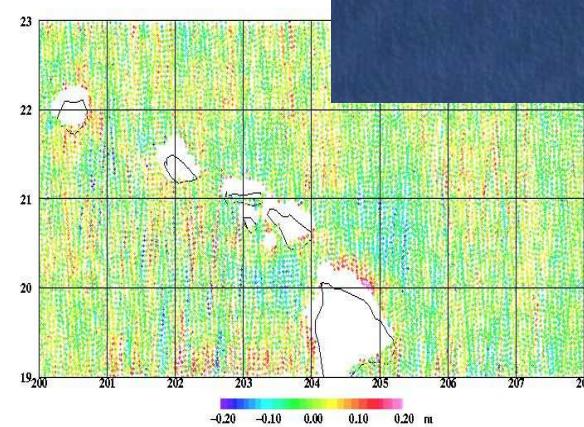
ERS GM partly retired (used>64°)

CRYOSAT HAS HUGE IMPACT

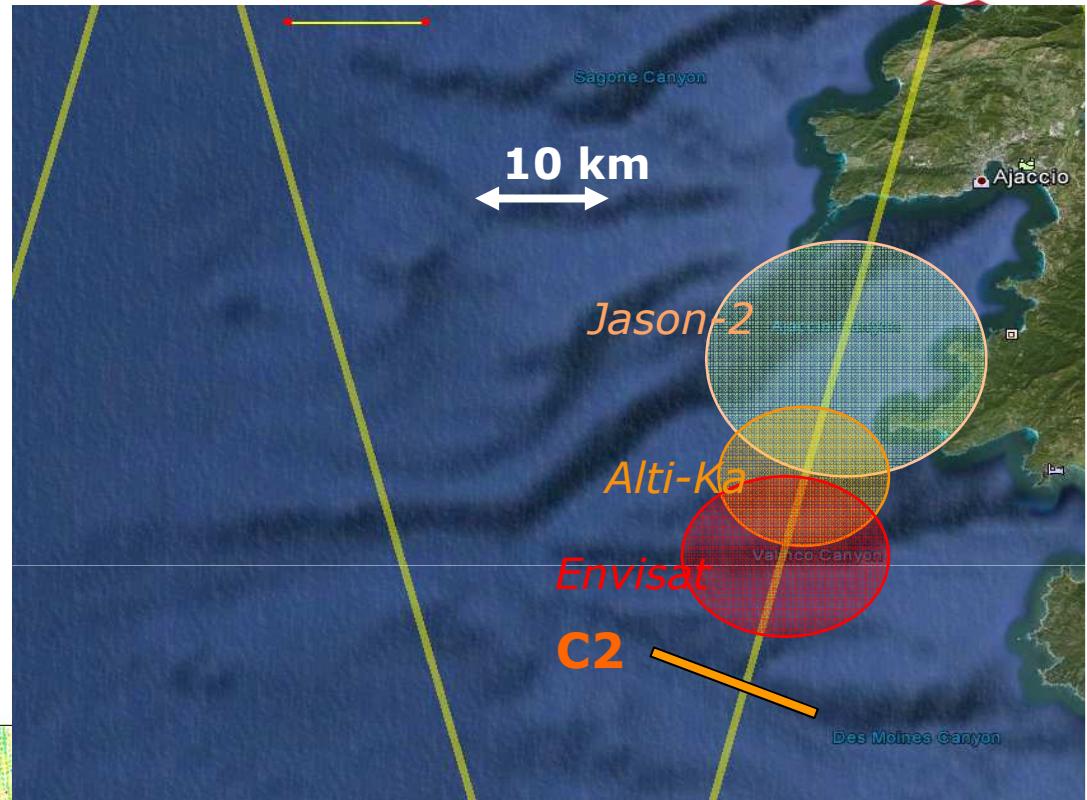
**SAR and SAR-in by
DTU processing (LARS)**



1 Year Cryosat-2 (DTU13)



4.5 Years Cryosat-2



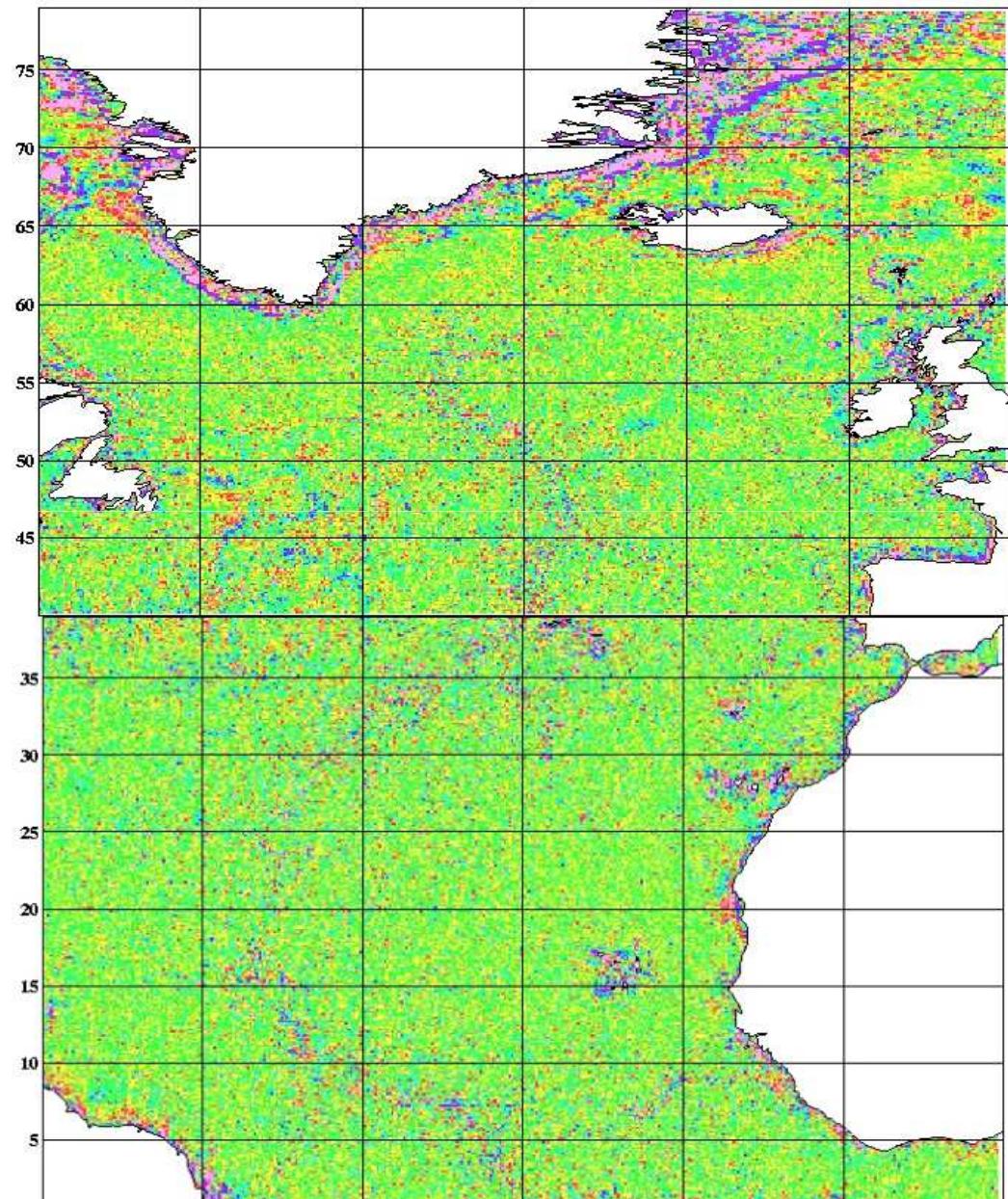
Filtering: (DTU15)

**Decrease spatial filtering
from 9 (DTU10)
to 6.5 km (DTU13)
To 5.5 km (DTU15) half wl.**

**Resolves more signal
Related to geophysical
Structures:
I.e. the Mid-Atlantic
Spreading ridge.**

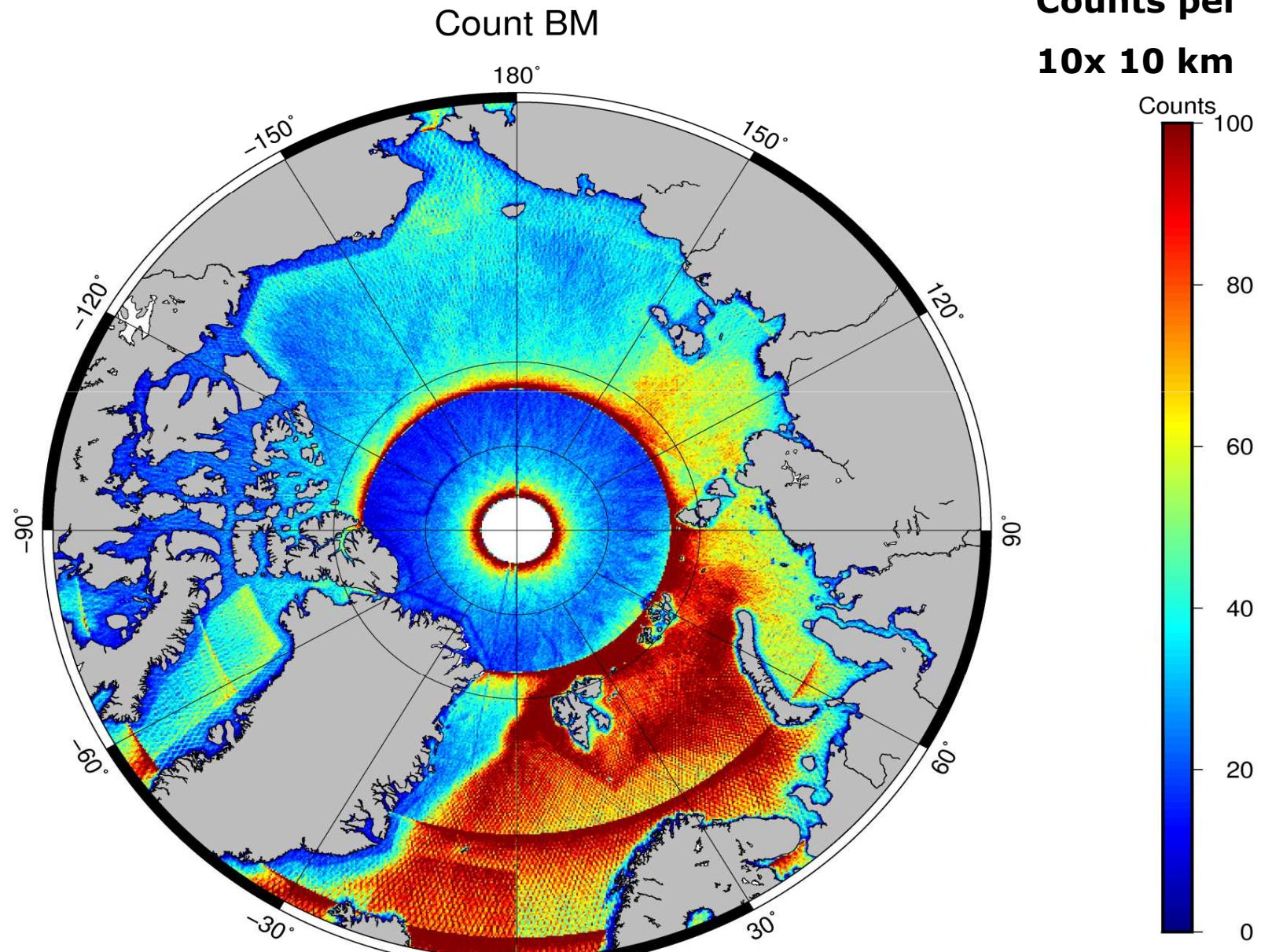
**Decrease Tile size from
2 by 10 dg to 1 by 5 dg.**

Shows DTU10 – DTU13



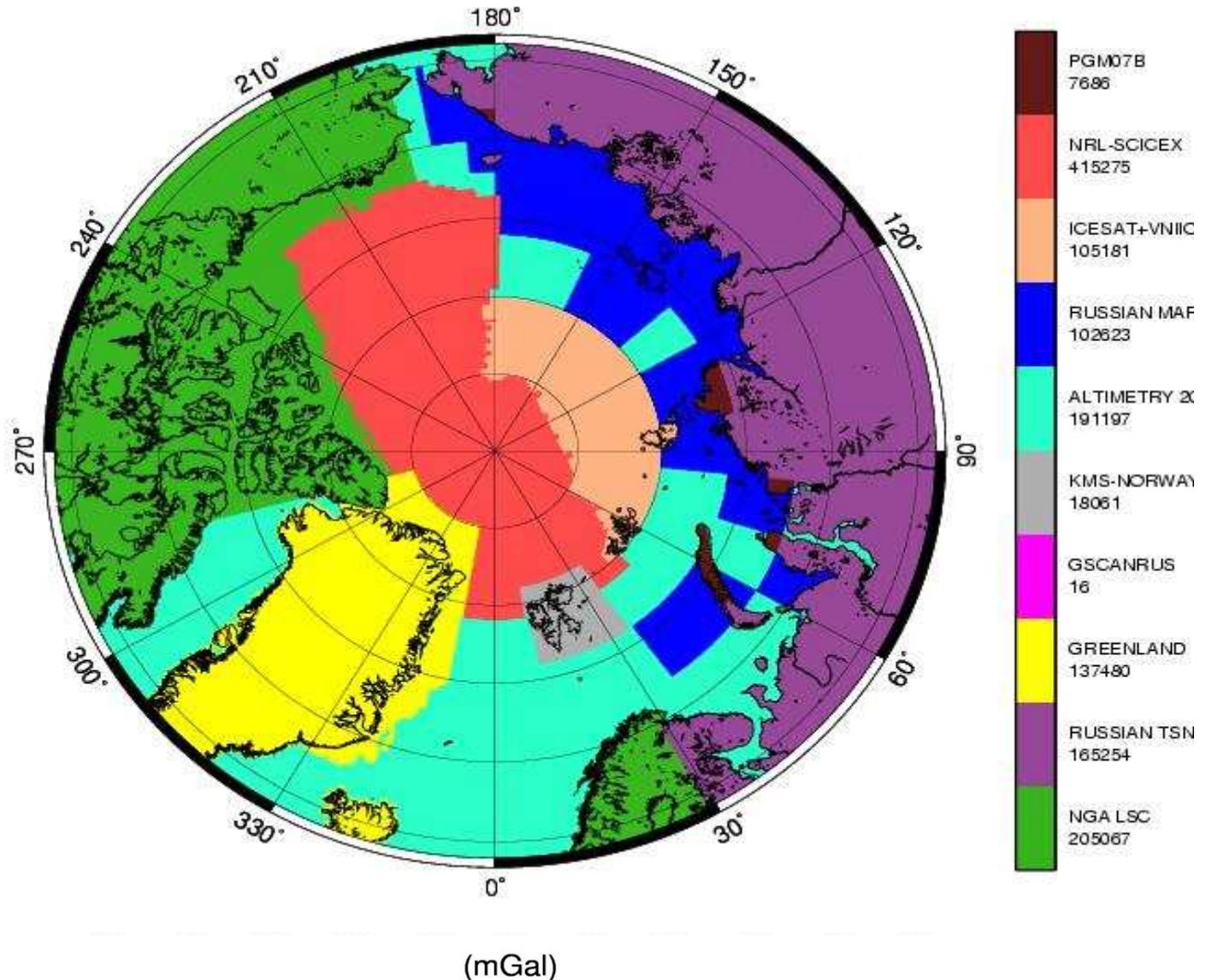
Arctic:

Cryosat-2 LRM+SAR+SARin



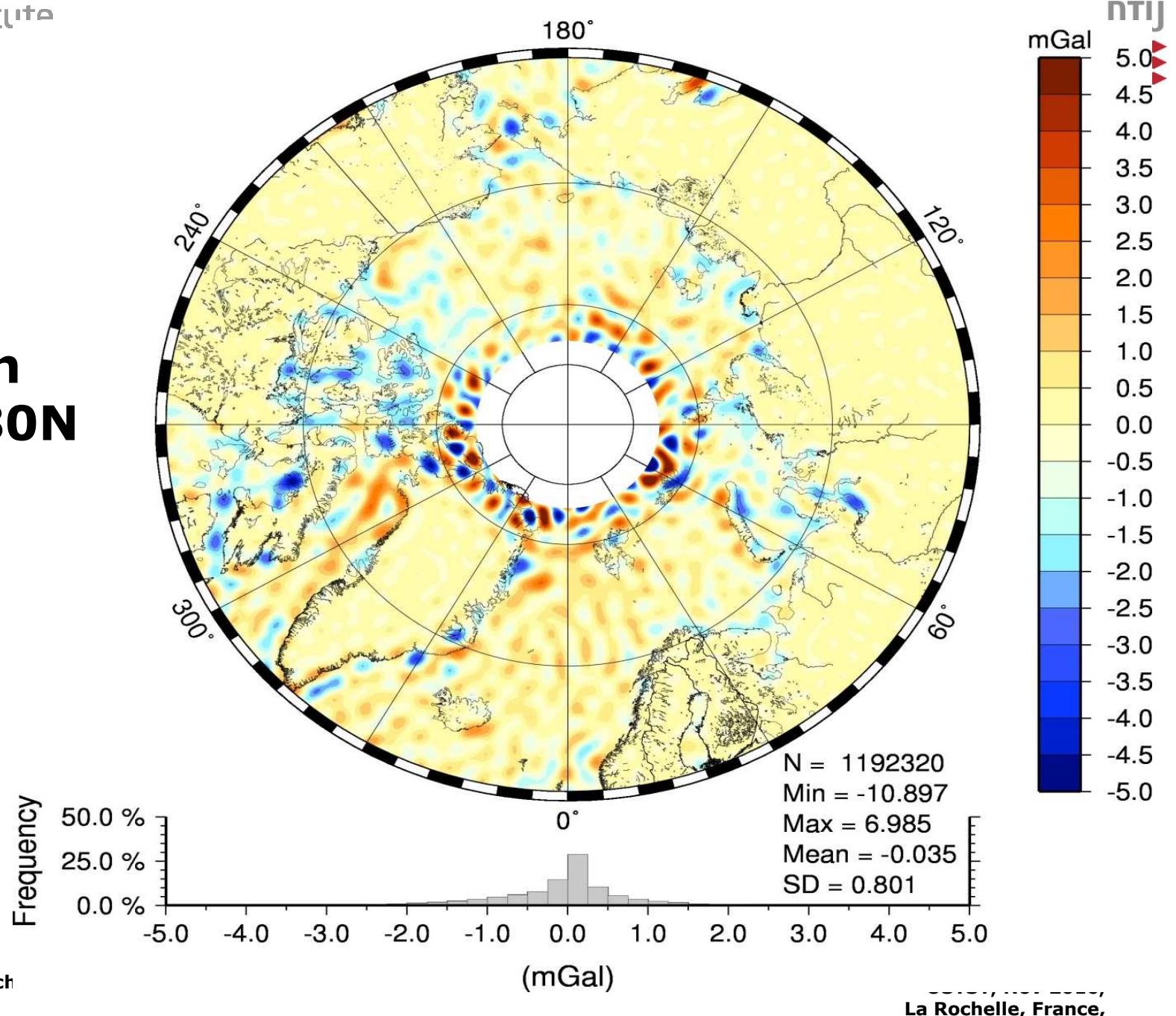
Arctic Ocean. Evaluation with GOCE GOCO 05S to d/o=200

ArcGP

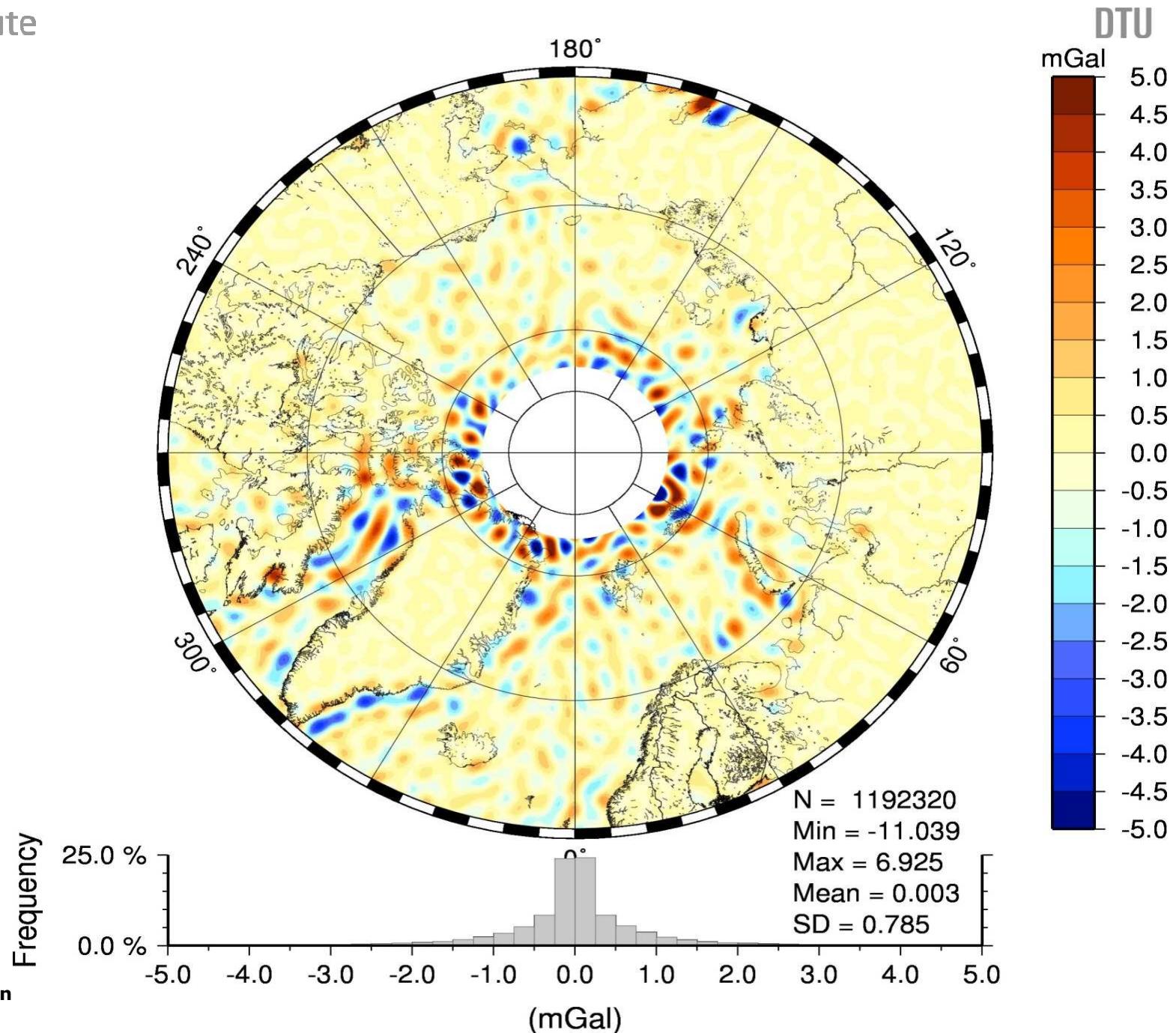


SS 23.1

DTU15
Patched in
north of 80N

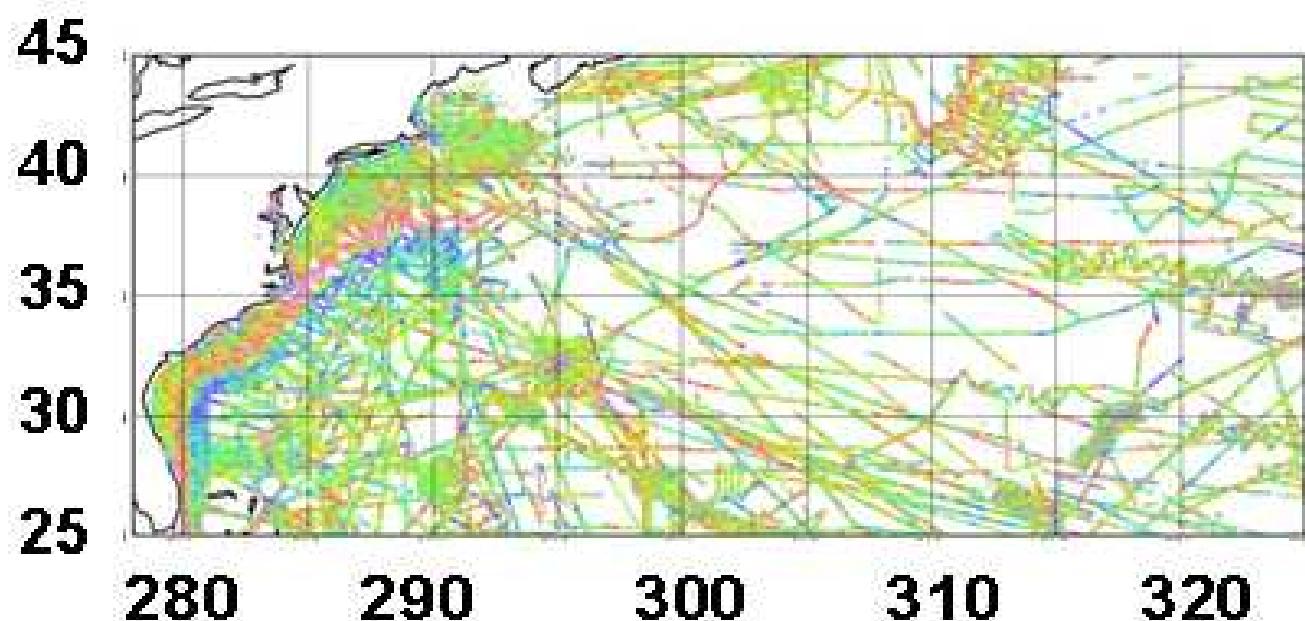


DTU15



Comparisons NW Atlantic

New edited NGA 2014
eastcoast marine gravity
($\Delta = 2\text{mgal}$)

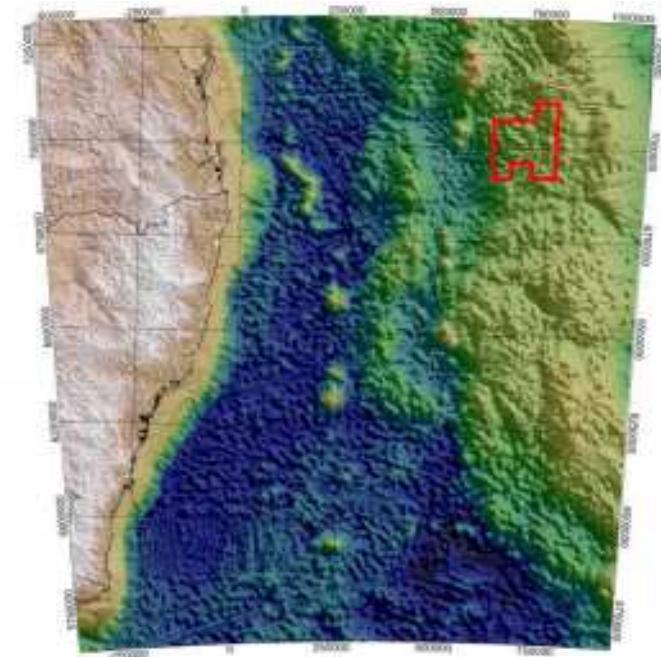


321.400 obs		Mean	Std Dev.	Max Dev
2015 Recon 2.4mill obs	Std (mGal)	Mean (mGal)	Max (mGal)	
DTU15	2.65	0.5	33.9	89
DTU13	2.83	0.5	32.2	80
DTU10	2.90	0.5	32.2	40
SS 23.1	3.13	0.7	43.4	9
SS V18.1	0.41	3.96	36.99	
SS V21.1	0.43	3.93	36.81	
SS V23.1	0.41	3.99	38.20	

Australian Geoscience Survey 2009

Accuracy around 1 – 1.5 mgal

**Confirm altimetric Gravity at the
1 – 1.5 mGal accuracy level.**



54000 obs	Std (mGal)	Min (mGal)	Max (mGal)
DTU15	1.81	-5.9	8.6
DTU13	2.00	-6.1	8.6
SS 23.1	1.98	-9.7	11.1

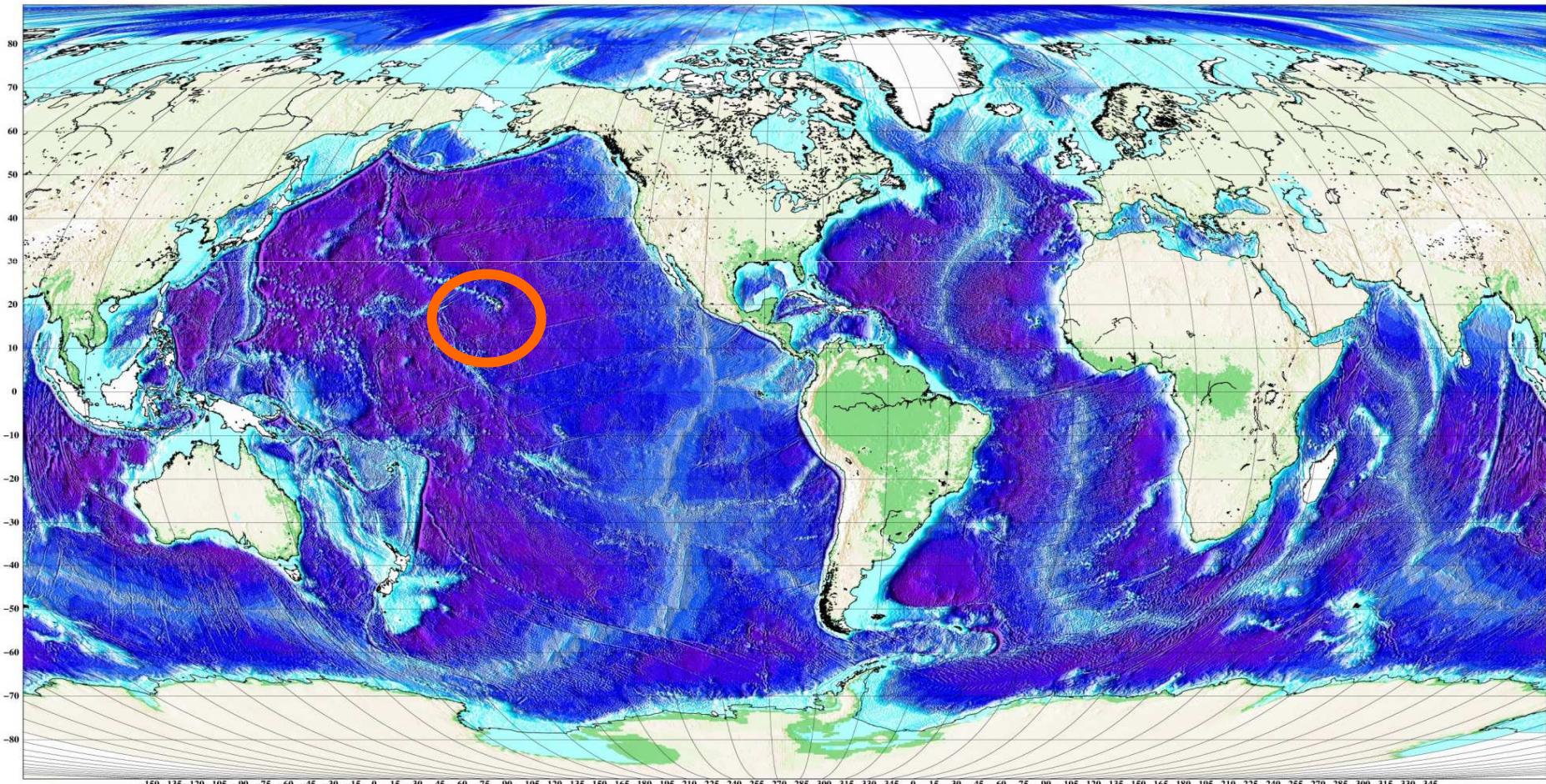
Altimetric gravity accuracy better than 2 Mgal.

**Constrains the use of marine gravity to regions
with recent accurate GNSS positioned surveys**

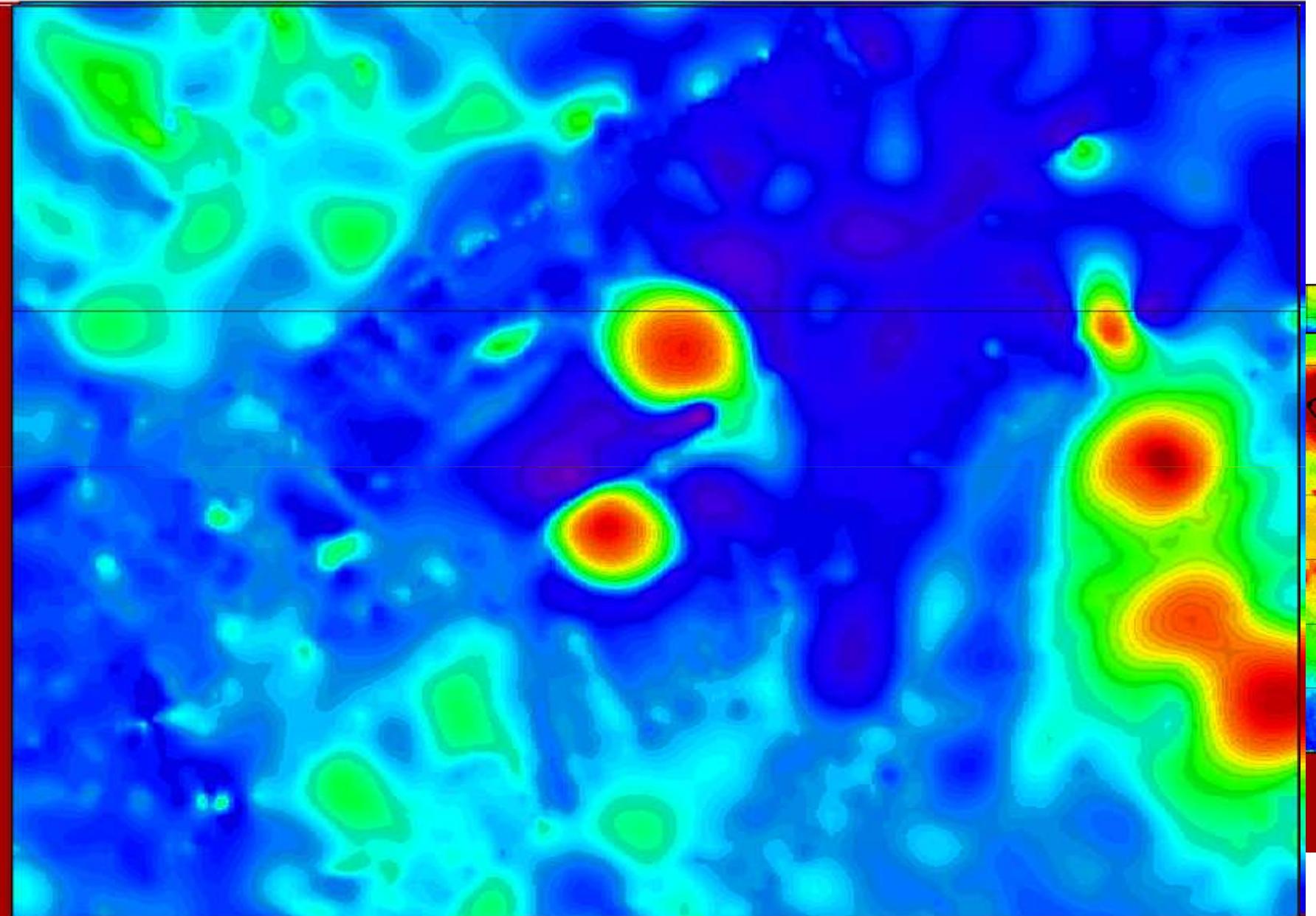
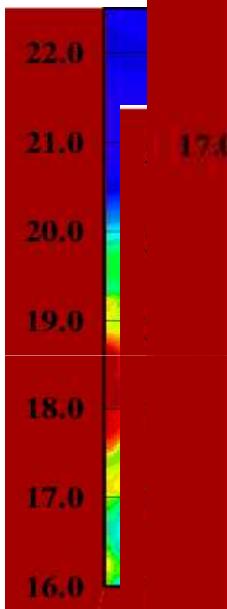
DTU15 Bathymetry (30 sec).

Based on GEBCO14 30 sec bathymetry.

Updated bathymetry inversion using DTU15GRA on 30 sec resolution.

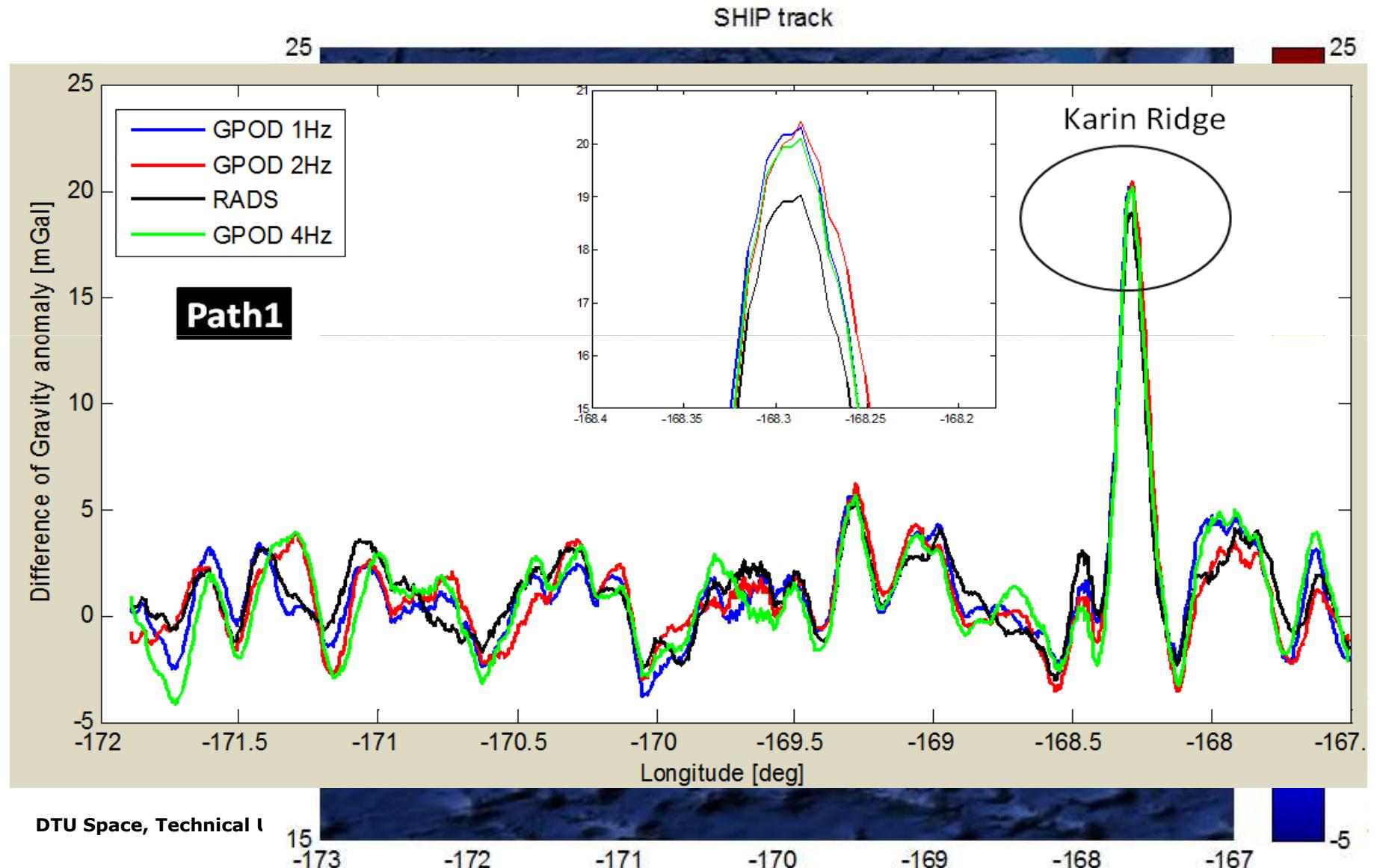


B

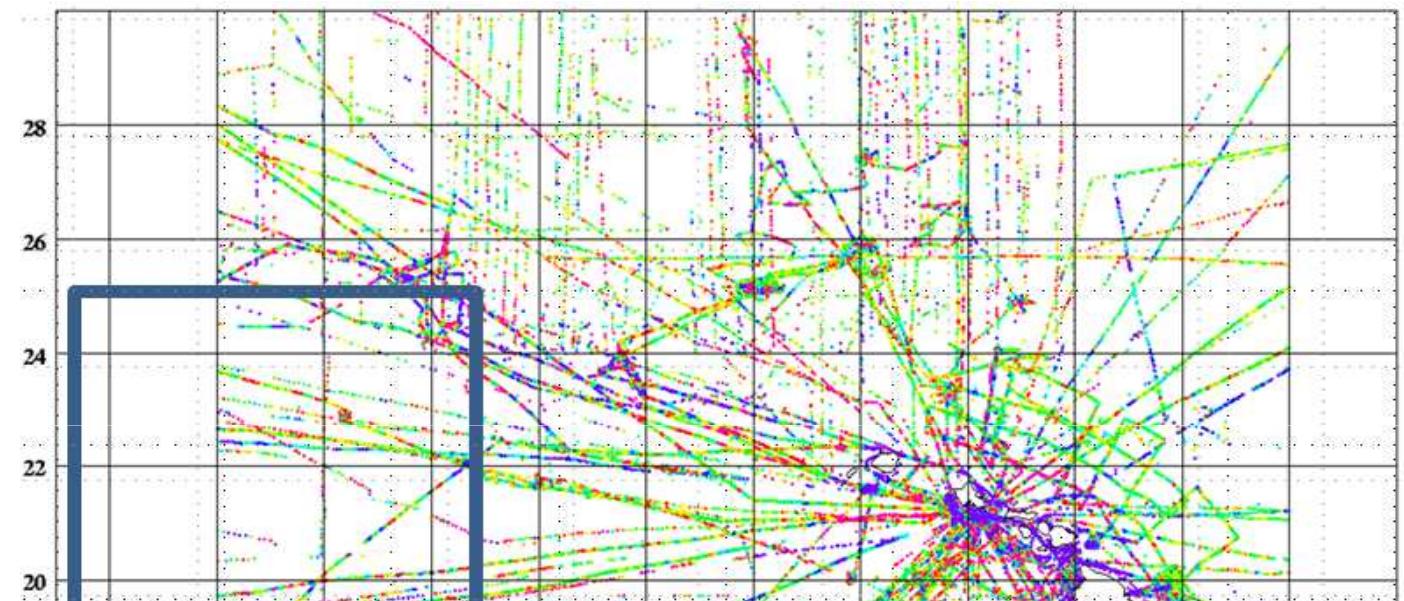


GEE
13

Problematic Marine surveys (accidental seamount in altimetry)



Marine Surveys



	Std Grav	Nb Obs	Mean & Std Depth	GEBCO08 (1 min)	GEBCO14 (30 sec)	DTU 15 (30 sec)
Ridge Region	34.1	14101	4620 891	409	397	389

Summary

DTU15Gravity exhibit fantastic accuracy. Even on the 1-1.5 mGal in several regions.

Marine gravity data "particularly pre GNSS" is challenged in many regions

Despite significant improvements we can still improve the gravity field

Working towards the 1 mGal accuracy level.

Further improvements in coastal and Arctic regions (new 2-step reprocessing).

Improving coastal regions using DTM.

Inclusion of SARAL-AltiKa + HY2 + Sentinel-3

Plan to release DTU17 in January.

