

Gravimetric quasi-geoid of the Baltic Sea and comparison to GNSS levelling, DTU21-MSS and tide gauges

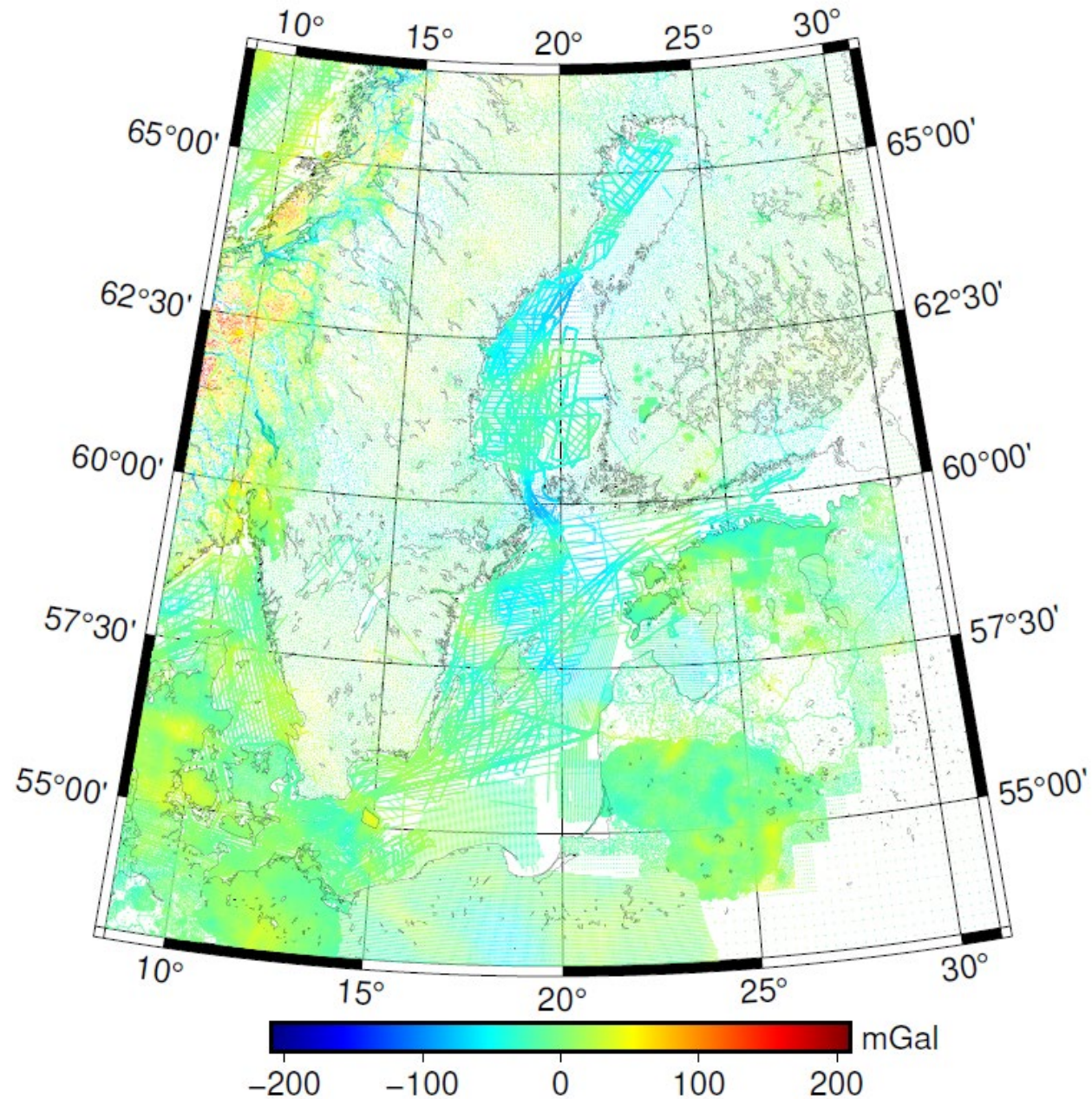
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The FAMOS project region and data

- FAMOS is an international project including 7 countries around the Baltic Sea.
- New FAMOS gravity database release in 2021

ϕ	λ	$\Delta\phi$	$\Delta\lambda$
53.0°-66.5°	8.5°-31.0°	0.02°	0.03333°



Computation steps

Remove:

$$\Delta g_{rd} = \Delta g - (\Delta g_{XGM2019e, d/o 720} + \Delta g_{RTM})$$



Compute:

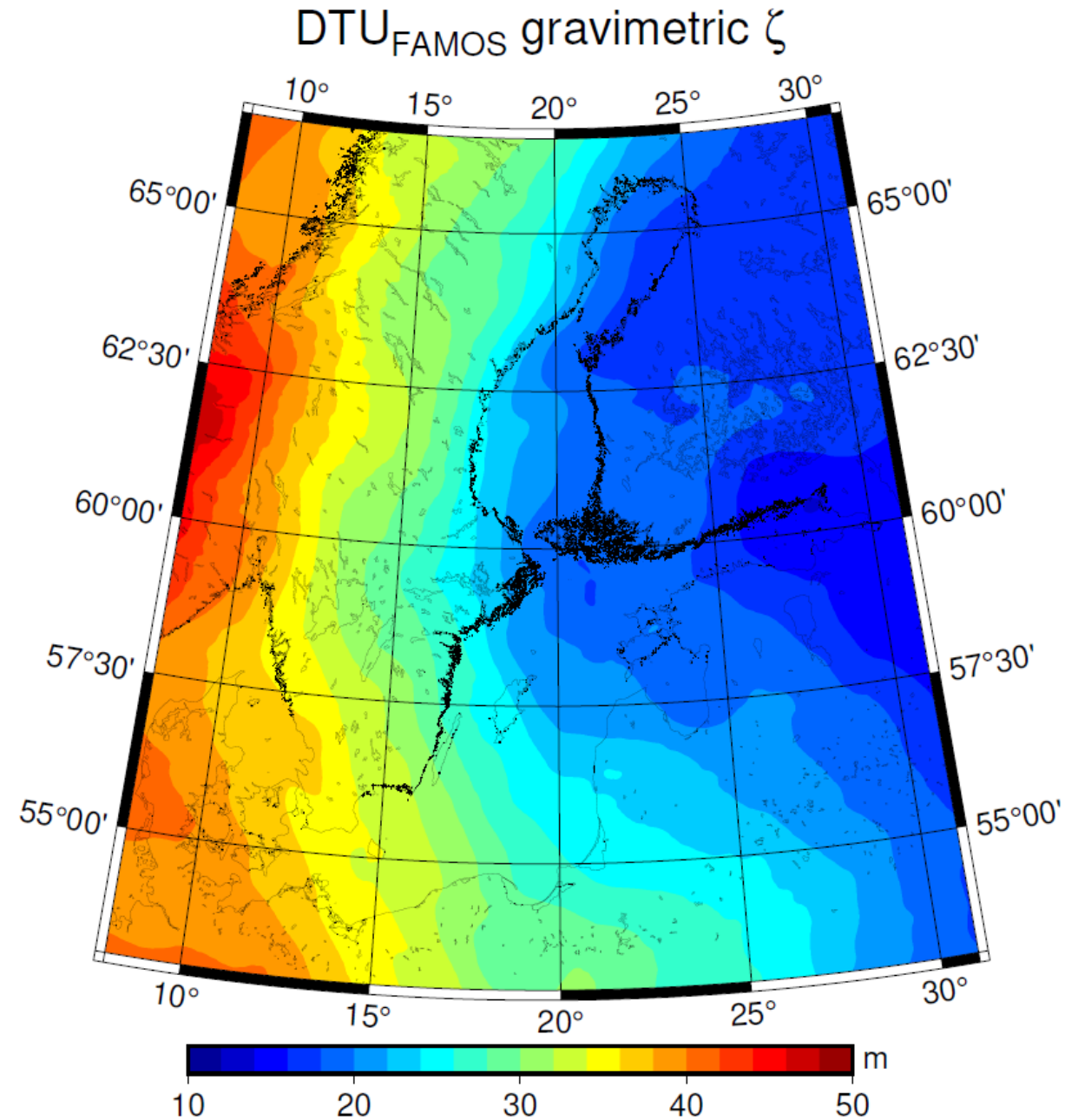
$$\Delta g_{rd} \rightarrow \zeta_{rd}$$

by Stokes/Molodensky integral using
spherical FFT



Restore:

$$\zeta = \zeta_{rd} + \zeta_{XGM2019, d/o 720} + \zeta_{RTM}$$

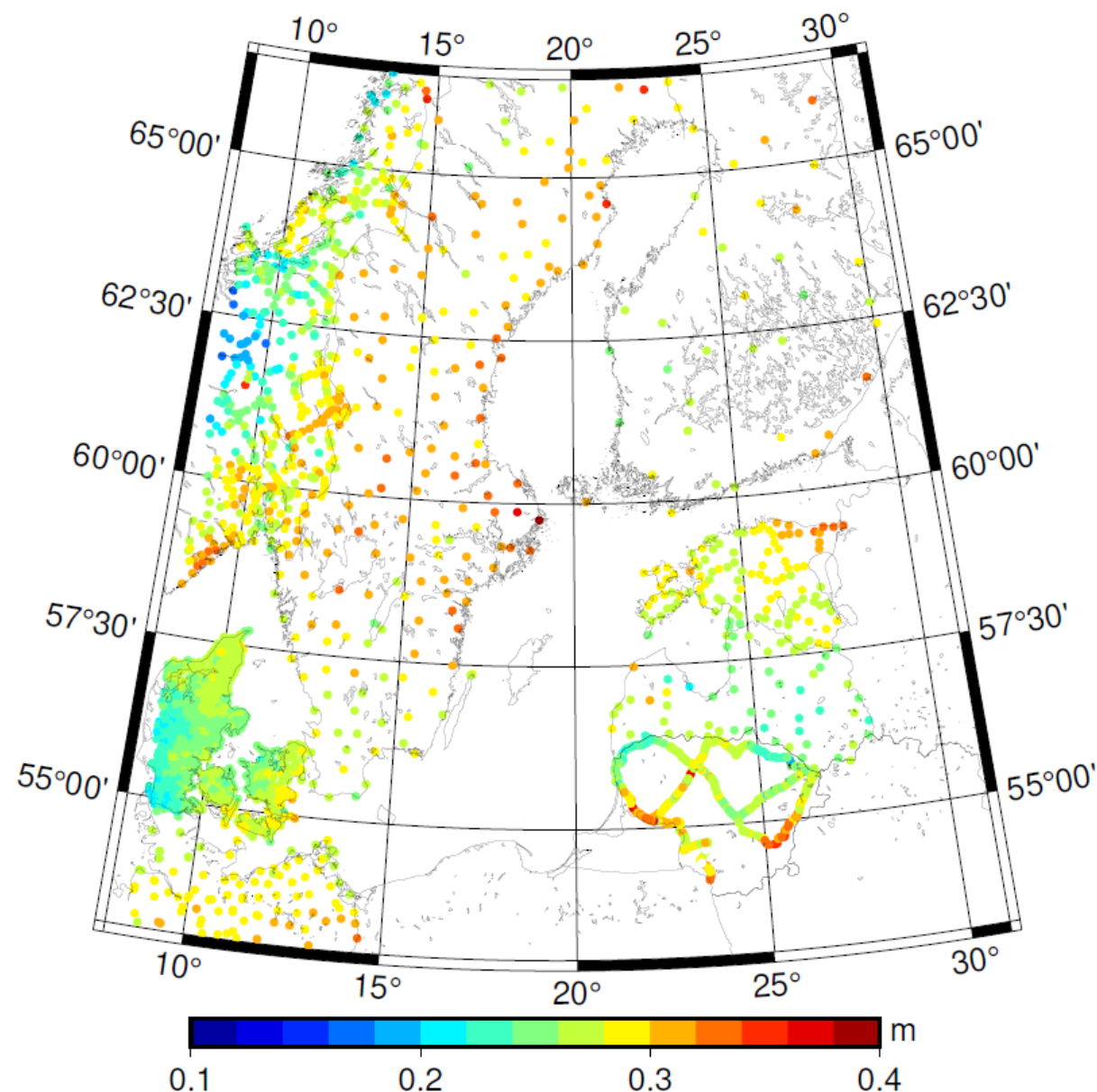


Comparisson to GNSS levelling data from the involved countries

N	Mean	St.D.	Min	Max
2122	0.270 m	0.028 m	0.069 m	0.417 m

- GNSS in ITRF2008 zero tide system
- Reasonable fit in most of the countries.
- Most variation in Norway and Lithuania
- Visible East-West tendency.

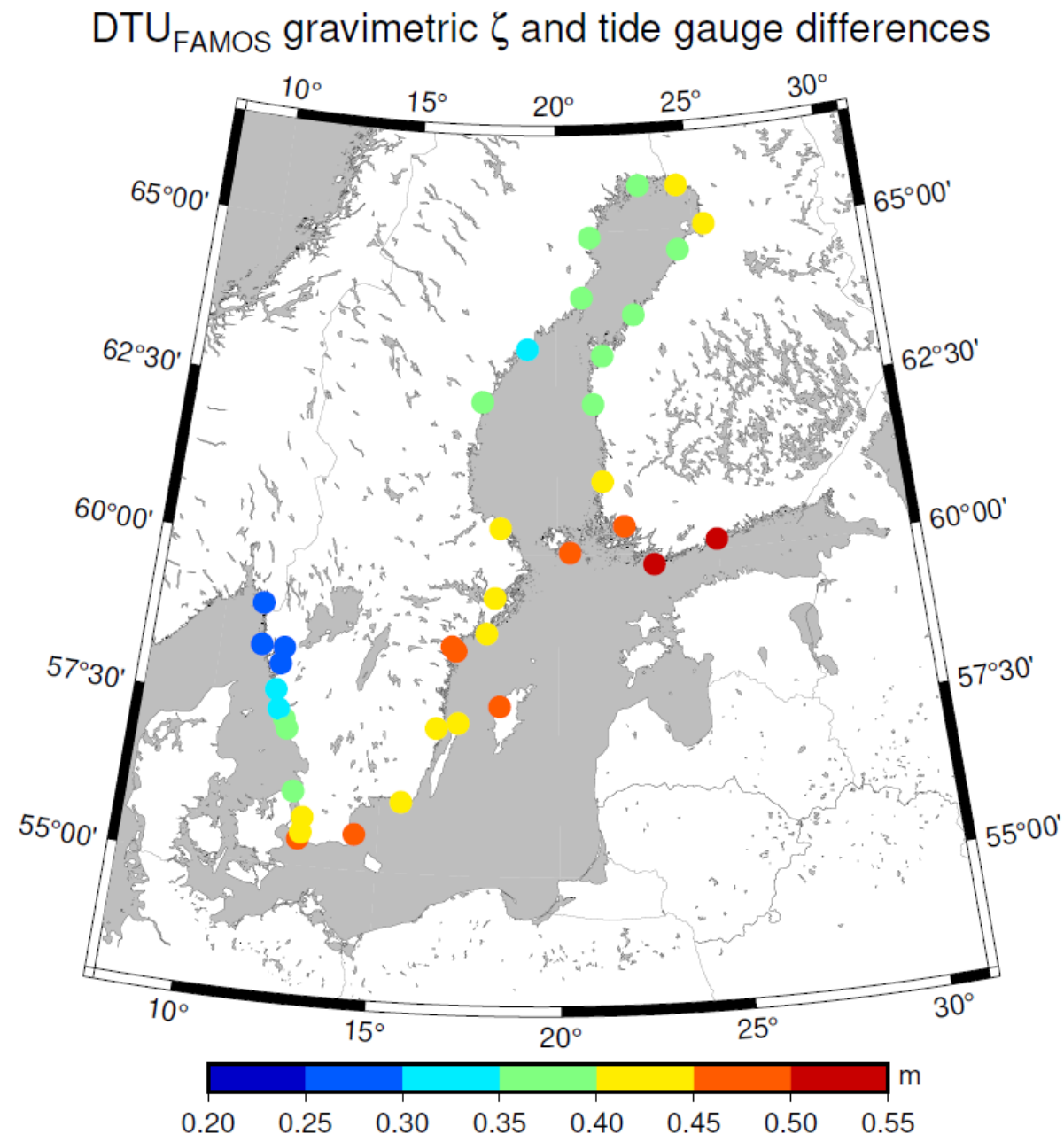
DTU_{FAMOS} gravimetric ζ and GNSS levelling difference



Comparisson to tide gauge data from Sweden and Finland

N	Mean	St.D.	Min	Max
38	0.404m	0.063 m	0.259 m	0.530 m

- BOOS sealevel stations heights in BSCD2000, update to 2022.
- Reasonable fit, differences do not fluctuate too much.
- Good consistency in the Gulf of Bothnia

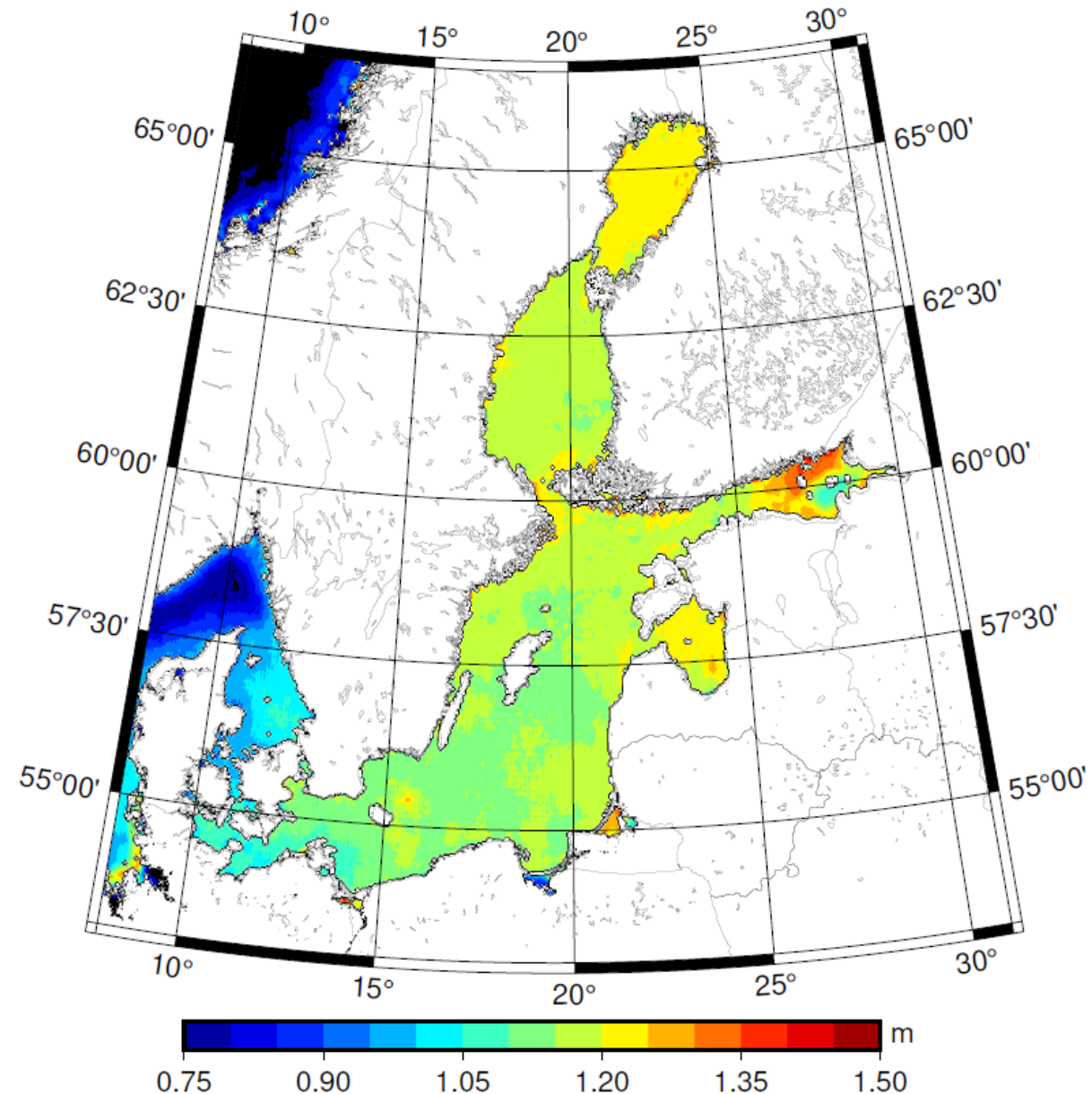


Comparisson to DTU21 Mean Sea Surface

- DTU21-MSS (altimetry)
- Good consistency in the Baltic Sea and the Gulf of Bothnia.
- The performs poorly in the Gulf of Finland. Likely due to lack of gravity data from Russia.
- Some significant differences close to the coast.

Mean	St.D.	Min	Max
1.05m	0.19 m	-0.50 m	3.21 m

DTU_{FAMOS} gravimetric ζ and DTU21-MSS difference



References

- <http://www.famosproject.eu/famos/>
- Zingerle, Philipp; Pail, Roland; Gruber, Thomas; Oikonomidou, Xanthi (2019): The experimental gravity field model XGM2019e. GFZ Data Services.
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- Andersen, O. B., Abulaitijiang, A., Zhang, S., and Rose, S. K.: A new high resolution Mean Sea Surface (DTU21MSS) for improved sea level monitoring, EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-16084,
<https://doi.org/10.5194/egusphere-egu21-16084>, 2021.
- <http://www.boos.org/>

DTU



Thank you for your attention!