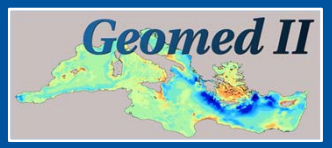


The Geomed2 combined geoid model

Sean Bruinsma (1), Frank Reinquin (1)

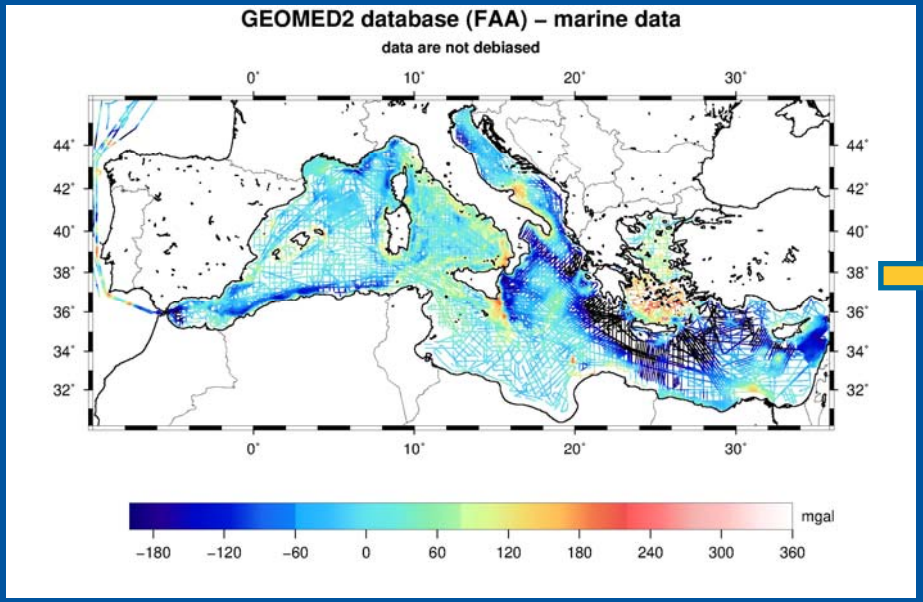
Georgios Vergos (2), Ilias Tziavos (2), Riccardo Barzaghi (3), Daniela Carrion (3), Sylvain Bonvalot (4), Lucia Seoane (4), Marie-Françoise Lequentrec-Lalancette (5), Corinne Salaün (5), Per Knudsen (6), Ole Andersen (6)

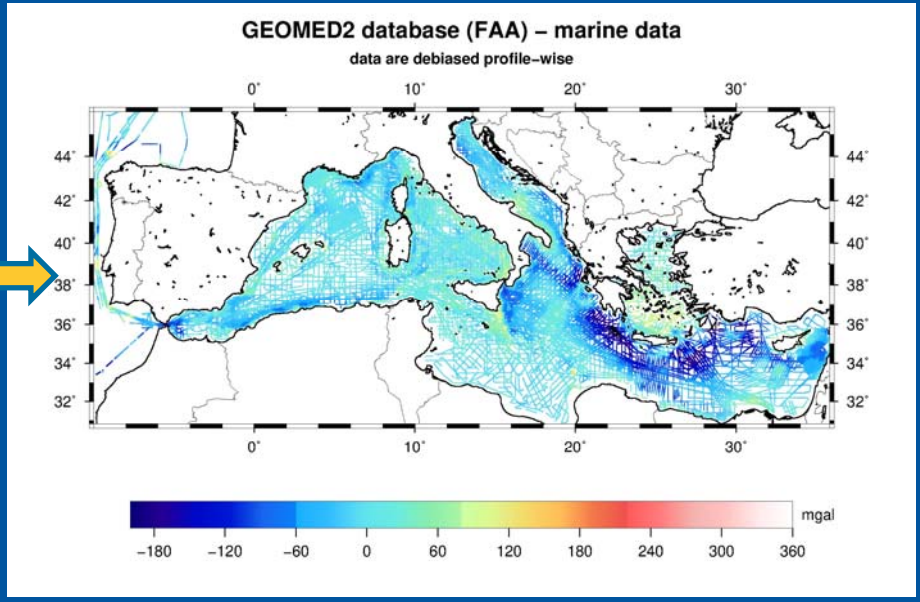
(1) CNES, Space Geodesy Office, Toulouse, France
(2) Aristotle University of Thessaloniki, Greece
(3) Politecnico di Milano, Italy
(4) GET UMR 5563, Toulouse, France
(5) SHOM, Brest, France
(6) DTU Space, Copenhagen, Denmark

Marine data

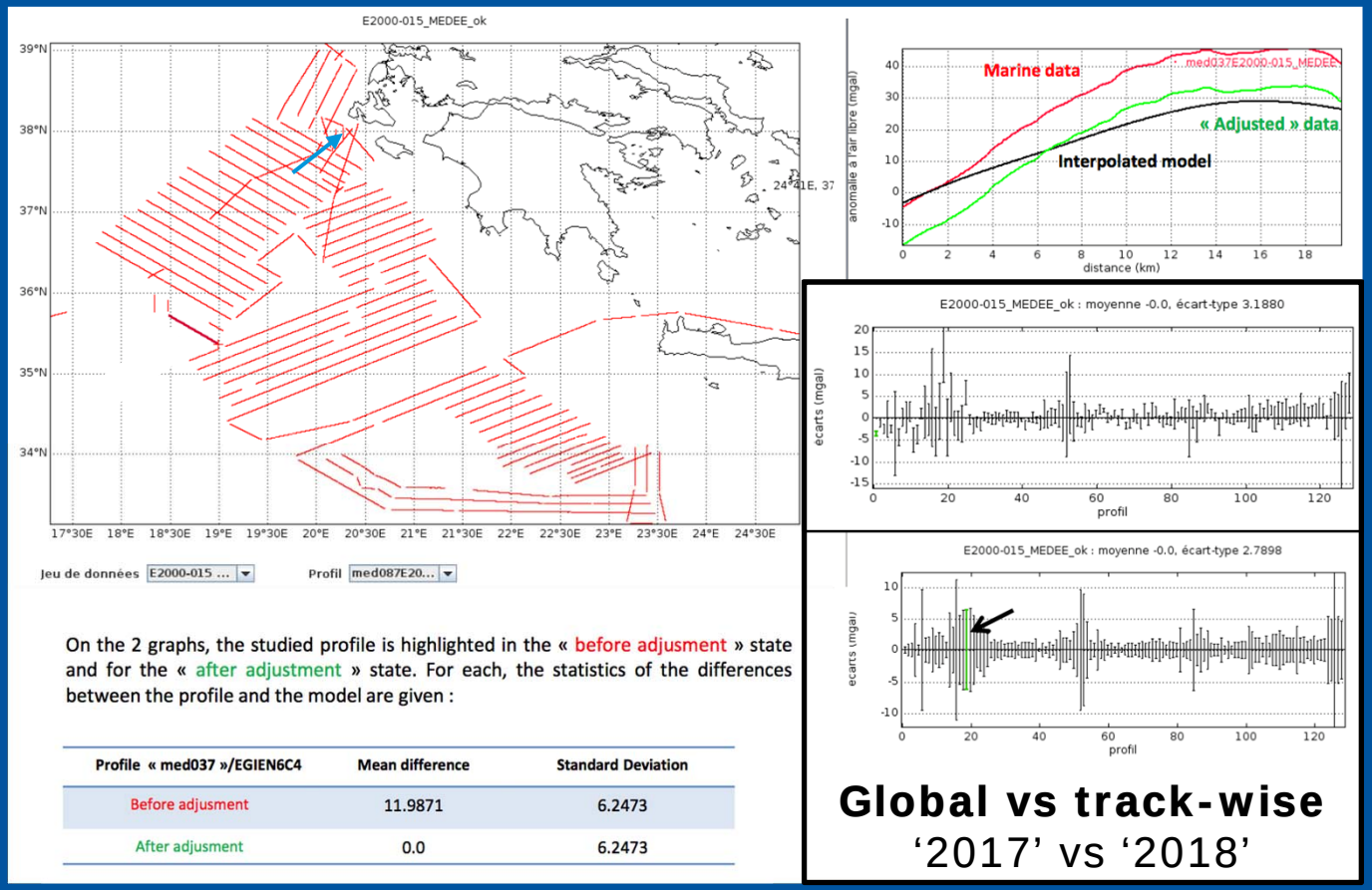
Biases are present in the ship gravity data. Last year, they had been removed on a per campaign basis; this did not lead to better results, and the covariance of the residuals was far from theoretical expectation (shown later).

Now, the entire ship database ('new' data too)was de-biased by SHOM *per profile*:





Marine data de-biasing: good vs bad example



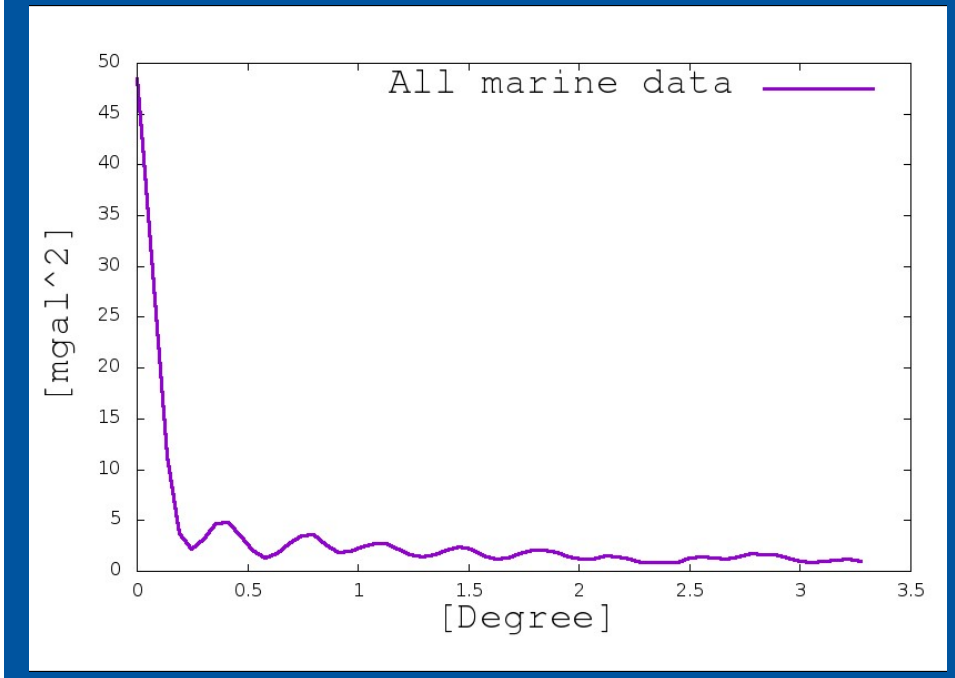
Global vs track-wise
'2017' vs '2018'

In this example for a campaign in the Ionian Sea, all ship tracks were corrected for bias with respect to the model EIGEN6-C4.

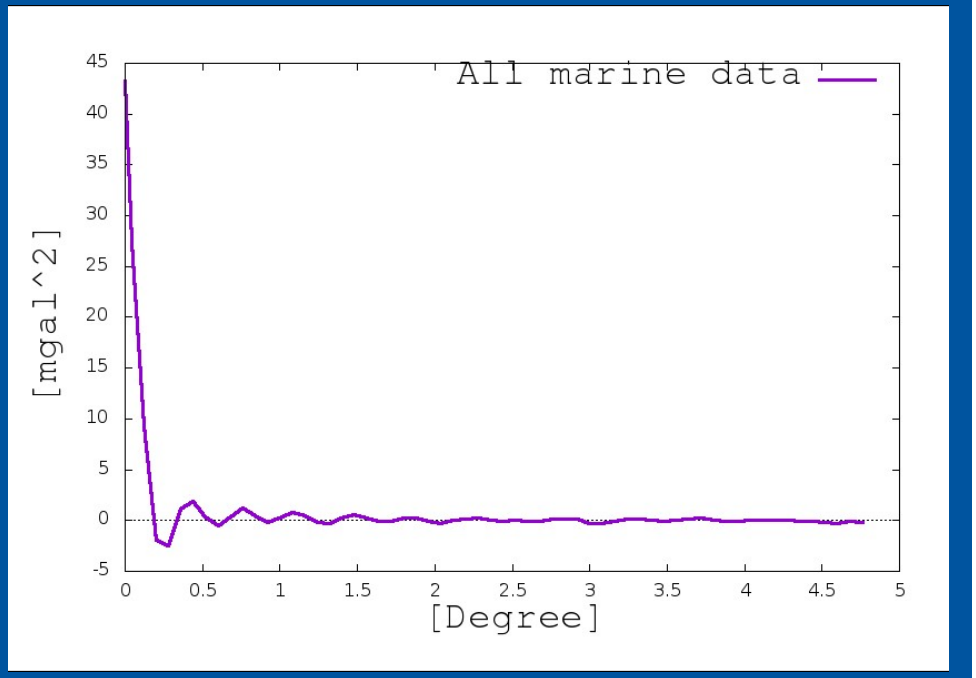
After the correction, the campaign bias is 0.0 and StD decreased from 3.2 to 2.8 mgal.

Marine data de-biasing

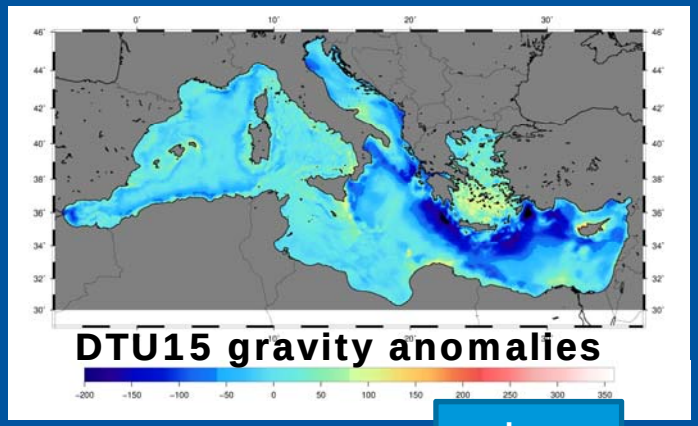
Before bias corrections



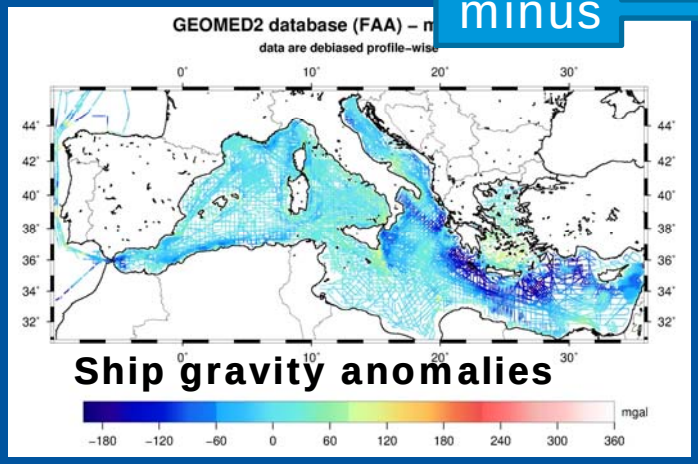
After track-wise bias corrections



Altimeter-inferred data

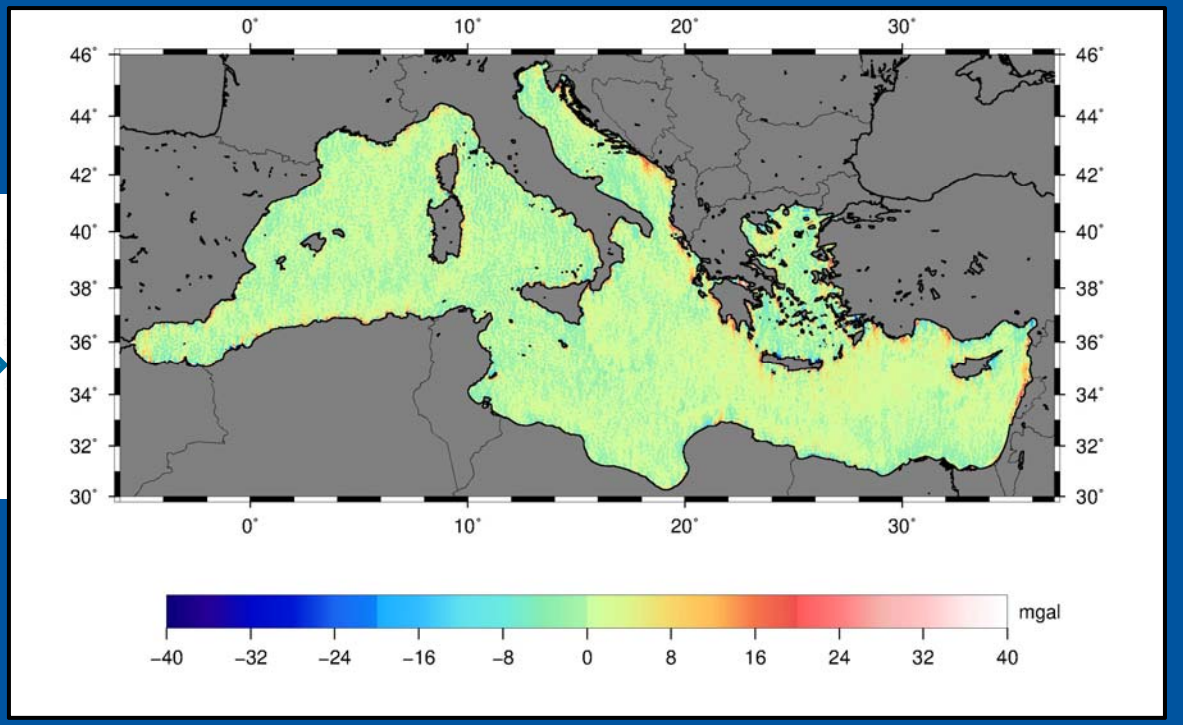


minus



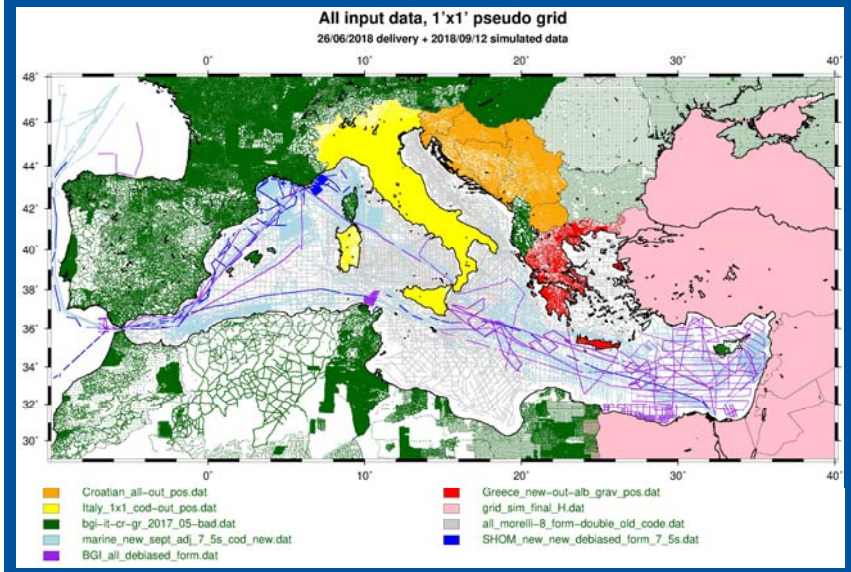
DTU15 minus UCSD v24

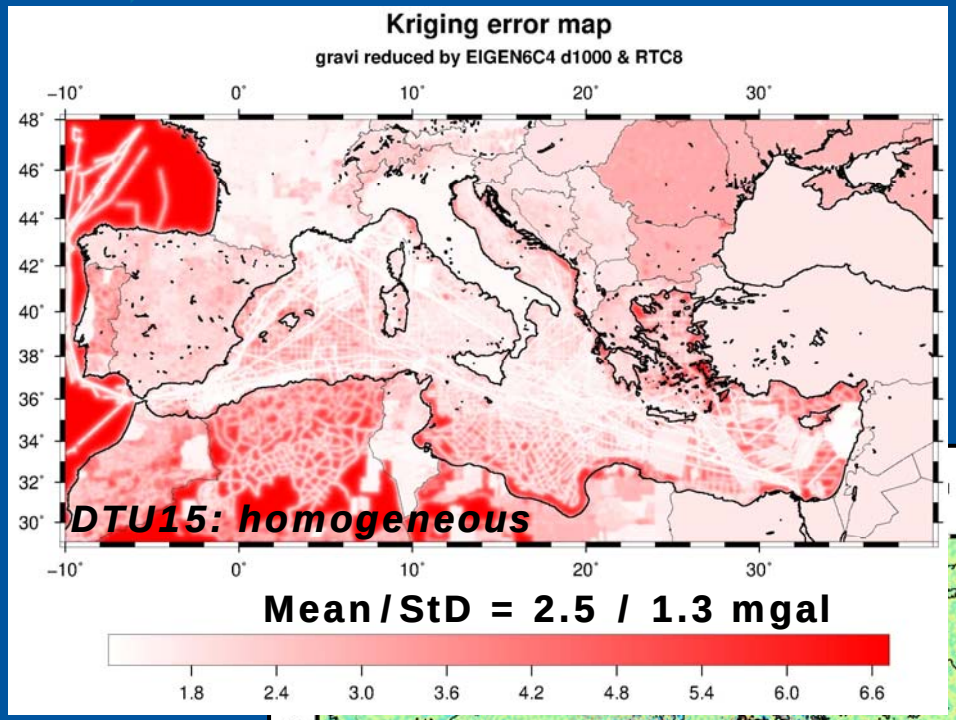
StD=3.66 mgal



Calculation of regular 2'x2' residual gravity grid

All data on a 1'x1' pseudo grid (*kriging*) 2'x2' residual gravity grid

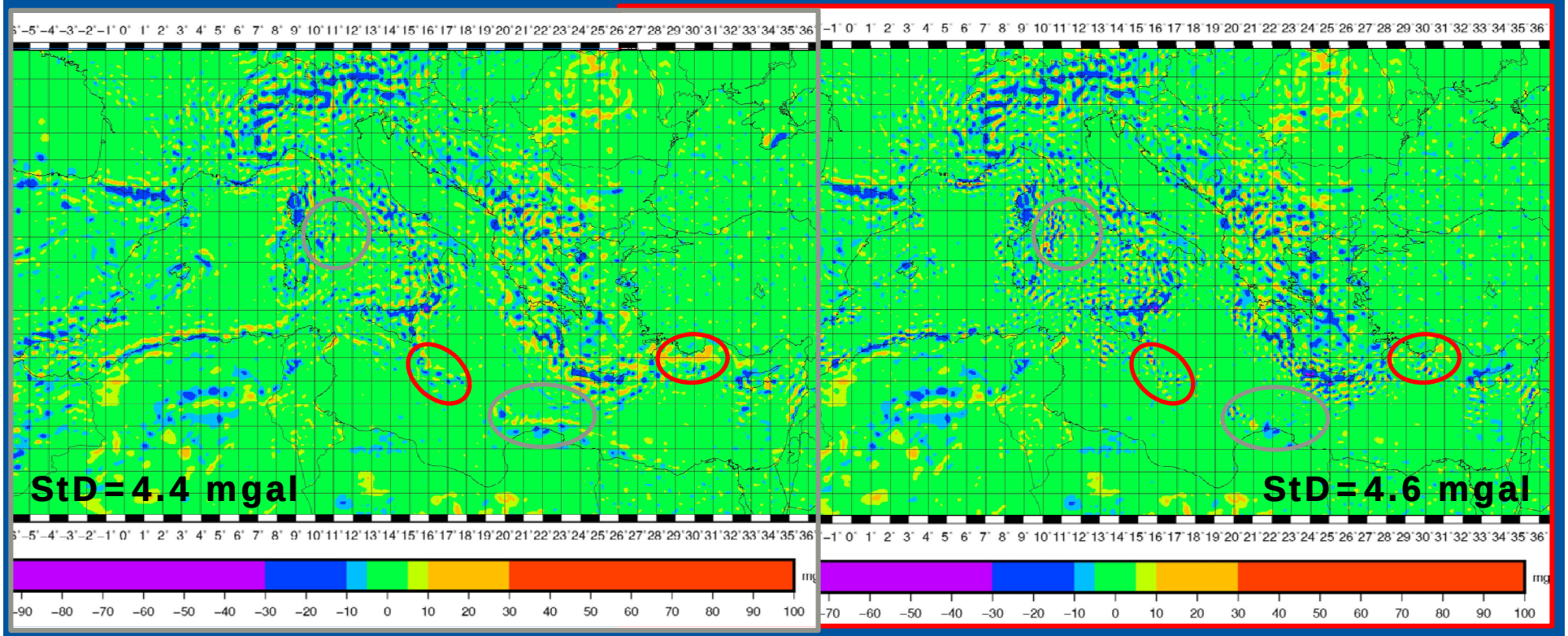




DTU15 fill-in (NB: same over land)

RTC corrections over sea?

The gridded gravity residuals in the Med **with (left)** and w/o (right) RTC correction

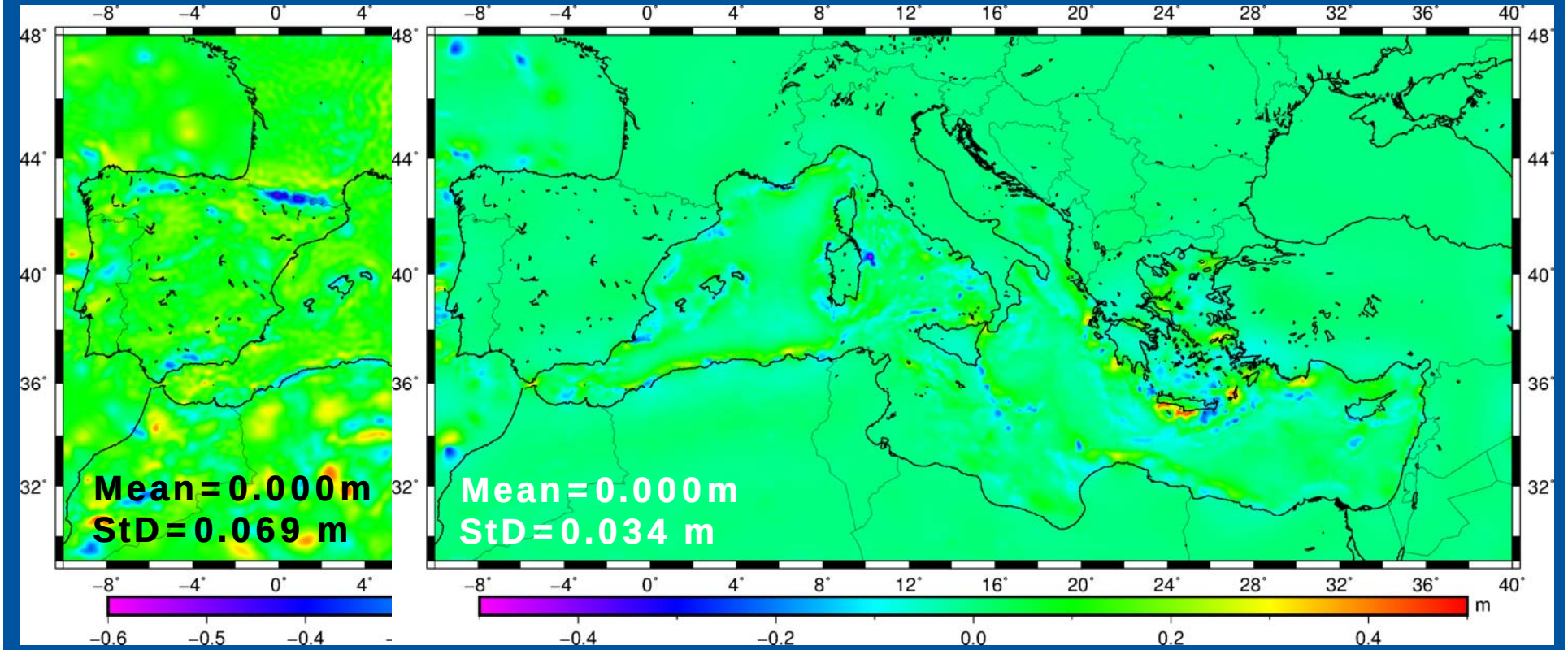


Residual geoid (Stokes-WG solutions)

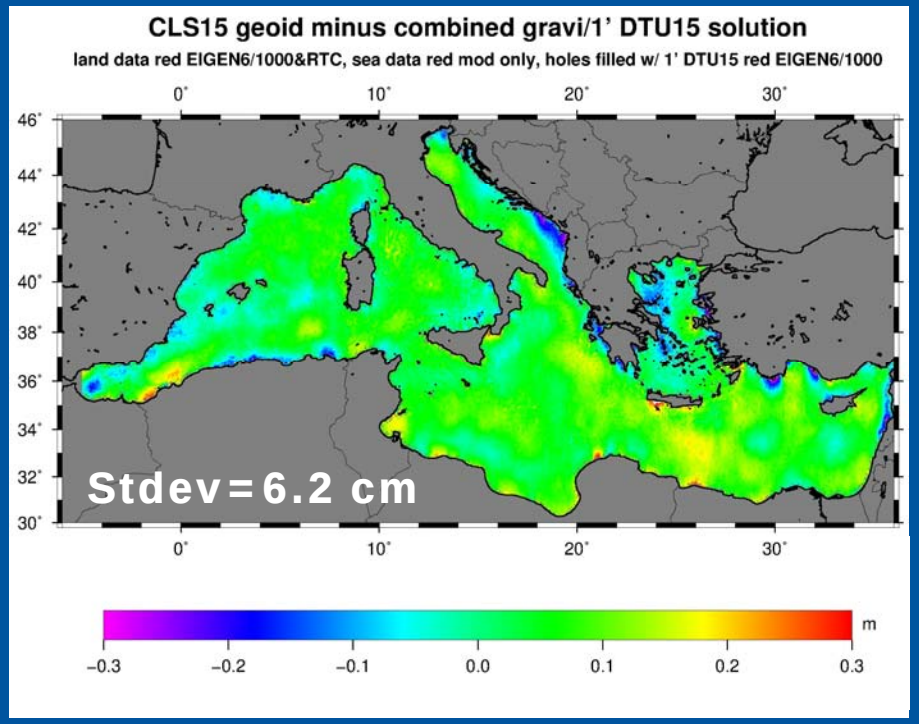
Effect of RTC over sea

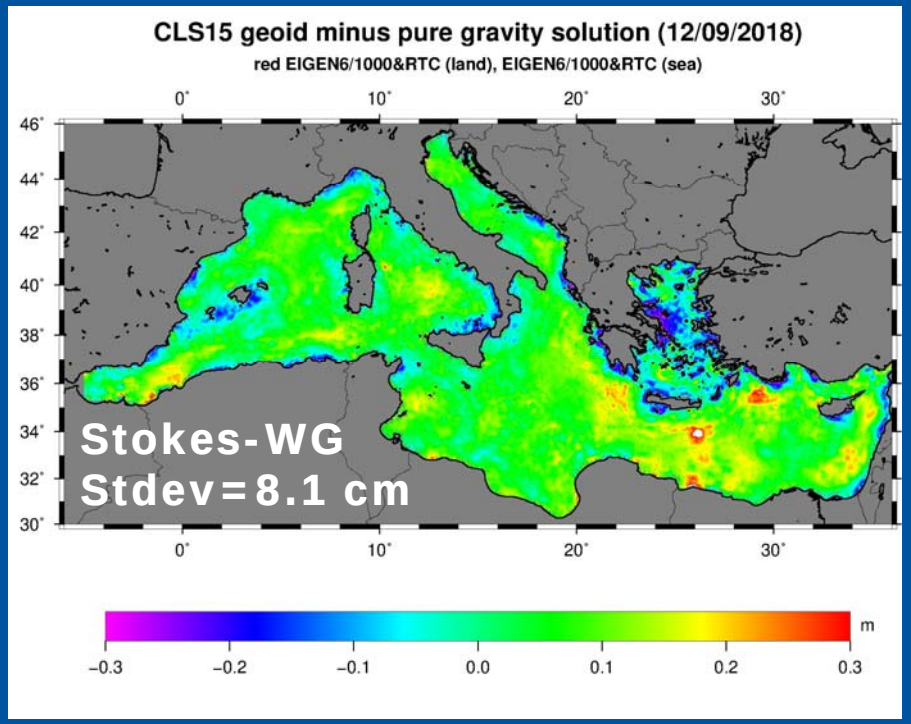
Residual geoid with RTC

Difference w&w/o RTC over sea



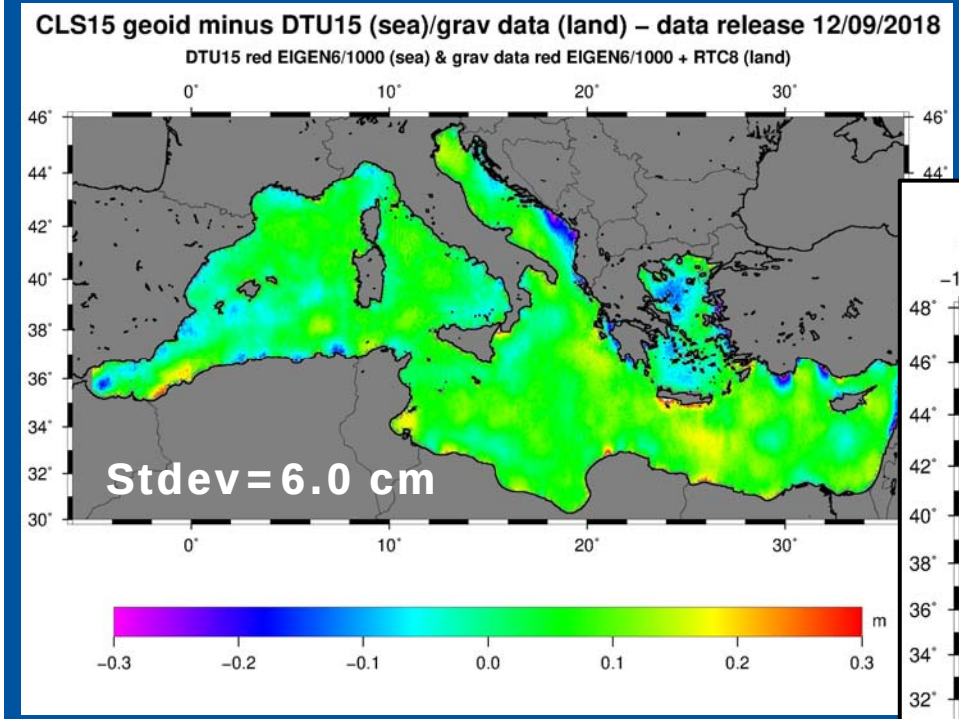
Comparison to 'independent' marine geoid



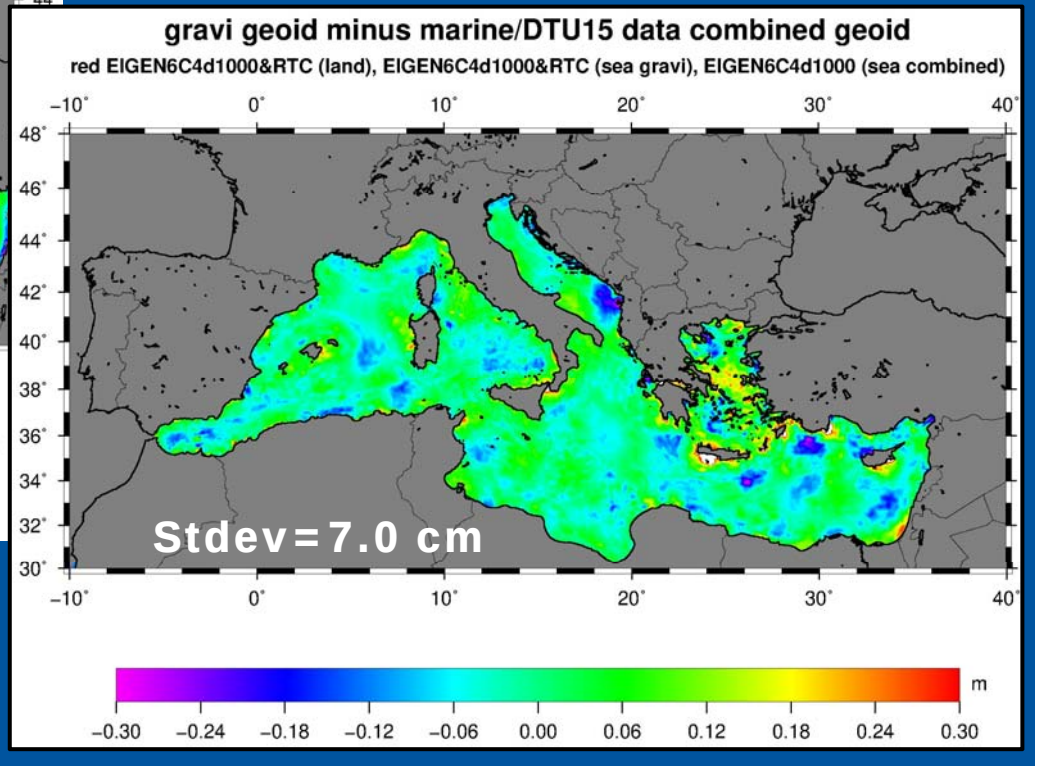


Combined geoid solution (currently too simple scheme: DTU15 in the empty grid cells)

Comparison to 'independent' marine geoid



Geoid: *Gravimetric* (WG) – *Combined*



'DTU15' geoid solution;
Current combined solution is almost the same

Conclusions and future work

- Debiasing and trackwise bias adjustment of the marine gravity data resulted in a better covariance function and improved the final geoid by ~2 cm (GPS/Lev)
- Simulating the residual gravity anomaly signal in areas with voids or no data, provides reliable results. Using a GGM as fill-in is a «less attractive» option as no data were assimilated in the GGM development
- RTC *over the Med* leads to ambiguous results
- The most accurate geoid seems to be obtained with altimeter-inferred gravity data

- Final gravimetric geoid tuning in October 2018, run collocation solutions and optimize FFT-WG etc.
- Test additional, more balanced, data combination methods.
- Evaluate the models using drifter data (comparison of geostrophic current speed)