



|| GRAVITY, GEOID AND HEIGHT SYSTEMS 2016

The Experimental Gravity Field Model XGM2016

R. Pail¹, T. Fecher¹, D. Barnes², J. Factor²,
S. Holmes³, T. Gruber¹ and P. Zingerle¹

¹Technical University of Munich,

²National Geospatial-Intelligence Agency,

³Stinger Ghaffarian Technologies





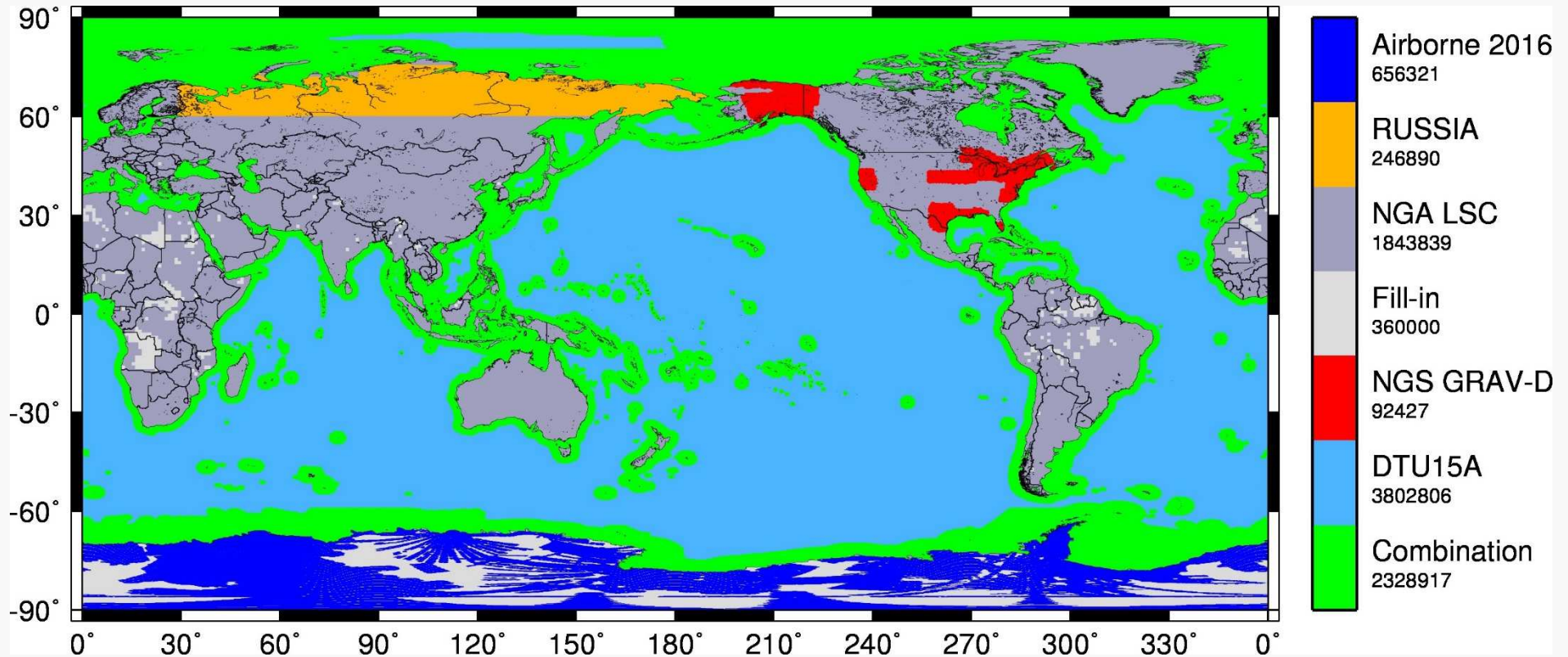
XGM2016: Set-up

- XGM2016: a combined gravity field model up to d/o 719
- Satellite information from GOCO05s*
- 15'x15' gravity anomaly area means from NGA's global data base
- Gravity anomaly update from new altimetric and terrestrial survey data, as well from new procedures for data processing
- Combination based on full normal equation matrices up to the maximum degree
- Regionally dependent weighting strategy considering the individual accuracy of each altimetric and terrestrial data cell

*Mayer-Gürr, T., and the GOCO Team (2015), The combined satellite gravity field model GOCO05S, Geophysical Research Abstracts, Vol. 17, EGU2015-12364, EGU General Assembly, Vienna

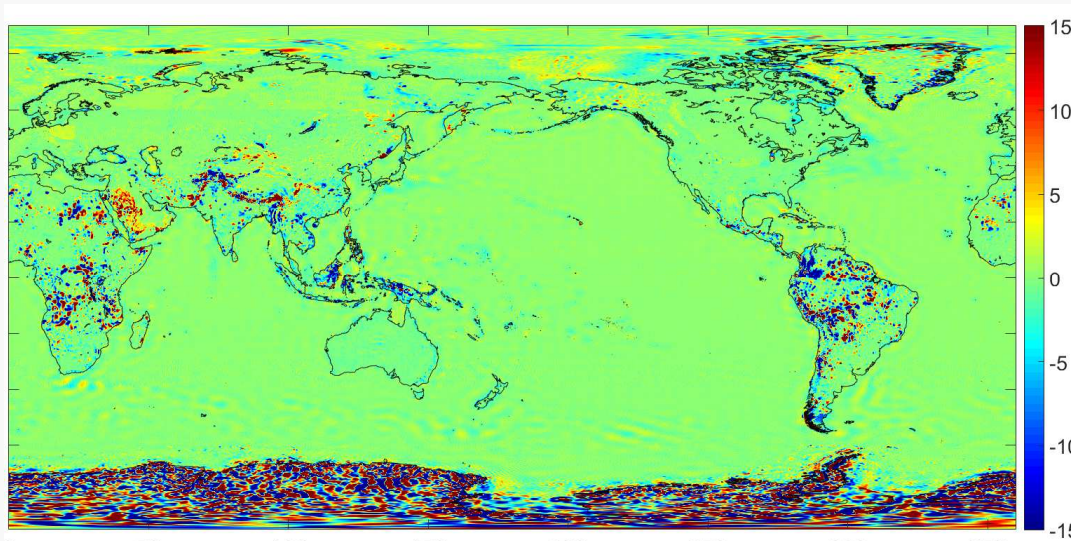
XGM2016: Input data

Global gravity anomaly data set – data origin



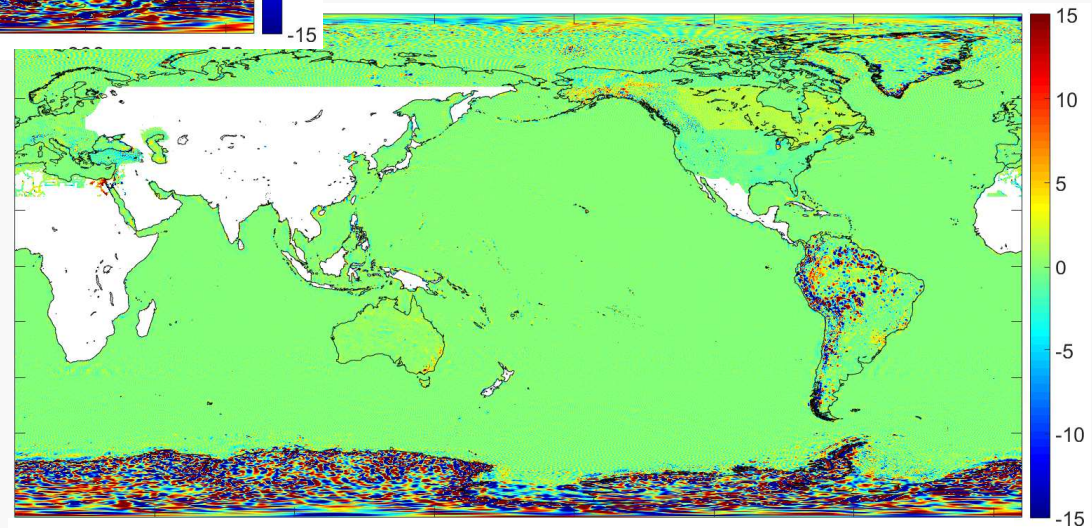
XGM2016: Input data

Global gravity anomaly data set [mgal]



Difference to gravity anomalies used for EGM2008

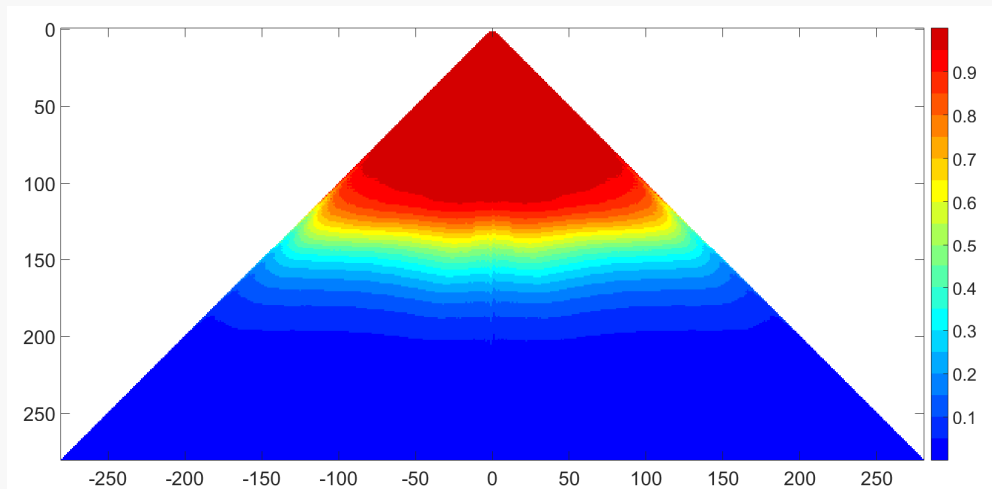
Difference to gravity anomalies used for GOCO05c





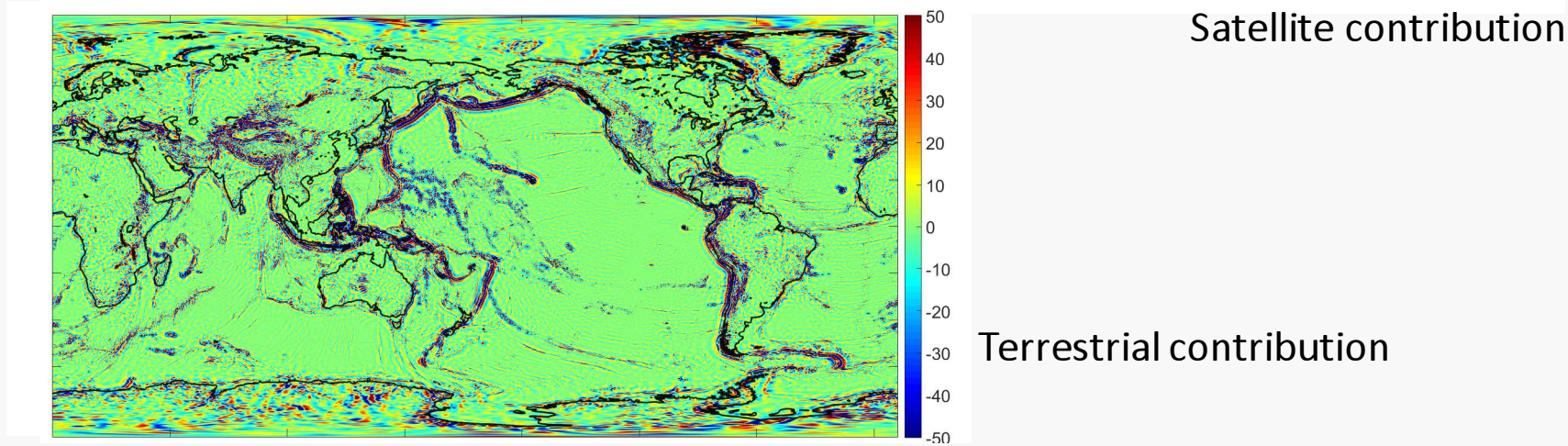
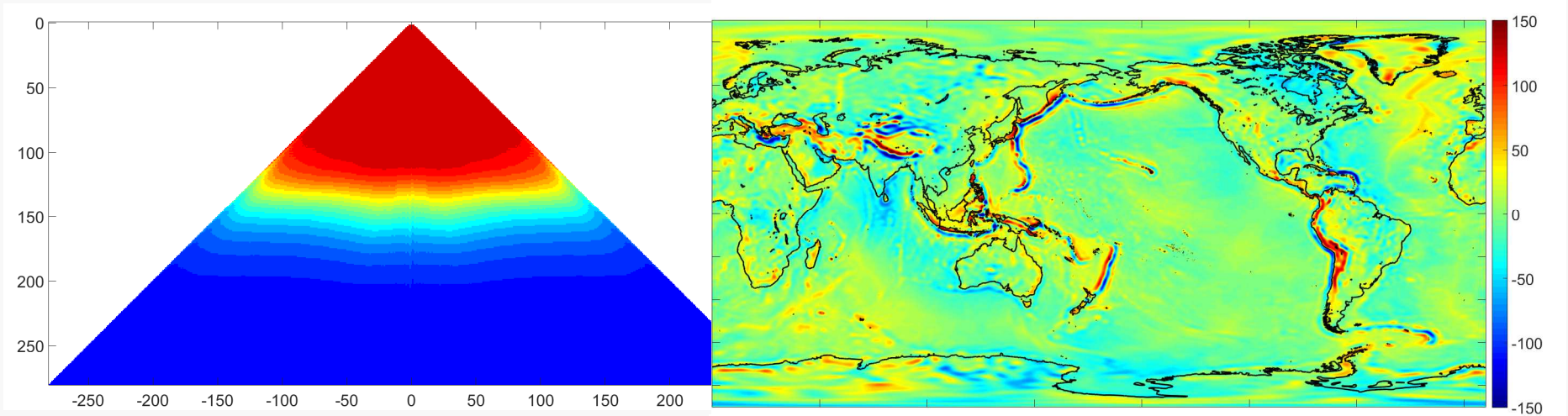
XGM2016: Results

Relative contribution of satellite information: 0 = 0%; 1 = 100%;



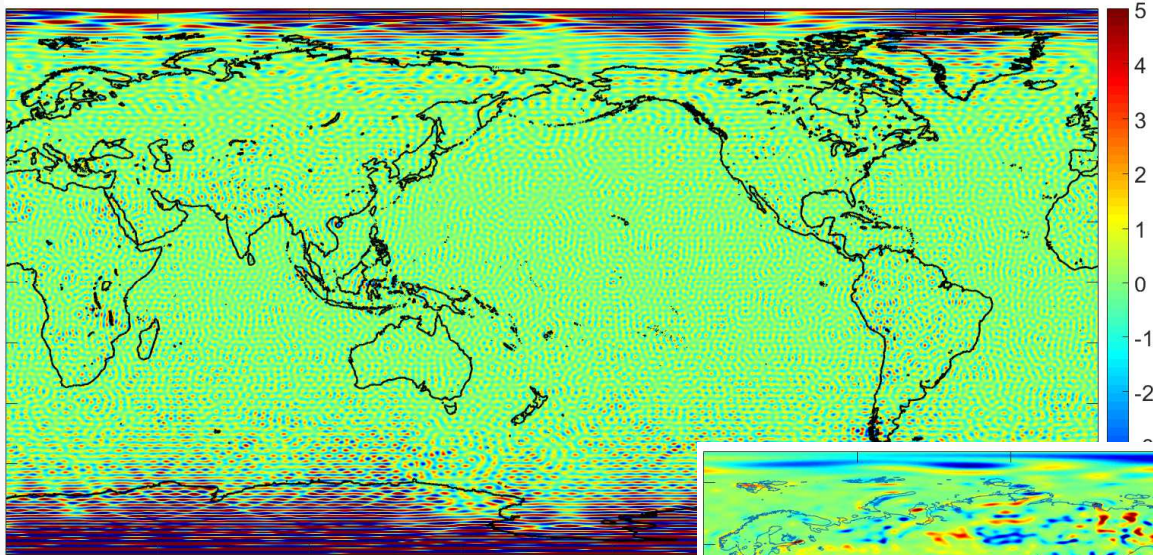
XGM2016: Results

Relative contribution of satellite information: 0 = 0%; 1 = 100%;



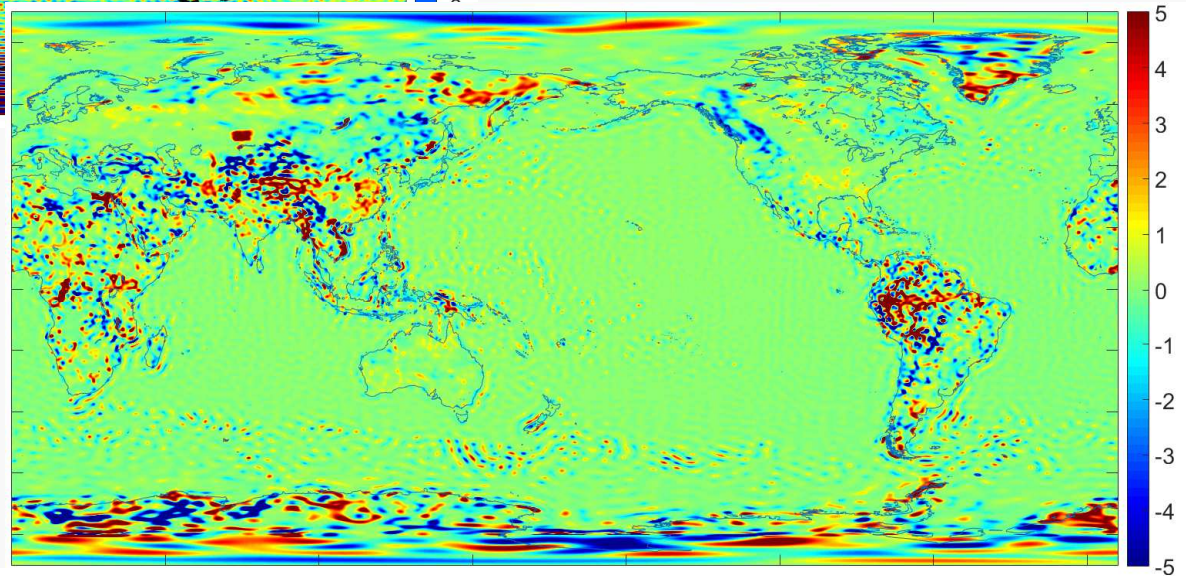
XGM2016: Results

Gravity anomaly differences [mgal]



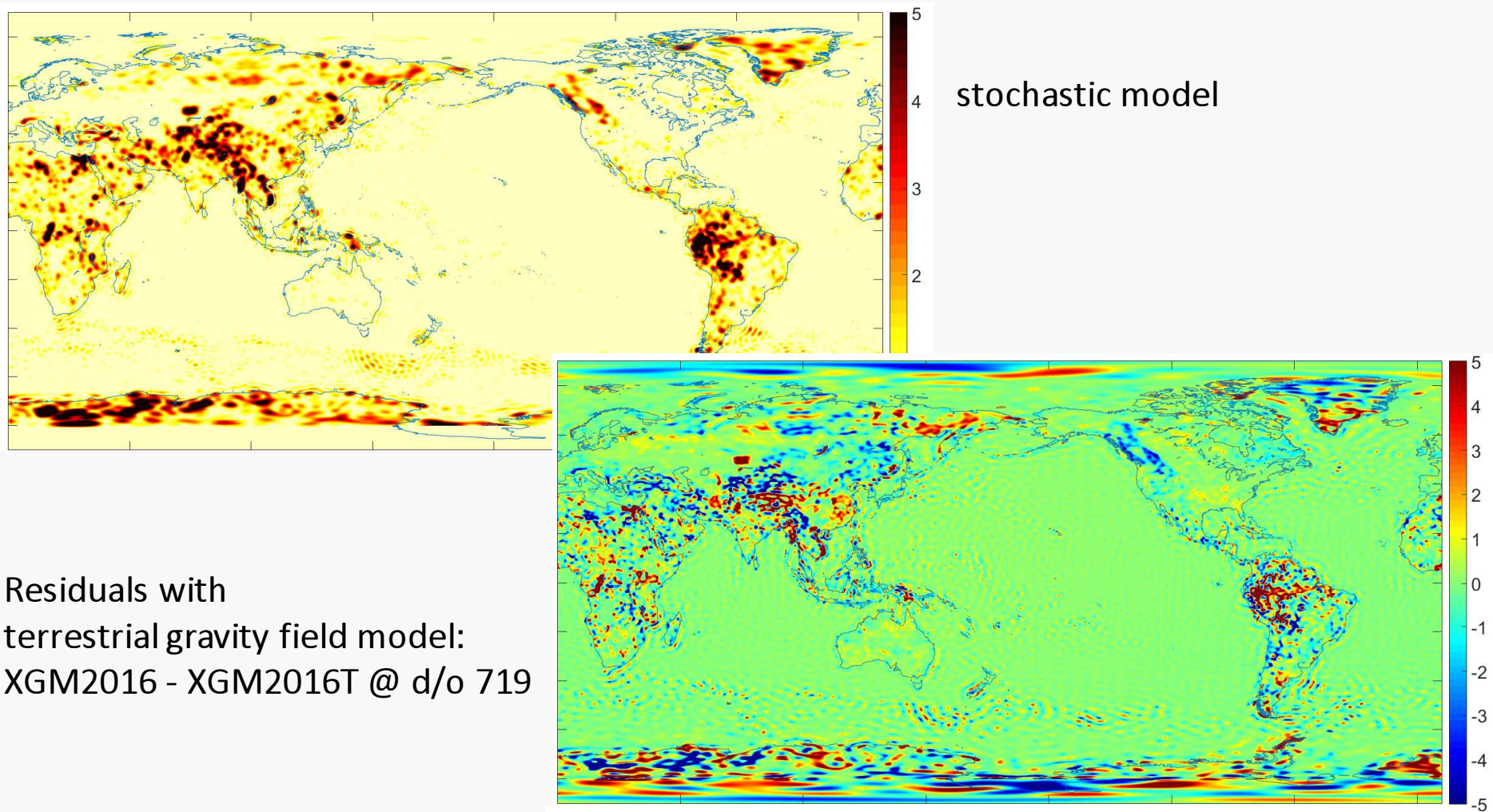
Residuals with
satellite gravity field model:
XGM2016 - GOCO05s @ d/o 200

Residuals with
terrestrial gravity field model:
XGM2016 - XGM2016T @ d/o 719



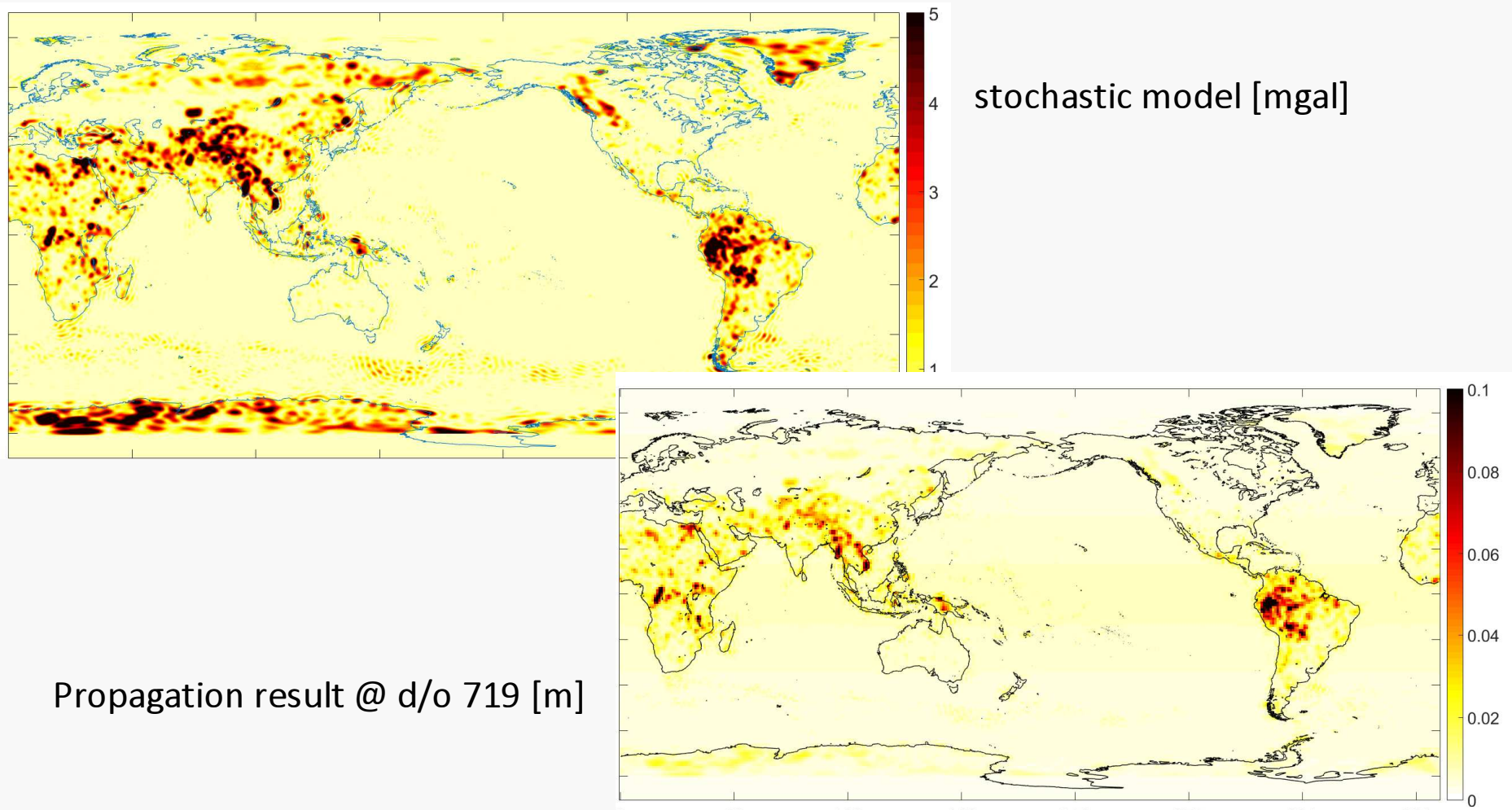
XGM2016: Results

Gravity anomaly differences [mgal]



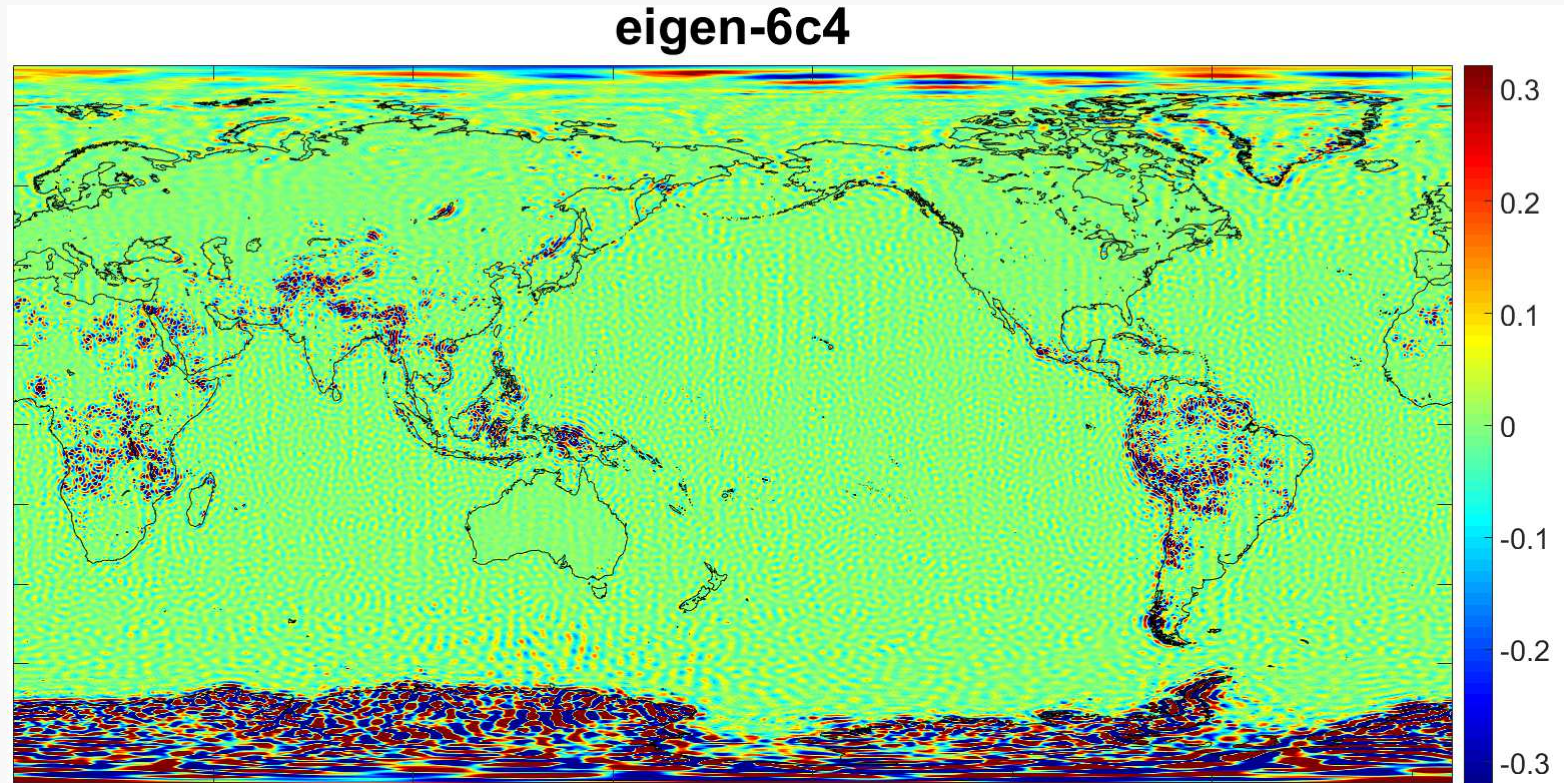
XGM2016: Results

Variance-covariance propagation into geoid heights



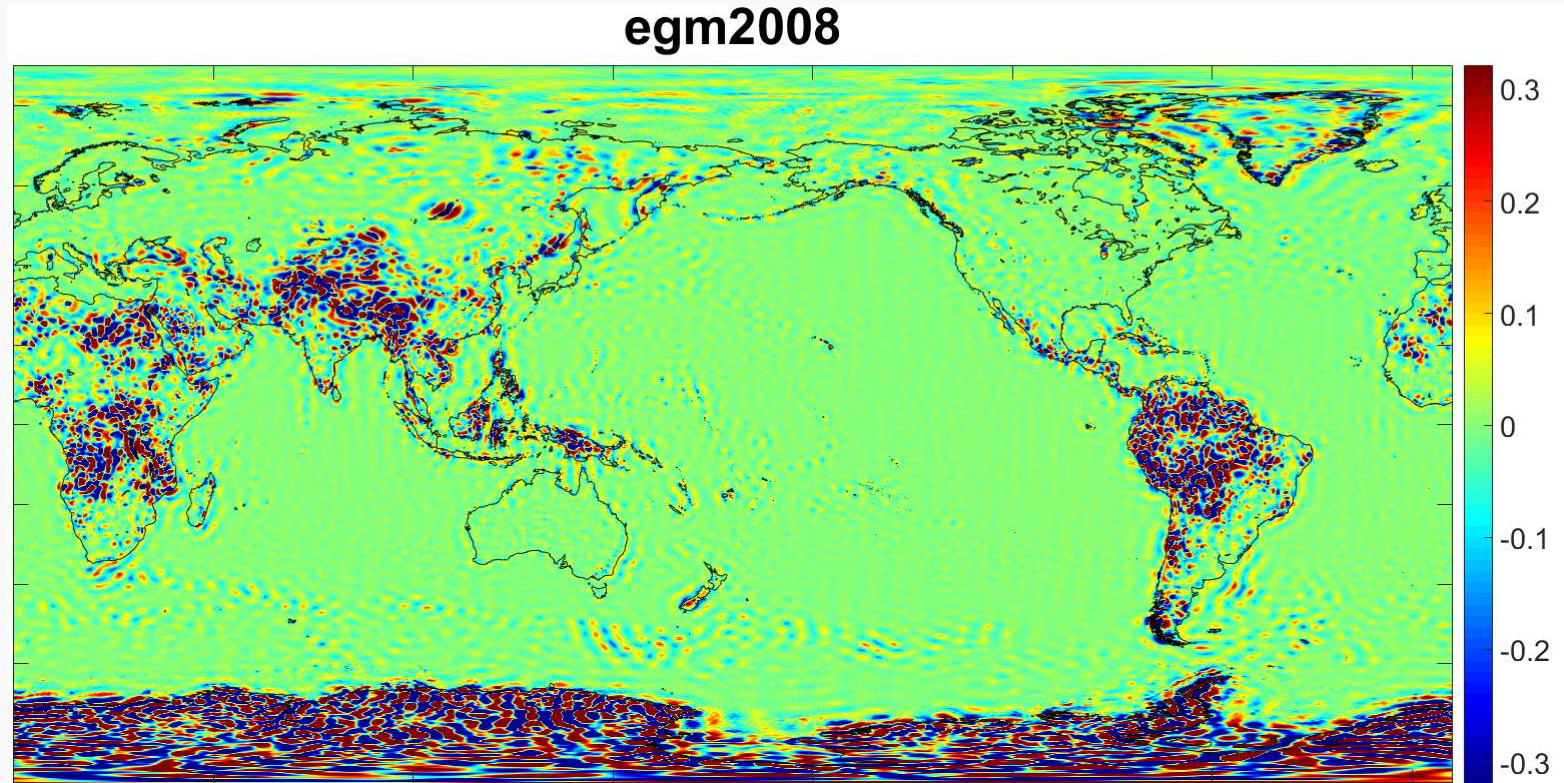
XGM2016: Results

Geoid height differences [m]



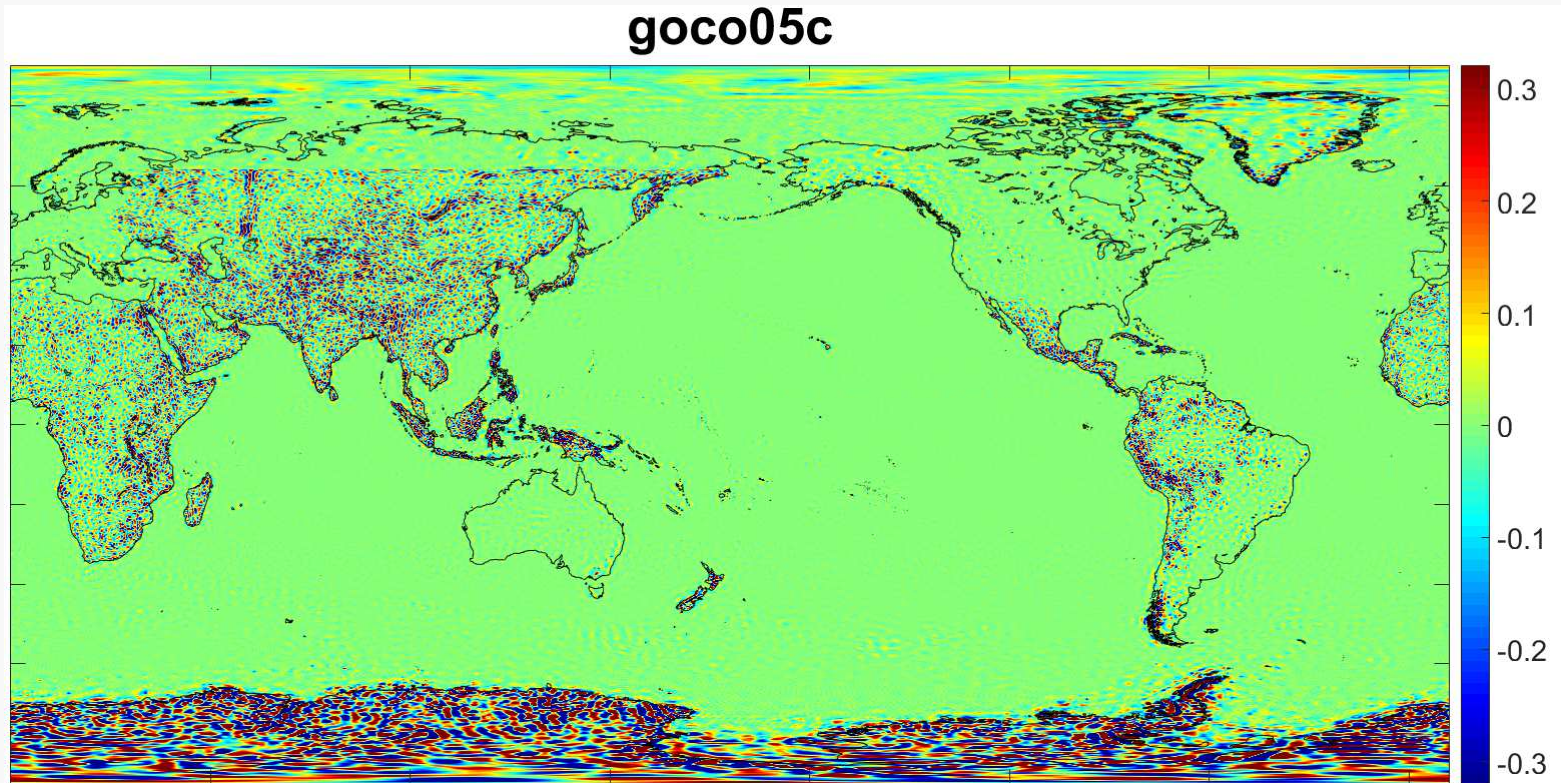
XGM2016: Results

Geoid height differences [m]



XGM2016: Results

Geoid height differences [m]

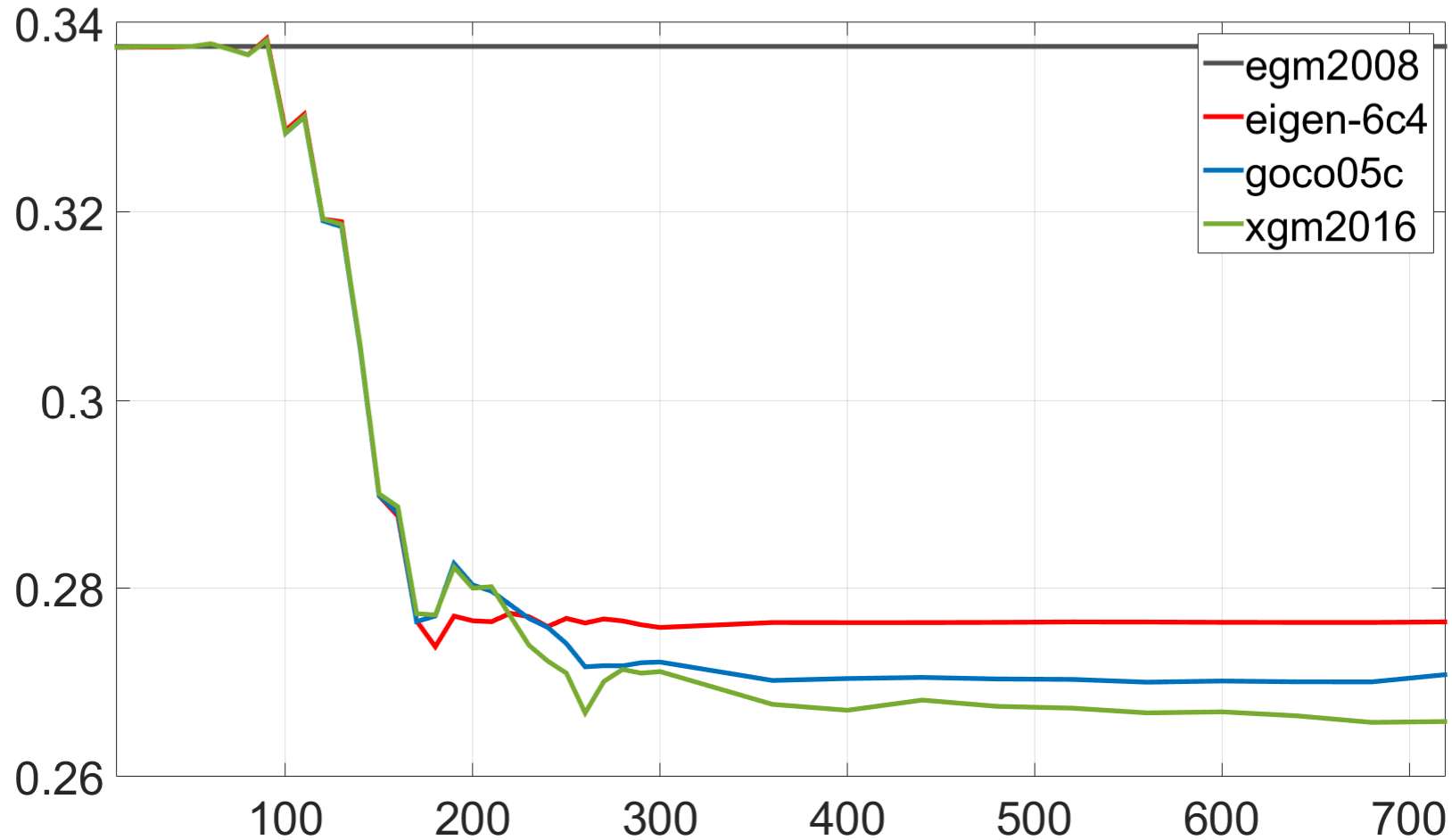




XGM2016: Results

GPS-leveling: RMS [m]

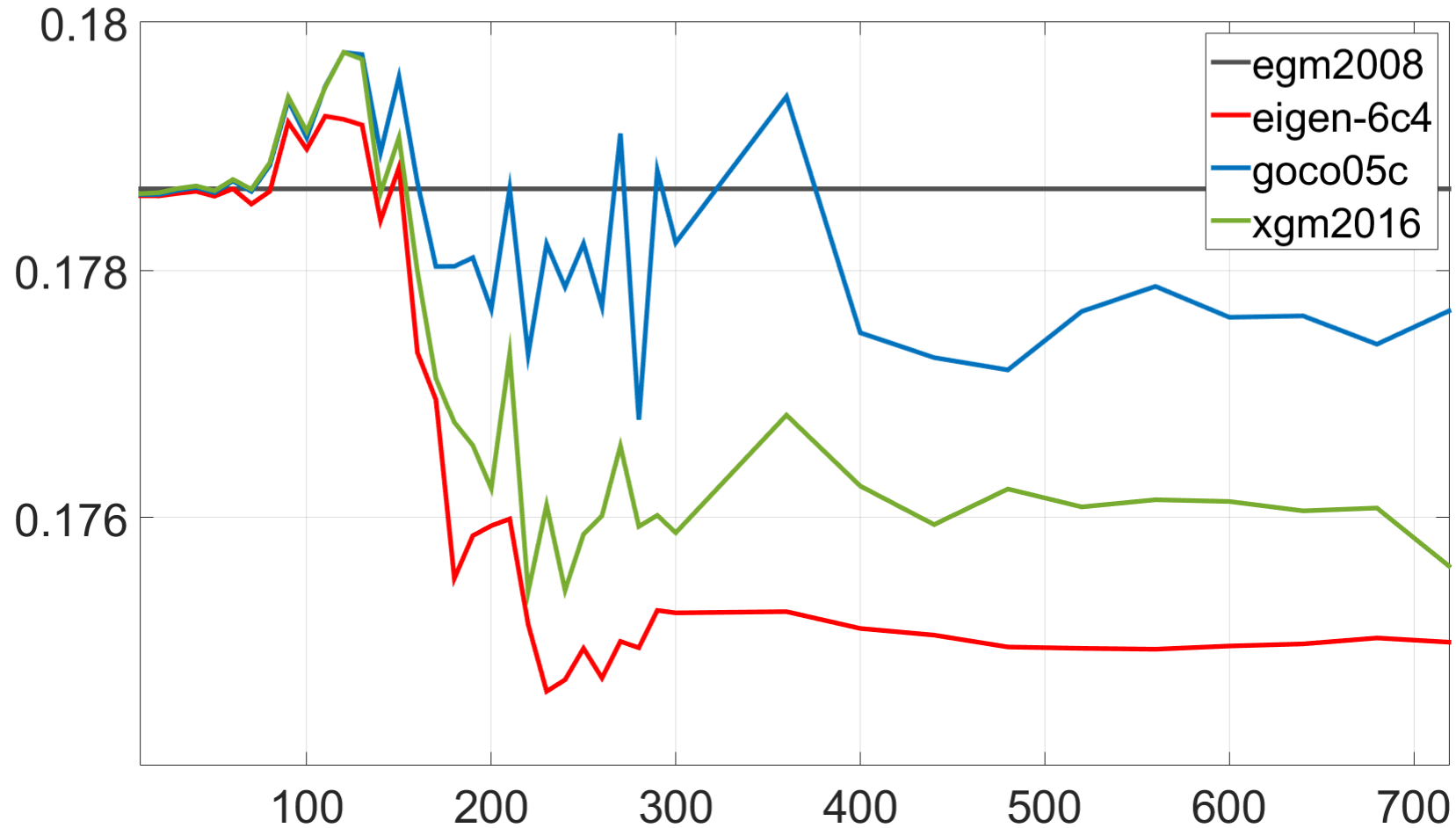
Brazil: largest improvement > 6cm



XGM2016: Results

GPS-leveling: RMS [m]

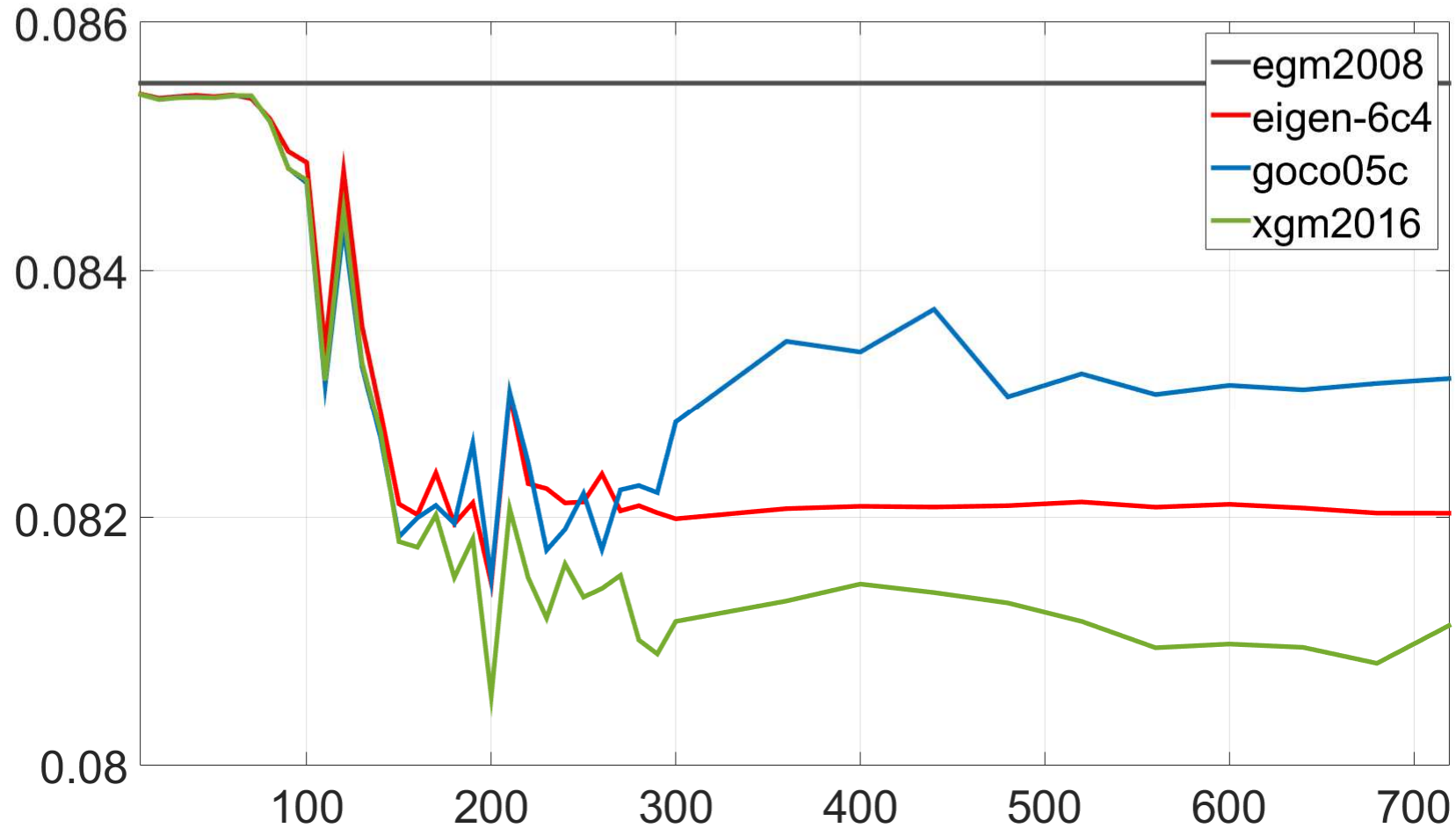
Australia: smallest improvement ~ 3mm



XGM2016: Results

GPS-leveling: RMS [m]

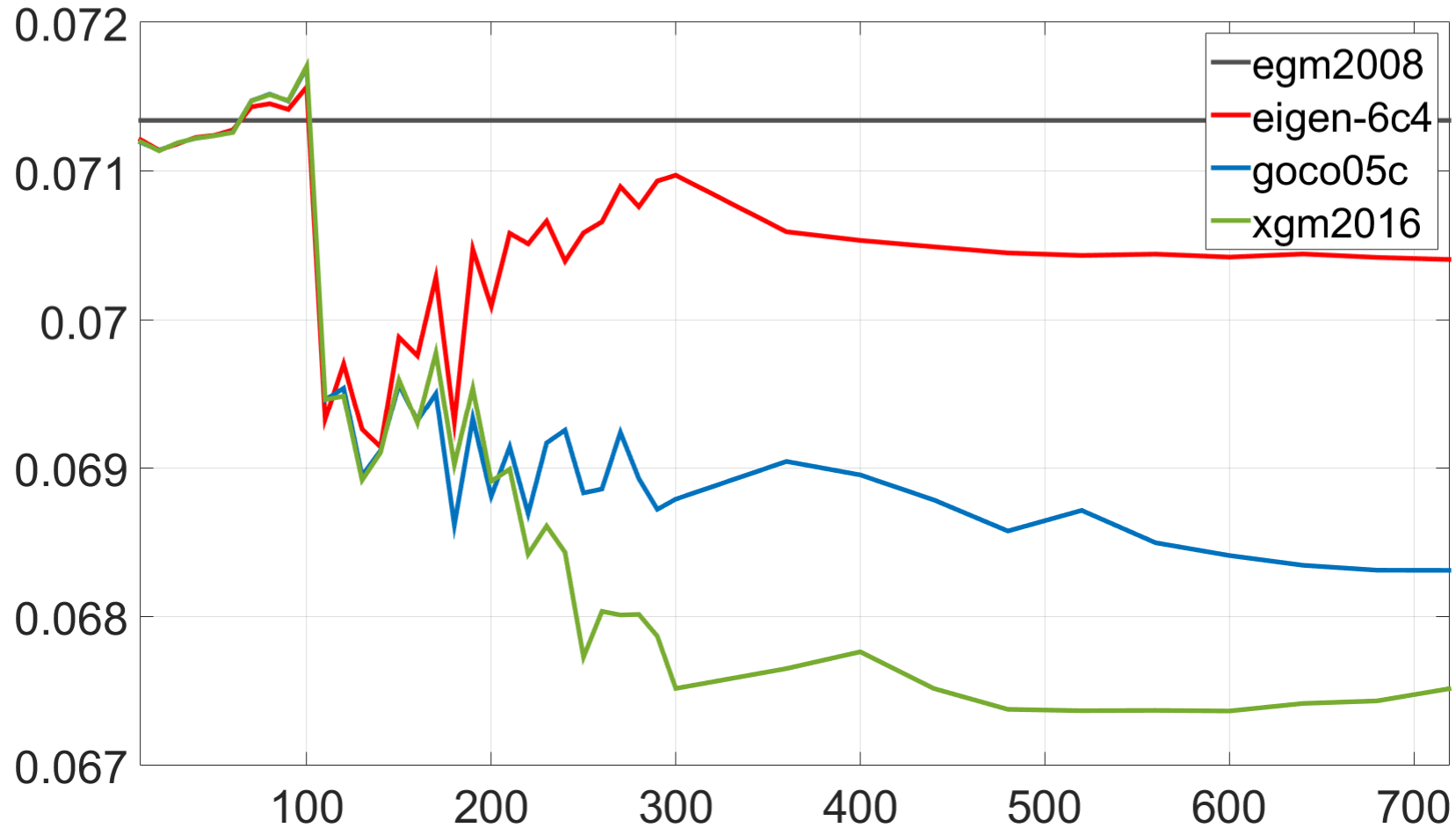
Canada: improvement ~ 4mm



XGM2016: Results

GPS-leveling: RMS [m]

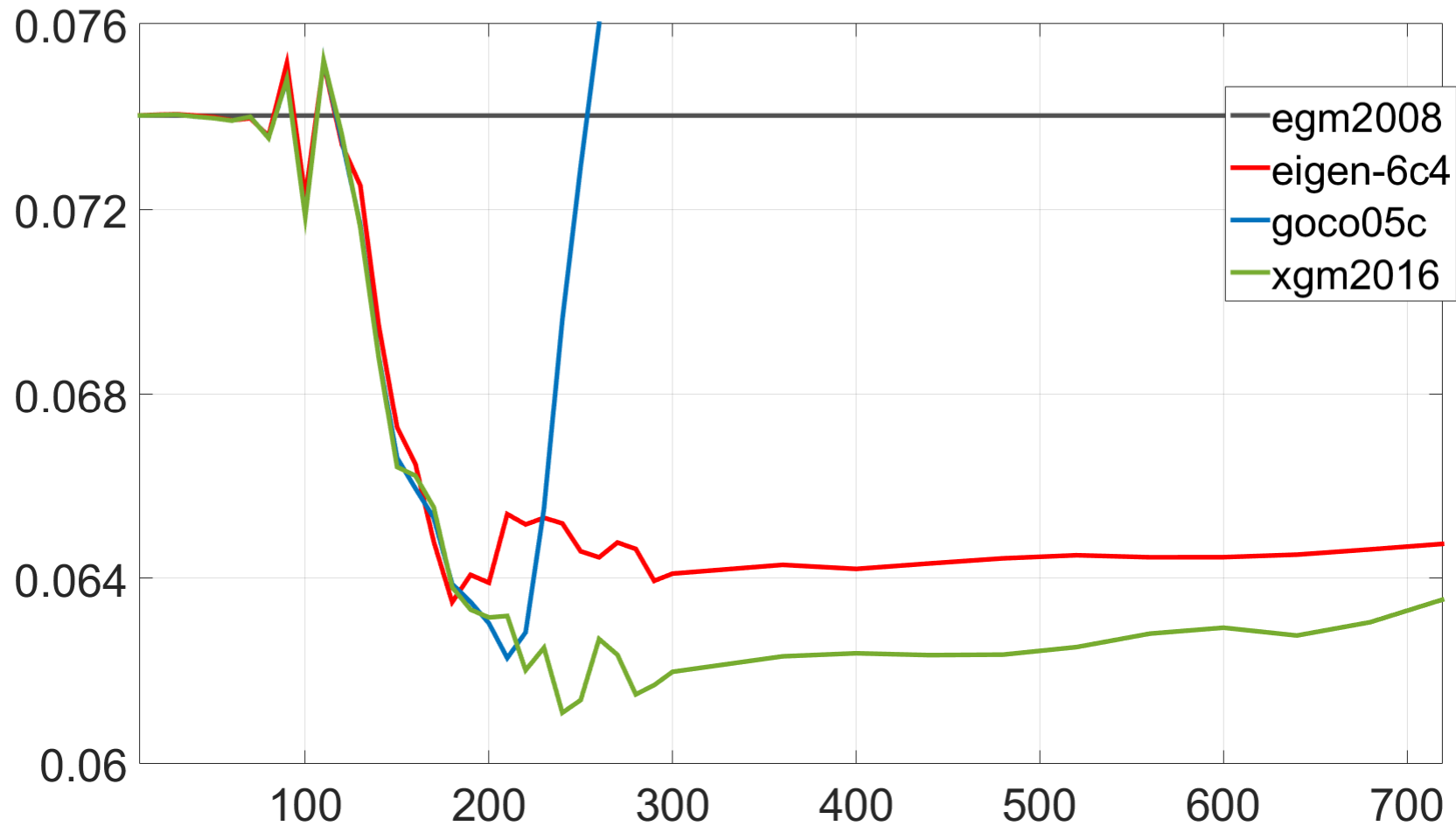
USA: improvement ~ 4mm



XGM2016: Results

GPS-leveling: RMS [m]

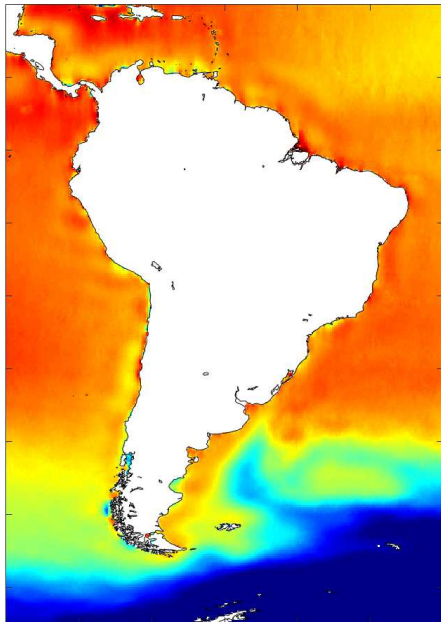
Japan: improvement > 1cm



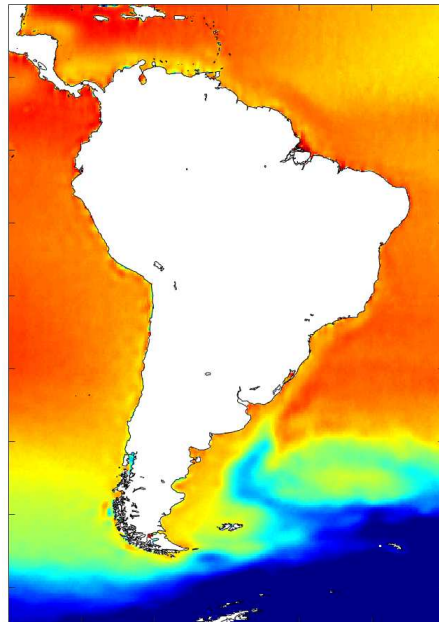
XGM2016: Results

MDT [m] w.r.t. DTU13_MSS, unfiltered

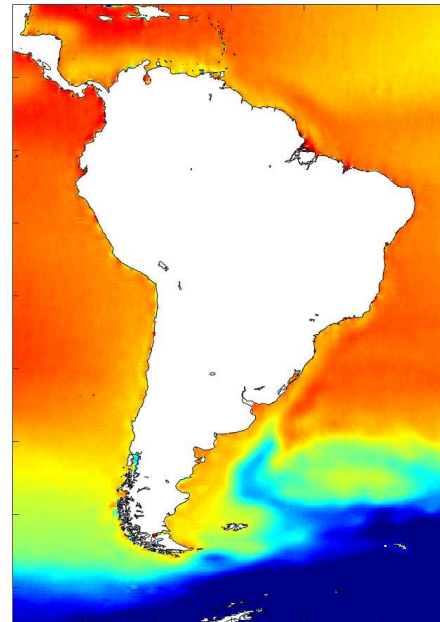
egm2008



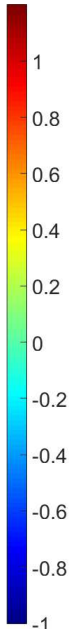
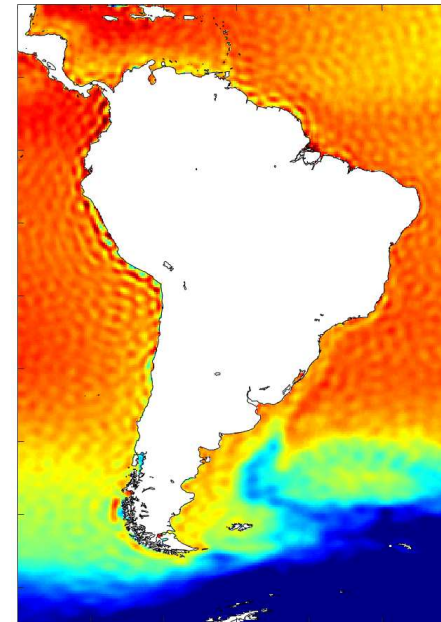
goco05cx



xgm2016x



eigen-6c4



XGM2016: Results

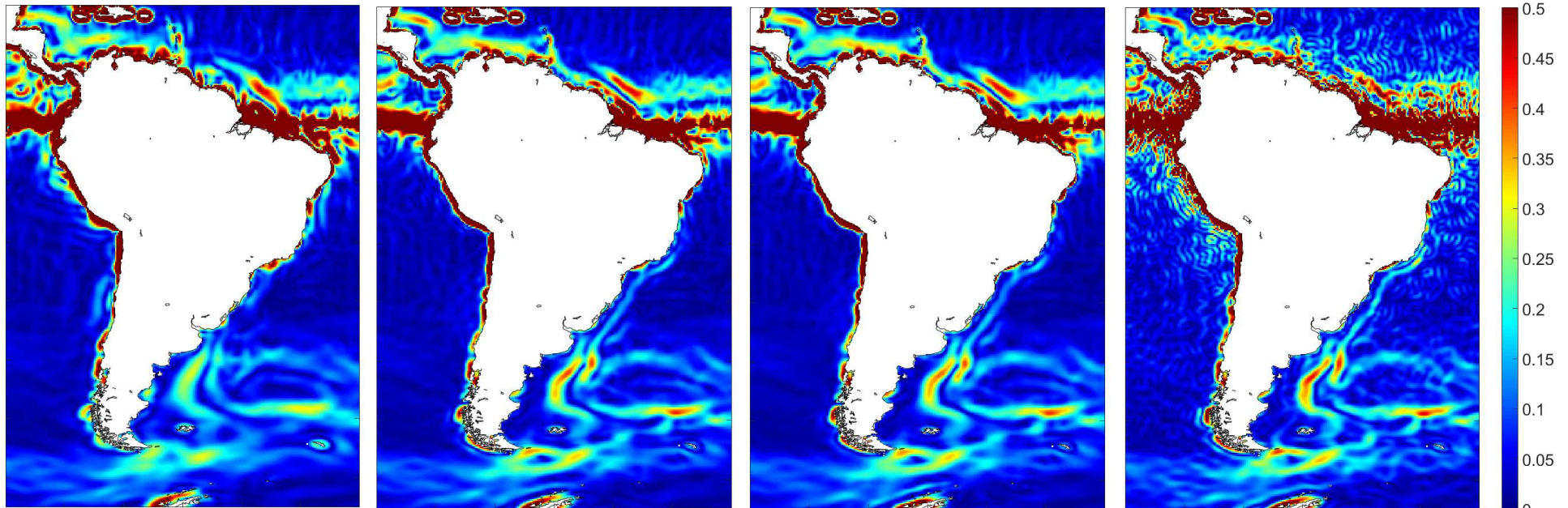
Ocean current velocities [m/s] w.r.t. DTU13_MSS, Gauss 60 km

egm2008

goco05c

xgm2016

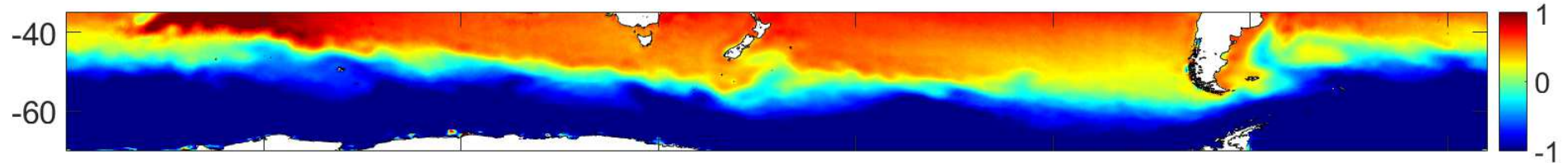
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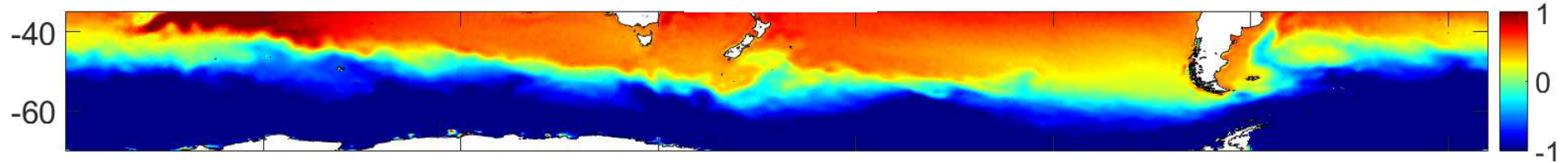
XGM2016: Results

MDT [m] w.r.t. DTU13_MSS, unfiltered

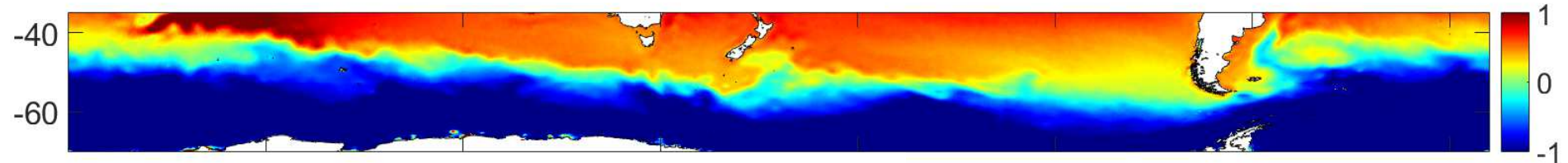
egm2008



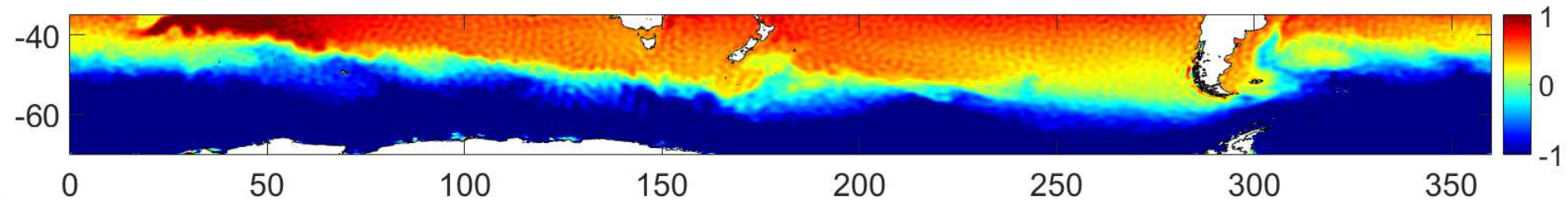
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xgm2016x



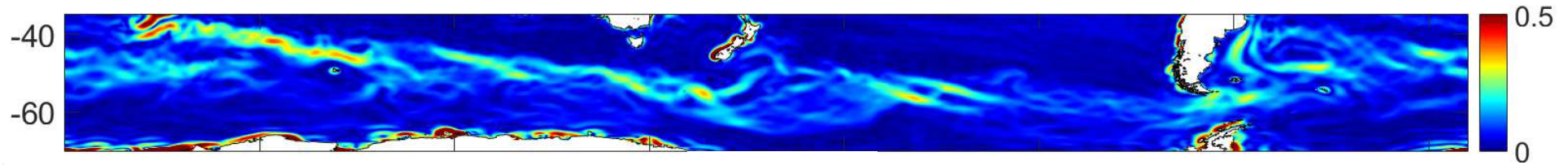
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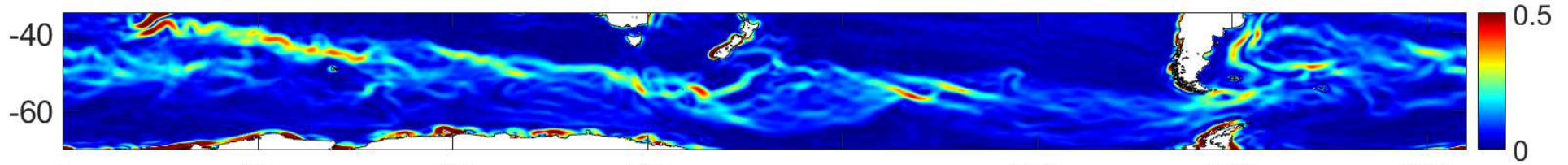
XGM2016: Results

Ocean current velocities [m/s] w.r.t. DTU13_MSS, Gauss 60 km

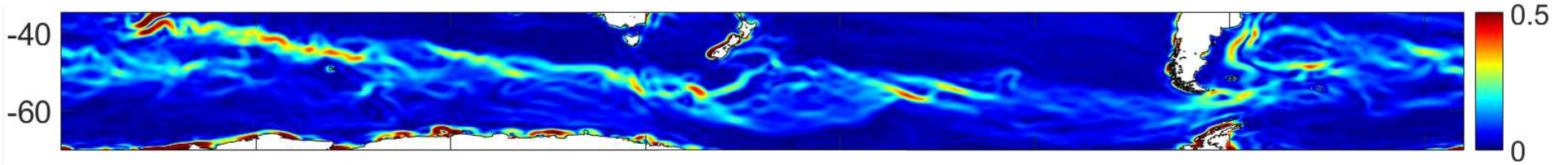
egm2008



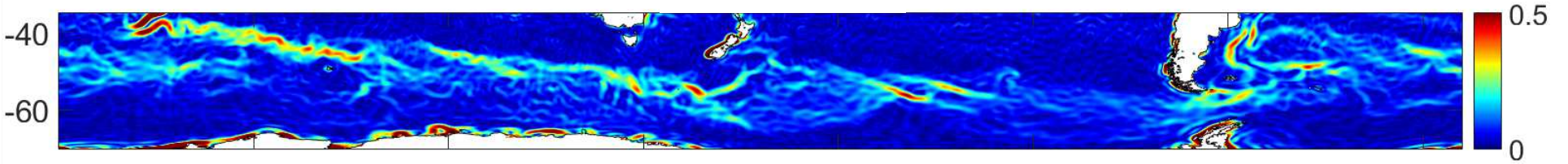
goco05c



xgm2016x



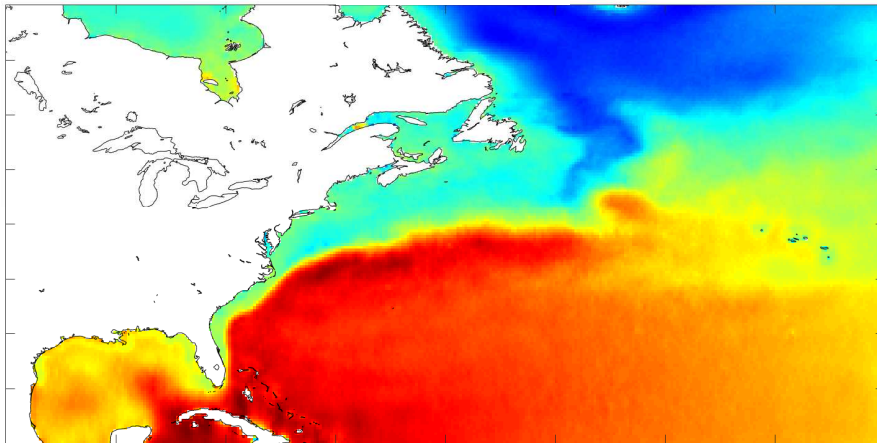
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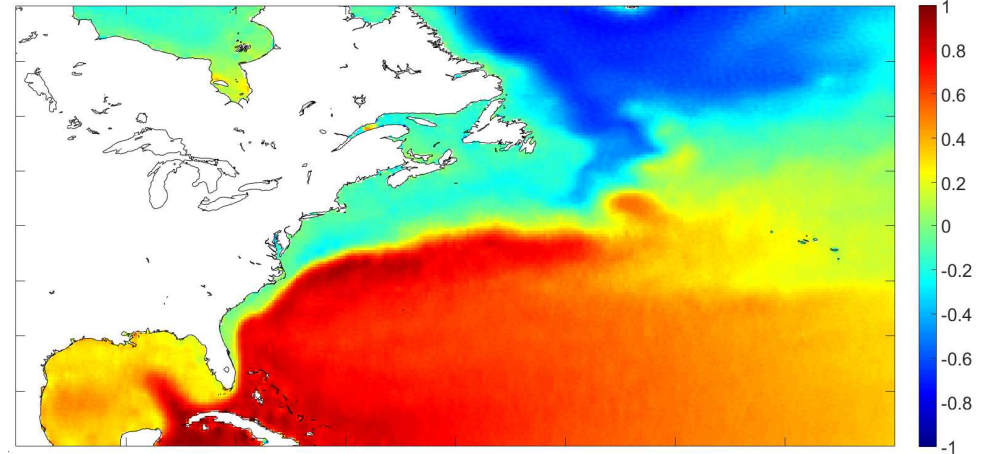
XGM2016: Results

MDT [m] w.r.t. DTU13_MSS, unfiltered

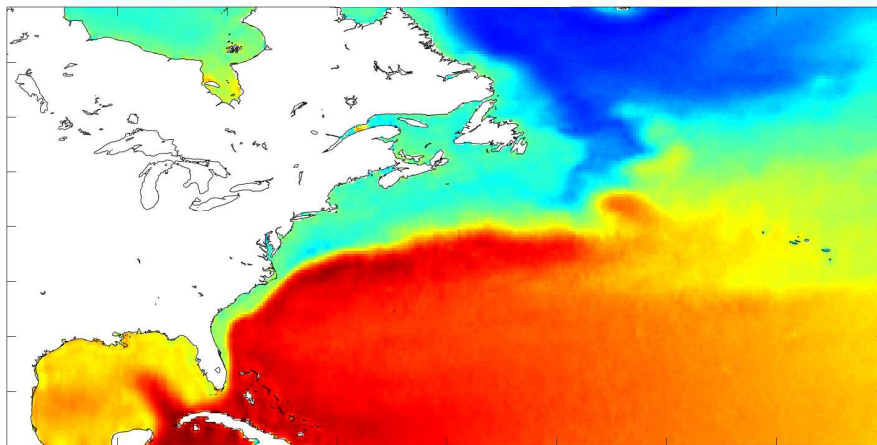
egm2008



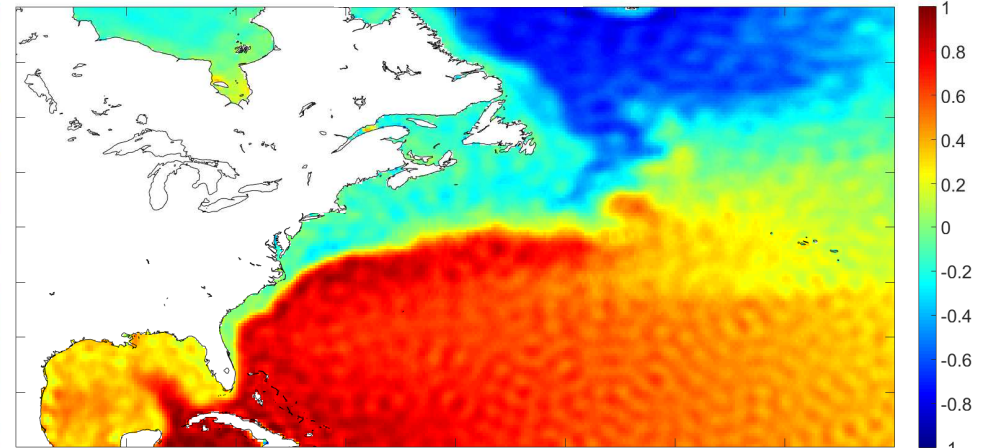
xgm2016x



goco05cx



eigen-6c4

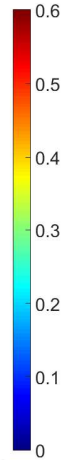
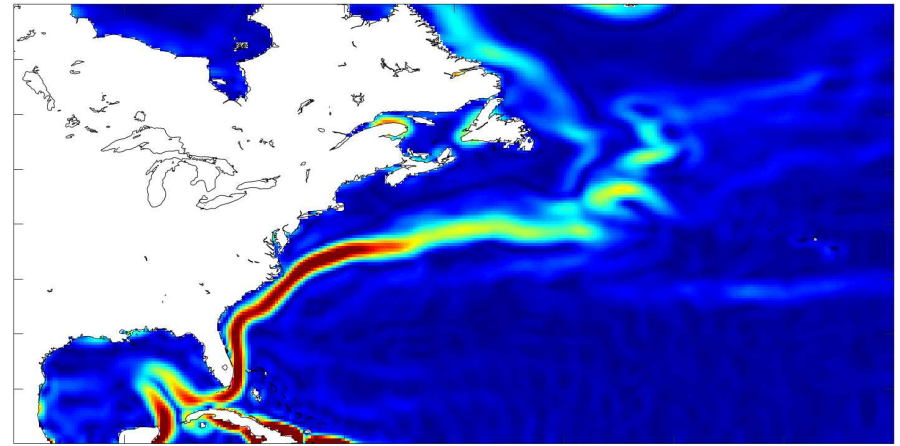
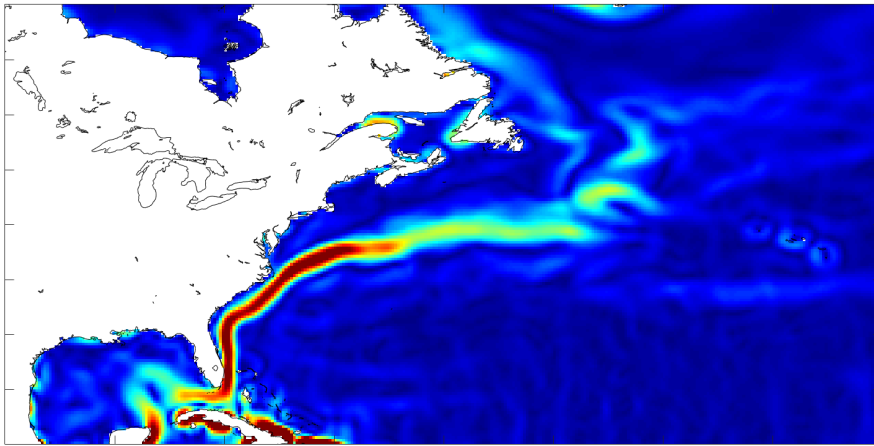


XGM2016: Results

Ocean current velocities [m/s] w.r.t. DTU13_MSS, Gauss 60 km

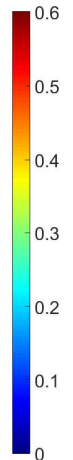
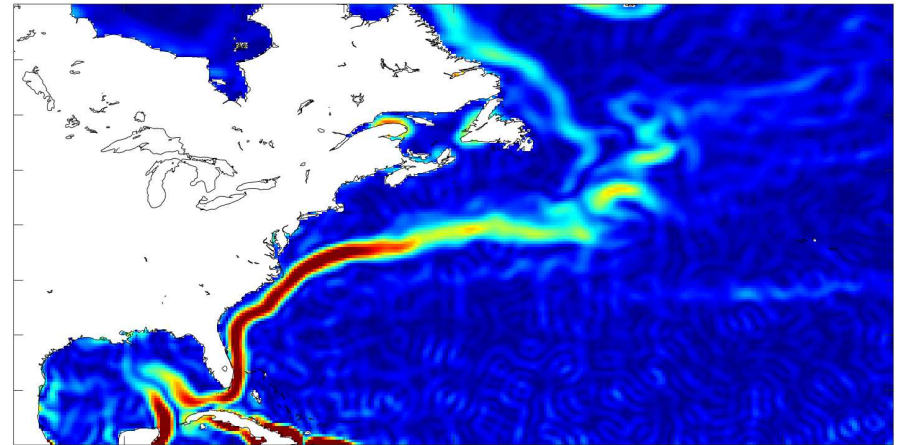
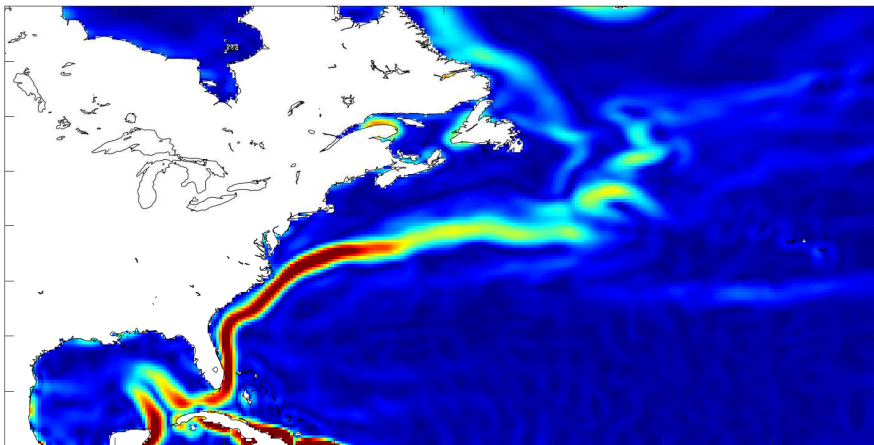
egm2008

xgm2016



goco05c

eigen-6c4






XGM2016: Summary

- XGM2016: a combined gravity field model up to d/o 719
- Based on GOCO05s and NGA's gravity data base
- Benefit from GOCE in comparison to EGM2008 clearly visible
- Benefit due to the improved gravity data base clearly visible
- Good model performance compared to other gravity models
- Improvements in GPS-leveling results
- XGM2016 suitable for oceanographic applications

Acknowledgements:

- CPU hours for the calculation of XGM2016 were granted by
Leibniz Supercomputing Centre (LRZ) 
- GOCO05s is a product of the GOCO Project Team