

Towards an updated, enhanced regional gravity field solution for Antarctica

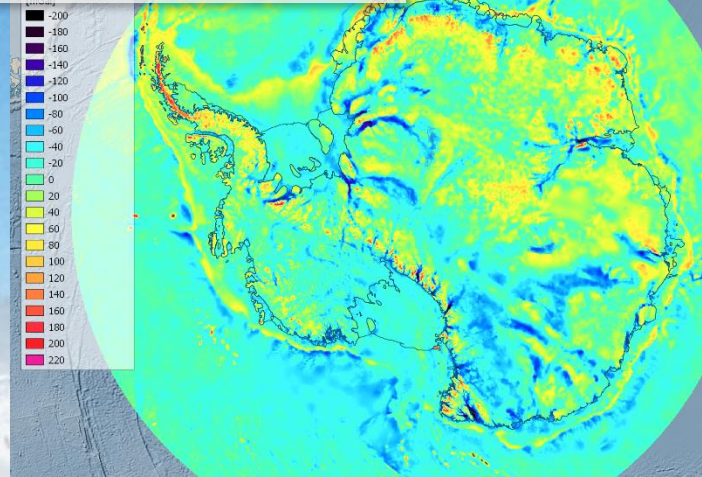
Mirko Scheinert, Philipp Zingerle, Theresa Schaller, Roland Pail, Martin Willberg

IAG SC2.4f „Gravity and Geoid in Antarctica“ (AntGG) + SCAR EG GIANT

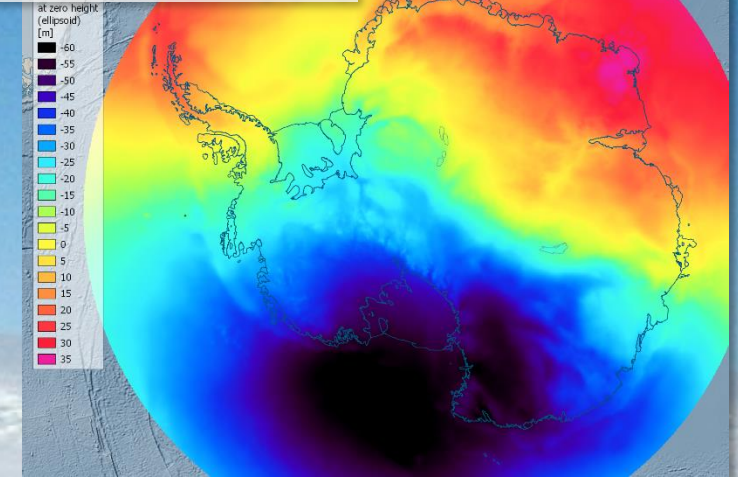
major update to Scheinert et al. (2016)

- inclusion of new measurements
- higher resolution (10 km → 5 km)
- improved processing
 - thorough treatment of topography
 - partition-enhanced least-squares collocation (LSC) (Zingerle et al. 2021)
- more datasets (provided in terms of functionals of the disturbing potential)
 - gravity anomaly
 - gravity disturbance at topography and at constant height (5,000 m)
 - height anomaly
 - 2nd radial derivative
 - Bouguer anomaly
 - accuracy measures from LSC

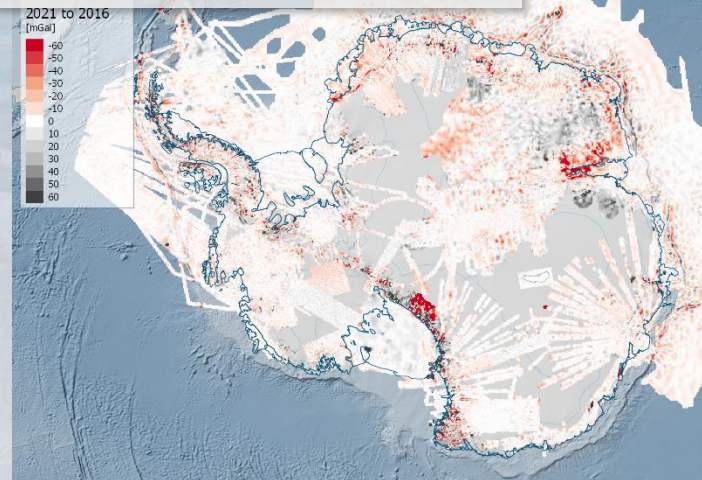
Gravity anomaly [mGal]



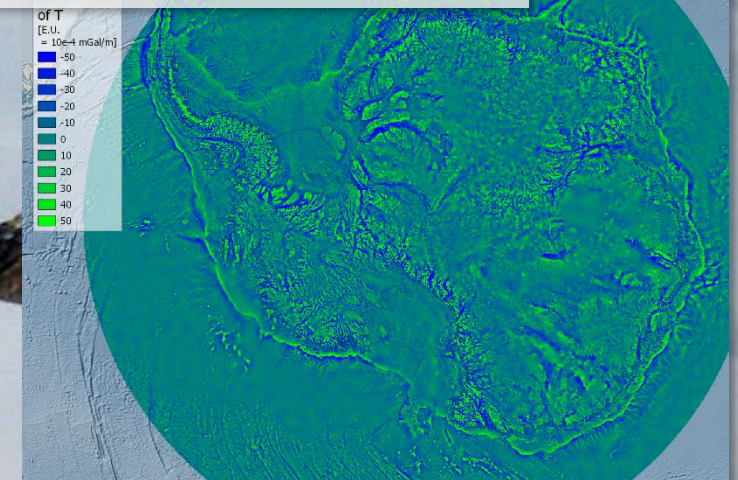
Height anomaly [m]



Difference 2021 – 2016 [mGal]



$\partial^2 T / \partial r^2$ [E.U. = 10^{-4} mGal/m]



Conclusions

high-resolution spherical harmonic expansion allows to count for long wavelengths (satellite model GOCO05S) and short(er) wavelengths (topography, Earth2014) in a consistent way

reduced gravity observations exhibit smaller residuals

- better suited for compute step

partition-enhanced least-squares collocation

- enables fast computation of entire Antarctica in one step
- provides desired functionals and realistic accuracy measures

provision of different datasets at 5 km grid resolution

publication in preparation

- will be combined with release of data products

Acknowledgement: Funding by German Research Foundation (DFG), projects SCHE 1426/24-1 and PA 1543/18-1

References

- Scheinert, M., F. Ferraccioli, J. Schwabe, R. Bell, M. Studinger, D. Damaske, W. Jokat, N. Aleshkova, T. Jordan, G. Leitchenkov, D. D. Blankenship, T. M. Damiani, D. Young, J. R. Cochran, T. D. Richter (2016): **New Antarctic Gravity Anomaly Grid for Enhanced Geodetic and Geophysical Studies in Antarctica**. *GRL*, doi: 10.1002/2015GL067439
- Forsberg, R., A. V. Olesen, F. Ferraccioli, T. Jordan, H. Corr, K. Matsuoka (2017): **PolarGap 2015/16**, Final Report, ESA 4000115220/15/NL/gp.
- Hirt, C. and M. Rexer (2015): **Earth2014: 1 arc-min shape, topography, bedrock and ice-sheet models – Available as gridded data and degree-10,800 spherical harmonics**. *Int. J. Appl. Earth Obs. Geoinf.*, doi: 10.1016/j.jag.2015.03.001
- Hirt, C., M. Rexer, M. Scheinert, R. Pail, S. Claessens, S. Holmes (2016): **A new degree-2190 (10 km resolution) gravity field model for Antarctica developed from GRACE, GOCE and Bedmap2 data**. *J. Geodesy*, doi: 10.1007/s00190-015-0857-6
- Zingerle, P., R. Pail, M. Scheinert, T. Schaller (2019): **Evaluation of terrestrial and airborne gravity data over Antarctica – A generic approach**. *J. Geod. Sci.*, doi: 10.1515/jogs-2019-0004
- Zingerle, P., R. Pail, M. Willberg, M. Scheinert (2021): **A partition-enhanced least-squares collocation approach (PE-LSC)**. *J. Geodesy* (revision in review).