

Name

GGG1D.0 (Greenland GNET glacial-isostatic adjustment estimate, 1D viscosity structure, version 1)

Domain

Greenland

Type

Regional GPS-calibrated forward modelling solution

Group within IMBIE2

Sasgen, Khan

Resolution

Spherical-harmonic cut-off degree and order 256

Load model

GPS-calibrated version of GREEN1 (Fleming & Lambeck 2004), augmented by last century retreat of Kangerlussuaq glacier system.

Earth model

Lithosphere thickness: 60 km, upper-mantle viscosity of 5×10^{20} Pa s (best fit to GPS data), lower-mantle viscosity of 2×10^{22} Pa s. Low-viscosity zone in area of former hot spot local (Kangerlussuaq area) represented by introducing asthenosphere layer of 200 km with 1×10^{19} Pa s.

Reference

Khan et al. 2016

Sasgen et al. 2016, *in prep.*

Brief description:

For GGG1D.0 (GPS only), regional patterns of GIA were computed for nine major drainage sectors of the Greenland ice sheet. In regions with good RSL coverage, the model GREEN1 reconciled well with the GPS uplift rates. In the other regions, the total load change since the Last-Glacial Maximum (LGM) was adjusted by a scale factor to fit the GPS uplift rates. Special treatment was required for the Kangerlussuaq area; a low-viscosity zone was added and the retreat since the year was 1900 was considered and provided excellent fit to the data. Compared to e.g. ICE-5G the model described substantially greater uplift in the Northwest and Southeast of the ice sheet.

Comments:

No GRACE data used (only GPS and RSL). Elastic correction was based on a composite field of surface-ice elevation change derived from various space- and airborne instruments. The apparent mass change for the Greenland ice sheet is ca. 30 Gt/yr. Uncertainty estimation is in progress.

No GRACE data used. Uncertainty estimate currently being prepared.

Files provided:

- **urate_grid_GGG-1D.0.txt**, rates of radial displacement (mm/yr)
- **grate_Stokes_GGG-1D.0.sh**, rate of change of the gravitational potential (dimensionless/yr) – fully normalized Stokes coefficients [degree n, order m, cos(n,m), sin(n,m)]

Khan, S. A., Sasgen, I., Bevis, M., van Dam, T., Bamber, J. L., Wahr, J., ... & Csatho, B. (2016). Geodetic measurements reveal similarities between post-Last Glacial Maximum and present-day mass loss from the Greenland ice sheet. *Science Advances*, 2(9), e1600931.

