



GOCE Gravity Models Compared to EGM2008, GRACE and Ship Gravity Measurements

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We assess the GOCE spherical harmonic coefficients from three different solutions (direct, space-wise and time-wise) by comparing them to a global geopotential model (EGM2008), a GRACE only gravity field model (ITGGrace2010s) and ship gravity measurements. Comparison will take place in the spectral domain and the spatial domain. In the spatial domain we also focus on a small area around the Reykjanes ridge, southwest of Iceland, which shows a clear signal from the mid-ocean ridge. Comparisons in the spatial domain are done with the polar gap excluded but in the spectral domain comparison all coefficients are included.

In the spectral domain comparison, ITGGrace2010s is closer to EGM2008 than all the three GOCE models for spherical harmonic degrees smaller than 100. Due to the polar gap the space-wise and time-wise solutions have significant differences from EGM2008 in the zonal coefficients. Between degrees 100 and 150, the space-wise and time-wise solutions and ITGGrace2010s are similar in terms of degree RMS differences w.r.t. EGM2008. For degrees larger than 150, the space-wise and time-wise solutions show improvement compared to the GRACE gravity model, while the direct solution already shows improvement from degree 120 onwards.

In the spatial domain, EGM2008 shows a significant difference w.r.t. the three GOCE solutions in areas in Africa, South America and Himalayas where terrestrial gravity data is unavailable or not accurate. Strong patterns along the Greenland coast line appear in the difference between the GOCE/GRACE models and EGM2008. After applying Gaussian smoothing, differences between GOCE models and EGM2008 appear along the Reykjanes ridge, while the difference between ITGGrace2010s and EGM2008 appears as a tilted geoid surface. Preliminary comparisons with ship gravity data near the Reykjanes Ridge show no improvements for the GOCE models compared to ITGGrace2010s.