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Improved Regional Gravity Fields from GRACE in situ Observations

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Within the dedicated TOPO-EUROPE project RESEL-GRACE (Refined European sea level estimations by combining different data sets with regional GIA modeling and regional GRACE gravity field models) regional mean and time-variable gravity models are derived directly from GRACE instrumental data for European regions of interest (Mediterranean Sea and Fennoscandia). The estimation of spherical harmonic coefficients as routinely generated for global monthly fields from GFZ has the principal disadvantage that regional solutions can only be derived with limited accuracy.

Therefore GFZ is integrating regional gravity field modeling into the GRACE processing software which is more suitable for small scale focusing. The GRACE K-band measurements can be explicitly (e.g. by means of the energy balance approach) transformed into gravity functionals and calibrated by use of appropriate background models. One alternative for representing these in situ observations over an area of interest is based on radial base functions instead of spherical harmonics. Whereas the modeling of coarse signal structures generally needs only a few parameters, finer structures require a considerably larger number of parameters. In our approach the number of isotropic base functions for modeling the coarser and finer structures of the gravity field is predefined by the chosen highest resolution level. The choice of a set of resolution levels allows a multi-resolution representation (MRR), which splits the gravity field into a number of detail signals related to the chosen resolution levels. This allows that estimated gravity parameters can be directly physically interpreted; loading computations are as straightforward as in the spherical harmonic domain.
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