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# Multi-resolution representation of the gravity field from satellite and terrestrial data

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Around the time the new global Earth Gravity Model EGM 06 will become available, it makes sense to highlight alternative approaches for regional gravity modeling. Since the Earth's gravity field is relatively smooth over the oceans, has finer structures over the continents and is even rough over the mountains, a multi-resolution representation (MRR) seems to be an appropriate candidate for an alternative modeling. A MRR means basically the approximation of a signal under different resolution levels. Thus, we decompose the gravity field into a system of modules each related to a specific geographical region and frequency band. Whereas the modeling of coarse structures needs generally only a small number of observations, finer structures, however, require a considerably larger number of observations. Consequently, the computation of the individual modules depends on the data distribution.

Within this framework many recent approaches were discussed and applied. In this paper we determine regional static and spatial-temporal high-resolution gravity models from satellite and surface data using the multi-resolution technique based on spherical wavelet theory. Since the MRR corresponds to a sequence of low-pass filters, it can be applied directly to in-situ data avoiding a loss of information associated with the common spherical harmonics approach of uniform resolution. Furthermore, our MRR, based on spherical isotropic functions, accomodates for loading computations in the spectral domain as easily as spherical harmonics. Here, we present various examples, e.g. a regional time-dependent gravity model of the Amazon basin and a static high-resolution gravity model for Colombia, computed from CHAMP, GRACE and terrestrial data.