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High-resolution regional gravity model from satellite and terrestrial data using spherical wavelet theory

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This paper deals with the application of the multi-resolution technique based on wavelet theory to determine a regional high-resolution gravity model. The basic idea of the multi-resolution representation is to split an input gravity signal into a certain number of detail signals. Since each detail signal is related to a certain frequency-band it is in fact computable from different data sets covering specific parts of the frequency spectrum. In our approach we estimate the low-level detail signals, i.e. the long-wavelength part of the gravity field, e.g. from potential data derived directly from CHAMP or GRACE (using kinematic orbits, accelerometry data and the energy method). The high-level detail signals or short-wavelength gravity components are computed from Faye anomalies derived from terrestrial, airborne and altimetric observations. However, the frequencies associated with the medium-level detail signals require a special handling, because they are present in both the satellite and the in situ data. Hence, we address different combination strategies for an optimized solution. Finally, we apply the developed combination procedure to determine a consistent high-resolution (quasi)geoid model for Colombia. It is noted that developed methodologies can be applied to other regions of interest.