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The high-degree constituents of the bathymetric stripping corrections to gravity field quantities

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In gravimetric inverse methods for studying the lithosphere structure, the bathymetric stripping corrections are applied to observed gravity data. The bathymetric stripping corrections are usually computed for a constant value of the ocean density contrast. The currently available global geopotential models and the global elevation and bathymetry (ocean bottom depth) data allow modelling the topography corrected and bathymetry stripped gravity field quantities to a very high spectral resolution (up to degree 2160 of spherical harmonics) using methods for a spherical harmonic analysis and synthesis of gravity field. The approximation of the actual seawater density distribution by the mean value, however, yields relative errors up to 2% in computed values of the bathymetric stripping corrections. To reduce these errors, we adopt a depth-dependent theoretical model of the seawater density distribution to account for density variations due to pressure. The smaller lateral seawater density variations due to salinity and temperature and other oceanographic factors are not taken into consideration. The depth-dependent seawater density model is facilitated in expressions for the bathymetry-generated gravitational field quantities. The newly derived expressions for computing the bathymetry-generated gravitational field quantities are utilized in compiling global maps of the topography corrected and bathymetry stripped gravity field quantities with a resolution complete to degree 2160 of spherical harmonics.