



Computation of indirect and direct effects of the second Helmert's condensation using STRM30 digital elevation model

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The indirect and direct effects of Helmert's second method of condensation are computed globally using the digital elevation model SRTM30 in 30 arc-seconds. The computation assumed a constant density of the topographic masses. The closed formulas are used in the inner zone of half-degree block, and Taylor series are used in the outer zone where the 1D fast Fourier transform (FFT) is utilized.

Globally, the mean value of the indirect effect is -2.9 cm. The bias is larger over land areas (-6.4 cm), and smaller over the ocean areas (-1.5 cm). The indirect effect is negative everywhere and its minimum reaches -236.0 cm at the peak of Himalayas (8685 meter, SRTM30). The standard deviations of the indirect effect are (+/-)15.9 and (+/-)0.6 cm to the land and ocean areas, respectively.

Similar to the indirect effect, the direct effect is not zero over ocean areas - the indirect effect has mean value and standard deviation of -0.02 and (+/-)0.1 mGal respectively over oceans. Over land areas, the mean value of the indirect effect is -0.7 mGal and the standard deviation is (+/-)6.0 mGal. The minimum value reaches -274.3 mGal and is located at latitude -13.579 deg and longitude 289.496 deg, at height of 1426 meters in the Andes Mountains.