Geophysical Research Abstracts, Vol. 9, 10583, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10583

Evaluation of the parameters affecting the wavelet solution of geodetic integrals

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A computational scheme using the wavelet transform is employed for the numerical evaluation of the Stokes, terrain corrections, Poisson, deflection geoid and Vening Meinesz integrals. The role of the kernel singularity, grid size and spacing in the wavelet multiresolution analysis are studied. The integrals are approximated in finite multiresolution analysis subspaces. The wavelet algorithm is built on using an orthogonal wavelet base function. A new wavelet algorithm is introduced where large matrices are formed. The full solution with all equations requires large computer memory. Multiresolution properties of the wavelet transform are used to divide the full solution into parts. Each part represents a level of wavelet detail coefficients or the approximation coefficients. Wavelet thresholding is used for the compression of the kernel. The integrals with higher fast dropping kernel achieve higher compression levels with acceptable practical accuracy. The grid size and spacing effectively affect the compression levels achieved. A detailed numerical examples and analysis are given to illustrate the use of the wavelet procedure for the numerical evaluation of geodetic integrals with different grid sizes and spacings. Conclusions and recommendations are given with respect to the suitability, accuracy and efficiency of this method.