Geophysical Research Abstracts, Vol. 7, 02196, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02196

Global and local isostatic coherence from the wavelet transform

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A method to compute the variations in lithospheric elastic thickness (T_e) has been developed, using the wavelet transform. The technique, which uses a superposition of two-dimensional Morlet wavelets in a geometry named a 'fan' wavelet, is designed to yield isotropic yet complex wavelet coefficients for the co- and cross-spectra of gravity and topography data. These are then used to compute a spatially-varying, isostatic coherence, from which both global and local estimates may be obtained. We applied the method to synthetic gravity and topography generated for a thin elastic plate of uniform thickness 20 km, yielding an apparent, spatially variable T_e of 24.5 ± 3.5 km. The estimated global coherence for this model appears to fit the theoretical prediction as well as Fourier transform-based estimates, and is smoother than these. We also computed the wavelet coherence, and hence spatially-varying T_e, for a plate of non-uniform thickness, yielding a difference with the model of -2.0 ± 1.7 km.