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A new Multiscale Method for Earth Structure Determination from normal Mode Splitting

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The splitting function $c = \sum_{n=0}^{\infty} \sum_{j=1}^{2n+1} c_{nj} Y_{nj}$ is a radial average of three-dimensional heterogeneity of the Earth. Its coefficients are related to internal properties δm and the topography δd by

$$c_{nj} = \int_0^a K_n^m(r) \delta m_{nj}(r)\, dr + \sum_d K_n^d \delta d_{nj} \ ,$$

where K_n denotes the degree-dependent sensitivity kernel of a given mode. We present a new multiscale method for the determination of δm and δd. At first, the splitting function c is decomposed by a spherical wavelet. Now it is possible to determine wavelet coefficients of δm and δd by a linear equation system. Then δm and δd can be reconstructed by wavelets on the three-dimensional ball. The main advantage of a wavelet method is its localisation property. If the wavelets are chosen appropriately it is also possible to reconstruct the harmonic and anharmonic part of the Earth's density separately, whereas gravitation based models provide only the harmonic part. Hence, we will be able to use our results to construct a multiscale Earth model from a combination of gravitational and seismic data.