Spectral representations of Earth inner density structures and gravity field

P. Novak (1), R. Tenzer (2), and P. Vajda (3)

(1) Department of Mathematics, University of West Bohemia, Univerzitní 22, Plzeň, Czech Republic (panovak@kma.zcu.cz), (2) National School of Surveying, University of Otago, Dunedin, New Zealand (robert.tenzer@otago.ac.nz), (3) Geophysical Institute, Slovak Academy of Sciences, Dubravska cesta 9, 845 28 Bratislava, Slovak Republic (peter.vajda@savba.sk)

We give a consistent mathematical scheme which can be applied uniformly for a description of the Earth inner density structures and the forward modeling of respective gravitational field parameters. The mathematical scheme facilitates the generic expressions describing the spatial chracterics of an arbitrary density (contrast) layer with a variable depth and thickness having a laterally distributed radial density variation and its gravitational field. The information on the geometry and density distribution of a volumetric mass layer is described by means of spherical harmonics. These generic expressions can uniformly be applied to model all major known density structures within the Earth interior using methods for a spherical harmonic analysis and synthesis of the gravitational field. This is demonstrated on specific examples given for various density models commonly adopted for the approximation of crust density structures.