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Geodynamic applications of the truncation filtering methodology: A synthetic case study for a point source of force representing the upward pressure around a magmatic body

P. Vajda, L. Brimich
Geophysical Institute of the Slovak Academy of Sciences[1]

A b s t r a c t : A model geodynamic event generated by an upward pressure associated with expanding forces of a magmatic body represented here by a point source of force embedded in an elastic halfspace is presented. Such simplified model, which may be considered relevant for instance to geodynamic studies of volcanic or magma processes, produces a displacement field generating a perturbed density distribution. Both the displacements and the perturbed density produce a change in gravity on the surface of the halfspace. Such (temporal) change in gravity, i.e., a change in the surface gravity caused by our model geodynamic event, can be interpreted using the truncation filtering methodology. The said change in gravity is transformed by a 2D truncation filter into truncation sequences. The pattern of a dimple is observed in the sequence of the first derivative of the Z quantity (cf. *Vajda, 2000; 2001*, and *Vajda et al., 2000*). The relationship between the instant of the onset of the dimple pattern and the depth of the point source of force of our model geodynamic event is established by analytical derivation. The purpose of this synthetic case study (modeling) is to provide a method for estimating the depth to the magmatic body producing a geodynamic (volcanic) event – the effect of upward magmatic pressure.

Key words: geodynamics, inverse problem, gravity data interpretation, point source, temporal variation, planar model

[1]Dúbravská cesta 9, 842 28 Bratislava, Slovak Republic
e-mail: geofvajd@nic.savba.sk; geofbrim@nic.savba.sk