Analytical derivation of the instant of the dimple pattern onset in 2D-truncation filtering methodology for a point source of heat geodynamic model

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A b s t r a c t : A model geodynamic event, representing a magmatic body heating the surrounding lithosphere, here simplified as a point source of heat embedded in an elastic halfspace is presented. Such model produces a thermoelastic 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, as was already shown by *Vajda et al. (2000)* by means of computer simulations. One of the truncation sequences displays a dimple pattern. Computer simulations have indicated that the instant of the dimple onset could be used for determining the depth of the point source of heat. Here the relationship between the instant of the onset of the dimple pattern and the depth of the point source of heat 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 heating the surrounding lithosphere based on the interpretation of real temporal change of gravity in thermally disturbed areas using the truncation filtering methodology.

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

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