

## DETERMINATION OF DENSITY, VELOCITY, AND BOUNDARIES OF THE GEOLOGICAL MEDIUM WITH ARBITRARY BOUNDARIES AROUND A BOREHOLE

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**Abstract.** This work is dedicated to a combined inverse problem using seismic and gravimetric data. For the case of two-dimensional geological medium in the vicinity of borehole, the problem of determining density, seismic wave velocities and layer boundaries is solved for arbitrary surface of discontinuity. The acoustic impedance (density-velocity product), and travel times of seismic waves, as a function of horizontal coordinate  $x$ , are assumed to be known in each layer. These functions do not impose any restrictions, i.e. these functions are arbitrary. The position of the upper border of the first layer is also known and seismic and gravimetric data are given on it.

A borehole is considered with density  $\rho$  and velocity  $V$  known in each layer based on GIS (Geographical information systems) data. The relation between density and velocity is assumed to be  $V=mp^l$ , where  $m$  and  $l$  are constants to be determined. According to these data, densities, velocities, and locations of discontinuity surfaces are determined as a function of horizontal coordinate for each layer.

**Keywords:** combined inverse problem of geophysics, vicinity of borehole, density, velocity.

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