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About well-posed definition of geophysical fields'

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We introduce a new approach to the downward continuation of geophysical fields based on approximation of observed data by continued fractions. Key Words: downward continuation, continued fraction, Viskovatov's algorithm. Many papers in geophysics are devoted to the downward continuation of geophysical fields from the earth surface to the lower halfspace. Known obstacle for the method practical use is a field's breaking-down phenomenon near the pole closest to the earth surface. It is explained by the discrepancy of the studied fields' mathematical description: linear presentation of the field in the polynomial form, Taylor or Fourier series, leads to essential and unremovable instability of the inverse problem since the field with specific features in the form of poles in the lower halfspace principally can't be adequately described by the linear construction. Field description by the rational fractions is closer to reality. In this case the presence of function's poles in the lower halfspace corresponds adequately to the denominator zeros. Method proposed below is based on the continued fractions. Let's consider the function measured along the profile and represented it in the form of the Tchebishev series (preliminary reducing the argument to the interval [-1, 1]): There are many variants of power series' presentation by continued fractions. The areas of series and corresponding continued fraction's convergence may differ essentially. As investigations have shown, the most suitable mathematical construction for geophysical fields' continuation is so called general C-fraction:

where (, z designates the depth) For construction of C-fraction corresponding to power series exists a rather effective and stable Viskovatov's algorithm (Viskovatov B. "De la methode generale pour reduire toutes sortes des quantitees en fraction continues". Memoires de l' Academie Imperiale des Sciences de St. Petersburg, 1, 1805). A fundamentally new algorithm for Downward Continuation (in an underground half-space) a field measured at the surface, allows you to make the interpretation of geophysical data, to build a cross-section, determine the depth, the approximate shape and size of the sources measured at the surface of the geophysical fields. Appliance of the method are any geophysical surveys: magnetic, gravimetric, electrical exploration, seismic, geochemical surveying, etc. Method was tested on model examples, and practical data. The results are confirmed by drilling.