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Studying of nonlinear deforming processes of geological environment by gravimetric means

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Studying of nonlinear deforming processes of geological environment by gravimetric means
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Gravitation is the main factor of deformation and structurization in the geological medium. Acting constantly, it assists the development of such nonlinear processes, as creep and relaxation of stresses.
Creep consists in tendency to medium balance. When it is broken, the part of elastic energy which had been saved in the medium, transforms, to external forces work, providing stress cracking.
Relaxation process or relaxation flow always finishes with destruction of medium. Stress cracking is also the main mechanism of creep flow. Thus both of processes provide variation of petro density properties, as main condition of anomalies formation in the field of gravity force.
Extension of rheological properties of geological medium had shown that for the first approximation it behaves as viscous liquid with properties of rheological Maxwell's body. Elastic-viscous medium at sudden loads behaves as elastic. But at long time loading they reveal a viscous reaction which is irreversible.
The stress necessary for support the reached stress level which diminishes in time is a characteristic feature of Maxwell's body.
Deformation properties of elastic-viscous medium are identical with properties of creep. This commonwealth, as at a level of samples of rocks, or as on level of Earth's crust in the whole, allows considering elastic-viscous model, as a basis for development of a method for estimation of nonlinear time variations of geological medium deformations, using anomalies of the gravity force field.
The theoretical precondition of this problem solution is the theory of linear heredity equations which in the best way describe the behavior of medium with properties of rheological Maxwell's body.
Extension of the equation which describes deforming of many types it material, which is characterized by heredity for the case of complex triaxial stress structure has allowed formulating the important principle named by principle Vollter's (Rabotnov, 1948).
According to this principle it is possible to solve many different problems of hereditary deforming if there is a solution of a corresponding problem for linear elastic medium model. For this purpose it's necessary to change the elastic modules by time operators in the solution of the elastic problem.
We (Filatov, 1990) obtained the deforming problem solution for the medium with density heterogeneity of arbitrary form and established functional dependence between components of the displacement vector of and gravitational potential gravity force field measurements of density heterogeneity (extended Mindlin's problem).
On the basis of that solution, we could solve the problem for the linear-viscous medium, which allows studying nonlinear processes of deforming, using special analysis.
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