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Modeling the dynamics of introduction of ore-bearing trappean intrusions into the cover of the Siberian platform

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In this paper, the dynamics of introduction of trappean intrusions is investigated within the framework of the previously constructed mathematical model of mantle-crust fluid magmatic systems in the Siberian platform. The ore-bearing differentiated intrusions of the northwestern part of the Siberian platform are the flat bodies characterized by weak inclination, extension to the tens of kilometers and thickness from tens to hundreds of meters. Intrusions contain various types of mineralization: from sulphide massive or impregnated ores to inclusions of drop-like formations and ingots of native iron. Each specific magmatic body is characterized by genetic features of ore inclusions, as well as the features of local petrographic structure. A common genetic sign of intruding dynamics is a non-isothermal unsteady flow of a heterophase fluid containing a variable amount of crystals, gas bubbles, droplets of various sizes and, in some cases, xenoliths of the cover rocks, in a slit-like cavity in a mass of rocks. The study of evolution of such a fluid-magmatic system is based on a non-stationary, non-linear model of the dynamics of heat and mass transfer in heterophase multicomponent media, taking into account the rock deformation. The interfacial interaction corresponding to the local parameters of a hydrodynamic flow is described in the framework of the model of a flow-through multi-tank reactor based on minimizing the Gibbs potential. The paper considers various regimes of unsteady, nonisothermal flow of such heterophase media along a flat, uniform in height channel with variations in its slope of up to 30 degrees. The work was financially supported by the Russian Foundation for Basic Research, grants No. 16-29-15131, 16-01-00729.