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Modeling of convective heat-mass transfer in permeable parts of seismic focal zones of the Kamchatka region and associated volcanic arcs

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The paper presents a non-isothermal model of hydrodynamic heating of lithospheric rocks above magma chambers in application to the seismic focal zone of the Kamchatka region and associated volcanic arcs. The effect of convective heating of mantle and crustal rocks on dynamics of metasomatic changes and convective melting was studied. In the existing models of ore-forming systems, fluid mass transfer is determined mainly by the retrograde boiling of magmas in meso-abyssal intrusive chambers. Analysis of the manifestations of deposits of the porphyry formation of the Pacific Ocean active margins shows the decisive participation in their formation of mantle-crust ore-igneous systems. The model of convective heat-mass transfer in fluid mantle-crust systems coupled with magma chambers is designed with the consideration of effects of interphase interaction in rocks of permeable zones above igneous fluid sources. Numerical simulation of the dynamics of fluid systems under the volcanoes of the frontal zone of Kamchatka shows altered ultramafic rocks in metasomatic zoning and the presence of facial changes in the mineral composition of wehrlitized rocks. In the mantle wedge of the northwestern margin of the Pacific Ocean, over which epicontinental volcanic arcs developed in the post-Miocene stage, there is possible combination of the products of different-time and different-level igneous systems in the same permeable "earth's crust-lithospheric mantle" transition zones. Assuming that the "cratonization" of volcanic sections of the continental Earth's crust follows the "metasomatic granitization" pattern, the initial element of which is the wehrlitization of mantle wedge ultramafic rocks, the processes of metasomatic fertilization of mantle wedge rocks were investigated using a flow-through multiple-reservoir reactor. In the seismically active regions of the Pacific transition lithosphere, specific conditions for heating of areas of increased permeability above mantle fluid sources should be recorded. Metasomatic columns in such fluid systems can describe the formation of at least three levels of convective melting of metasomatized mantle wedge substrates, as well as the formation of a region of high-temperature fluid change of mafic intrusion rocks in the Earth's crust. The work was financially supported by the Russian Foundation for Basic Research, grants No. 19-05-00788.