

# **Numerical techniques for solving the inverse retrospective problem of mantle dynamics**

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I discuss an inverse (time-reverse) problem of thermal evolution of a viscous inhomogeneous incompressible heat-conducting fluid describing dynamics of the Earth's mantle. Present observations of geophysical fields (temperature, velocity) are incorporated in a three-dimensional dynamic model to determine the initial conditions of the fields in the geological past. I present and compare numerical techniques for solving the inverse problem: backward advection, adjoint, and quasi-reversibility methods. The methods are applied to restore the evolution of the mantle structures such as mantle plumes and descending lithospheric slabs.