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Inversion of Initial Conditions for Temperature-Driven Stokes Flow

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Simulations of dynamical natural processes relies on initial conditions which are usually poorly constrained, while the current state of system is well-known. Thus, inversion of initial conditions is considered as a PDE-constrained optimization problem with the goal functional representing mismatch between numerical results and observations. We consider an incompressible Stokes flow driven by the temperature changes. The system of equations consists of momentum equation, incompressibility condition and energy equation. This flow type describes motion of fluids with very slow velocities and large viscosities, and it is used in simulation of convection in the Earth's mantle [1]. Optimization problem is solved by the adjoint approach [2].

[1] G. F. Davies, *Dynamic Earth*, Cambridge University Press, 1999.

[2] M. D. Gunzburger, *Perspectives in Flow Control and Optimization*, SIAM, Philadelphia, 2003.