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Combined Mantle Convection and Mineral Physics Simulation

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Convection in the Earth's mantle is a complicated process affected, among others, by material parameters of the polycrystalline aggregates. To analyze the impact of competing thermal and chemical effects on processes in the earth's mantle, we integrate a thermodynamic model of mineral phase assemblages with a convection simulation code. The stable phases at given pressure and temperature conditions are determined by Gibbs free energy minimization. Relevant parameters of the mass and energy balance equations in the convection simulation, such as density and latent heat at phase boundaries, are controlled by the properties of the resulting phase assemblages. We also compute elastic moduli of the mineral phases in order to enable comparison between our model and seismological observations during post-processing.