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The effect of weak postperovskite on the Earth thermal history

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An interest in the lowermost mantle dynamics has been recently encouraged by the discovery of the postperovskite phase at the base of the mantle. Since then numerous studies appeared addressing the issues of the postperovskite transport properties, its effects on the core-mantle boundary region dynamics, core heat flux etc. Several evidences indicate that the postperovskite may have a lower viscosity than perovskite at the same pressure and temperature conditions. It has been shown that the soft postperovskite layer or isolated patches lying at the bottom of the mantle affect the dynamics of the slabs, the geoid and enhance the heat flux from the core. The perovskite-to-postperovskite phase transition only takes place in the relatively cold material and the postperovskite patches are nowadays expected in the presumably cold paleoslab areas. Therefore no postperovskite was probably present in the warm mantle in the early stages of the Earth thermal history. After it appeared its ammount was changing with time during the mantle evolution. Here we will present the results of a 2D numerical simulations of the mantle thermal evolution. We use the axisymmetric model with the Newtonian rheology with the viscosity dependent on the temperature and phase. We study the effects of the initial temperature, rheological parameters and internal heating rate on the mantle evolution. The perovskite to postperovskite phase change is taken into account and the effects of a possible rheological weakening on the core cooling will be discussed.