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Comparative effects of six phase transitions in the mantle

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Reconstruction of the mantle flows within the mantle is important for understanding of the Earth evolution. We have calculated about two hundred models of mantle convection with various parameters of phase transitions. Olivine, Wadsleite, Ringwoodite, Perovskite, post Perovskite, Garnet- Perovskite and spin transition. These phase transitions on the depths 410, 560, 660, 700, 1500 and 2700 km have very different values of Clapeyron slopes, density jumps and transition widths. Mantle convection structure mainly depends on phase parameter (p=slope*density jump), which appear to be very similar in absolute value for almost all transitions. Results are presented on the diagram for Nusselt number as a function of phase parameter - p and width of transition, which shows that phase transition 660 km partially slows down mantle flows on about 5% and all other transitions increase the intensity of mantle convection for about approximately 8% (2% for one phase transition). We also done special analysis of joint effects of two phase transitions close to each other: very thin (5km) Ringwoodite-Perovskite with negative slope and thick (40 km) non-olivine components Garnet-Perovskite. Joint effects of these transitions greatly depend on convective flows and can change results of tomography interpretation.
Also it was received good correlation between real MTZ width for different regions (hotspots, subduction zones etc.) with results of modeling.