

The thesis is focused on the investigation of Rayleigh-Bénard problem in an extended setting approximating the conditions in the Earth's mantle. The aim is to evaluate the influence of depth- and temperature- dependent material parameters, dissipation, adiabatic heating/cooling and heat sources on the qualitative characteristics of thermal convection. We identify the critical values of dimensionless parameters that determine the onset of convection and characterize the dominating convection patterns in marginally supercritical states. These issues are addressed by the application of linear stability analysis and weakly non-linear analysis. It has been found that the character of convection differ substantially from the standard case of Rayleigh-Bénard convection.