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Dynamiical layering in mantle convection - impact on the viscoisity structure

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Thermal boundary layers play a key role for the dynamics of the Earth's mantle. They mark the transition between the core and the mantle and , at least locally and transient, the transition between the upper- and the lower mantle at a depth of 670 km. There is much evidence that these boundary layers do not resemble the picture of a simple thermal boundary layer, as known from thermal convection at high Rayleigh number. Especially the lower boundary seems to be of complex structure, possible induced by compositionally dense material. Present models of mantle convection, aiming at simulating the complex structure and dynamics of the lower boundary layer require several ad hoc assumptions. Especially the density excess and the mass of compositionally distinct need to be assumed. Both conditions are critical for the dynamics but hardly constrained. The internal boundary at 670 is usually implemented by specifying a density jump through a phase boundary, We have developed models where the internal boundary as well as a thermochemical CMB , displaying topography which result from compositionally distinct piles , develop self consistently without the named ad hoc assumptions. As a starting condition we assume that a chemically stratified mantle, as resulting from fractional crystallization in an early magma ocean , is heated by the hot core. Double diffusive convection in material with strongly temperature dependent viscosity leads then to layering and, in a later state to the formation of a rough lower thermochemical boundary layer. Especially the viscosity profiles, as emerging from this configuration are investigated and compared with recent results from inversion studies.