The Impact of the Iron Spin-transition on Seismic Signatures in Bullen's C-Layer

*M Hosein Shahnas[1], Russell N. Pysklywec[1], David A. Yuen[2]

1. University of Toronto, 2. University of Minnesota

Bullen's C-Layer lies between 660 km and 1200 km and has distinctive signatures characterized by discontinuities which may have geodynamical origins. The high-spin to low spin transition of Fe^{++} in iron-magnesium oxides in the lower mantle is a second-order phase transition which causes changes in the density, and elastic properties. They are likely to occur below ~1200 km depth with the highest degrees of influence at about 1800 km depth, depending on the local temperature conditions. We have investigated the dynamical consequences with a compressible spherical convection model, where this transition has been included. Depending on the magnitude of this second-order transition, the sinking slabs may be stagnated at mid mantle depths (~1600 km) or be slowed at the shallower depths. Similarly the rising plumes can be stagnated below ~1600 km depth; resulting a layered convection in the lower mantle. Our results show the potential importance of the high-spin to low spin transition in creating visible seismic signatures in the Bullen’ s C-layer and the D-layer.

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