

The rhythm of the interior activity of the Earth controlled by mantle convection

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In Cretaceous, there existed magnetic superchron, and at that time mantle activity was very vigorous; the spreading rate of oceanic floors was very high and the seamount chains and the continental flood basalts were formed. The mechanism of the correlations between the magnetic reversal frequency and the mantle plume activity is supposed to be intermittent passing of slabs and hot plumes due to the 660km phase transition.

In this study, we investigate the effect of the negative Clapeyron-slope of the 660km transition zone on the mantle convection, and the time scale of the collapse of the stagnant slab on the transition zone. The parameters are Rayleigh number, internal heating rate, Clapeyron slope of the 660km transition zone. We calculate thermal convection in three dimensional spherical shell and estimate the time scale and spatial scale of the pattern transition. We scope on the relation of the total heat flow at the surface to that of the core-mantle boundary, and how long time lag can arise in convecting state.