The 64th GRC & The 9th MEXT Shin-Gakujutsu "Core-Mantle Coevolution"
International Frontier Seminar

Lateral temperature variation through ICB to CMB in geodynamo simulations

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In the last two decades, magnetohydrodynamics (MHD) simulations have represented basic characteristics of the geomagnetic field. The models of these dynamo simulations are very simple, and parameter regime is quite far from the expected values of the Earth's outer core. Resent seismic observations suggests that inner core has a seismic anisotropy, and the seismic anisotropy suggests aspherical growth of the inner core. To explain inner core anisotropy and aspherical growth of the inner core, a number of dynamo simulations has been performed with prescribed boundary conditions at ICB to take into account the inner core heterogeneity. In the present study, we solve the heat equation for the inner core and outer core simultaneously with applying the same thermal diffusivity for the entire core. In the present model, the heat flux and temperature at ICB are not the given condition, but the output of the simulation. The results show that the time averaged thermal structure at ICB is likely to the simulation results with homogeneous heat flux boundary conditions. The time averaged lateral temperature variation is approximately 26% of the average temperature difference between ICB and CMB, while lateral heat flux variation is only 6% of the average heat flux at the ICB. The dominant stable temperature variation is in the lateral direction: The temperature at the high latitude is higher than that around the equator. This lateral variation penetrates to the CMB, and the warm patch around the pole also generate weak magnetic field area at the pole only in the dynamo simulation case.

CoreMantle Coevolution

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