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Effects of Ekman number and thickness on stably stratified region below core-mantle boundary in numerical dynamo simulations in a rotating spherical shell

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In the previous study [Nakagawa, 2011], this has been investigated in fluid dynamical behaviors on stably stratified region in 300 km below core-mantle boundary (CMB) with numerical dynamo simulations in a rotating spherical shell, which seems not for the magnetic field generation to affect the main dynamics including stratified region but to have the filter effect for small-scale patches of magnetic field. However, in this study, the Ekman number was higher than the ordinary numerical dynamo simulations, which would be $O(10^{-5})$. Here we try to decrease the Ekman number as an order of 10^{-5} and varying the thickness of stratified region that may be consistent with seismic analyses [Tanaka, 2007; Helffrich and Kaneshima, 2010], which would be less than 100 km, to investigate dynamical behavior of the dynamo action in a rotating spherical shell. The stratified region that is the same formulation as Takehiro and Lister [2001] is implemented into Parody-JA code [Aubert, 2005]. When lower Ekman number is used, the stratified region may work for the filter of small-scale patches of radial magnetic field if the Rayleigh number is high enough to be less than 1 of frequency ratio between Rossby and buoyancy waves and the dynamics across the stratified boundary is strongly decoupled, which is slightly different from the previous study. This means that the different dynamics in the stratified region may exist because the radial resolution in the previous study has been very low compared to the current cases. In the presentation, we will also show the effect of thickness of stably stratified region below CMB and discuss an importance of stratified region below CMB in the core dynamics.