Geodynamo simulation with Ek=O(10E-7): (1) Basic features

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We have performed a geodynamo simulation with low Ekman number (Ek) of the order of O(10E-7). We numerically solve the time development of thermal convection motion of an electrically conducting fluid confined in a rapidly rotating spherical shell, or the outer core.The MHD equations are numerically solved by the finite difference method on a spherical grid system called Yin-Yang grid. The calculation was performed on 512 nodes (or 4096 processors) of Earth Simulator super computer. Our highly optimized simulation program enabled us to perform geodynamo simulation under such a low Ekman number region. In this talk, we will report the basic features of the MHD fields in the low Ek condition; the convection fluid velocity, magnetic field, and electric current. The convection motion is organized as a set of dynamically flutteringthin sheets, or sheet plumes. The electric current is organized as a set of helical springs. A bunch of (almost) straight magnetic field lines are threading through the springs. We also have performed geodynamo simulations in which effects of the resistive inner core are taken into account in our Yin-Yang dynamo code. Effects of the inner core will be reported.