Effect of precession on thermally driven convective dynamo

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The geodynamo is believed to be powered by thermal or compositional convection in the Earth's metallic fluid core. This mechanism has been well studied particularly by recent computer simulations. Fluid motion driven by luni-solar precession is also recognized as a possible cause of the geomagnetic field. This model has been mainly studied by laboratory experiments rather than numerical simulations. Here, I attempt to carry out numerical simulations of Earth-type dynamo driven by both of the energy sources. The thermal and compositional buoyancy is basically constrained by an isotropic boundary condition. Although heterogeneities of the mantle and inner core are of some importance, it is hard to consider extreme asymmetry because the Earth's structure is basically spherical. On the other hand, precession is fundamentally anisotropic, originating from a gravitational torque to change the Earth's spin axis. Therefore, precession has an effect of breaking symmetry of the dipole magnetic field, while buoyancy tends to maintain the symmetry. This character might be important in considering the cause of the geomagnetic excursion and reversal. I explain a geodynamo model driven by both thermal buoyancy and precession and report some numerical results with relative importance of these two driving sources changed.