Geodynamo Models with Core Evolution

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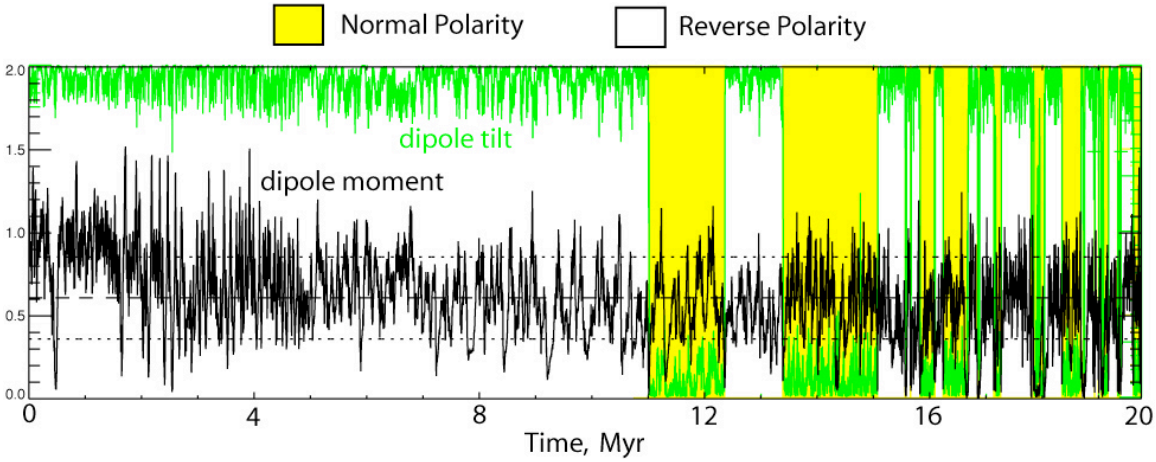
Numerical dynamos with time-variable control parameters that simulate the secular evolution of the core are used to interpret long-term trends in geomagnetic field behavior, including changes in polarity reversal frequency. Dynamos with time evolution in convective forcing, inner core size, and rotation rate show trends in dipole field intensity and fluid velocity with systematic variations in polarity chrons in some cases. The dynamo model shown below started in a non-reversing state and subject to anomalously fast inner core growth rate (simulating a pulse of rapid cooling of the core) evolves over 20 Myr to a reversing state with substantial trends in dipole intensity and polarity chron length. The dispersion of polarity chron lengths in the dynamo model with anomalous evolution is qualitatively similar to the observed dispersion of geomagnetic polarity chrons since the end of the Cretaceous Normal Superchron.

The dynamo code *MAG* used here is supported by the Computational Infrastructure for Geodynamics (CIG).



A 20 Myr simulation of an evolving geodynamo model, showing the effects of accelerated core cooling on the frequency of geomagnetic polarity reversals.

Reference*:* Driscoll, P. and P. Olson, Polarity Reversals in Geodynamo Models with Core Evolution, *Earth Planet Sci. Lett.,* (in press), 2009.