Paleomagnetic Intensity Data as a Time Series: Opening a Window Into Dynamics of Earth's Fluid Core?

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We consider paleomagnetic intensity data obtained from sedimentary cores as a time series related to fluctuations of the fluid velocity in Earth's core. Although this is a gross oversimplification of the relationship between these two vector fields, some aspects of their possible interaction might be obtained through inversion of paleomagnetic intensity data. In particular, the onset and development of turbulence as seen in laboratory experiments on fluid instabilities may be contained in a paleointensity time series. Just as in these laboratory experiments, changes in flow regimes of Earth's fluid core and the effects of irregularities on the development of bifurcations should be traceable in relative paleomagnetic intensity data. For example, growth of the inner core would alter the geometry determining instability properties that are detectable in the observed growth and decay of paleointensity. Limiting this interpretation are factors such as errors in timing and in measured relative paleointensity.

Non-linear inversion of records from the ODP983 dataset of paleomagnetic intensities will be presented. Growth and decay with time of paleomagnetic amplitudes are modelled as exponential and two harmonics. This simple model accounts for most of the paleomagnetic amplitude signal, thus providing a first step in modelling the dynamical processes producing the magnetic field.

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