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New Evidence for Rotational Instability in Earth's Core

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We report on regions of significant coherence between the Paleomagnetic Axial Dipole Moment data set (PADM2M,Ziegler, 2011) and a simulated lunar tidal strain over the past 2 Myr. Such coherence between tidal strain and composite records of relative paleomagnetic intensities from oceanic cores (SINT2000, PISO1500) has been found previously. The recent PADM2M data set, comprised of both Absolute Paleointensity from volcanics as well as records of relative paleointensity from oceanic cores, is used to provide further evidence of the effect of long term lunar strain on rotationally excited instability in Earth's core.

Our model for a tidally excited elliptical instability in Earth's fluid core predicts its growth and decay and corresponding behaviour of the paleomagnetic field, which we also find. Extraction of the tidal strain from the paleomagnetic record using our algorithm developed for this purpose, shows known reversals occur at maximum strains. While such a precise coincidence might have occurred independently of our model's instability, we find significant coherence across all three of the above datasets with simulated lunar strain. Replacing the lunar strains with zero-mean, Gaussian noise produces coherences with our paleomagnetic data sets that do not rule out rotational instability in Earth's core.