

Implications of geomagnetic secular variation for understanding the core

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We have increasingly rich descriptions of the variation of the magnetic field with time on both historical and palaeomagnetic time scales, both subjects dear to the heart of Prof. Kono. The historical record, and to a certain extent the palaeomagnetic record, when viewed at the core surface, present some features that fit together with theory and simulation, but there are also some enigmatic features. I will discuss the three different domains in the core, namely the cylinders above and below the inner core, the region immediately outside this region and the equatorial belt. Of the three the latter poses the most challenges, since the observations (and palaeomagnetic observations to a lesser extent) indicate the presence of strong flux spots which are azimuthally aligned, features rarely, if ever, seen in numerical simulations. The historical record strongly suggests the importance of torsional oscillations as an underlying contributing factor to geomagnetic 'jerks' and exchanges between core and mantle of angular momentum. These also hold the promise to contribute to our understanding of the internal strength of the magnetic field, the coupling between core and mantle and the variation of electrical conductivity in the mantle.