NEW INSIGHTS FOR GEOMAGNETIC JERKS FROM ANALYSIS OF VARIATIONS IN LENGTH OF DAY

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It is commonly assumed that rapid changes in the geomagnetic field arise as a result of changes in flow at the top of the core. Simple arguments suggest that a geomagnetic jerk, a sharp change in the second time derivative of the geomagnetic field, should be associated with a sharp change in the first time derivative of the surface core flow. Evidence has been presented that at least some features of geomagnetic jerks can be explained in terms of torsional oscillations; this would imply a contemporaneous discontinuity in the rate of change of length of day. We have presented indirect evidence for this occurrence in past work; here, we prevent direct evidence for two discontinuities in length-of-day time derivative prior to the 1969/1971 geomagnetic jerk(s). For these jerks, we can quantify the torque discontinuity on the Earth that would be required to match the observations. Because of the nature of the background variation of length-of-day, such quantitative estimates are harder to make for subsequent jerks, although in these cases as well there is clear direct evidence for discontinuities in length-of-day time derivative. Torsional oscillations are not capable of explaining all features of observed geomagnetic jerks; however, our study provides further evidence that they are an important part of the phenomena.

Geomagnetic jerk, length-of-day, torsional oscillations

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