

Short-Term Changes in the Geomagnetic Field: High-Resolution Records and the Relation to Geodynamo Simulations

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Rapid changes of the geomagnetic field challenge the resolution of the best natural recorders. Volcanic records are literally shot full of holes with gaps of unknown length between each cooling unit. Sedimentary recordings are smoothed to an unknown degree by poorly understood remanence lock-in and diagenetic magnetization processes. Moreover, hiatuses may be common, especially in environments of rapid deposition, and they are usually difficult to identify. Thus paleomagnetic records are always incomplete and give only lower bounds on how fast and complex the field changes actually were. Geodynamo simulations provide a complementary approach to this problem, but limitations in computer power have prevented them from operating near the parameter regime appropriate for the core, with concomitant loss of spatial and temporal resolution. Nonetheless, they can provide insight into what kinds of field behavior may occur.

To make progress in the face of such difficulties we need to bear these shortcomings in mind while pushing forward on all fronts. In this paper we explore the possibility that at least some reversals and excursions are much more complex than typically portrayed, with episodes of oscillatory and very rapid field change.

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