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Magnetic jerks induced by field roughness

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Geomagnetic jerks are the shortest temporal variations of the core magnetic field registered by observatory and satellite data. Neither the physical mechanism producing such abrupt changes nor their observed characteristics at the Earth's surface are well understood and remain as outstanding issues in geomagnetism. We used synthetic core flow models to solve the radial magnetic induction equation in order to reproduce jerks and their characteristics, such as their non-global distribution and their various amplitudes for each component of the field. This demonstrates that geomagnetic jerks are not necessarily generated by impulses of the core flow, and that steady core flow may produce jerk-like timeseries at Earth's surface due to roughness of the field on the core-mantle boundary. We examine the dependence of magnetic jerk occurrence times and their characteristics on each type of flow.