# A Global Statistical Model of Extreme Geomagnetic Field Fluctuations

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The statistics of unusually high rates of change in the horizontal component of the geomagnetic field (dB/dt) are a useful indicator of the likelihood of damaging geomagnetically induced currents (GIC) in ground-based infrastructure such as electricity networks. Using extreme value theory (Coles, 2001) we present a global model of the probability of extreme |dB/dt| based on several decades of measurements from 125 magnetometers worldwide, with time cadences (dt) ranging from 1 to 60 minutes.

The occurrence rate of peaks in |dB/dt| above the 99.97th percentile is a function of magnetic latitude, magnetic local time, month, sunspot number, solar wind and interplanetary magnetic field conditions, and the direction of the field fluctuation. This information may be used to improve the extreme value model. The patterns of occurrence are presented and compared with previously studied distributions of Sudden Commencements, Pc5 ULF waves, and auroral substorm onsets, giving insight into the relative importance of these drivers in GIC modelling.

Reference:
S. Coles, An introduction to Statistical Modeling of Extreme Values, Springer-Verlag London ltd, 2001.