

EGU2020-8763

<https://doi.org/10.5194/egusphere-egu2020-8763>

EGU General Assembly 2020

© Author(s) 2023. This work is distributed under the Creative Commons Attribution 4.0 License.



Probability estimation of a Carrington-like geomagnetic storm

Isabel Serra^{1,2,3}, David Morriña^{3,4,5}, Pere Puig^{3,5}, and Álvaro Corral⁶

¹Centre de Recerca Matemàtica, Complex Systems, Spain (iserra@crm.cat)

²Barcelona Supercomputing Center, E-08034, Barcelona, Spain.

³Departament de Matemàtiques, Universitat Autònoma de Barcelona (UAB), E-08193, Barcelona, Spain.

⁴Unit of Infections and Cancer - Information and Interventions (UNIC - I&I), Cancer Epidemiology Research Program (CERP), Catalan Institute of Oncology (ICO)-IDIBELL, L'Hospitalet de Llobregat, Barcelona, Spain.

⁵Barcelona Graduate School of Mathematics (BGSMath), Edifici C, Campus Bellaterra, E-08193, Barcelona, Spain.

⁶Complexity Science Hub Vienna, Josefstädter Straße 39, 1080, Vienna, Austria.

Intense geomagnetic storms can cause severe damage to electrical systems and communications. this work proposes a counting process with Weibull inter-occurrence times in order to estimate the probability of extreme geomagnetic events. It is found that the scale parameter of the inter-occurrence time distribution grows exponentially with the absolute value of the intensity threshold defining the storm, whereas the shape parameter keeps rather constant. The model is able to forecast the probability of occurrence of an event for a given intensity threshold; in particular, the probability of occurrence on the next decade of an extreme event of a magnitude comparable or larger than the well-known Carrington event of 1859 is explored, and estimated to be between 0.46% and 1.88% (with a 95% confidence), a much lower value than those reported in the existing literature.