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Exomagnetic storms on Earth-like exoplanets

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The plasma conditions around exoplanets are likely to be important indicators for defining an exoplanet's habitability. Magnetic disturbances like interplanetary coronal mass ejections (ICMEs) result in magnetic storms, which influence a planet's magnetic field and possibly its atmosphere. Due to that, exomagnetic storms on Earth-like exoplanets may play a role in defining the exoplanets habitability in addition to well known other factors. On Earth the disturbance storm time (Dst) index is used to measure the severity of magnetic storms as a result from a magnetic disturbance, e.g. an ICME. We therefore investigate how the magnetic storm strength and the Dst index on hypothetical exoplanets with Earth-like magnetic fields behave depending on the distance of the planet from a Sun-like star. The input data for the calculation of the Dst index come from Wind, STEREO-A, STEREO-B, VEX, MESSENGER or ULYSSES in order to make realistic assumptions for the impacts of ICMEs on exoplanets with a Sun-like star. To quantify the scale factor of the magnetic field strength at different heliocentric distances we analyze an event sample, consisting of more than 660 magnetic flux ropes. We present an example event that was measured at 1 AU and scaled it to different distances with an increased magnetic field strength and a shorter duration. For the scaled event we use the Obrien & McPherron Dst model and compare the outcome with the actual modelled Dst at 1 AU. This is done with the purpose to see how the magnetic storm strength on an exoplanet changes at different heliocentric distances and therefore show whether such possible exomagnetic storms may play a role in planetary habitability.