

Satellite Vulnerability to Geomagnetic Storms

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There are several examples where satellite on orbit have failed or partially failed during geomagnetic storms resulting in large insurance claims. Whether the storm is directly responsible for the failures is very controversial, commercially sensitive, and difficult to prove conclusively since there are so few examples. However, there are many non-fatal errors, or anomalies, that occur during the lifetime of spacecraft that enable a statistical analysis. Here we present an analysis of over 5000 satellite anomalies that shows for the first time a statistically significant link between satellite anomalies and geomagnetic storms. We find that the period of highest risk lasts for six days after the start of a magnetic storm. Approximately 40% of anomalies could be due to a random occurrence, but in addition there are between 0 and 35% of satellite anomalies that we attribute as being directly related to geomagnetic storms. We show that the risk depends on satellite prime contractor, orbit type, and age of satellite.