A Comparison of Gamma and Lognormal Distributions for Characterizing Dst Variations of Long-lasting Geomagnetic Storms

*M. Chantale Damas[1], Jason Chou[1], Ying Dong[1]

1. Queensborough Community College of the City University of NY (CUNY)

In this study, the Disturbance Storm Time (Dst) profile of long-lasting storms are investigated. Dst variations for the entire duration of storms are approximated using both gamma and lognormal distributions. Profiles of fifty storms were evaluated so far and preliminary analysis showed that the Gamma distribution function may be a better fit overall than the lognormal distribution. Although both distributions tend to approximate the main phase of storms reasonably well, the gamma distribution function tend to approximate the recovery phase much better. Further analysis also shows that the gamma distribution function is also a much better fit than the lognormal distribution for storms caused by ICMEs as opposed to CIR storms. This may due CIR storms long duration recovery phases that can sometimes last days to weeks. This also applies to other storms such as High-Intensity, Long-Duration, Continuous AE Activity (HILDCAA) events with highly fluctuating magnetic fields. Of interest, energy dissipation is also modeled as a diffusion-like process where a 1-D diffusion profile would be equivalent to a Gamma distribution of k = 0.5. Profiles of evaluated storms show this diffusion-like profile suggesting the existence of a diffusion-like process in the energy dissipation in the ring current. More storms are being added to this study to further support our analysis and conclusion. Methods used and results will be discussed

Keywords: Dst, Geomagnetic Storms, Ring Current, ICMEs, CIRs, HILDCAA

