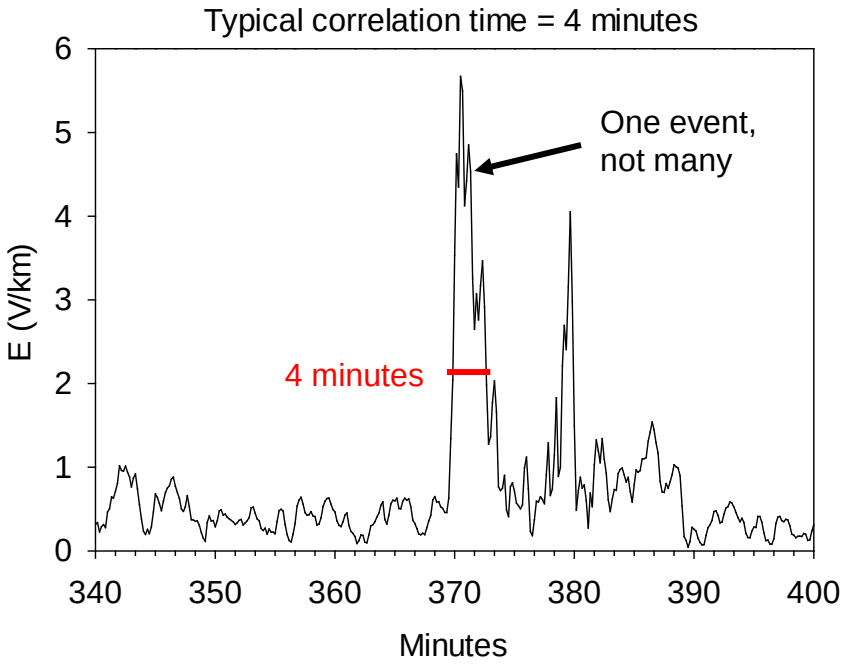
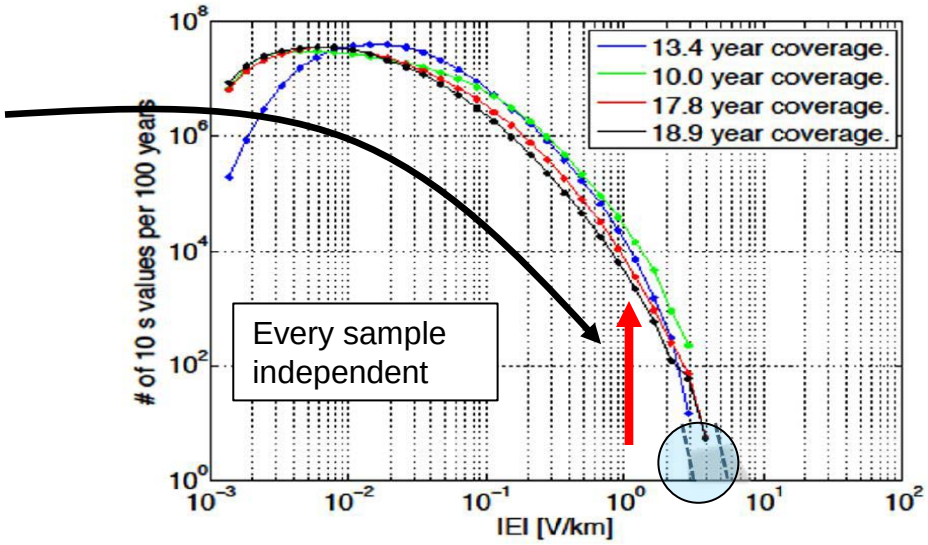
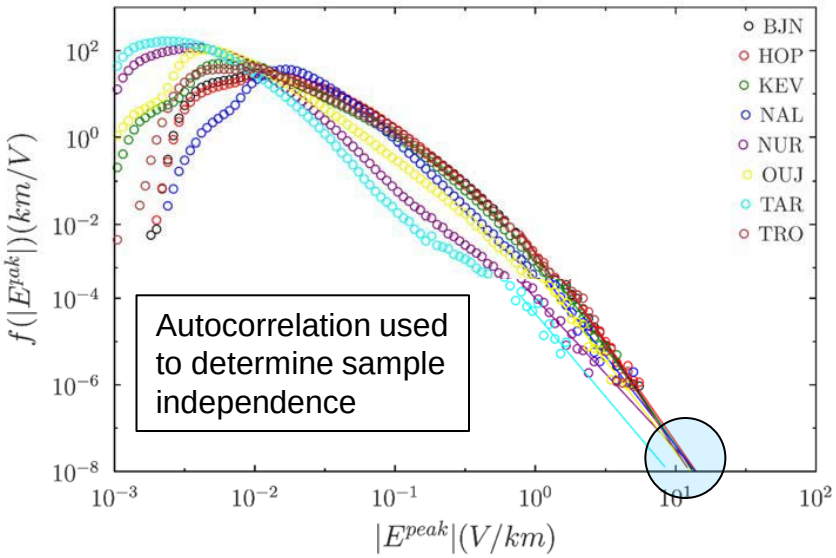
Statistical Methods Used To Develop the Benchmark

- **Autocorrelation of the geo-electric field signal determines the independence of samples**
- **Oversampling of the signal results in over counting of midrange geo-electric fields that bias the extrapolation to smaller benchmark field magnitudes**







Geomagnetic Latitude Scaling

- **Data show that more severe GMD events have different geomagnetic latitude scaling**
  - Weaker disturbances resemble the general trend of the proposed NERC scaling for the geo-electric field
  - More severe disturbances show amplification of the geo-electric field over the proposed NERC scaling at mid geomagnetic latitudes
- **Data set only includes 9 events more severe than Dst = -300, but the trend between 50-55 degrees north geomagnetic latitude appears to be robust.**
  - Indicates a mid latitude geo-electric field ~ 2X or more higher than the proposed NERC scaling
- **Proposed NERC scaling should be adopted**
- **Additional analysis and severe disturbance modeling should be done to provide refined geo-electric field scaling for near-term revisions**