

Complex magnetospheric-ionospheric electric currents as a driver of spatiotemporally localized extreme ground geoelectric fields.

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The spatiotemporal ground geoelectric field structures can be very complex during extreme storm conditions, and it has been discovered recently that the most extreme geoelectric field can be spatiotemporally localized. For many of the studied storms the most extreme geoelectric field were seen only at a single observatory. Further, these localized events were often associated with the largest field amplitudes over the entire storm, making them perhaps the most significant driver of extreme geomagnetically induced currents (GIC).

We do not yet understand the magnetosphere-ionosphere processes that are responsible for the localized events. However, the localized geoelectric field signature has to be a reflection of localized electric currents in the magnetosphere-ionosphere system. Since the ground-level spatial localization can be on scales of the order of 100 km, it appears that the electric current source for the localization has to be in the ionosphere. There are also indications that magnetospheric tail-related processes such as bursty bulk flows (BBF) and their coupling to the ionosphere may play a role in the localization. In this presentation, I will discuss the significance of the localized geoelectric fields and speculate some of the possible drivers for the phenomenon. The presentation is a call for contributions from the entire magnetosphere-ionosphere community to address the interesting phenomenon.

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