Geophysical Research Abstracts
Vol. 21, EGU2019-14855, 2019
EGU General Assembly 2019

Small scale variability in ionospheric electric field and conductivity: contributions to GIC.

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Geomagnetically Induced Currents (GIC) are driven by variations in the ionospheric electric currents, which in turn are enhanced by space weather activity. These currents are a convolution of the structure of the electric field and Pedersen and Hall conductivities in the ionosphere and there is evidence that the meso-scale structure of the currents is important in terms of the rate of change of the surface horizontal magnetic field (dH/dt), relevant to hazardous GIC. Thus it is important to determine the relative importance of the variabilities of the electric field and conductivities, not least how they relate to each other on meso (few 100 km) and small (<100 km) spatial scales.

We use data from the mainland European Incoherent Scatter (EISCAT) radars to derive estimates of the local electric field and conductance for an active period in September 2005, that contained a wide range of substorm activity and a moderate geomagnetic storm. These data were taken whilst the radar was performing a short-dwell scan and as such provide information on both the temporal and spatial variability of the parameters. We compare the tri-static electric field measurements with the Hall and Pedersen conductivities to establish the relationship between them. Finally we perform an initial analysis of the variability of these parameters in relation to an independent measure of dH/dt provided by local magnetometers. This will allow us to establish whether the variability in the electric field or conductivity is more important for generating large dH/dt.