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Towards understanding the role of the ionospheric electric field in geomagnetically induced currents: Electric field variability on different temporal and spatial scales as measured by EISCAT

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The Pedersen currents that flow in the ionosphere close electric circuits that link the magnetosphere to the ionosphere. There is evidence that the meso-scale structure of both Pedersen and Hall ionospheric currents is important in terms of the intense surface dH/dt, which is relevant to hazardous geomagnetically induced currents (GIC).
Ionospheric currents are a convolution of the structure of the electric field and the relevant conductivity; the ultimate intention is to examine the variability of both these ingredients (E-field and conductivity) and determine their relative contributions to meso- and small-scale variability in dH/dt.
The work presented here is an initial investigation into the spatial and temporal variability of the ionospheric electric field as measured by the EISCAT radars over northern Norway. It makes use of two techniques for measuring the E-field variability: A) the unique tristatic capability of the EISCAT UHF in providing a vector measurement at high temporal resolution; B) a monostatic scan over several minutes to provide a vector estimate. By comparing the distributions of the E-field values from the two techniques, operating simultaneously, we will gain insight into both the spatial and temporal variability under different geomagnetic conditions and how the measurements relate to each other.