Geophysical Research Abstracts
Vol. 20, EGU2018-12029, 2018
EGU General Assembly 2018

Local, Short-Lived, and Atypically Large Ground Magnetic Field Variations in Sweden and their Link to Geomagnetically Induced Currents

Andrew Dimmock (1), Lisa Rosenqvist (2), Emiliya Yordanova (1), Mats Andre (1), and Ella Carlsson (3)

(1) Swedish Institute of Space Physics, Uppsala, Sweden, (2) Department of Defence and Security Systems and Technology, Swedish Defence Research Agency, Stockholm, Sweden, (3) Swedish Institute of Space Physics, Kiruna, Sweden

Space weather is a global phenomenon which poses significant risks to both space-based assets and ground infrastructure. However, the impacts felt on the ground are often extremely localised and short-lived. Therefore, the ability to provide accurate, long-lead, and actionable forecasts remains a challenging problem. For example, sudden and dramatic enhancements of Geomagnetically Induced Currents (GICs) can be driven by short-lived and localised magnetic field structures in which the driving mechanism is not well understood. To improve forecasting capabilities, and for a complete understanding of the global space weather problem, it is important to study and quantify the nature, occurrence, and origin of localised of space weather effects. In this work, we focus exclusively on the impacts measured by Swedish ground-based magnetometers.

We thoroughly investigate several case studies in which Sweden was subject to extreme space weather effects in the form of large and localised GICs. Each of our events began with a prolonged period of southward IMF providing substantial energy input to the magnetosphere. The extended loading and "preconditioning" of the magnetotail was likely followed by a sudden but large energy release, enhancing the ionospheric currents which map to the Swedish station latitudes. We examine the physical magnetosphere-ionosphere coupling mechanisms and magnetospheric configurations which drive these local and harmful "spike-like" events. We also put these results into context with localised conditions such as the ground conductance and regional infrastructure.