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The increasing dependence on GNSS-based methods and technologies for global or regional navigation and communication has raised concerns about the impact of space weather on these systems. Temporal and spatial ionosphere variations caused by driving forces, such as changes in solar radiation, solar wind, and the Earth's magnetic field contribute to errors in satellite navigation positioning and communication systems. In this study we will focus on the impact of space weather in the Arctic region related to total electron content (TEC) and scintillation changes.

Measurements from the GNSS network of stations in Greenland are analyzed and geophysical variables such as such as TEC, amplitude scintillation indices (S_4), and phase scintillation indices (σ_ϕ), are calculated together with 2D/3D electron density and scintillation maps. For the TEC we applied data from the Greenland GNET network of stations – consisting of 62 stations, while the scintillations data are based on 50 Hz sampled data from a set of sites on the west coast of Greenland (i.e., Thule, Sisimiut, and Kangerlussuaq).

The GNSS-derived data is augmented by ground-based geomagnetic measurements, such as the Dst-index and magnetic H-component data obtained from the Greenland magnetic stations. Extreme ionosphere events will be presented and the underlying geophysical process will be identified and discussed. Especially results where large-scale gradients in the regional TEC are compared with the growth of scintillations.

We will identify crucial elements and parameters (such as the auroral oval and the auroral electrojet), driving these changes in the Greenland TEC, S_4 and σ_ϕ distributions, in order to come up with appropriate algorithms and tools for monitoring and predicting Arctic TEC and scintillation large-scale patterns.