

GNSS TEC and Scintillation monitoring under the Cusp to support rocket experiment in the Arctic

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The project termed GENIUS (GNSS TEC and Scintillation monitoring under the Cusp) has been funded by SIOS (Svalbard Integrated Arctic Earth Observing) and has been recently concluded. GENIUS aimed at supporting the rocket experiments launched in the frame of the Grand Challenge Initiative (GCI)-Cusp project with detailed regional information on the ionospheric structuring (TEC spatial and temporal gradients) and on the scintillation occurrence at Svalbard. The local monitoring of the TEC gradients and scintillation occurrence during the rocket campaigns helps to understand how the multi-scale physics of heating and precipitation revealed flying in the ionosphere is associated to the plasma irregularities probed by L-band receivers at ground. In the frame of the project, upgrade of the existing network of TEC and scintillation monitors at Svalbard took place to enable GNSS multi-constellation observation of the ionospheric irregularities. The field campaign took place between 7 January 2019 and 18 January 2019, during which activities were conducted in Ny-Ålesund (“Dirigibile Italia” Station and Kartverket) and Longyearbyen (Adventalen). In this paper, we show the ionospheric scintillation scenario depicted by analyzing raw amplitude measurements recorded by the GNSS receiver in Svalbard in correspondence with Vision-2 rocket experiment, conducted on 7 December 2018 between 11:05 UT and 11:20 UT. The figure below reports an example of the conducted analyses on satellite G05 (frequency E5a) whose signal was recorded by the GNSS receiver in “Dirigibile Italia” Station.

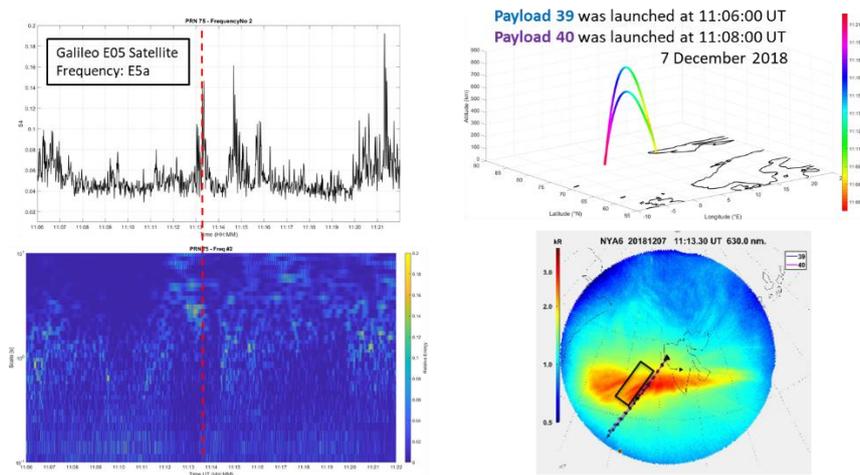


Figure 1. (top right) Panel b: tracks of the two payloads and corresponding times. (bottom right): tracks of the payload 39 in dark blue and of payload 40 in purple (arrows indicate the position at minute 11:13:30 UT) superimposed to All Sky Imager Intensity at 630.0 nm, black rectangle indicate the area covered by G05. (top left): time series of 1-second-S4 index for satellite G05 (frequency E5a) calculated from 50 Hz raw data. (bottom left) Instantaneous spectrum of the time series in top left panel [1]. Red dashed line indicates 11:13:30 UT.

References

- [1] Spogli, L., Piersanti, M., Cesaroni, C., Materassi, M., Cicone, A., Alfonsi, L., ... & Ezquer, R. G. (2019). Role of the external drivers in the occurrence of low-latitude ionospheric scintillation revealed by multi-scale analysis. *Journal of Space Weather and Space Climate*, 9, A35.