



The effects of the strong thunderstorms seen in the ionosphere above Poland by DEMETER and Swarm satellites.

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Abstract

Lightnings and particularly TLEs (sprites, jets, elves, halos) are associated with the electromagnetic connections and interactions between atmosphere, ionosphere and magnetosphere. DEMETER was a low-altitude microsatellite, it operated from June 2004 till December 2010 on a polar, circular orbit which altitude at the beginning was 710km but it was decreased to 660 km. DEMETER measured variations of the electric field in low frequency range from 0 to 20 kHz. The plasma analyzer instrument measured variations of the ion density 4 s time resolution. Langmuir probe gave the value of the electron temperature and density. A detector of energetic particle measured electrons and protons with energies from 70 keV to 2.34MeV every 4 s in survey mode and 1 s in burst mode. DEMETER has clearly shown, that thunderstorms and TLE can affected the ionosphere even at altitude of its orbit (680km). It registered many strong thunderstorms in Poland during its time of operation.

The Swarm constellation comprises 3 identical satellites launched on 22 November 2013 into a near-polar orbit. This set of satellites is still operating. Two of them are operating on the circular, polar orbits with initial altitude 460. Third one has also circular orbit, but with altitude 530. The orbits of the first 2 satellites are in almost the same plane, but third one is close to be perpendicular to the first two. The payload containing Vector Field Magnetometer, Absolute Scalar Magnetometer and Electric Field Instrument among other allows to study the effects in the ionosphere generated by thunderstorms. The measurements performed during flights over thunderstorms areas in Poland will be discussed in our presentation.

The discussion of the cross correlation between the ground based registrations (PERUN and VERA systems) and DEMETER and Swarm measurements of the ULF/ELF/VLF waves, electron density and temperature variations in the ionosphere related to the strong thunderstorms in Poland will be presented.

This work was supported by grant NCN 2017/27/B/ST10/02285 and ESA Contract No:4000112769/14/NL/FF/gp