NA1 Exchange Program Report

Basic Information

Title:

Visit the ionospheric research group of Institute of Atmospheric Physics, participation at the Solar variability and coupling effects in the Earth's atmosphere workshop

Visitor:

Veronika Barta

Host:

Petra Koucká Knížová

Dates of Visit:

2017.11.12-2017.11.16

Number of the Call:

CALL5

Home Institute/Laboratory/Company Information

Short Name: GGI, RCAES, HAS

Country: Hungary

Host Institute/Laboratory/Company Information

Short Name: UFA CAS

Country: Prague

(1) see list of participants

Expert Program report

The objective of the visit was to share mutual experience between the Hungarian and Czech ionospheric groups and coordinate their actual and future cooperation. The period of the visit was timed to the workshop in the host institute, which is addressed to the variability and coupling phenomena in the atmosphere and ionosphere and the solar influence on the system. The purpose of the workshop was to meet and work in a small group. The participants of the workshop were respected members of the international community, mainly from Central and East Europe.

In the workshop I presented the ionospheric related research, which has been performed in the recent years at the Geodetic and Geophysical Institute. The VISRC-2 digital ionosonde has been installed at the Nagycenk Geophysical Observatory, Hungary in 2007. The following measurements are performed: vertical sounding in every 15 minutes, oblique sounding in the collaboration with the Space Research Centre, Warsaw. The thunderstorm related mechanical and electrodynamic coupling mechanisms between the troposphere and the ionosphere have been studied using statistical analyses and event studies. The studies focused on the changes of the lower ionosphere, especially the sporadic E (Es) layer. Data of different lightning detection systems (WWLLN, LINET), foEs parameter measured at more ionosonde stations (Rome, Pruhonice, Nagycenk), sprite events observed from Sopron and Nydek and data of a five-point continuous Doppler sounding system were used in this complex study. The results indicated that the critical frequency foEs decreased during and after lightning activity. Further studies suggested the possibility of a cause-and-effect relation between a thunderstorm and an overlying Es layer. The time series of the fmin and foE parameters recorded at meridionally-distributed ionosonde stations in Europe were analyzed during the most intense solar events (July 14, 2000; Sep/Nov 2001 and Oct/Nov2003) of the Solar Cycle 23. Extreme increases of the fmin values (2-7 MHz) were observed at almost every European station during the most intense solar flares of the selected events. This response of the fmin parameter increases with increasing latitude. The latitude dependence of the fmin variation in response to X-ray changes (and without proton events) is relatively modest. During the time of the increased values of the fmin parameters the concurrent absence of the foE parameter was detected. This total radio fade-out was observed for hours to days in almost every event at high latitude stations due to the Polar Cap Absorption (PCA) caused by the precipitation of high-energy protons.

In the workshop we talked about a possible cooperation with Finnish, Czech and Russian researchers in connection with the solar flares and solar proton event effects on the lower ionosphere. The idea is to perform a detailed analysis on the impulsive solar event which occurred in September, 2017 using the fmin and foE data recorded at more meridionally distributed ionosonde stations and compare the results with chemical atmospheric models. The planned close scientific cooperation will be established on a long-term basis which will be very beneficial for successful development of scientific ionospheric community on both the regional and international level (NA1).