Geophysical Research Abstracts
Vol. 17, EGU2015-8926, 2015
EGU General Assembly 2015

The multi-instrumental radio diagnostics of the ionosphere for Space Weather Program

Andrzej Krankowski (1), Hanna Rothkaehl (2), Sergey Pulinets (1,3), Iurii Cherniak (1), and Irina Zakharenkova (1)

(1) University of Warmia and Mazury in Olsztyn, Space Radio-Diagnostics Research Centre (SRRC/UWM), Olsztyn, Poland (kand@uwm.edu.pl), (2) Space Research Centre, Polish Academy of Sciences, Poland, (3) Space Research Institute, RAS, Space Geophysics, Moscow, Russian Federation

To give a more detailed and complete understanding of physical plasma processes that govern the solar–terrestrial space, and to develop qualitative and quantitative models of the magnetosphere–ionosphere–thermosphere coupling, it is necessary to design and build the next generation of instruments for space diagnostics and monitoring. Novel ground- based wide-area sensor networks, such as the LOFAR (Low Frequency Array) radar facility, comprising wide band, and vector-sensing radio receivers and multi-spacecraft plasma diagnostics should help to solve outstanding problems of space physics and describe long-term environmental changes.
The LOw Frequency ARray – LOFAR – is a new fully digital radio telescope designed for frequencies between 30 MHz and 240 MHz located in Europe. The three new LOFAR stations will be installed until summer 2015 in Poland. The LOFAR facilities in Poland will be distributed among three sites: Lazy (East of Krakow), Borowiec near Poznan and Baldy near Olsztyn. Each site will host one LOFAR station (96 high-band+96 low-band antennas).
The new digital radio frequency analyzer (RFA) on board the low-orbiting RELEC satellite was designed to monitor and investigate the ionospheric plasma properties. In addition to the in-situ space plasma measurements the topside sounders will be installed onboard the “Ionosphere” spacecrafts to retrieve the vertical distribution of electron concentration in the topside ionosphere. The first two satellites are scheduled for launch at the first half of 2016. These two-point ground-based and topside ionosphere-located space plasma diagnostic can be a useful new tool for monitoring and diagnosing turbulent plasma properties. In order to improve and validate the large scale and small scale ionospheric structures we will also use the GPS observations collected at IGS/EPN: global and regional TEC maps created with high special and temporal resolution, ROTI maps over the Northern Hemisphere and the data retrieved from FORMOSAT-3/COSMIC radio occultation measurements.
The main purpose of this presentation is to describe new advanced diagnostic techniques of the near-Earth space plasma and point out the scientific challenges of the radio frequency analyzer and topside sounder located on board of low orbiting satellites and LOFAR facilities.