

Ionospheric research for space weather service support

I. Stanisławska¹, T.L. Gulyaeva², B. Dziak-Jankowska³

¹ **Space Research Centre, Polish Academy of Sciences (SRC PAS), Bartycka 18st., Warsaw
00-716, POLAND.
(E-mail: stanis@cbk.waw.pl)**

² **Pushkov Institute of Terrestrial Magnetism, Ionosphere and Radiowave Propagation,
Russian Academy of Sciences (IZMIRAN), Kaluzhskoe Sh.4, a.d. Troitsk, 142190 Moscow,
RUSSIA.
(E-mail: gulyaeva@izmiran.ru)**

³ **Space Research Centre, Polish Academy of Sciences (SRC PAS), Bartycka 18st., Warsaw
00-716, POLAND.
(E-mail: bdziak@cbk.waw.pl)**

ABSTRACT

Knowledge of the behavior of the ionosphere is very important for space weather services. A wide variety of ground based and satellite existing and future systems (communications, radar, surveillance, intelligence gathering, satellite operation, etc) is affected by the ionosphere. There are the needs for reliable and efficient support for such systems against natural hazard and minimalization of the risk failure.

The joint research Project on the ‘Ionospheric Weather’ of IZMIRAN and SRC PAS is aimed to provide on-line the ionospheric parameters characterizing the space weather in the ionosphere. It is devoted to science, techniques and to more application oriented areas of ionospheric investigation in order to support space weather services. The studies based on data mining philosophy increasing the knowledge of ionospheric physical properties, modelling capabilities and gain applications of various procedures in ionospheric monitoring and forecasting were concerned.

In the framework of the joint Project the novel techniques for data analysis, the original system of the ionospheric disturbance indices and their implementation for the ionosphere and the ionospheric radio wave propagation are developed since 1997. Data of ionosonde measurements and results of their forecasting for the ionospheric observatories network, the regional maps and

global ionospheric maps of total electron content from the navigational satellite system (GNSS) observations, the global maps of the F2 layer peak parameters (foF2, hmF2) and W-index of the ionospheric variability are provided at the web pages of SRC PAS and IZMIRAN. The data processing systems include analysis and forecast of geomagnetic indices ap and kp and new eta index applied for the ionosphere forecasting. For the first time in the world the new products of the W-index maps analysis are provided in Catalogues of the ionospheric storms and sub-storms and their association with the global geomagnetic Dst storms is investigated.

The products of the Project web sites at **<http://www.cbk.waw.pl/rwc>** and **<http://www.izmiran.ru/services/iweather>** are widely used in scientific investigations and numerous applications by the telecommunication and navigation operators and users whose number at the web sites is growing substantially from month to month.

Key words: Ionosphere, GNSS, space weather