

# IONOSPHERIC EFFECTS OF HIGH SOLAR AND GEOMAGNETIC ACTIVITY

**Boška J, Burešová D, Kouba D, Šauli P**  
**Institute of Atmospheric Physics Academy of Sciences of the Czech Republic, Boční**  
**II/1401, 14131 Prague 4, Czech republic**

## **Abstract:**

During years 2003 - 2004, in the descending phase of 11-year solar sunspot cycle, several periods of a sudden enhancements of solar and geomagnetic activity were observed. Effects of these strong events, as they were monitored at Průhonice observatory (49.59 N; 14.33E) and other European ionospheric stations, are main object of the paper. Two strong geomagnetic storms characterized by  $K_p = 9$  were observed during second half of the year 2003 (28 October - 5 November and 19 - 23 November). These events were accompanied by sudden disturbances in the Earth's ionosphere and strong ionospheric storms with duration of 4 - 5 days. The first event (28 October - 5 November 2003) is one of the strongest episodes, which was observed during actual solar cycle. Geomagnetic index  $K_p$  reached value 9 for two days. This geomagnetic situation resulted in the strong ionospheric storm (positive phase of the storm occurred 28 October, 2003) that strongly affected ionospheric parameters (critical frequency of the ionospheric F2 layer) during more than 5 days. The course of this storm, as it was recorded on several European ionospheric stations, is reported. During second storm 19-23 November, 2003 many interesting phenomenon were observed. The November storm was weaker than the October storm, however the effects in the ionosphere (due to configurations of geomagnetic field) were very dramatic and unexpected. Several extraordinary phenomena (optical aurora and auroral ionospheric layers at midlatitudes, quick changes in electron density profiles) were observed. Extraordinary auroral ionospheric layers (at 150 - 300 km heights interval) were visible on ionograms measured in Průhonice observatory 20 November 2004 between 15 and 22 hours UT. Electron density profiles, computed from ionograms during this time interval, show pronounced rapid changes of the profiles with maximum ionization about  $3 - 6 \cdot 10^5 \text{ cm}^{-3}$  at heights 150 - 200 km. These values are 3 - 6 times larger than normal values of electron concentration at the same time. New digisonde measurements (DPS 4 equipment) started regular ionospheric soundings and ionospheric drift measurements at Průhonice observatory in January 2004. The second part of this paper deals with effects of high solar and geomagnetic activity, which were observed at Průhonice observatory in ionospheric drifts measurements during 2004 year. Many interesting changes of the ionospheric drifts were observed on the records of the 5-minutes drift measurements July - August 2004, and on the 15-minutes measurements during several autumn events.

