

# Variations of electric field power spectra and meteorological values in the near ground atmosphere in Kamchatka during the solar events in November, 2004

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The paper [Smirnov et al. 2013] studies the effects of solar flares and geomagnetic storms on November 8 and 10, 2004 in time variations of electric field intensity together with other geophysical parameters observed simultaneously at “Paratunka” observatory on November 4 – 15. In particular, the data of solar event chronological sequence for this period, meteorological values (temperature, pressure, air humidity, wind velocity), geomagnetic indexes, cosmic and X-ray fluxes were applied. This data set allowed us to detect the phenomena with peculiarities: November 4-5 – fine weather days; November 6 – 7 ноября – days with anomalous diurnal variations of temperature and humidity; November 8 – the main phase of the first geomagnetic storm with imposed thunderstorm processes on electric field intensity diurnal variations; November 10 – second geomagnetic storm and November 11 – 12 – recovery period with imposed thunderstorm processes. It was interesting to study wave processes in the near ground atmosphere for this period by evaluating power spectral density by periodogram method (to be short, power spectra) of the mentioned above parameters in a wide range of atmospheric waves: gravitational waves ( $T = 5 \text{ min} - 3 \text{ h}$ ), heat tidal waves ( $T = 4 - 24 \text{ h}$ ) and planetary scale waves ( $T > 24 \text{ h}$ ). A detailed analysis of power spectra of the considered parameters was carried out in the paper [1]. It was shown that during calm geomagnetic conditions the greatest impact on electric field in the near ground atmosphere is caused by atmosphere relative humidity variations increasing the component with  $T \sim 24 \text{ h}$  period in its spectrum. Geomagnetic storms significantly distort electric field power spectrum decreasing the intensity in the period band of gravitational waves and heat tidal waves and increasing the intensity of the components with  $T \sim 48 \text{ h}$  period by about one order of the value in comparison to fine weather conditions. Simultaneously with that intensification of this component in galactic cosmic rays power spectrum was observed. Difference of power spectra of electric field and geomagnetic field horizontal component (both in

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composition and spectral component intensity) for fine weather conditions and during the geomagnetic storm on November 10 allow us to conclude there is no cause-and-effect relations between these values. Sequence of powerful solar flares accompanied by anomalous atmosphere temperature and humidity increase which resulted in appearance of strong thunderstorm processes during the geomagnetic storm on November 8 and did not allow us to detect the affects associated with galactic cosmic rays at this background.

#### **REFERENCES**

Smirnov, S.E., Mikhailova, G.A., Kapustina O.V., 2013: Variations in the quasi-static electric field in the near-Earth's atmosphere during geomagnetic storms in November 2004. *Geomagnetism and Aeronomy*, **4**, 502-514, doi: 10.1134/S0016793213040130.