Institute of Monitoring of Climatic and Ecological Systems SB RAS

National Research Tomsk State University

THE ELECTRIC FIELD OF THE UNDISTURBED ATMOSPHERE, ITS DIURNAL AND SEASONAL VARIATIONS IN THE SOUTHEAST OF WESTERN SIBERIA: A CASE STUDY ON TOMSK CITY

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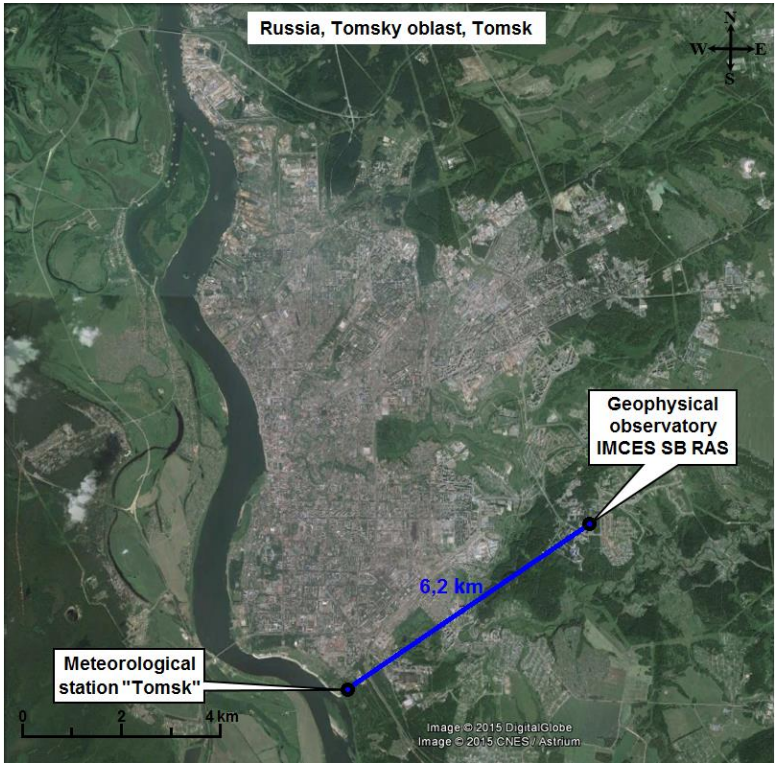
Used data and their processing

- The time series of one-minute average electric field potential gradient ($\nabla\varphi$) from 2006 to 2019 has been measured at the Geophysical Observatory of the IMCES SB RAS (Tomsk) using the electric field mills “Pole-2” (A.I. Voeikov Main Geophysical Observatory) and “CS110” (Campbell Scientific, Inc) was used in this study.
- Additionally the meteorological observations data at the GO IMCES SB RAS and at the Tomsk weather station (WMO ID 29430)[1], located about 6 km from the observatory, was used.
- Based on meteorological data according to guidelines[2] the electric field potential gradient variations during the fair-weather conditions was selected and analyzed.

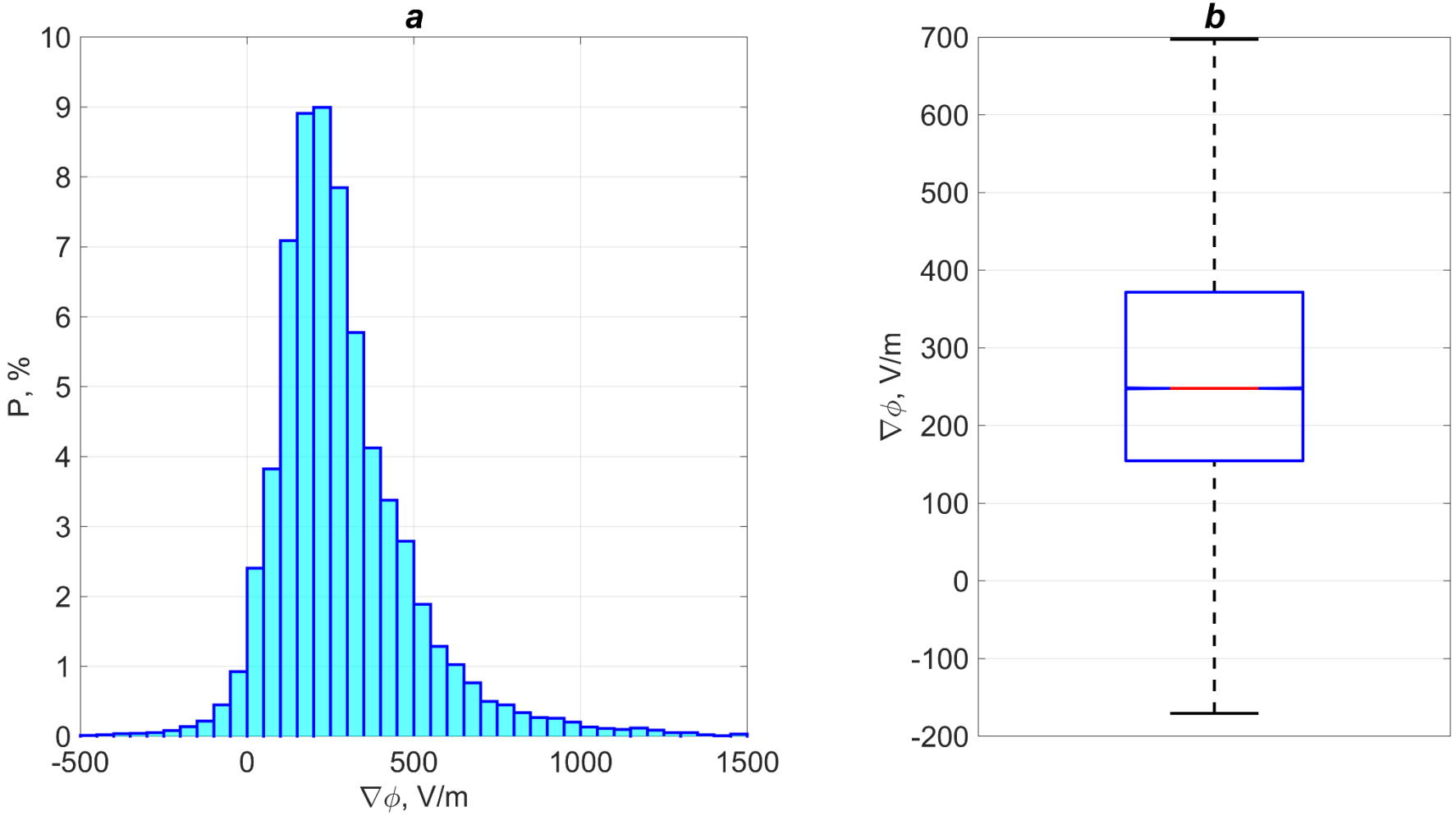


Relative positioning of meteorological station "Tomsk" and geophysical observatory IMCES SB RAS

1. RIHMI-WDC. Basic meteorological parameters. – URL: http://aisori.meteo.ru/ClimateR.

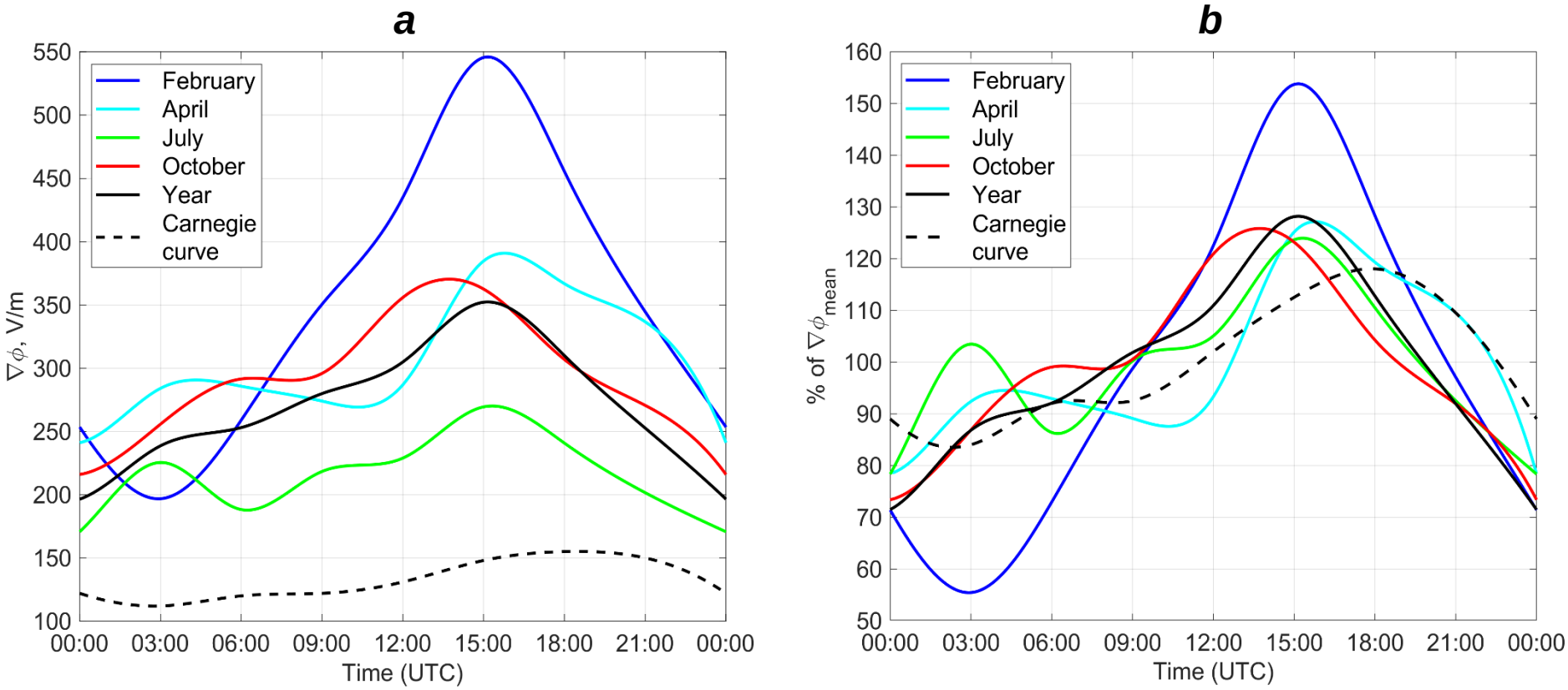
2. RD 52.04.168-88. Guidelines. Observations of atmospheric electricity at stations of the ground meteorological network. – Moscow.: USSR State Committee for Hydrometeorology, 1989. – 35 p.

Electric field of undisturbed atmosphere in Tomsk



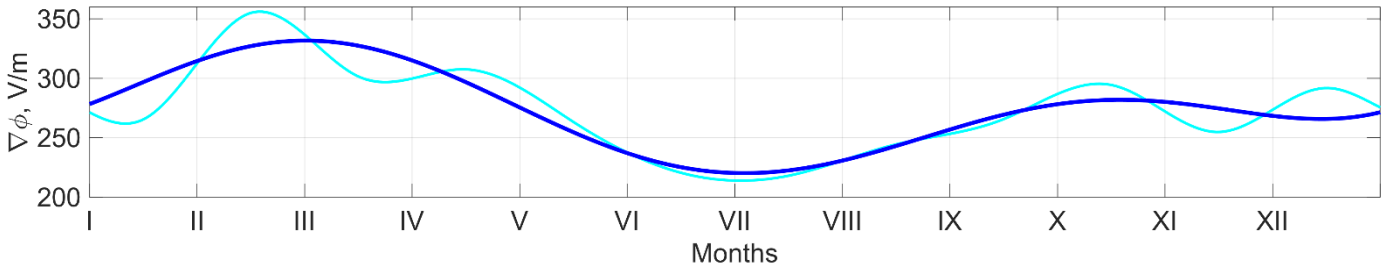
Distribution of ∇φ values in the fair-weather conditions in Tomsk (***a***) and its description using the quartile diagram (“Box Plot”; ***b***)

Diurnal variations of ∇φ values in the fair-weather conditions in Tomsk

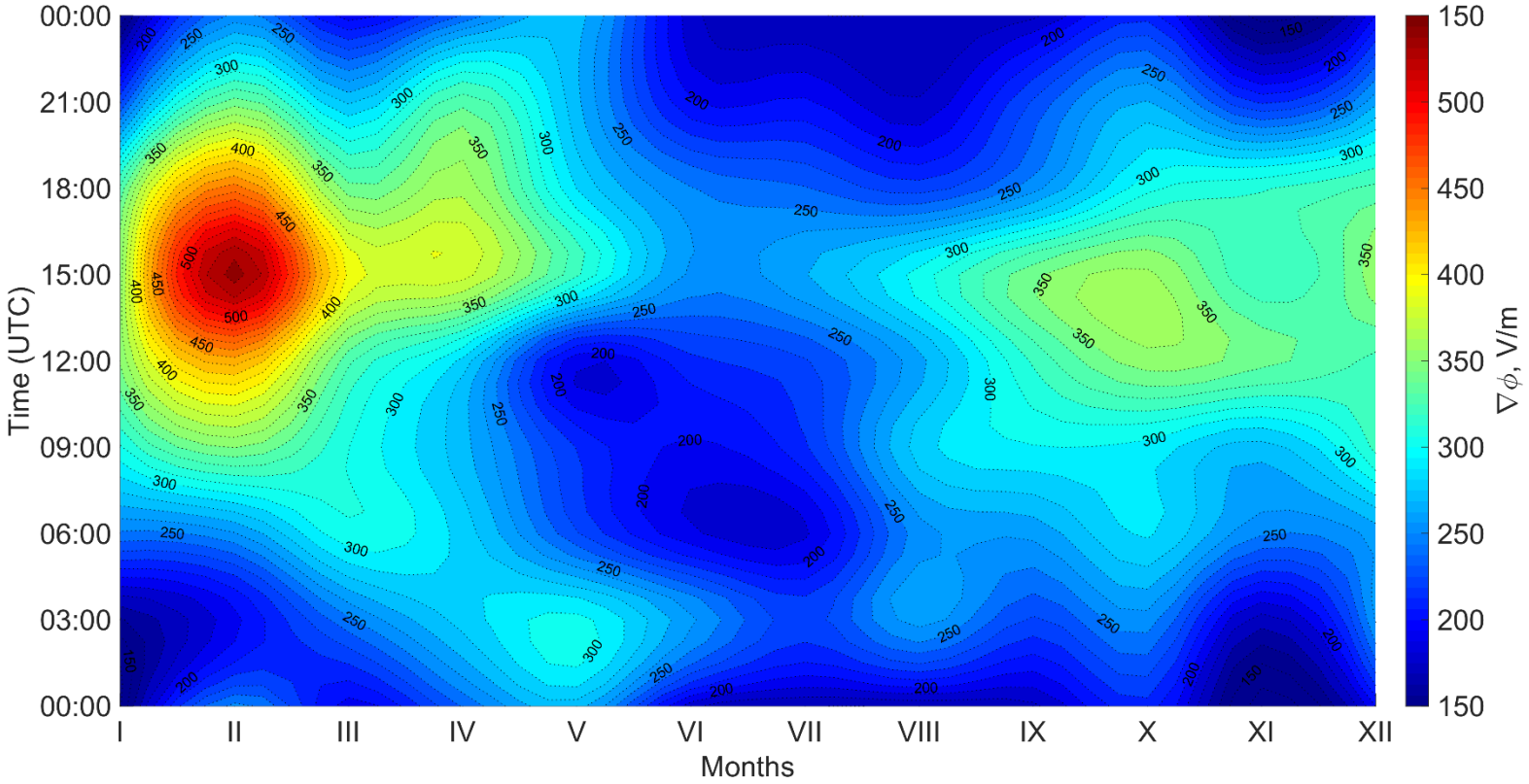


Smoothed daily variations of absolute (***a***) and normalized (***b***) ∇φ values

Seasonal variations of ∇φ values in the fair-weather conditions in Tomsk



Smoothed seasonal ∇φ variations in Tomsk



Smoothed seasonal–daily ∇φ variations in Tomsk

Main results

- ✓ The mean value of electric field potential gradient is 275 V/m, and its typical changes are in the range 155–372 V/m.
- ✓ The diurnal variation per year on average are characterized by a simple wave with a minimum at 7 hours and a maximum at 22 hours of local time (00 and 15 UTC, respectively).
- ✓ The changes over the course of a day normalized by the average $\nabla\varphi$ values, in general, are consistent with daily pattern called the Carnegie curve, however, their maximum and minimum are shifted relative to the curve by an earlier time (~ 3 hours).
- ✓ In the annual mode, the maximum $\nabla\varphi$ in Tomsk is observed in February, and the minimum in June–July. Variance of $\nabla\varphi$ values also has been in-creasing from summer to winter.

Thanks for attention!

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