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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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Introduction

Currently, many researchers have an interest to the investigation of the electric field in the fair-weather conditions along with its diurnal and seasonal variations across all regions of the world.

However, a similar study in the southeastern part of Western Siberia has not yet been carried out. In this regard, the paper aims to estimate the mean values of a potential gradient of the electric field and its variations using the example of Tomsk.

1. Used data and their processing

The time series of one-minute average electric field potential gradient ($\nabla\varphi$) from 2006 to 2019 was 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 29430) [http://aisori.meteo.ru/ClimateR], located about 6 km from the observatory, was used.

Based on meteorological data according to guidelines [RD 52.04.168-88] the electric field potential gradient variations during the fair-weather conditions was selected and analyzed.

2. 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 increasing from summer to winter.

Conclusion

Estimates of typical values of the electric field potential gradient during the fair-weather conditions, as well as its daily and seasonal changes for the territory of the south of Western Siberia using the example of Tomsk, were obtained for the first time.

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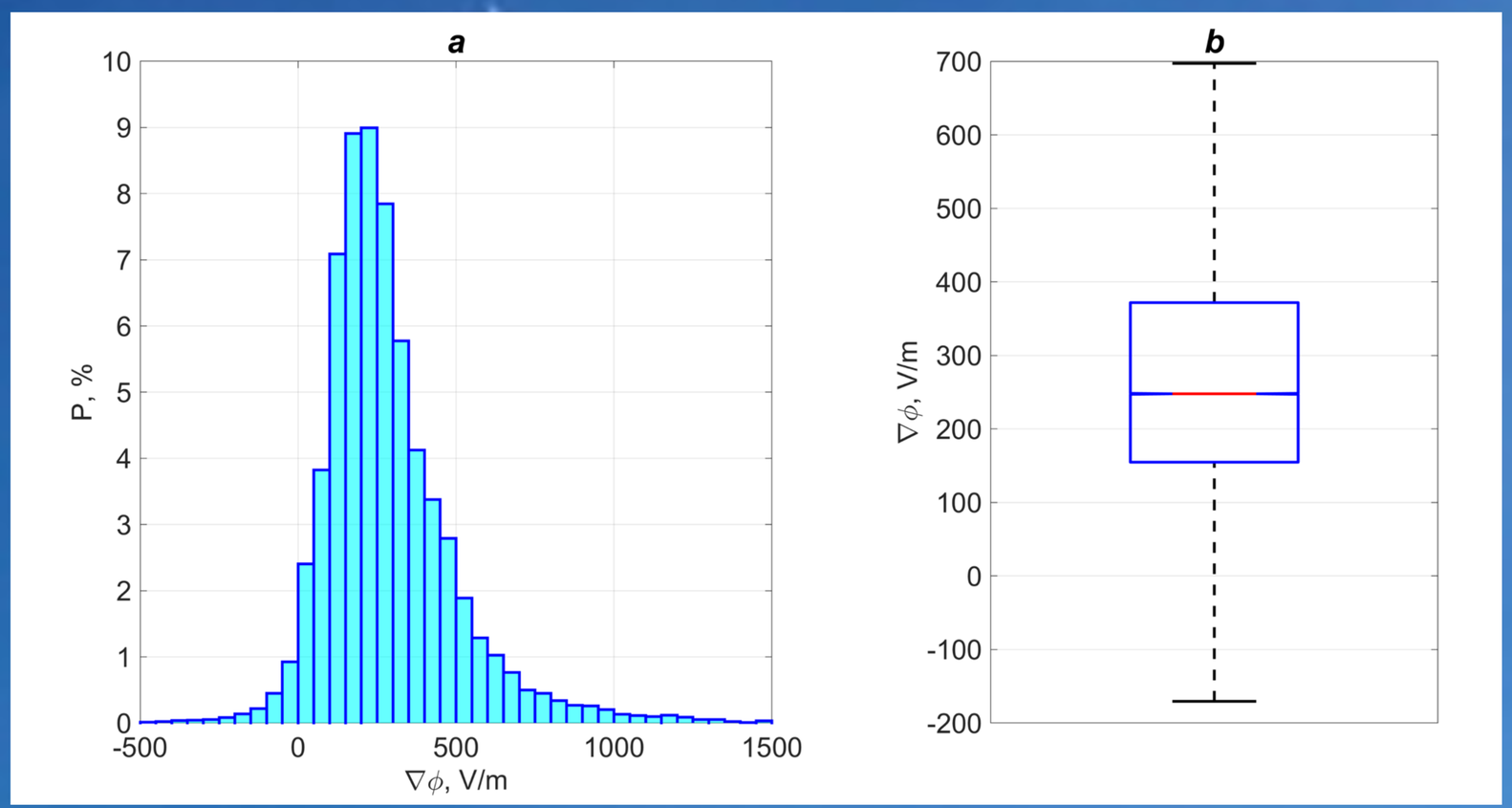
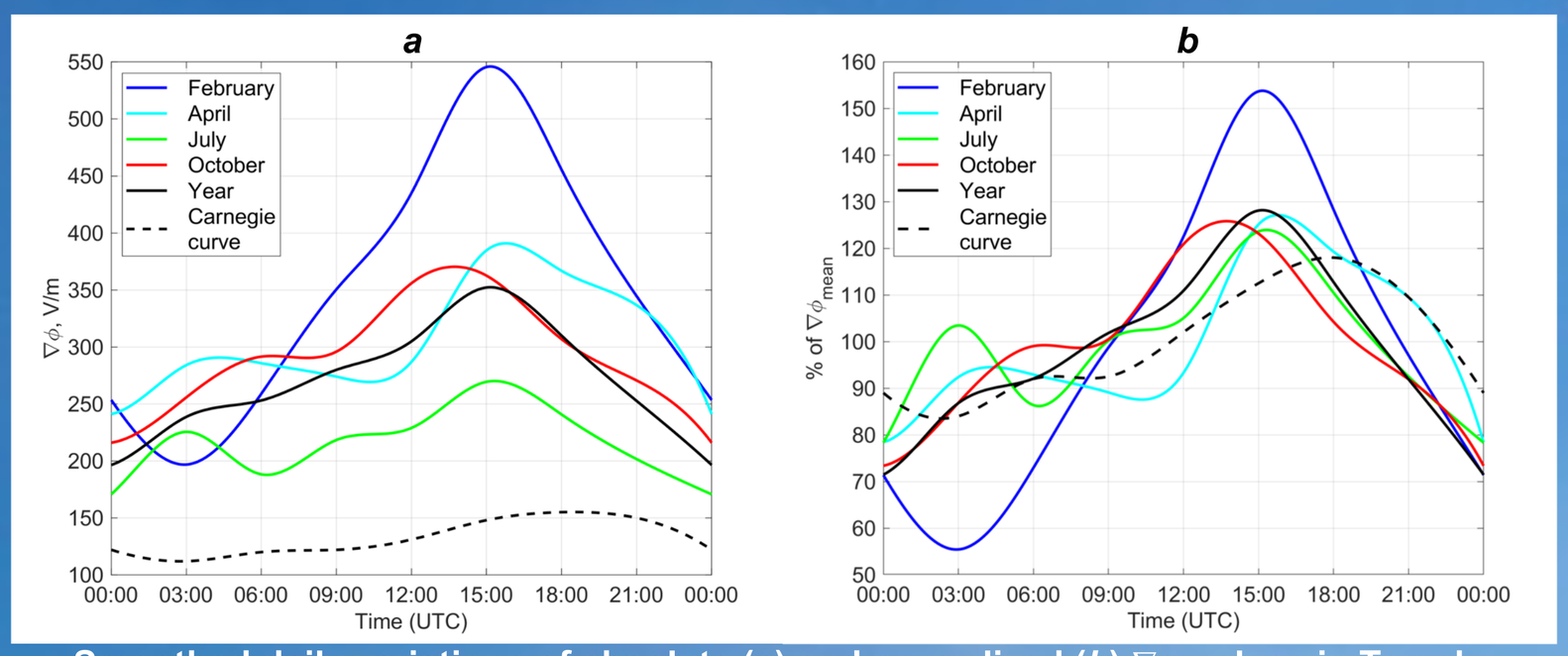
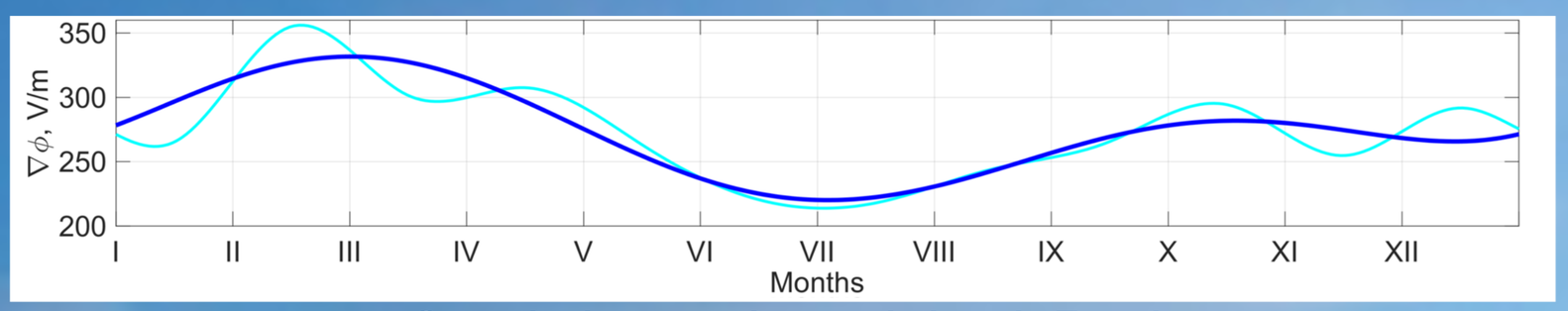


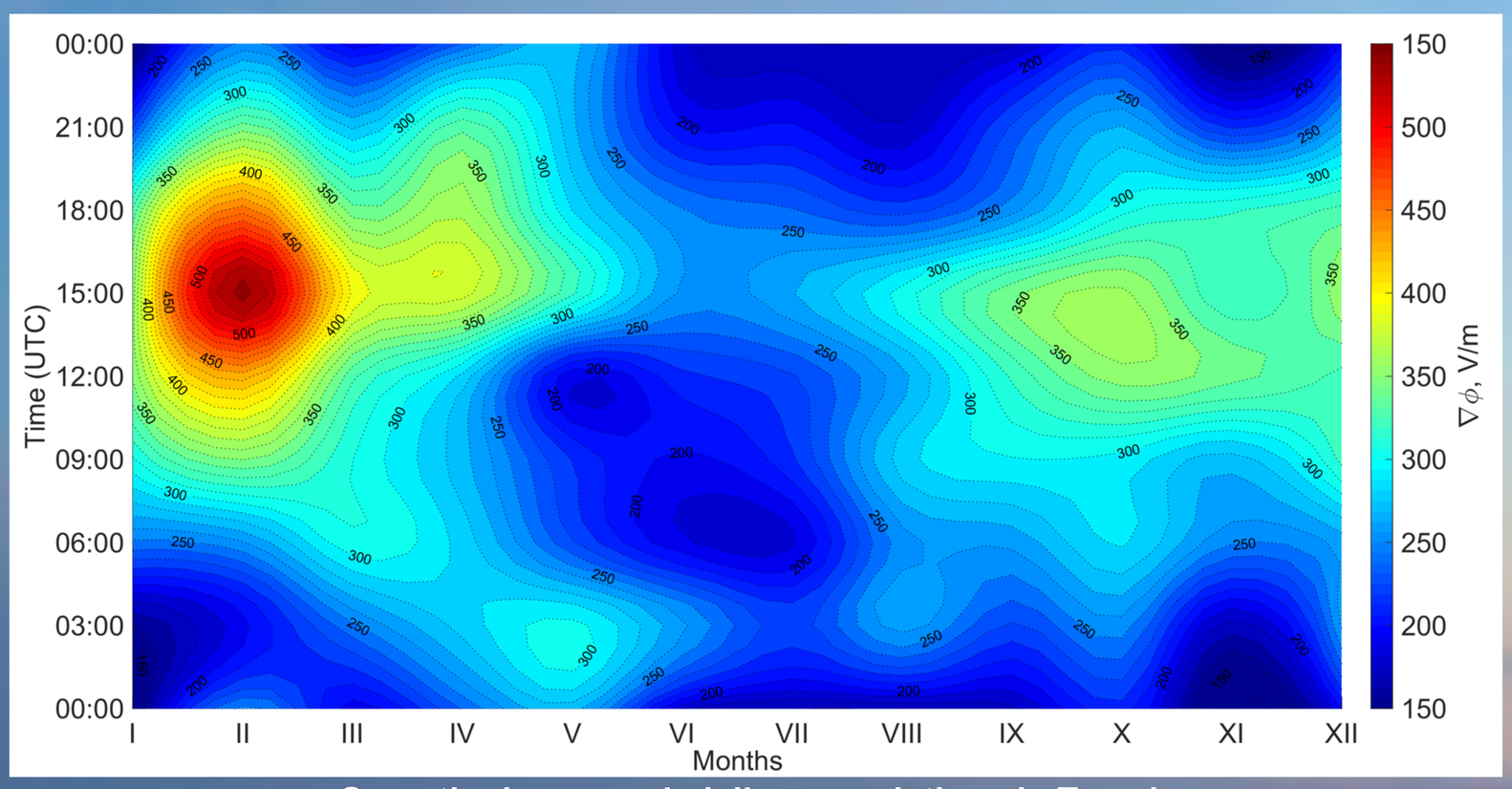
Distribution of $\nabla\varphi$ values in the fair-weather conditions in Tomsk (*a*) and its description using the quartile diagram ("Box Plot"; *b*)



Smoothed daily variations of absolute (*a*) and normalized (*b*) $\nabla\varphi$ values in Tomsk



Smoothed seasonal $\nabla\varphi$ variations in Tomsk



Smoothed seasonal–daily $\nabla\varphi$ variations in Tomsk