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THE COMPARISON OF LIGHTNING ACTIVITY REGISTERED BY DIFFERENT LIGHTNING DETECTION SYSTEMS IN THE SOUTH-EAST OF WESTERN SIBERIA

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Introduction

In the second half of XX – early XXI centuries, an increase in the proportion of convective clouds has been noted in Northern Eurasia [1]. Under continued foregoing trend, according to [2], the frequency of *Cumulonimbus* occurrence and related to them hazardous phenomena will become more frequent. Therefore, an operational identification of convective hazardous phenomena, in particular, thunderstorms, has essential meaning. The aim of this work is to compare the results of lightning registration in the southeast of Western Siberia using different lightning detection systems.

1. Used data and their processing

The single-point lightning detector LD-250 by Boltek installed on account of training laboratory at the Department of Meteorology and Climatology, Geology and Geography Faculty, Tomsk State University (56.46° N, 84.93° E). LD-250 allows detecting lightning discharges within radius of up to 480 km in a fully automatic mode. The data processing carry out in the RimDataLightning author tool, the output file contains information on the polarity and time of the discharge and the coordinates of the lightning strike point [3]. Since the beginning of the XXI century the World Wide Lightning Location Network (WWLLN) is actively elaborating, providing information on the coordinates of discharges over the entire globe through received electromagnetic signals of thunderstorm sources in the VLF band (3–30 kHz) [4].

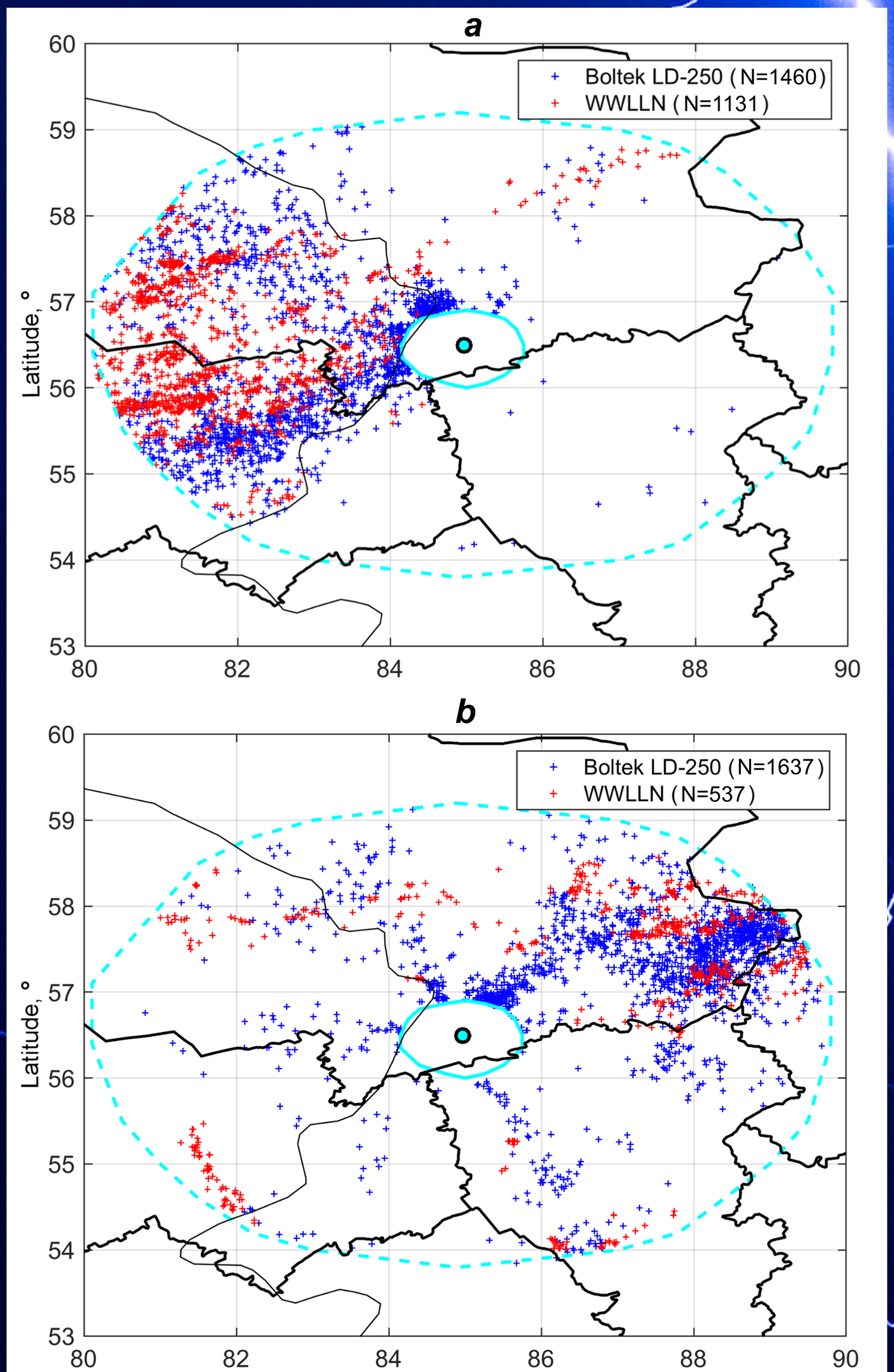
2. Results

For comparison, we used the period July 1 to 25, 2019, when numerous thunderstorms were observed over the study area. The coordinates of lightning discharges in one day were mapping with markers superimposed on each other, corresponding to LD-250 and the WWLLN. An analysis of the results showed good qualitative agreement between the positions of the thunderstorm centers. The correlation coefficient between the daily number of lightning discharges detected by LD-250 (the CG, IC and CC lightning) and the WWLLN is 0.89 for the study period. However, the number of lightning discharges by LD-250 is usually 2-3 times higher than captured by the WWLLN.

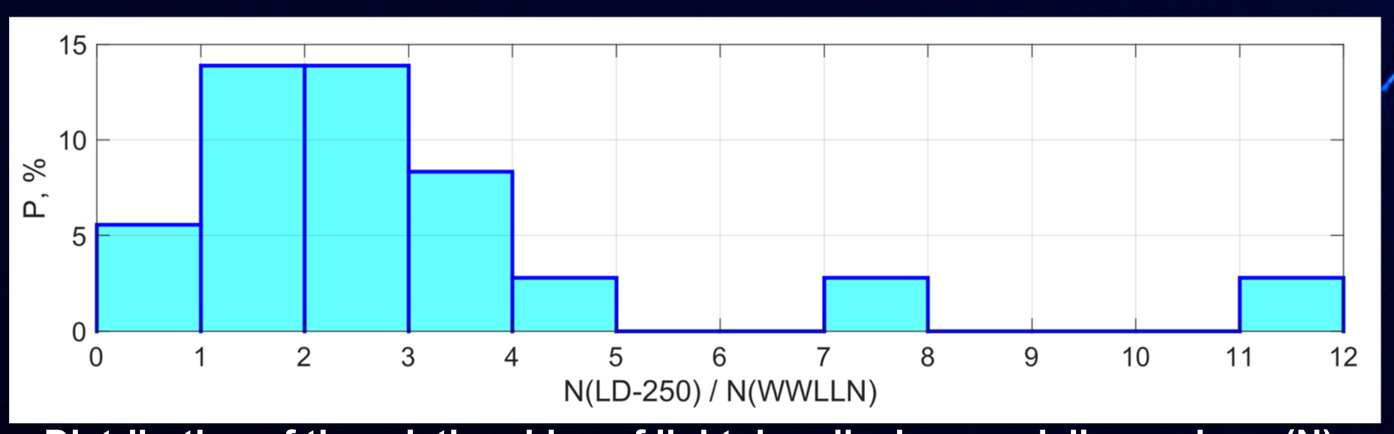
Conclusion

The comparison of lightning activity registered by single-point lightning detector LD-250 and lightning detection systems WWLLN in the south-east of Western Siberia was carried out.

[1] Mokhov I.I., Akperov M.G. Tropospheric lapse rate and its relation to surface temperature from reanalysis data // Izvestiya. Atmospheric and Oceanic Physics. 2006. V. 42. № 4. P. 430–438.
[2] Chernokulsky A.V., Bulygina O.N., Mokhov I.I. Recent variations of cloudiness over Russia from surface daytime observations // Environmental Research. 2011. V. 6, № 3. P. 035202.
[3] Konstantinova D.A., Gorbatenko V.P. The results of the registration of lightning over the southeastern territory of Western Siberia // Izvestiya vuzov. Fizika. 2011. V. 54, № 11/3. P. 156–162.
[4] World Wide Lightning Location Network. – URL: https://wwlln.net/.



Examples of the lightning discharges maps in one day by the Boltek LD-250 and WWLLN data (*a* – July 9, 2019; *b* – July 19, 2019)



Distribution of the relationships of lightning discharges daily numbers (N) by the Boltek LD-250 and WWLLN data

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