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An efficiency of lightning data assimilation for the convection forecast over Krasnodar region of Russia

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Introduction
Well known that the technique of lightning data assimilation improves the forecast of convective weather events. Now lightning detection systems deploy worldwide and Russia is not an exception. However, the efficiency of this method for the severe weather forecast over Russia is still unexplored. Consequently, the objective of this work is the conducting research about the possibility of application of lightning detection data to the weather hazard prediction over Krasnodar region of Russia.

Methodology
This work presents simulation results of seven case studies of the most destructive convective storms observed in 2017 over Krasnodar region of Russia. In current research we computed BASE experiment (without lightning assimilation) and LTNGDA experiment (with assimilated lightning data gathered from Worldwide Lightning Location Network [1,2]. Both experiments are computed using WRF-ARW v. 3.9.1 with 2 km resolution and 30 vertical levels. The advance time is 48 hours. The domain of interest is (45.5-46.4 N; 37-41 E). Some used parameterizations: cu convection – Kain-Fritsch, microphysics - NSSL 2–moment Scheme with CCN Prediction.
Then the difference in vertical profiles of the air temperature and cloud water content in points with observed lightning for both experiments is analyzed. The convection thunderstorm evolution is also studied. But the main goal of the research is the accuracy of the surface air temperature, relative humidity, pressure and rains evaluated for BASE and LTNGDA experiments. Bias, abias and rmse are obtained. The station data are used for the comparison.

Conclusions
According to the preliminary results it was found that lightning assimilation helps to improve the short-term forecast of air temperature, pressure, relative humidity and rain. It concerns not only its forecast estimations. The LTNGDA technique makes the cumulus precipitation localization more accurate.

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References

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