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Extreme frost forecasting in Krasnoyarsk using the WRF-ARW regional model / Bykov A.B., Vetrov A.L., Kalinin N.A. // Hydrometeorological research and forecasts. 2025, no. 3 (397), pp. 64-76.

The reasons for the occurrence of severe frost in Krasnoyarsk are studied, and the accuracy of its forecasting with the WRF-ARW regional model is assessed. Four episodes of cold weather events in 2019, 2020 and 2023 are analyzed. All the cases are associated with the formation of a strong anticyclone over the West Siberian Plain and advection of very cold Arctic air in front of the high-altitude ridge accompanied by the clear-sky weather. The formation environments of an urban heat island were studied, its intensity was found to vary from 4.0 to 8.0°C, with an average of 6.4 °C. The zones of maximum temperature are situated on the both Yenisei banks in the areas of the densest building. During the daytime, the urban heat island effect is less pronounced than at night. The WRF-ARW model was found to simulate the urban heat island on the second forecast day, although it overestimated predicted air temperatures, especially in the daytime. An absolute error in air temperature predictions for the time moments close to the time of daily minimum temperatures was 2,6 °C and 3.9°C (24 and 48 hours of model time, respectively).

Keywords: numerical prediction of temperature, frost, WRF-ARW model, urban heat island, Krasnoyarsk

Tab. 5. Fig. 4. Ref. 14.