

DOI: <https://doi.org/10.37162/2618-9631-2025-4-7-32>

Wind gust nowcasting using numerical forecasts, radar technologies and machine learning: implementation, capabilities and limitations / Smirnov A.V., Kiktev D.B., Muravev A.V. // Hydrometeorological research and forecasts. 2025, no. 4 (398), pp. 7-32.

The paper presents the results of testing a surface wind gust nowcasting system conducted in May–September 2024 at the Hydrometcentre of Russia using the machine learning Random Forest algorithm applied to the output products of the pySTEPS statistical nowcasting model and the COSMO-Ru2.2 numerical weather prediction system. The significance of observations from automatic weather stations in the Central Federal District as control data for wind gust nowcasting is assessed. Some systematic features of numerical gust forecasts during the testing period are revealed. The problems of synchronizing data from various sources are discussed, the weather conditions with significant gusts over a large area are analyzed in detail, and the quality assessment is provided using the FSS metric. In the developed version of the nowcasting system, on the basis of accumulated information and according to the FSS skill score, the useful forecast horizon for wind gusts is limited to 30 minutes.

Keywords: wind gust nowcasting, numerical weather prediction, radar observations, machine learning

Tab. 8. Fig. 13. Ref. 11.