



The automated forecast to 12-36h ahead of storm wind and heavy rainfalls over the territory of Siberia

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The territory of Siberia is more great then territory of European part of Russia. Development of successful method of forecast of storm summer winds, including squalls and tornadoes, that often result in human and material losses, could allow one to take proper measures against destruction of buildings and to protect people. Well-in-advance successful forecast (from 12h to 36h) makes possible to reduce the losses. Prediction of these phenomena involved is a very difficult problem for synoptic of Siberia till now day. The existing graphic and calculation synoptic methods still depend on subjective decision of an operator. At the present time in Russia there is no hydrodynamic model for forecast of the maximal speed of storm wind and heavy rainfalls with Q more 20mm/12h. Hence the main tools of objective forecast are statistical methods using the dependence of the phenomena involved on a number of atmospheric parameters (predictors). We have adapted for the territory of Siberia our hydrodynamic-statistical operative methods of forecast of these phenomena for Europe.

Statistical decisive rule of the alternative and probability forecast of these events was obtained in accordance with the concept of "perfect prognosis" using the data of objective analysis. For this purpose the teaching samples of present and absent of storm wind and heavy rainfalls were automatically arranged that include the values of forty physically substantiated potential predictors. Then the empirical statistical method of choosing of most informative vector-predictor for every phenomenon was used that involved diagonalization of the mean correlation matrix of the predictors and extrac-

tion of diagonal blocks of strongly correlated predictors. The statistical decisive rules for diagnosis and prognosis of the phenomena involved were calculated for the most informative vector-predictor (we used the criterion of distance of Mahalanobis and criterion of minimum of entropy by Vapnik-Chervonenkis). Successful development of hydrodynamic models for short-term forecast and improvement of 36h forecasts of pressure, temperature and others parameters allowed us to use the prognostic fields of those models for calculations of the discriminant functions and the values of probabilities of dangerous wind and rainfalls in the nodes thus to get fully automated forecasts.

For prognosis of the phenomenon of the storm wind and the rainfall involved with the given advance period 12, 24, 36 hours the values of the discriminant functions and the probabilities of these phenomena were calculated using the prognostic values of operative hemispherical model of Hydrometeorological Center of Russia in the nodes of the rectangular mesh 150x150 km over the territory of Siberia. In order to change to the alternative categorical forecast the author proposes the empirical threshold values specific for that territory of Siberia and for phenomena of the storm wind and for strong rainfalls advance periods 12, 24, 36 hours. The prediction even 36h advance of the summer storm wind (velocity more 24m/s) was so exact: in the south of Krasnoyarskiy areal on 18.06.05, in Novosibirsk on 24.06.05, ($V=37\text{m/s}$) in Altay on 24.06.05 too, in Turukhansk on 4.07.05, in the South of Teimyr peninsula on 20.07.05. The value of estimate of the warning is 86%. The error of "false alarm" is not very high, and so the value of Pirsy-Obukhov criterion is $T=0,78$. The values of estimate of forecast of rainfalls with quantity of precipitation Q more then 49mm/12y are high too ($T=0,69$). The territory of Siberia has not very many meteorological stations and so hydrodynamic forecast of storm wind and heavy rainfalls is not successful. This new automated statistical method turned out successful and objective.