

# Forecast of strong precipitation for locations of the European territory of Russia

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The Hemisphere Forecast Model (HFM) for forecasting meteorological fields in the free atmosphere and in the boundary layer of the atmosphere (BLA) is used in the Hydrometeorological Center of Russia. The HFM constitutes also the basis for forecasting meteorological quantities and weather characteristics for locations of the European territory of Russia (air temperature and humidity, wind speed and direction, wind gusts, three layer cloudiness, widespread and convective precipitation, fogs, snowstorms, glaze ice etc.) [1- 3]. The forecast of strong precipitation (more than 7 mm per 12 h) is of particular importance among the mentioned characteristics.

The accuracy of the initial data on temperature and humidity is the most important for forecasting strong precipitation. The comparison of these meteorological quantities (especially humidity) at different levels of the atmosphere exhibits a considerable difference between these fields in the data of different meteorological centers in GRIB code.

Prolonged experience of hydrodynamic forecast of elements and characteristics of weather (including precipitation) at various geographical locations enabled to accumulate considerable experience in this area in the course of operational forecasts in the Hydrometeorological Center of Russia.

This concerns: the resolution of the prognostic model and the completeness of physical processes, the accuracy of the initial data for different meteorological quantities, the type of precipitation: widespread, convective and mixed, and, finally, the conditions when the processes of condensation and precipitation intensify.

This is one of the conceivable reasons why differ the prognostic quantities of precipitation calculated in the principal forecast centers (Exeter, NCEP et al.).

Using a more powerful computer, now available in the operational prediction group, we implemented the variant of the model with a resolution of 30 km with adaptation of physical processes, and we did all the preparatory work for the output of operational prognostic data.

Numerical experiments on strong precipitation prediction with alternation of horizontal resolution were carried out in the Hydrometeorological Center of Russia using the HFM. Three variants of resolution (grid steps) were obtained: 150 km, 75 km and 30 km. Table 1 shows the calculation results for strong precipitation cases for various points of the European territory of Russia. The number of examples ensures the plausibility of the statistics enabling to judge how successful are strong precipitation forecasts.

## REFERENCES

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**Table 1**

DATE	LOCATIONS	PRESIPITATIONS (mm/day)					ERRORS OF FORECASTS: STEP 30 KM - REAL
		FORECASTS			REAL		
		150 KM	75 KM	30 KM			
02.12.2005	KRASNODAR	10.0	10.7	12.6	26.0	-15.4	
	ROSTOV	11.0	12.1	13.3	23.0	-10.0	
	STAVROPOL	12.0	13.6	19.2	19.0	0.2	
03.12.2005	KRASNODAR	7.0	6.8	20.8	18.0	2.8	
	ROSTOV	7.0	9.4	14.6	35.0	-20.4	
	STAVROPOL	6.0	6.3	13.4	24.0	-10.6	
05.12.2005	KRASNODAR	4.0	6.1	6.2	18.0	-11.8	
	ROSTOV	4.0	4.9	7.4	22.0	-14.6	
07.12.2005	BELGOROD	6.0	5.8	8.3	13.0	-4.7	
08.12.2005	MOSCOW	5.8	6.8	8.5	10.0	-1.5	
	BELGOROD	5.2	6.6	16.4	23.0	-6.6	
	VORONEJ	4.9	6.4	19.3	19.0	0.3	
	KURSK	6.5	7.9	11.5	20.0	-8.5	
	TAMBOV	6.3	7.1	17.5	19.0	-1.5	
	TULA	8.4	9.2	9.7	11.0	-1.3	
09.12.2005	MOSCOW	3.0	7.4	9.0	11.0	-2.0	
	IVANOVO	5.6	7.3	8.5	21.0	-12.5	
	KOSTROMA	4.0	5.4	7.2	21.0	-13.8	
	RJAZAN	6.0	8.7	10.7	20.0	-9.3	
	TAMBOV	6.3	9.6	9.0	11.0	-2.0	
	TULA	3.8	6.8	7.3	16.0	-8.7	
10.12.2005	KOSTROMA	1.0	2.3	1.9	12.0	-10.1	
11.12.2005	MOSCOW	2.4	3.3	7.0	7.0	0.0	
	KALUGA	3.1	1.9	10.7	11.0	-0.3	
12.12.2005	S.-PETERBURG	4.6	6.3	8.5	29.0	-20.5	
	TVER	5.2	6.7	8.6	13.0	-4.4	
20.12.2005	MOSCOW	2.4	6.2	12.6	14.9	-2.3	
12.05.2005	MOSCOW	5.8	8.7	18.2	19.8	-1.6	
20.05.2005	MOSCOW	5.0	6.7	12.3	14.9	-2.6	
25.05.2005	MOSCOW	3.2	4.1	8.7	9.0	-0.3	
13.06.2005	MOSCOW	3.5	5.5	12.3	12.5	-0.2	
14.06.2005	MOSCOW	7.9	9.0	9.3	9.6	-0.3	
18.03.2005	MOSCOW	2.6	4.2	11.0	8.3	2.7	
SUM OF 33 FORECASTS		176.0	230.6	367.6	562.1	193.4	
PERSENTAGES		31.3	40.9	65.4	100.0	34.6	