



The potential of using model precipitation forecasts to predict floods on the example of the south of Western Siberia

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In late May 2014, the highland south of Western Siberia become a disaster area. Wave cyclones actively moving along the periphery of the anticyclone from the west to the east caused heavy rains which occurred in the period of intensive snow melting in the mountains. This process resulted in a sharp water level rise up to critical elevations in rivers of the Altai Republic and the Altai Krai. Maximum levels were observed in the period May 27 - June 1, 2014. Dozens of settlements were within the flooding zone.

Was it possible to foresee flooding using model precipitation forecasts?

The analysis involved precipitation fields as output of non-hydrostatic mesomodel of the COSMO international consortium [1-2] and Semi-Lagrangian Absolute Vorticity (SLAV) model [3-4].

Technological complexes COSMO and SLAV are introduced in the Computer SGI Altix 4700 of the West Siberian Computing Center (Novosibirsk) with well-run initial and boundary data acquisition system, launch of calculation units on models, and resulting output in map, text, and GRIB formats. The spatial step in the modification of COSMO being run in the West Siberian Computing Center (SOSMO-SIB14) is 14 km or 0.125 degrees. The step in the SLAV model is about 50 km.

Model precipitation forecasts showed a surprisingly good results for areas with complicated topography. Modeled precipitation were averaged for four sites surrounding each weather station. The COSMO generated a forecast with heavy rainfall warning already at May, 24 with maximum for this model lead time of 72 hours, that is, for May, 27. Precipitation forecast for Chemal was 33mm (actual quantity 17 mm), for Yaylyu - 24 mm (33 mm), and for Kyzyl-Ozek — 10 mm (24 mm), respectively. Further predictions were confirmed with a relatively low rate of "false alarms" at individual stations. Results of two models were different. For COSMO the accuracy of heavy rainfall forecast POD was 90-50%, FOH - 60-30%; for SLAV the "hit" rate was slightly higher (FOH - 70-20%), though less likely to reach high values: POD was 50-10%.

However, the flood forecasting requires accounting for water catchment in river basins. Analysis of precipitation forecast for Biya and Katun river basins showed an even greater coincidence with actual values.

The efficiency of using precipitation forecasts to predict floods may be improved with application of simple coupling algorithm: a maximum of modeled precipitation.

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