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Automatized system of precipitation monitoring and recording with use of radiolocation for urban areas

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One of the most important lines of work in the field of increasing the efficiency of functioning of urban water disposal systems is automatization of precipitation recording with application of new technological tools for measuring precipitations fallout and forecast.
In 2016, the Russian State Hydrometeorological University (RSHU) carried out an experimental investigation of the developed Automatized Information System for Atmospheric Precipitation Recording (AIS «Osadki»), in the course of which estimation of the quality of forecast of daily amount of atmospheric precipitations in Saint Petersburg.
In the process of the experimental research, agreement of the indications of the precipitation gauge Pluvio2 installed on the experimental site (Saint Petersburg, Belyi island), the data obtained from Federal Hydrometeorological Service (FHS – Rosgidromet) and prognostic data obtained as a result of work of the numerical mesoscale model WRF was estimated.
The initial data for forecast were:
– data from the external global meteorological model GFS (Global Forecast System) or NCEP (National Centers for Environmental Prediction) in the GRIB2 format;
– data about hydrometeorological parameters from the stations of the Rosgidromet network that are located directly in the area of modelling in the GRI2 format;
– data about the radial velocity and radar reflectivity of a Doppler meteorological radar in the LITTLE_R format.
Sets of daily precipitation amounts for the period from 1 May 2016 to 22 June 2016 obtained from FHS, the precipitation gauge Pluvio2 and the WRF model were analyzed. As the result of the analysis, the following numerical characteristics were obtained:
Mean value: FHS – 4.3849, Model – 1.99, Pluvio2 – 2.63;
Mean-square deviation (σ): FHS – 9.99, Model – 5.99, Pluvio2 – 6.58;
Variation coefficient (V): FHS – 2.27, Model – 3.00, Pluvio2 – 2.49;
Minimum (min): FHS – 0, Model – 0, Pluvio2– 0;
Maximum (max): FHS – 49.00, Model – 40.76, Pluvio2 – 42.76.
The statistical relationship between the datasets was estimated through the correlation coefficient:
Relationship between WRF Pluvio2 – 0.86;
Relationship between WRF FHS – 0.74;
Relationship between Pluvio2 FHS – 0.67.
The statistical analysis of the data obtained from FHS, the precipitation gauge Pluvio2 and the WRF model led to the following conclusions:
– the strongest correlational relationship turned out to be the data of the WRF model and those measured by the precipitation gauge Pluvio2 (correlation coefficient 0.86);
– the data of FHS correlate with the data of the precipitation gauge Pluvio2, being above the measured amount of precipitations averagely two times as much (which agrees with the previous investigations, carried out in 2012 – 2013).
The obtained results confirmed the necessity of introduction of the developed AIS «Osadki», that makes it possible to estimate and forecast precipitation amount, which is necessary for increasing the efficiency of urban water disposal systems.