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A complex of the numerical models in the study of the catastrophic floods

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The catastrophic flash floods caused by heavy prolonged rainfalls in the Ukrainian Carpathians in March 2001 and along the Elbe river in August 2002 are under consideration in the presented study. A new approach was proposed recently by the authors for the study of the flood events in Europe which is based on a complex of different numerical models: (1) REgional MOdel (REMO) developed in MPI-M (Hamburg); (2) Combined Model of the Cloudy Troposphere (CMCT) and (3) 1-D spectral cloud model both developed in UHMI. Further development of the proposed method particularly with more fine resolution (10 km horizontally) will be presented.

REMO was used in a forecast mode with restart every midnight and run for just 30 hours every day of the events. A new ice scheme was implemented in REMO recently that improved representation of precipitation formation processes in the model. But the precipitation intensity and sums were still 1.5-2 times less then the measured ones for these extreme cases.

The hourly outputs from REMO were used for initializing of CMCT that is the 3-D mesoscale diagnostic model with possibility to calculate vertical motions from the continuity equation and, hence, to determine further developments of clouds by positive thermodynamic rate of condensation. The maximum of the integral thermodynamic condensation rates were comparable with measured precipitation intensity for the studied cases in a whole.

1-D spectral cloud model was initialized by thermodynamic characteristics obtained hourly from REMO and CMCT. This model includes droplets, raindrops and ice crys-

tals and the main microphysical processes in clouds: condensation (sublimation) on activated CCN (IN), collision-coalescence of precipitation particles for droplets, freezing, etc. The microphysical model has allowed to obtain a time development of precipitation rates far more close to observed ones, particularly for Dresden in simulation with more fine resolution.