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Hydrometeorological aspects of the Real-Time Ultrafinescale Forecast Support during the Special Observing Period of the MAP*

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Abstract. During the Special Observation Period (SOP, 7 September–15 November, 1999) of the Mesoscale Alpine Programme (MAP), the Canadian Mesoscale Compressible Community Model (MC2) was run in real time at a horizontal resolution of 3 km on a computational domain of 350×300×50 grid points, covering the whole of the Alpine region. The WATFLOOD model was passively coupled to the MC2; the former is an integrated set of computer programs to forecast flood flows, using all available data, for catchments with response times ranging from one hour to several weeks. The unique aspect of this contribution is the operational application of numerical weather prediction data to forecast flows over a very large, multinational domain. An overview of the system performance from the hydrometeorological aspect is presented, mostly for the real-time results, but also from subsequent analyses. A streamflow validation of the precipitation is included for large basins covering upper parts of the Rhine and the Rhone, and parts of the Po and of the Danube. In general, the MC2/WATFLOOD model underestimated the total runoff because of the under-prediction of precipitation by MC2 during the MAP SOP. After the field experiment, a coding error in the cloud microphysics scheme of MC2 explains this underestimation to a large extent. A sensitivity study revealed that the simulated flows reproduce the major features of the observed flow record for most of the flow stations. The experiment was considered successful because two out of three possible flood events in the Swiss-Italian border region were predicted correctly by data from the numerical weather models linked to the hydrological model and no flow events were missed. This study has demonstrated that a flow forecast from a coupled atmospheric-hydrological model can serve as a useful first alert and quantitative forecast.

Keywords: mesoscale atmospheric model, hydrological model, flood forecasting, Alps

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