Prediction of flash flood in complex terrain using rainfall estimates from radar and very-short-range rainfall simulations from a dynamic model and an automated algorithmic system

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Abstract. Operational predictions of flash floods caused by convective rainfall in mountainous areas require accurate estimates of rainfall distributions in time and space. The details of the spatial distribution are especially critical in complex terrain because watersheds are generally small in size, and position errors in the placement of the rainfall can incorrectly distribute the rain over the watershed. In addition to the need for good rainfall estimates, accurate flood prediction can benefit from surface-hydrologic models that are capable of predicting stream response to the time and space varying precipitation input. We applied different techniques for estimating and predicting a convective rainfall event from a flood-producing thunderstorm over the Buffalo Creek watershed in July of 1996. Precipitation estimates from the National Weather Service WSR-88D and the National Center for Atmospheric Research S-Pol dual-polarization radar, co-located east of Denver, were compared. Very short range simulation from a convection-resolving dynamic model, that is initialized variationally using the radar reflectivity and Doppler winds were compared with simulation from an automated –algorithmic forecast system that also employs radar data. The radar estimates of rain rate, and the two forecasting systems that employ the radar data, had degraded accuracy by virtue of the fact that they were applied in complex terrain. These rainfall estimates and forecasts were input to a surface-hydrologic model for simulation of stream discharge associated with the flood.