Multiscale Hydrologic Evaluation of Radar Rainfall for Flow Simulations

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We made an evaluation of the performance of a hydrologic model to produce real-time flow forecasts. The model has been developed by the Iowa Flood Center (IFC), and it is implemented operationally to produce streamflow forecast for the communities of the State of Iowa in the United States. The model parameters are calibration-free. It has a parsimonious structure, that reproduces the more significant processes involved in the transformation from rainfall to runoff. The operational model uses a rainfall forcing produced by IFC, derived from the combination of rainfall fields of seven NEXRAD radars. However, this rainfall forcing does not include bias adjustment from rain gauges, due to the non-existence of a raingage network that enable the correction in real-time. In consideration, the model is also run offline using bias-adjusted rainfall products as Stage IV, and more recently MRMS. We used an extensive record of five years of IFC rainfall product and Stage IV, to evaluate the performance of the hydrologic model and the sensitivity of the flow simulations to model input. The model is not calibrated to any particular rainfall product. The distributed structure of the model allows to obtain results at any channel of the drainage network. We obtained simulated hydrographs at about 150 locations with different sub-basin spatial scales, where there are available USGS gages with streamflow observations. We obtained error metrics as Nash Sutcliffe efficiency and root mean square error, by comparing flow simulations to observations. We evaluated also the number of occurrences of hits and false alarms of discharge forecasts exceeding flood stage.