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Assessing the Impact of Radar-Rainfall Uncertainty in Streamflow Prediction

ABSTRACT

Hydrological models and quantitative precipitation estimation (QPE) are considerable uncertainties for flood forecasting systems. Previous research focused on different hydrological aspects separately, ignoring the relevance of existing errors in rainfall estimation. Measuring the relative impact of rainfall uncertainty quantitatively has remained challenging. Therefore, this paper presents a systematic approach to evaluate the influence of QPE uncertainty in streamflow forecasting. In this work, the Hillslope Link Model (HLM) was run for Iowa between 2015 and 2020, altered the Multi-Radar/Multi-Sensor System (MRMS) and two IFC radar-derived products were used as the input of the hydrological model; we examined the performance by comparing the simulated results and 122 discharge gauges observations.

The results suggest that QPE uncertainty is important in streamflow forecasting uncertainty spatially and seasonally. Underestimations during the cold season are observed indicating that different weather systems lead to differences. Moreover, the QPE product improvement is linked to the radar's location and performance metrics. The patterns for different radar products are generally similar but also show some differences, implying that the QPE algorithm plays a significant role. This study's results are a step towards separating modeling and QPE uncertainties and emphasize the importance of considering radar and rainfall estimation methods to improve flood forecasting accuracy.

Keywords

Discharge
QPE

Reference

Nicolas sr., Witold F Krajewski. Assessing the Impact of Radar-Rainfall Uncertainty in Streamflow Prediction. *ESS Open Archive*. December 18, 2023.