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Uncertainty in Evapotranspiration Inputs Impacts Hydrological Modeling

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ABSTRACT

This work addresses the role of accurate input data in hydrological model simulations and explores the often-overlooked errors associated with evapotranspiration (ET). While existing literature primarily focuses on uncertainties in rainfall, this study underscores the necessity of considering errors in ET, as evidenced by some studies suggesting their substantial impact on hydrological model responses. A comprehensive exploration of uncertainty quantification resulting from errors in ET in hydrological model simulations is presented, highlighting the imperative to scrutinize this facet amidst diverse uncertainties. There are two approaches for addressing uncertainty in potential evapotranspiration (PET) inputs as discussed: directly considering uncertainty in PET data series or accounting for uncertainty in the parameters used for PET estimation. Furthermore, details are provided about the existing error models for PET measurements, revealing a limited number of studies that specifically account for ET-related uncertainties. Researchers commonly address ET errors by considering both systematic and random errors; some studies suggest that systematic errors in PET have a more substantial impact compared to random errors on hydrological model responses. In summary, the objective of this paper is to offer an in-depth exploration of uncertainty associated with PET inputs and their influence on hydrological modeling.

Key words: hydrological modeling, potential evapotranspiration, precipitation, random errors, systematic bias, uncertainty analysis

HIGHLIGHT

• The main objectives of this study are to (a) conduct a thorough analysis of the literature's existing evapotranspiration (ET) error models; (b) determine if ET errors actually affect runoff from hydrological models; and (c) determine the effects of systematic and random errors on model performance and outputs. (d) To determine the necessity of incorporating ET errors into future research endeavors.

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