A NEW HYDROLOGIC ROUTING MODEL WITH APPLICATIONS FOR RIVER REACHES IN APALACHICOLA-CHATTAHOOCHEE-FLINT (ACF) RIVER BASIN

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Abstract. A key element of hydrologic routing models is the storage-discharge relationship assumed to follow a certain mathematical form, usually a linear or a power function, the parameters of which are calibrated based on existing inflow-outflow data. While this assumption simplifies the model calibration process, it also constrains the models to operate by this function throughout their flow range. In view of the complex and nonlinear river flow behavior, this approximation undoubtedly introduces errors.

This research presents a new hydrologic river routing approach that is not limited by the above assumption. River reaches are modeled as cascades of interacting conceptual reservoirs, with storage-discharge functions identified by the data. A novel parameter estimation approach has been developed to identify these functions and all other model parameters based on control theory concepts. After calibration, these functions indeed exhibit different mathematical forms at different regions of their active variation range. The new approach is applied and successfully demonstrated in real world reservoir and river routing applications from the Apalachicola-Chattahoochee-Flint (ACF) River basin.