

## **Estimating Seasonality Impact on Catchment-Scale Water Balance Using Top-down Approach**

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**Abstract.** Seasonal variations of climate and catchment water storage affect the partitioning of rainfall into evapotranspiration and runoff. Motivated by top-down approach, this study provides a new method for estimating the seasonality effect on catchment scale water balance. The method is based on observed climatic (rainfall and potential evapotranspiration) and stream-flow data obtained from over 330 unregulated catchments in Australia. It assumes that catchment scale annual evapotranspiration consists of climate-controlled and storage-controlled evapotranspiration. Climate-controlled evapotranspiration can be accurately represented by the Budyko type relationships, while storage-controlled evapotranspiration relates more closely to seasonal water storage. This study suggests that the seasonality effect on mean annual evapotranspiration cannot be adequately represented by a simple phase shift between rainfall and potential evapotranspiration and the effect of water storage needs to be considered. Results show that inclusion of seasonal water storage significantly improves evapotranspiration predictions for catchments with winter dominant rainfall.