Hydrologic Responses of Angat Dam Watershed, Philippines Using Different Reservoir Configurations in the Soil and Water Assessment Tool (SWAT)

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ABSTRACT

Hydrological models help examine watershed responses to operating conditions, particularly in heavily regulated systems. The Angat Dam Watershed in the Philippines supports domestic water supply, irrigation, hydropower production, and flood control, so accurately representing reservoir behavior is critical for water resources planning. This study assessed how reservoir outflow configurations influence hydrological simulations using the reservoir module of the Soil and Water Assessment Tool (SWAT). Four model configurations were compared at monthly and daily time steps. The simulations applied observed reservoir releases (IRESCO = 1 for monthly and IRESCO = 3 for daily) and simplified release-rate rules (IRESCO = 0 for both time steps). The results showed that incorporating measured reservoir releases improved outflow representation, achieving NSE values of 0.73 and 0.69 for monthly and daily simulations, respectively, compared with 0.20 and −0.09 using simplified release-rate rules. However, using measured outflows could lead to unrealistic artificial emptying on coarser temporal scales due to flow smoothening and by highlighting outflows that exceed inflows, which is not an issue with using simple release-rate rules. These findings highlight the importance of selecting appropriate reservoir configurations in SWAT to better represent reservoir dynamics and support effective water resources management in the Philippines.