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Application of interpolated and high-resolution reanalysis data in SWAT modeling of a critical river basin in the Philippines: The case of the Apayao-Abulug River Basin (AARB)

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ABSTRACT

Despite the rich surface and groundwater resources of the Philippines and its role in development, only a handful of literature focus on its hydrology. This is rooted on "data poverty" in the country due to lack of data itself and by disjuncts in data access. The Apayao-Abulug River Basin (AARB) in Northern Luzon has an estimated 83.63% vegetation cover (2015 NAMRIA Land Cover Map of Luzon) and is inhabited by indigenous people that implement the *Lapat* system: a forest conservation method. The study used the Abulug streamflow data to calibrate and validate 9 different SWAT models for AARB from the combination of two reanalysis datasets (ERA5 and CHIRPS-CHIRTS) and interpolated (precipitation and temperature) data through ordinary kriging of PAGASA synoptic stations, with three LULC maps; ESRI 2017, NAMRIA 2015, and ESA CCI 2016. Results show that ERA5 driven SWAT models can be successfully calibrated without compromising other water balance components. All SWAT models however struggle to be validated both deterministically and stochastically. The best deterministic and stochastic calibration signal was achieved with the ESRI+ERA5 driven model (NSE=0.704, PBIAS=0.250, RSR=0.539, *p-factor*=0.700, *r-factor*=0.980). The study also explored the effects of different LULC maps to calibration and validation performance, and parameter uncertainties of the top 5% best simulations of each of the ERA5 driven models. Results suggest that overall performance of the models is not affected by the difference between LULC maps but significantly affects the spread of parameter values for CN2 and GW_DELAY. High streamflow peaks (HSEs) were associated with tropical cyclones (TCs), and the *Habagat* and *Amihan*. Low streamflow events (LSEs) show high frequency relative to HSEs suggesting significant drought hazard despite minimal LULC change.

Keywords: *hydrologic modeling, SWAT, interpolation, kriging, reanalysis datasets, LULC maps*