

**Title**

Evaluation and Improvement of a Stochastic Parametric Tropical Cyclone Rainfall Model - for Flood Impact Assessment

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**Abstract**

BaCla is a new stochastic parametric precipitation model to estimate rainfall associated with Tropical cyclones (TCs) in a computationally efficient way. It is validated for a number of calibration cases along with the current benchmark IPET deterministic method. The results of these models are compared with the observed StageIV-based rainfall. Two predictive parameters, the pressure deficit [hPa] ( $\Delta P$ ) and maximum sustained wind speed [m/s] ( $v_{max}$ ) are tested for the BaCla model. Frank copula is used by the BaCla model to predict the peak amount of rainfall. It employs the adapted Holland wind profile to create a 1D rain profile. Asymmetry may be added to make a 2D rain profile. The calibration study challenges the assumption that the radius of maximum wind speed ( $R_{vmax}$ ) is equal to the radius of maximum precipitation ( $R_{pmax}$ ) in the BaCla model. Additionally, it is observed that the radial fit overestimates rainfall in scenarios where the peak amount of rainfall is less than 2.8mm/hr. These observations lead to modifications in the relationship between  $R_{vmax}$  and  $R_{pmax}$ , the radial fit threshold, and the fitting coefficients of the adapted Holland wind profile for rainfall distribution in the improved BaClHa model. The new BaClHa model is verified with new and calibrated sets of TCs. The BaClHa model shows potential in achieving good accuracy along with global applicability at a limited computational expense.