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## Understanding catchment influences on flood generating processes - accounting for correlated attributes

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Understanding flood generating mechanisms is critical for model development and evaluation. While several studies analyse how catchment attributes influence flood magnitude and duration, very few studies examine how they influence flood generating processes. Based on prior knowledge about runoff behaviour and flood generation, we assume that flood processes depend not only on climate, but also on catchment characteristics such as topography, vegetation and geology. Specifically, we hypothesize that the influence of catchment attributes on flood processes will vary between different climate types. We tested our hypothesis on the CAMELS dataset, a large sample (671) of catchments in the United States. We classified 61,828 flood events into flood process types using a previously published location-independent classification methodology. Then we quantified the importance of both individual attributes (comparing probability distributions of different flood types) and interacting attributes (using random forests). Accumulated local effects allow interpretability of random forest with correlated attributes. Results show that climate attributes most strongly influence the distribution of flood generating processes within a catchment. However, other catchment attributes can be influential, depending on climate type. Based on the subset of influential catchment attributes, a random forest model can predict flood generating processes with high accuracy for most processes and climates, demonstrating capabilities to predict flood processes in ungauged catchments. Some attributes proved less influential than common hydrologic knowledge would suggest and are not informative in predicting flood process distribution.