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Streamflows dynamics at continental scale: using stremaflow correlation to identify hydrologically similar catchments in the contiguous US

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In this study, a novel process-based analytical method to predict the cross correlation of river flows at arbitrary locations is applied to reproduce the observed seasonal streamflow correlations between 413 catchments of the MOPEX dataset across the contiguous US. Given the parsimony of the analytical approach, the proposed tool proves particularly valuable in cases where limited hydrological information are available, making its use especially appealing for sparsely gauged areas in large-scale settings. Our exercise shows that highly correlated outlets share similar hydrologic signatures across a wide range of geomorphoclimatic conditions. Model predictions can therefore be used to regionalize streamflow regimes, identify redundancy or gaps in streamflow gauging networks and characterize spatial patterns of flow regimes along stream networks. In particular we show that model predictions of streamflow correlation can be used to identify pairs of hydrologically similar outlets and relate target (ungauged) sites with available donor (gauged) outlets. Additionally, we analyze how the density of available streamflow gauging stations affect the performance of the method, which in most circumstances outperforms spatial proximity as a selection criterion for donor sites, especially in sparsely gauged networks.