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Synthesis of streamflow recession curves in dry environments

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The elucidation and predictability of hydrological systems can largely benefit by extracting observed patterns in processes, data and models. Such type of research framework in hydrology, also known as synthesis has gained significant attention over the last decade. For instance, hydrological synthesis implies that the identification of patterns in catchment behavior can enhance the extrapolation of hydrological signatures over large spatial and temporal scales. Hydrological signatures during dry periods such as streamflow recession curves (SRC) are of special interest in regions coping with water scarcity. Indeed, the study of SRCs from observed hydrographs allows to extract information about the storage-discharge relationship of a specific catchment and some of their groundwater hydraulic properties. This work aims at performing a synthesis work of SRCs in semi-arid & arid environments across Northern Mexico. Our dataset consisted in observed daily SRCs in 63 catchments with minima human interferences. Three streamflow recession extraction methods (Vogel, Brutsaert and Aksoy-Wittenberg) along with four recession models (Maillet, Boussinesq, Coutagne y Wittenberg) and three parameter estimation techniques (regressions, lower envelope y data binning) were used to determine the combination among different possible methods, processes and models that better describes SRCs in our study sites. Our results show that the extraction method proposed by Aksoy-Wittenberg along with Coutagne's nonlinear recession model provides a better approximation of SRCs across Northern Mexico, whereas regression was found to be the most adequate parameter estimation method. This study suggests that hydrological synthesis turned out to be an useful framework to identify similar patterns and model parameters during dry periods across Mexico's water-limited environments.