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Analytic flow duration curves to understand discharge regimes across elevation gradients in Alpine environments

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Recent progress in the estimation of flow duration curves (FDC) from a few climatic parameters (in particular mean precipitation depth and frequency) and key discharge recession parameters allows potentially new insights into the hydrologic response of catchments across scales and climatic gradients. We tested the physically-based framework developed originally by Botter at al. (2007) for summer streamflow of 25 Swiss catchments characterized by negligible anthropic influence and showing a wide range of hydroclimatic regimes, including snow and glacier influenced streamflows. Special attention was paid to estimate all model parameters from readily available data sets such as gridded daily precipitation and land use information.

While the analytic modelling framework has been tested for many rainfall-driven catchments before, our results demonstrate that the framework is also suitable for snowmelt-influenced catchments and that some key model parameters show interesting relations with mean catchment elevation. This suggests that elevation can be considered being a good predictor for hydroclimatic gradients. Given that elevation gradients are also closely coupled to air temperature gradients , this opens new perspectives to assess how flow regimes in Alpine environments might evolve in a warming climate.