Temporal Configuration – Unlocking Hidden Streamflow Properties

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Abstract

Analytical tools are needed to identify and quantify artificial short- and long-term discharge fluctuations, which can disrupt the natural processes of a river. To measure the properties of discharge magnitude, frequency, duration, timing and flow change, such tools typically use a subset of metrics selected from over 170 descriptive statistical indices. Many metrics are based on multi-day mean or median discharges with associated variance or use a single value to describe the entire dataset. However, these source indices do not quantify the temporal configuration of streamflow, an additional hydrologic property that is often overlooked. To address this situation, a non-index approach to quantify all streamflow properties has now been developed using analysis methods based on the lag (1) temporal autocorrelation signature of the streamflow. The discharge (Q), discharge change (dQ/dt), and rate of discharge change (d ^{2}Q/dt ^{2}), along with sequential summations, are presented in novel infographics. A dam release river impact case study for the Colorado River at Lees Ferry, Arizona, is included to demonstrate this innovative way of analyzing streamflow datasets. The result is a set of new tools which yield detailed information about the hydrologic regime, are highly customizable, and can either be used as a stand-alone analysis or be integrated into other existing data analysis techniques. The end result is a better understanding of the hydrologic regime, more focused research, and more effective management planning.

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