Raster-based Analysis and Visualization of Hydrologic Time-Series

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Abstract. Annual, seasonal, and daily discharge patterns determine many of the physical and biological properties of a stream. Natural short- and long-term variation of streamflow is part of the normal processes of a river or stream whereas artificial short- and long-term fluctuations can disrupt the natural processes of a river. It is critical to recognize and identify such artificial fluctuations and disturbances to have a more complete understanding of river systems. This understanding can be used to modify current management efforts to achieve more natural flow regimes. A new procedure using dual-timescale graphs is presented to visualize streamflow characteristics and to measure temporal change objectively. Brief theoretical development, procedural guidelines, and interpretation of results are included in the development of this new approach.

The raster-based method is applied to two large river systems in the western United States. Data from U.S. Geological Survey (USGS) streamflow stations within the middle and upper Snake River Basin and upper Colorado River Basin were analyzed using a dual-timescale raster-grid to identify flow signatures and disturbances. Patch-analysis and pattern quantification techniques used in landscape ecology were applied to dual-timescale raster-based hydrographs. Both river basins included gaging stations where minimal human-caused disturbances have taken place within the respective watershed. These stations function as control sites for interpretation of grid-correlograms and patch-analysis results.

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