Contribution ID: **188** Type: **Oral Presentation**

Evidence of anomalous transport controls on long-term variability in stream water chemistry

Tuesday, 31 May 2022 11:00 (15 minutes)

We investigate the occurrence of anomalous (non-Fickian) transport in three neighboring hydrological catchments, at kilometer-length spatial scales and over a 36-year period. Using spectral analysis, we show that the fluctuation scaling of long-term time series measurements of a natural passive tracer (chloride), for rainfall and runoff, show evidence of a broad, power-law distribution of residence times in the catchments. This behavior can be described by a continuous time random walk (CTRW) formulation, which is based on an α-stable (non-normal) distribution of transition times. Our CTRW analysis reveals two distinct scaling behaviors of the chloride concentration at the catchment outlet: the travel time distributions scale as $\sim t^{-1+\beta}$ over relatively short times, and as $\sim t^{-1-\beta}$ over relatively long times, where $0 < \beta < 1$. Notably, the short time scaling coincides with a gamma distribution, which has been identified previously in the literature as a statistical description of travel time distributions. Overall, anomalous transport is seen as a clear "fingerprint" of the wide range of temporal contributions characterizing tracer retention and release through the domain, despite the long time scales and transport distances over which homogenization might be expected to occur.

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Time Block Preference

Time Block A (09:00-12:00 CET)

Participation

Unsure

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