



Application of the power spectral analyses and cross correlation analyses to estimate the delay time for an impacted intrapennine stream

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The time scales of catchment hydrologic and chemical response was evaluated using spectral analysis for an human impacted intra-Apennine forested catchment, draining into Bilancino reservoir (Florence, Italy). By comparing the spectral power of the input sediment source and output stations each wavelength determines how strongly the catchment attenuates hydrologic and chemical signals on each timescale. The delay time distribution of the turbidity dataset were calculated using the cross correlation function. Results show that the time of sediment particle transit ranging between 190 days to one year. Considering the spectra of turbidity the catchments exhibit fractal power-law scaling between $1/f^{1.5}$ and $1/f^{2.2}$. The turbidity dataset at the output station has consistently lower power spectrum than the inlet station along the range of the studied wavelengths. On the other hand, the output station shows a scaling exponent α higher than the inlet station. Implying a higher persistence of the turbidity “phenomena”. The fractal analysis points out that the system is not in equilibrium.