Groundwater-surface water exchange: A New Graphical User Interface for temperature time-series analysis

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Riverine systems have a dynamic exchange of water with the hyporheic zone and groundwater. Exchange fluxes can be challenging to estimate because they vary spatially and temporally and depend on many geological and hydrological properties. Temperature as a tracer has become a low-cost and robust method to monitor such fluxes both at local and reach (several channel widths) scales. Here, we present the capabilities and functionality of a new graphical user interface (GUI) developed in Python which is operating system independent. The GUI integrates standard and state-of-the-art signal processing methods with data visualization and analysis techniques. The signal analysis library allows the user to select the important frequencies to improve result confidence while the advanced LPMLEn and window function in FFT to reduce leakage in the extraction process of the amplitude and phase of the signals. The GUI streamlines the entire analysis process, from evaluating the raw temperature data to obtaining end-user specified parameters such as flux and streambed thermal properties. It allows for the analysis of single-probe and multi-probe data from short to long-term data sets.