



Seasonal changes in the diurnal in-stream nitrate concentration oscillations

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A variability of seasonal changes in the diurnal in-stream NO₃-N concentration oscillations was studied through high-frequency measurements of the stream-water's physical, chemical parameters (in-stream NO₃-N concentration, water temperature, dissolved oxygen, pH) and hydrometeorological variables (stream discharge, solar radiation) under hydrologically stable conditions. The study was carried out in 2006, within the 42 km² forested Padež stream watershed in the southwestern part of Slovenia, which is characterized by distinctive hydrogeological settings (flysch) and climate conditions (transitional area between the Mediterranean and continental climate). Fine temporal resolution of the data measured at 15 minute intervals enabled the identification of the main driving factors responsible for the seasonal variability in the diurnal pattern of the streamwater NO₃-N concentrations vs. seasonal and diurnal behavior of meteorological and other water chemistry constituents. Seasonal variability of the shifts in daily maximum (up to 6 hours) and minimum NO₃-N concentrations (between 1 and 3 hours) and changes in the amplitude of the daily NO₃-N concentration oscillations (in order of 0.1–0.3 mg/l-N) offer supplementary evidence of the in-stream NO₃-N processing by photoautotrophs. A wavelet analysis was further used to acquire clear, de-noised NO₃-N concentration signals on which models in the form of Fourier series were build, reaching R² values between 0.73 and 0.94. The models can be used to simulate the in-stream NO₃-N oscillating signal in order to obtain more accurate assessment of the NO₃-N exports from the forested watershed in different seasonal settings, undisturbed by the changing hydrological conditions.