Geophysical Research Abstracts
Vol. 12, EGU2010-2157, 2010
EGU General Assembly 2010

Seasonal Changes in 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 km^2 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 NO_3-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 NO_3-N concentrations (between 1 and 3 hours) and changes in the amplitude of the daily NO_3-N concentration oscillations (in order of 0.1–0.3 mg/l-N) offer supplementary evidence of the in-stream NO_3-N processing by photoautotrophs. A wavelet analysis was further used to acquire clear, de-noised NO_3-N concentration signals on which models in the form of Fourier series were build, reaching R^2 values between 0.73 and 0.94. The models can be used to simulate the in-stream NO_3-N oscillating signal in order to obtain more accurate assessment of the NO_3-N exports from the forested watershed in different seasonal settings, undisturbed by the changing hydrological conditions.