Geophysical Research Abstracts
Vol. 16, EGU2014-9999, 2014
EGU General Assembly 2014

Coupling of primary production and diel nitrate dynamics in a eutrophic lowland river system in central Germany

Michael Rode (1), Susanne Halbebel (2), Muhammad Rehan Anis (1), and Markus Weitere (3)

(1) Helmholtz Centre for Environmental Research - UFZ, Department of Aquatic Ecosystem Analysis and Management, Magdeburg, Germany (michael.rode@ufz.de), (2) Helmholtz Centre for Environmental Research - UFZ, Department of Lake Research, Magdeburg, Germany, (3) Helmholtz Centre for Environmental Research - UFZ, Department of River Ecology, Magdeburg, Germany

River ecosystem nutrient cycling and export are closely tied to the metabolic activity of primary producers. Although general patterns of diel variation in nutrient concentrations are known, recently developed in situ nutrient sensors allow description of fine-scale patterns of variation for extended durations, and they can potentially be used to quantify autotrophic assimilation. We used high frequency in situ measurements of nitrate (NO_3) and dissolved oxygen (DO) in the Bode River system of the TERENO hydrological Observatory of the Helmholtz-Association in central Germany to i) evaluate seasonal variation and river scale dependency of GPP and to ii) generate independent estimates of assimilatory nitrogen demand. We analyzed two year continues data (15 min interval) from four measurement stations ranging from the Selke third order forested stream in the lower mountain range to the sixth order lowland Bode River.

We are able to show that GPP follows a clear seasonal variation with highest values of up to 3 $gO_2m^{-2}d^{-1}$ in spring and an additional second peak during litter fall in autumn in the small forested stream. The lowland river shows a similar but less pronounced pattern with distinct higher GPP values of up to 6 $gO_2m^{-2}d^{-1}$. Surprisingly this two modal behavior was not found for the mid sized fourth order arable Selke stream with higher light availability. GPP strongly corresponded to the day length in the growing season showing the highest GPP of up to 8 gO_2 $m^{-2}d^{-1}$ in summer. This may be caused by high periphyton growth due to low dense riparian vegetation. A clear relationship of GPP and diel amplitudes of nitrate concentration could be observed in all streams and rivers but these relationships could only be identified for periods with highest GPP of each individual streams. In addition corresponding correlations (r) ranged between 0.5 and 0.6. The results show that high frequency in situ measurements potentially allow quantifying GPP and assimilatory nutrient uptake and may help to better calculate nutrient retention in rivers.