Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.29145

Role of aquatic macrophytes on diel evolution of lowland streams nutrient concentrations, pCO2 and d-13DIC

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The photosynthetic activity of aquatic plants can significantly alter the chemical signature of stream water, particularly for compounds related to carbon, nitrogen and phosphorus. To study the effect of plants, we monitored the evolution of these compounds over 24-hour cycles in small lowland streams draining more or less agricultural areas. The aim was to highlight biogeochemical processes linked to plant activity and to investigate the extent to which the parameters measured in the streams were dependent on the time of sampling. The results show that in spring a water body can change from a CO2 source (pCO2 = 4000 ppm) to a sink (300 ppm) between dawn and midday. In parallel, d-13DIC could vary by 8 ‰ in association with photosynthetic fractionation. These results show that the sampling period has a significant impact on the conclusions that can be drawn about the carbon balance. Nutrients do not evolve according to the diurnal cycle but the results show that freshwater aquatic macrophytes are hotspots of P sequestration as Fe oxides bound P. Dissolved Fe and P come from exchanges between groundwater and stream water. Sequestration of P is due to the increasing kinetics of dissolved Fe oxidation and precipitation during daylight photosynthetic activity. The occurrence and intensity of this reaction varies with season and land use.