Hydrology and Earth System Sciences
An Interactive Open Access Journal of the European Geosciences Union

Hydrol. Earth Syst. Sci., 12, 539-550, 2008
www.hydrol-earth-syst-sci.net/12/539/2008/

Lacustrine wetland in an agricultural catchment: nitrogen removal and related biogeochemical processes

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Abstract. The role of specific catchment areas, such as the soil-river or lake interfaces, in removing or buffering the flux of N from terrestrial to aquatic ecosystems is globally recognized but the extreme variability of microbiological and hydrological processes make it difficult to predict the extent to which different wetlands function as buffer systems. In this paper we evaluate the degree to which biogeochemical processes in a lacustrine wetland are responsible for the nitrate removal from ground waters feeding Candia Lake (Northern Italy). A transect of 18 piezometers was installed perpendicular to the shoreline, in a sub-unit formed by 80 m of poplar plantation, close to a crop field and 30 m of reed swamp. The chemical analysis revealed a drastic NO_3^--N ground water depletion from the crop field to the lake, with concentrations decreasing from 15–18 mg N/l to the detection limit within the reeds. Patterns of Cl^-, SO_4^{2-}, O_2, NO_2^--N, HCO_3^- and DOC suggest that the metabolic activity of bacterial communities, based on the differential use of electron donors and acceptors in redox reactions is the key function of this system. The significant inverse relationship found between NO_3^--N and HCO_3^- is a valuable indicator of the denitrification activity. The pluviometric regime, the temperature, the organic carbon availability and the hydrogeomorphic properties are the main environmental factors affecting the N transformations in the studied lacustrine ecosystem.

Final Revised Paper (PDF, 725 KB) Discussion Paper (HESSD)

Citation: Balestrini, R., Arese, C., and Delconte, C.: Lacustrine wetland in an agricultural catchment: nitrogen removal and related biogeochemical processes, Hydrol. Earth Syst. Sci., 12, 539-550, 2008. Bibtex EndNote Reference Manager