Speciation of Phosphorus in the Altenwörth-Reservoir of the River Danube

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With 2 figures and 8 tables in the text

Abstract

To estimate nutrient phosphorus deposits, availability and redissolution conditions in the Altenwörth-Reservoir of the River Danube/Lower Austria, fine sediments were repeatedly sampled from Nov. 86 to Sept. 87 at three sites. After wet sieving into three grain size fractions, two independent consecutive leaching techniques were applied. No significant changes of chemical and mineralogical composition occurred during the time of investigation. The fractionation patterns depend on the grain size, whereas the sampling site is of no influence upon the sieved samples. In the sequence dithionite/NaOH/HCl/hot NaOH, the HCl-extractable fraction is dominating, especially in coarser grains, which means bound to apatite or carbonates. The rise of NaOH extractable P towards fine grain size means Al-bound P. Within the sequence acetate buffer/acetic acid/oxalate buffer/decomposition with H2O2/HNO3, the huge amounts leachable with HNO3 mean apatite as well, and the dominating oxalate fraction at the fine grain size gives hints for binding to an Fe/Al/Mn-phase. The main amount of P is dialyzable as orthophosphate in the first two fractions of each sequence. No significant trend with locality and season was found. There are few connections between the amount of P and the main elements in the leaching solutions, indicating that P is not present in a stoichiometric phase, and a great deal of the main elements is dissolved from other parts of the sediment.

In comparison to other lake or river sediments of similar geochemical composition, termed as Ca/Al/Fe-contents, the total load of N, P and organic C is of medium range, the sediment of the Po being most similar.

When similar procedures are applied, the P-fractionation patterns of the Danube sediments are close to Lake Balaton, whereas the sediments of most Swedish lakes as well as Lake Piburg (Tyrol) release much more into dithionite and NaOH, possibly because the latter are higher in organic C and lower in Ca and Al.

Introduction

In aquatic systems, the contents of available nutrients is of decisive influence upon several activities of life. As early as in 1937 it was recognized by Ohle (Ohle 1937), that the availability is governed not only by the absolute amounts present, but also by the chemical speciation of the nutrients as well as physical, chemical