



Fast estimation of lacustrine groundwater discharge volumes based on stable water isotopes

Jörg Lewandowski (1,2,3), Jasper Gercken (1), Katrin Premke (1), Karin Meinikmann (1,2)

(1) Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany, (2) Humboldt University Berlin, Geography Department, Berlin, Germany, (3) lewe@igb-berlin.de

Lake eutrophication is still a severe problem in many parts of the world, commonly due to anthropogenic sources of nutrients such as fertilizer, manure or sewage. Improved quantification of nutrient inputs to lakes is required to address this problem. One possible input path for nutrients is lacustrine groundwater discharge (LGD). However, LGD has often been disregarded in water and nutrient budgets of lakes although some studies reveal an extraordinary importance of LGD for phosphorus inputs. The aim of the present study is to identify lakes that receive large LGD volumes compared to other input paths. Such lakes are more prone to high groundwater-borne nutrient inputs than lakes with small LGD volumes. . The simple and fast approach used in the present study is based on the fact that evaporation of surface water causes an enrichment of heavier isotopes in lake and river water while precipitation and groundwater are lighter and have similar isotopic signatures. The isotopic signature of lake water depends on a) the isotopic signature of its inputs and b) the lake's residence time (the longer the more enriched with heavier isotopes). In the present study we used the citizen science project "Tatort Gewässer" to let people collect lake water samples all over Germany. Based on additional information we identified lakes without or with small (compared to the lake volume) aboveground inflows. Based on the isotopic signatures of these lakes and additional background information such as the mean depth we could identify lakes in which groundwater is an important component of the water balance. The results will be used as a basis of intense research on groundwater-driven lake eutrophication.