

Wulka catchment hydrogeochemistry and the formation of Ca-Mg carbonate minerals in Lake Neusiedl

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Lake Neusiedl is located at the Austrian-Hungarian border and of great ecological and economic importance for this region. In view of constantly rising Earth's atmospheric temperature, atmospheric CO₂ level and associated evaporation rates, there is serious concern about the future development of this lake, particularly in its volume and composition. To counteract a steep drop in the water level, attention has recently been given to artificially discharging water into the lake. However, the impact on its hydrochemical balance could result in unforeseen consequences for its composition and ecology. Therefore, it is necessary to understand the hydrogeochemical cycles of the lake, as well as its carbonate system. Of particular interest is the formation of Ca-Mg carbonate minerals in Lake Neusiedl and potential environmental changes in the catchment area of the Wulka, which is the most important tributary stream of the lake. One lake site and the Wulka including her four main tributary streams were studied based on hydrological and hydrogeochemical data recorded during a spring and summer monitoring campaign. Therefore, the contribution of the individual tributaries to the overall system, as well as the influence of the geologically heterogeneous catchment area and distinct water-rock interaction were analysed and assessed. The tributary streams show a diverse hydrogeochemical composition indicating both silicate and carbonate weathering at distinct degrees, which can be also followed by radiogenic Sr distribution. Moreover, the suspended sediment load was examined using XRD, macrophotography stacking and high-resolution imaging techniques indicating recent Ca-Mg carbonate mineral formation in the water column of the lake. The suspended sediment shows a seasonal variability in the precipitation of low-Mg calcite, high-Mg calcite and protodolomite most likely via precursor mineral phases. Our findings highlight the need of developing sustainable strategies to preserve this vulnerable ecosystem.