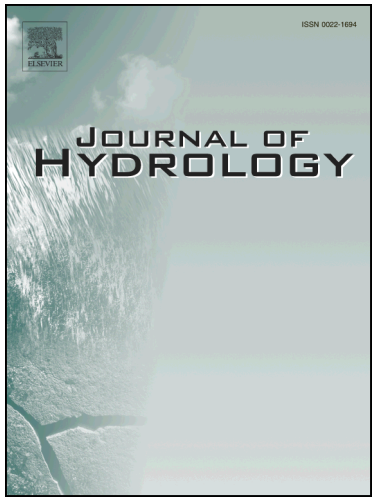

Research papers

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Identifying geochemical processes using End Member Mixing Analysis to decouple chemical components for mixing ratio calculations

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ABSTRACT

Mixing calculations (i.e., the calculation of the proportions in which end-members are mixed in a sample) are essential for hydrological research and water management. However, they typically require the use of conservative species, a condition that may be difficult to meet due to chemical reactions. Mixing calculation also require identifying end-member waters, which is usually achieved through End Member Mixing Analysis (EMMA). We present a methodology to help in the identification of both end-members and such reactions, so as to improve mixing ratio calculations. The proposed approach consists of: (1) identifying the potential chemical reactions using EMMA; (2) defining decoupled conservative chemical components consistent with those reactions; (3) repeat EMMA with the decoupled (i.e., conservative) components, so as to identify end-members waters; and (4) computing mixing ratios using the new set of components and end-members. The approach is illustrated by application to two synthetic mixing examples involving mineral dissolution and cation exchange reactions. Results confirm that the methodology can be successfully used to identify geochemical processes affecting the mixtures, thus improving the accuracy of mixing ratios calculations and relaxing the need for conservative species.