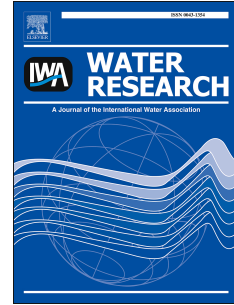


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Characterizing the capacity of hyporheic sediments to attenuate groundwater nitrate loads by adsorption

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1 **Characterizing the capacity of hyporheic sediments to attenuate groundwater nitrate**
2 **loads by adsorption**

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7 **Abstract**

8 Nitrate has been recognized as a global threat to environmental health. In this regard, the
9 hyporheic zone (saturated media beneath and adjacent to the stream bed) plays a crucial
10 role in attenuating groundwater nitrate, prior to discharge into surface water. While
11 different nitrate removal pathways have been investigated over recent decades, the
12 adsorption capacity of hyporheic sediments under natural conditions has not yet been
13 identified. In this study, the natural attenuation capacity of the hyporheic-sediments of the
14 Ghezel-Ozan River, located in the north-west of Iran, was determined. The sampled
15 sediments (from 1 m below the stream bed) were characterized via XRD, FT-IR, BET, SEM,
16 BJH, and Zeta potential. Nitrate adsorption was evaluated using a batch experiment with
17 hyporheic pore-water from each study site. The study was performed in the hyporheic
18 sediments of two morphologically different zones, including Z₁ located in the parafluvial
19 zone having the clay sediment texture (57.8% clay) with smectite/Illite mixed layer clay type
20 and Z₂ located in the river confluence area containing silty clay sediment texture (47.6%
21 clay) with smectite/kaolinite mixed layer clay type. Data obtained from the batch
22 experiment were subjected to pseudo-first order, pseudo-second order, intra-particle
23 diffusion, and Elovich mass transfer kinetic models to characterize the nitrate adsorption

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