



Nitrate source identification in urban groundwater

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The efficient utilization of urban groundwater requires the understanding of the fate and origin of potential pollutants. Here, particularly the pollution with nitrate still remains a challenge, especially for those urban areas without proper sanitation systems. To control and manage groundwater quality in these urban areas, nitrate source identification is thus essential. The hydrogeochemistry and stable nitrate isotopes in the urban aquifer of Mashhad were measured to identify the source of nitrate contamination and potential transformation processes. Nitrate concentration ranged from 8 to 166.1 mg/L and exceeded the limits for nitrate in drinking water in most of the wells (110 out of 261). Isotopic ratios of the O and N of nitrate in groundwater showed human wastewater and sewage as the main source of NO_3^- contamination. Furthermore, denitrification is not a considerably important process in the groundwater. Concentrations of NO_3^- and anions (PO_4^{3-} , SO_4^{2-} and Cl^-) revealed strong correlation ($R^2= 0.65$, 0.92 , 0.95 , respectively) confirming potential sewage influence. The majority of the aquifer is weakly acidic, and the chemistry of the groundwater is rather affected by land use and urbanization than by aquifer rock interactions. The lack of an efficient sewage system, particularly in the southern and central parts of the study area, directly leads to weak water quality. In future, management options require to be regarded for minimizing N input into groundwater because of lacking natural attenuation processes.