

Quantifying nitrate sources in groundwater using isotopic analysis combined with a Bayesian isotope mixing model in Northeastern suburbs of Beijing

LIANGSUO REN¹, CHUNLEI LU¹, LIRONG CHENG^{1*},
AIZHONG DING^{1*}

¹College of water sciences, Beijing Normal University, No. 19, XinJieKouWai St., HaiDian District, Beijing 100875, P. R. China (*correspondence: l.cheng@bnu.edu.cn ; ading@bnu.edu.cn)

Methods

A nitrate isotopic biplot accompanied with a Bayesian isotope mixing model (SIAR) were applied to estimate the proportional contribution of four dominant sources of nitrate (manure and sewage(M&S), NH₄⁺ in fertilizer and rain (NHF&R), soil N(SN), and unknown(UKN) [1, 2] in groundwater in Northeastern suburbs of Beijing. The results are shown in the figures below.

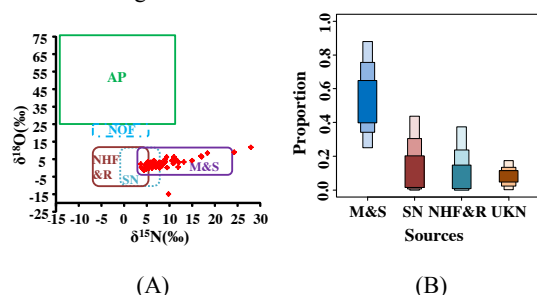


Fig.1. The biplot of nitrate isotope (A) and the proportion of major sources of nitrate (B) in groundwater.

Discussion of Results

The Bayesian isotope mixing model (SIAR) can calculate the contribution of different nitrate sources in groundwater, which is more accuracy than the mixing-model as the mixing-model based on mass balance cannot deterministically calculate the proportional contribution of different sources when the number of sources exceeds the number of isotopes analyzed [3, 4].

As indicated in the results, there are a certain proportion of unknown nitrate sources in the groundwater. This may be due to the fractionation effect of nitrogen and oxygen isotopes when nitrate entering the groundwater [4, 5], as well as biochemical reactions occur in the aquifer.

- [1] Meghdadi *et al.* (2018) *Environmental Pollution* **235**, 207 - 222. [2] Xue *et al.* (2009) *Water Research* **43**, 1159 - 1170. [3] Deutsch *et al.* (2006) *Organic Geochemistry* **37**, 1333 - 1342. [4] Moore *et al.* (2008) *Ecology Letters* **11**, 470 - 480. [5] Jackson *et al.* (2009) *Ecology Letters* **11**, 470 - 480.