Tracing the sources of nitrate in Yalu Tsangpo River using dual nitrate isotopes

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Based on a quantitative analysis of nitrate concentrations, the nitrate sources and temporal variability of mainstream and tributary in Yalu Tsangpo River(YTR) were assessed for the first time using dual isotope technology. Water samples were collected once in November 2016 and July 2017 for analysis of nitrate concentration and isotopic composition. The overall values of $\delta^{15}N\text{-}NO^{3-}$ and $\delta^{18}O\text{-}NO^{3}$- ranged from -0.6‰ to +12.2‰, and from -7.8‰ to +13.3‰ respectively.Duel isotopic composition suggested that nitrification of soil organic nitrogen was the main source of nitrate in mainstream and tributaries of YTR in winter. The inputs of soil with abundant organic matter from wetlands may be responsible for the significant contribution of soil organic nitrogen to nitrate in the YTR. In summer, as more soil particulates containing fertilisers may have flushed into the river by soil erosion as a result of the steep terrain and human causes, anthropogenic nitrogen inputs become more important in downstream than upstream because of intensive agricultural activities and urban input, especially at site Nugesha station. Furthermore, denitrification may have had an effect on the changing nitrate isotopic values in some area of YTR. Different sites show different characteristics of nitrate sources depending on the location, topography, landform, and climate of the river basins. These results provide useful information in revealing the fate of nitrate in different areas of YTR.