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氮同位素控制下黄河及其主要支流硝酸盐来源分析

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Tracing Nitrate Sources of the Yellow River and Its Tributaries With Nitrogen Isotope

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摘要 选取黄河小浪底水库及以下干流和支流河水为主要研究对象，利用氮同位素识别河水潜在硝酸盐来源，结果表明，研究区黄河干流及支流沁河和伊洛河河水硝酸盐含量均值分别为（4.77±0.95）、（3.45±1.71）和（4.50±0.91）mg·L^{-1}。研究区黄河干流河水$\delta^{15}N\text{-}NO_3^-$均值为（+3.2±4.5）‰，上游河水硝酸盐来源主要为土壤有机氮矿化，下游平原区河水硝酸盐来源包括土壤有机氮矿化以及化学肥料。沁河河水$\delta^{15}N\text{-}NO_3^-$均值为（+8.3±4.6）‰，丰水期河水硝酸盐来源包括大气降水、土壤有机氮矿化以及化学肥料；平水期河水硝酸盐受到生活污水和土壤有机氮矿化共同影响；枯水期沁河河水由于断流形成封闭水体，浮游植物和藻类生长以及反硝化作用是控制河水硝酸盐的重要因素。枯水期洛河和伊河河水$\delta^{15}N\text{-}NO_3^-$值分别为+10.9‰和+3.4‰，其中生活污水是洛河河水硝酸盐的重要来源，合成化学肥料是伊河河水硝酸盐的重要来源。

关键词： 河流 硝酸盐 氮同位素 来源识别 黄河

Abstract: Human activities have greatly affected the nitrogen (N) cycles in the terrestrial and aquatic ecosystems. The Xiaolangdi Reservoir on the Yellow River and the mainstream and tributaries of the River thereafter, including Qin River and Yiluo River, were selected as subjects in this study to trace potential nitrate sources of the waters with nitrogen isotope. It was found that the average nitrate content in the mainstream of the Yellow Rvier and its tributaries, Qin River and Yiluo River, was 4.77±0.95mg·L^{-1}, 3.45±1.71mg·L^{-1} and 4.50±0.91mg·L^{-1}, respectively; and the average $\delta^{15}N\text{-}NO_3^-$ in the mainstream was +3.2±4.5‰. Dissolved nitrate in upper stream of the Yellow River in the studied area came mainly from mineralized soil organic nitrogen, and in the rivers of the lower reaches from mineralized soil organic nitrogen and fertilizers applied. The average $\delta^{15}N\text{-}NO_3^-$ was +8.3±4.6‰ in the Qin River. Its nitrate came mainly from atmospheric precipitation, mineralized soil organic nitrogen and fertilizers during the high water season, and from sewage water and mineralized soil organic nitrogen during the normal water season, and from growth of phytoplankton and cyanobacteria, and denitrification in enclosed waters formed after the river discontiunued its flow during the low water season. Druing the low water season, the average $\delta^{15}N\text{-}NO_3^-$ was +10.9‰ and +3.4‰ in the Luo River and the Yi River respectively. In the former, sewage was the main source of nitrate, while in the latter the fertilizers.

Keywords: font-size: 10.5pt mso-font-kerning: 1.0pt mso-ansi-language: EN-US mso-fareast-language: ZH-CN mso-bidi-language: AR-SA river')" href="#">mso-fareast-font-family: 宋体" lang="EN-US">river nitrate nitrogen isotope source identification font-size: 10.5pt mso-font-kerning: 1.0pt mso-ansi-language: EN-US mso-fareast-language: ZH-CN mso-bidi-language: AR-SA Yellow River')" href="#">mso-fareast-font-family: 宋体" lang="EN-US">Yellow River

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