

Investigation of nitrate reduction process in coastal groundwater using nitrogen stable isotope

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The authors conducted the study to demonstrate the nitrate-nitrogen (NO₃-N) reduction process in the coastal groundwater of Seto Inland Sea, southern Japan. Eutrophication of Seto Inland Sea is regarded as one of the main environmental issue in Japan. Therefore, it is important to assess the NO₃-N discharge from land to the sea in this region. Especially, the NO₃-N transport process by groundwater is poorly understood. Saito et al. (2005) confirmed that NO₃-N concentration in groundwater significantly decreased at the coastal area.

In this study, we investigated the NO₃-N reduction process using the distribution of NO₃-N concentration and nitrogen stable isotope in the groundwater. The results are summarized as follows: 1) NO₃-N concentrations in the shallow (2~5m depth) and the deep groundwater (20~30m depth) were more than 20mgL⁻¹ in the midstream area of the catchment, whereas it decreased less than 5.0mgL⁻¹ in the downstream area. The inverse relationship between bicarbonate (HCO₃-C) and NO₃-N concentrations in the shallow groundwater suggests biochemical denitrification process in the coastal area. This is also supported by the low ratio of seawater contribution (less than 1.0%), and relatively low ORP in the groundwater of the downstream area; 2) Distribution of nitrogen stable isotope ratio implies the denitrification process in coastal groundwater, especially about the deep groundwater; 4) Based on these results, 20~40% of total nitrogen input to the study catchment were estimated to be removed by denitrification in coastal groundwater.