

Spatial distribution characteristic and seasonal change of N₂O in the groundwater of an agricultural catchment

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The distribution characteristics of nitrous oxide (N₂O) in an unconfined aquifer was examined based on the change of concentrations in N₂O, nitrate-nitrogen (NO₃⁻-N), and other chemical components with the groundwater flow in an agricultural catchment affected by the significant fertilizer application. N₂O concentrations were about 10ug L⁻¹ in the upstream area, and they were positively correlated with NO₃⁻-N concentrations. These results suggest that the nitrification process influences N₂O concentrations in the upstream area. On the other hand, in the downstream area, N₂O concentrations in the deeper groundwater (>15m) were significantly high (40ug L⁻¹), while they were very low in the shallower groundwater (<15m) (below the detection limit). The spatial distributions of DO and DOC suggest that the shallower groundwater is characterized by the strong reducing condition and high organic carbon content compared with the deeper groundwater. These results suggest that the complete denitrification process (NO₃⁻-N₂) occurred in the shallower groundwater, while the incomplete denitrification process causes the increase of N₂O concentrations in the deeper groundwater. This investigation was conducted in April. Furthermore, the second investigation was conducted in December. The result in wet season was compared with the result in dry season.

Keywords: groundwater, N₂O, denitrification, nitrification, agricultural catchment