Evaluate the spatial and temporal variation of N_2O and associated flux into the air

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In order to evaluate the spatial and temporal variation of N_2O and associated flux into the air in a granite unconfined aquifer of Ikuchi Island, water samples were collected from 9 observation wells with different depths and 6 observation wells in the groundwater discharge area from 2013 to 2015 and analyzed for N_2O, NO_3^--N and Cl^-. The results showed that the concentrations of dissolved N_2O changed with water depth, which can be attributed to the C/N ratio. When the C/N ratio ≤5, high concentrations of dissolved N_2O occur. In addition, the N_2O concentrations increased with the redox condition of water changes from oxidation to reductive. However, when water was in strong reductive conditions such as ORP ≤-200mV, the relative low concentrations of N_2O took place, since N_2O can change into N_2 due to the complete denitrification. Dissolved N_2O concentrations also increased in dry seasons, when most of observation wells being in a reductive state. In the groundwater discharge area, dissolved N_2O and NO_3^--N concentrations decreased along the groundwater flow pathway, which results from the dilution of seawater and denitrification. The flux of N_2O into air was estimated to be 49$gha^{-1}year^{-1}$, the same level as seawater emission rate. Whereas, in a high precipitation event(precipitation ≤30mm/day), 5$gha^{-1}day^{-1}$ (about 10 percent of annual N_2O emission) would emission into air.

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