

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 $ORP \leq -200mV$, 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 $49g\text{ha}^{-1}\text{year}^{-1}$, the same level as seawater emission rate. Whereas, in a high precipitation event(precipitation $\leq 30\text{mm/day}$), $5g\text{ha}^{-1}\text{day}^{-1}$ (about 10 percent of annual N_2O emission) would emission into air.