

Nutrient transport and surface water-groundwater interaction in the tidal river of a coastal megacity in Japan

Shin-ichi Onodera^{1*}, Mitsuyo Saito², Yuta Shimizu¹, Masashi Yoshikawa¹, Koki Onishi¹

¹Integrated Sciences, Hiroshima University, ²Ehime University

In coastal megacities, severe groundwater depression and water pollution occurred. These impacts affected to river environment change. Especially, the river mouth area has been deposited the polluted matters. These areas have characteristics of water level fluctuation which causes river water-groundwater interaction and the associated change in dynamics of nutrients. However, these effects on the nutrient transport in tidal reaches and nutrient load to the sea have not been fully evaluated in previous studies. Therefore, we aimed to clarify the characteristics of the nutrient transport with the river water-groundwater interaction in the tidal river of Osaka metropolitan city. We conducted the field survey from the river mouth to the 7km upstream area of Yamato River, which has a length of 68km and a watershed area of 1070 km². Spatial variations in radon (²²²Rn) concentrations and the difference of hydraulic potential between river waters and the pore waters suggest that the groundwater discharges to the river channel in the upstream area. In contrast, the river water recharged into the groundwater near the river mouth area. It may be caused by the lowering of groundwater level associated with the excess abstraction of groundwater in the urban area. The result also implies the seawater intrusion would accelerate the salinization of groundwater. The spatial and temporal variations in nutrient concentrations indicate that nitrate-nitrogen (NO₃-N) concentrations changed temporally and it negative correlated with dissolved organic nitrogen (DON) concentrations. Inorganic phosphorous (PO₄-P) concentrations showed the increasing trend with the increase of the river water level. Based on the mass balance, nutrient reproduction from the river bed was suggested in tidal reach. That was estimated to be 10 % of total nitrogen and 3% of phosphorus loads from the upstream.

Keywords: nutrient transport, surface-groundwater interaction, megacity, radon