Estimation of Submarine Groundwater and TP Flux near the Intertidal Zone by the Budget Analysis using the Marine Observation Data

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Submarine groundwater (SGW) flux and total phosphors (TP) flux with SGW near the intertidal zone of Omae beach was estimated by the budget analysis using the marine observation data. Omae Beach located in Shuku River mouth in the northeastern part of Osaka Bay. It is a natural beach, but is surrounded by reclaimed grounds. SGW is discharged and is recharged from/to the sea bottom of coastal zone of the beach, thought that detail of it is not clarified yet. Therefore we estimated not only SGW flux but also its TP flux based on the marine observation data.

Coastline of the beach is about 900m and the length of intertidal zone is about 150m. Marine, river and groundwater observations were carried out in Oct. 10 and 11, 2007. Salinity observations at 5 stations were carried out every high tide, mean level and low tide. Water level was measured at offshore of the intertidal zone during about 24 hours. Flow speeds of two rivers were measured at high and low tide. The analyzed area, which is surrounded by the beach and the outer boundary, is about 1860×10^6 m^2.

The through water volume of the boundary, C, was calculated by the summation of temporal variation of volume of the area, dV, river discharge, Q, precipitation volume, P and evaporation volume, E. Temporal variations of salt volume of the area could account by C. However, temporal variations of TP volume of the area were not balanced with TP volume by C. It is suggested that water and salt budgets of the area is dominated by through flow, but TP flux with SGW can not neglect for TP budget, because TP concentration of pore water is very high generally.

Water balance included SGW was estimated by water budget, $dV=Q+P-E+Cs+SGW$. Cs is through water volume formulated by salinity. Temporal variations of TP flux with SGW were also estimated by TP budget. In this time, TP flux with SGW means summation of submarine fresh groundwater (SFG), recirculated saline groundwater (RSG) and TP release from the bottom sediment (pore water) by diffusion. SGW discharged during flood tide and recharged during ebb tide. It agrees with the previous study. TP flux with SGW was larger than that with through flow across the boundary, and was about ten times of the popular release velocity of TP. It means that the bottom sediment and pore water is important for the source of TP to the water column, and TP is supplied by not only release by diffusion but also groundwater flow.

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