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Coastal water quality modeling accounting for groundwater influence in tidal lake in Korea

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Many investigations on groundwater impact reveal that 10–50% of nutrient loading in coastal waters comes from the submarine ground water, particularly in the macro-tidal flat as in the west coast of Korea.
In this study, we analyze the long-term observed data of groundwater and surface water quality, then material budeget has been investigated using a box model to quantify the contribution of groundwater effect to coastal water mass. The additional source of loading by submarine groundwater has been accounted for simulation of long-term prediction of coastal water quality by using the fully three-dimensional water quality model ROMS-ICM IKim and Lim, 2009; Kim et al., 2011).
Long-term monitoring data set of coastal water quality indicates a possible signal of groundwater influence on the salinity reversal and the excess mass outbalancing the normal budget in Saemangeum tidal lake in Korea. In the present study, we analyze the observed data to examine the influence of submarine groundwater, and then a box model has been demonstrated to quantify the influx and efflux into/from. A three-dimensional numerical model has been applied to reproduce the process of groundwater dispersal and its effect on water quality of Saemangeum tidal lake.
The water quality model (ROMS-ICM) consists of hydrodynamic model of ROMS and eutrophication model of CE-QUAL-ICM (Kim et al., 2011). The ROMS-ICM has been implemented for the seasonal variation of state variables by applying to the Saemangeum tidal lake and coastal waters of Korea. The model has been calibrated with observed data of water quality parameters such as temperature, salinity, chlorophyll, dissolved oxygen, phosphorus, and nitrogen.
The results show that groundwater influx during summer monsoon contributes significantly in 20% more than during dry season to water quality in tidal lake. Using by the three-dimensional water quality model, the seasonal variations of state variables have been reproduced in promise of prediction of future condition of coastal environment.
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