Development of a regional river-ocean seamless model for the island of Kyushu

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Typhoons and heavy rainfall events cause strong river runoffs that result in low salinity and turbid conditions near the coast. To simulate these events realistically, a river-ocean seamless model is developed so that river runoffs from multiple rivers and oceanic flow can be captured on a regional scale. The coupling of the traditional numerical river and ocean models often results in discontinuity in the currents near the river mouth since river models often do not include the effect of tides. Tidal currents near river mouths are strong and enable saltwater intrusion towards land as salinity is reduced due to mixing. Saltwater intrusion is considered to play an important part in enhancing biological activities within rivers. The goal was therefore to simulate the variability of the flow and salinity near river mouths realistically while not increasing the computational cost as much as possible. As a first step, the Kyushu-island model was developed with a two-layer (river water and oceanic water layers) model with tides forced by varying the sea level along the lateral boundaries. The model successfully captured the variability in transport after multiple rainfalls and typhoon-related events comparable to observations. However, the model tends to show a delay in peak discharge time. The bias in the magnitude of the river discharge appears to be a result of differences in the land-surface properties for each river basin.

Keywords: River runoff, Coast, Coupled model

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