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Salt water intrusion in the Pearl River networks, China

Wei Zhang¹, Rongxiang Zhou², and Xiaomei Ji³

¹College of Harbour, Coastal and Offshore Engineering, Hohai University, Nanjing, China (w.zhang@hhu.edu.cn)

²College of Harbour, Coastal and Offshore Engineering, Hohai University, Nanjing, China (zrx@hhu.edu.cn)

³College of Harbour, Coastal and Offshore Engineering, Hohai University, Nanjing, China (VASTOCEAN@hhu.edu.cn)

The Pearl River networks is a typical river networks system with channel density ranging from 0.81-0.88m/m². Recent years, with the rapid development of economy, the intensive human activities have great impacts on the networks system. Sand excavation is the most severe one, which directly led to the averaged 4-6m riverbed downcutting over the Pearl River networks. Consequently, salt water intrusion has become much serious than it was before. In this study, a coupled 1-D river networks and 3-D estuarine combined numerical model has been established to evaluate the influence of bathymetry changes and sea level rising on the salt water intrusion in the river networks. Two period of bathymetries in 1990s and 2000s have been used to simulate the length of salt water intrusion (LSR). It is found that the LSR in 2000s was 24 km farther upstream than that in 1990s. However, the LSR is no more than 3 km when sea level rises by 30 cm. This implies that impact of bathymetry changes overwhelms the sea level rise on LSR. The result also shows that LSR has the negative and positive correlation with river discharge and tide range respectively, which means that LSR will decrease and increase with river discharge and tidal range increasing. Furthermore, it is quite interesting to notice that the LSR is also quite relative to the flow ratio at the apex of the delta. With the same river discharge from the upper stream, the more the discharge come from the West River, the less LSR will happen, which would be quite useful to the authority to transfer the water to control the salt water intrusion in Pearl River networks.