

Mud siltation in the north harbour of Incheon, Korea

Shin Hyun-Jung¹, Guan-hong Lee¹, Soongji Lee¹, Jeong Shin Lee², Tim Dellapenna³, Josh Williams³, Young Taeg Kim⁴ and Ho Kyung Ha¹ and Jae Il Kwon⁵

¹ Department of Oceanography, Inha University, 100 Inharo, Incheon, 402-751, Korea
E-mail: hyunjung@inha.edu

² Department of Environmental Engineering, Kwangwon University, Seoul, Korea

³ Department of Marine Sciences, Texas A&M University, Galveston, TX, 77554, USA

⁴ Ocean Research Division, Korea Hydrographic and Oceanographic Administration, Korea

⁵ Korean Institute of Ocean Science and Technology, Korea

The development of North Harbour was initiated at a macro-tidal flat within the Harbour Complex of Incheon, Korea in 1997 (Fig. 1). To maintain the design depth of -14m below LLW (Low LowWater) from the tidal flat of 2m above LLW, dredging operation has been repeated over the last 13 years within the unbalanced (disequilibrium) North Harbour. In efforts to reduce the siltation within the harbour, this paper attempts to estimate siltation rate and then determine dominant mechanisms for the siltation within the North Harbour. The siltation rate was estimated and then confirmed by the following two independent methods: comparison of available hydrographic sheets and radioisotope analysis of gravity cores. The sedimentation rate varied from 10cm/yr in the far end of the harbour to about 100cm/yr at the entrance (Fig. 2). In order to determine dominant mechanisms for siltation, two ADCPs and two CTDs were deployed at the entrance and the far end of the harbour over a month, and examined flow mechanisms for a harbour basin (Fig. 3). Moreover, the EFDC model simulation indicated that the eddy forms during the flood of spring tide and it appears to be responsible for the high siltation at the harbour entrance (Fig. 4).

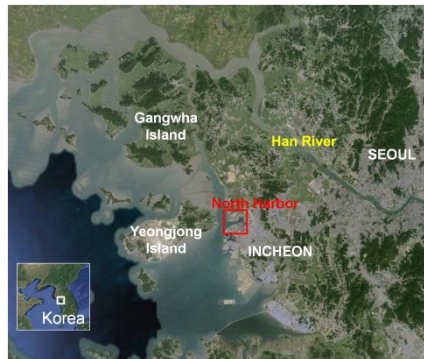


Fig. 1. Location map of North Harbour.



Fig. 2. Sedimentation rate in the North Harbour. The rate was evaluated with the core length divided by the year of sedimentation.

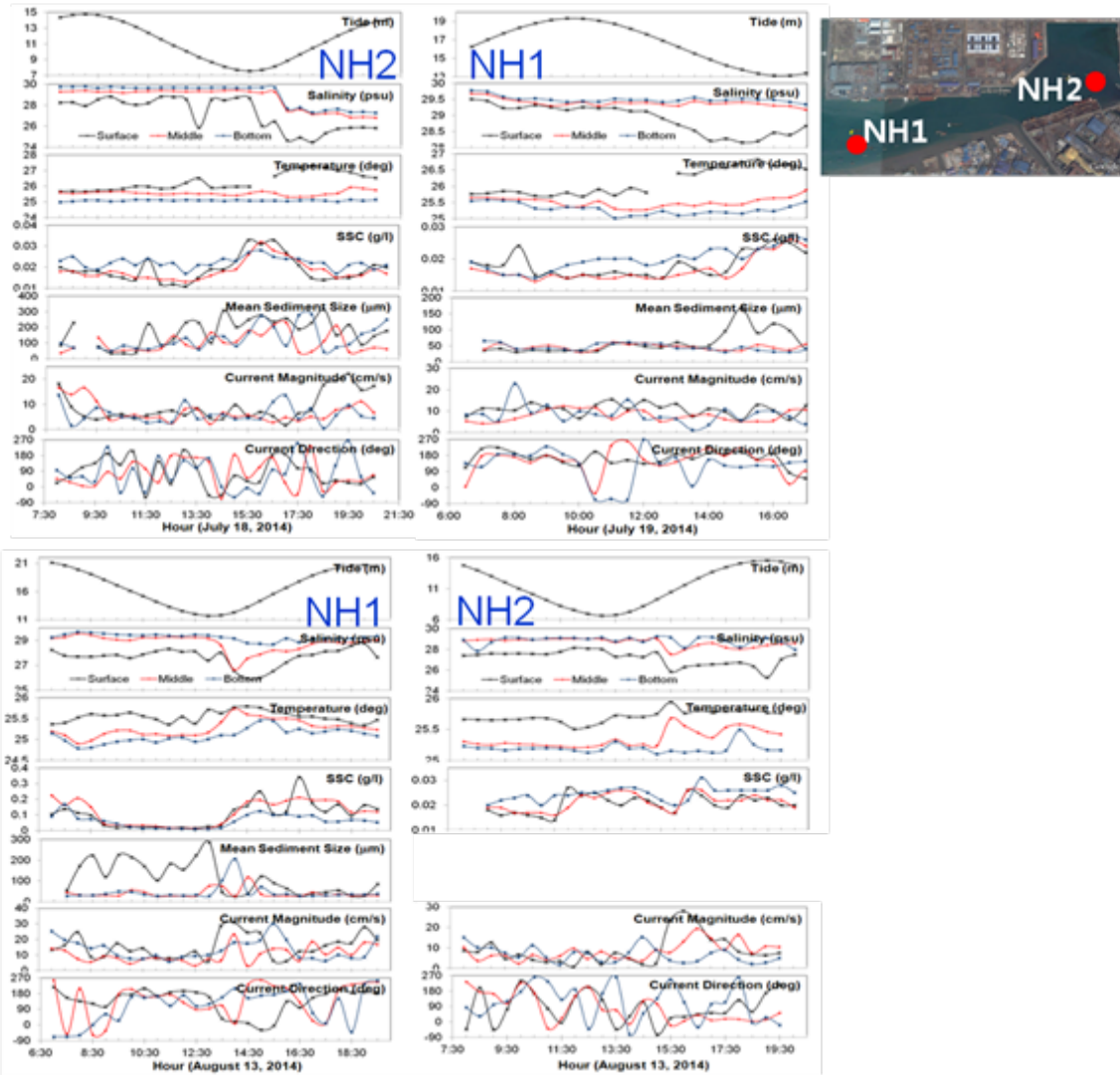


Fig. 3. Time-series of flow and suspended sediment concentration at two stations (NH1 and NH2) during two tidal stages.

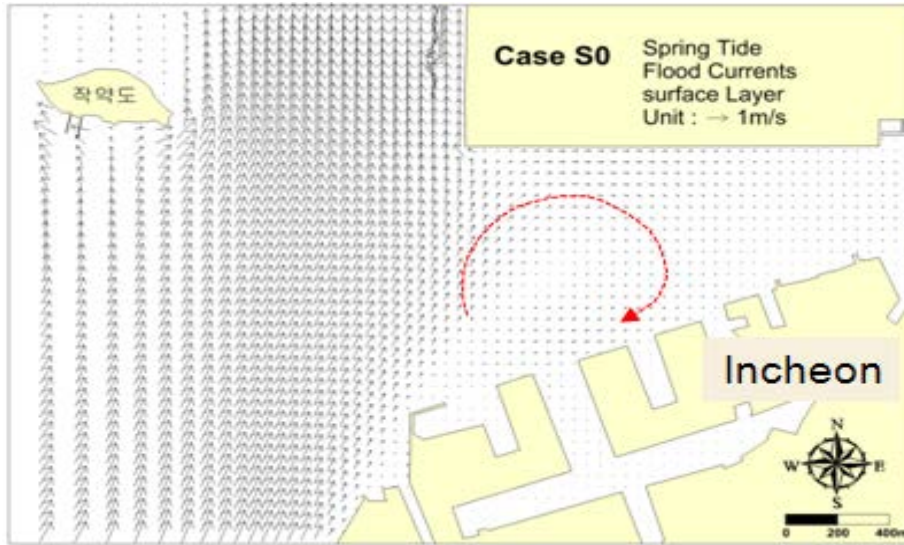


Fig. 4. The model simulation indicates that the eddy is responsible for high siltation at the harbour entrance.