Numerical simulations of flow and river plume structures in the inner part of Tokyo Bay

*Waku Kimura[1], Eiji Masunaga[2], Hiromune Yokoki[2]

1. Graduate School of Science and Engineering, Ibaraki University, 2. Ibaraki University

Numerous previous literatures reported flow structures in Tokyo Bay using methods of filed observations and numerical simulations. However, high resolution numerical approaches resolving reclaimed islands and river mouths have not been reported in previous studies. This study presents numerical simulations using an oceanic simulator, SUNTANS, with high resolution unstructured triangle grids. The model is forced by river discharges (Sumida, Arakawa, Nakagawa, Edo Rivers), tides (four main tidal constituents) and wind stress. The computational period is April 1st to 31, 2011 (1 month). Model validations compared with observed data of tidal elevations and surface currents show good agreements with filed data and numerical results. Time averaged surface currents show eastward flows in the inner most of the bay. Meanwhile, northward flows appeared far from river mouth due to dominant northward winds. Time-and-depth averaged flows represent a westward (toward the bay mouth) convergent flow in the middle of the bay. This convergent flow is supposed to be generated by southward river plumes and northward wind-induced flows. Comparisons between tidal flows and wind-induced flows show that tides dominate in river mouths and along west coast, and winds dominate along the east coast. In addition, this study investigated effects of a closed river barrage located at the Edo River mouth. Fresh water from the Edo River outflows into the Arakawa River mouth, which results in decreasing in salinity around the Arakawa River mouth and increasing in salinity the Edo River mouth. The effect appears within areas approximately 5 km far from the river mouths.

Keywords: Tokyo Bay, Numerical simulations, River plume

