論文の要旨

題 目 Tidal characteristics in a multi-channel estuary: A Case study on the Ota River estuary
（感潮河川網における潮汐特性：太田川河口域を対象としたケーススタディ）

氏名 DANIAL, MOCHAMMAD MEDDY

This dissertation studies the tidal characteristics of a multi-channel network, particularly investigates the temporal variation of tidal discharge and the phase difference between the tidal discharge and water level at three branches connected to a channel junction. The temporal variations of the tidal discharge were measured by an innovative FATS instruments which deployed at three branches connected to the channel junction during a low-flow condition. The temporal variation of flow division between two seaward branches connected to the channel junction can be investigated using discharge asymmetry index during spring and neap tide. Moreover, FATS is applied to measure the temporal variation of tidal velocity during high flow and normal flow condition. In addition, the cross-sectional average salinity at the tidal channel junction is also measured using FATS to investigate the behavior of subtidal salinity. Moreover, the tidal velocity at the tidal channel junction is simulated using a 2D numerical model to investigate the 2D velocity distributions in the eastern and western branches connected to the channel junction.

The discharge asymmetry index shows that the inequality of flow division is obviously prominent during the spring tide duration, where the eastern branch has the capability to deliver greater amounts of subtidal discharge, approximately 55–63%, compared with the western branch. However, the equality of flow division between the eastern and western channels can be observed clearly during the neap tide period.

The phase difference between the two seaward branches shows a slightly different behavior, where a mimic standing wave characteristic ($\Delta\varphi = \sim 88.5°$) is observed at the

western branch and a mixed wave characteristic ($\Delta\varphi = \sim 78°$) is observed at the eastern branch. The larger phase difference at the western branch is because the western branch is more convergent compared to the eastern branch. Likewise, the phase difference at the northern branch (landward branch of the junction) shows a mimic standing wave ($\Delta\varphi = \sim 90°$), which is slightly higher than the phase difference in the two seaward branches. This result implies that the phase difference is slightly increased after passing through the junction into the northern branch.

The application of FATS can estimate the temporal variation of tidal velocity during high flow condition (flood event) and normal flow condition. In addition, the temporal variation of subtidal salinity at the northern branch is smaller than at the eastern and western branch irrespective of the tidal range. The temporal variation of subtidal salinity in the eastern and western branches are almost equal without relation to the tidal range.

Numerical results of tidal velocity at the tidal channel junction show that the velocity at the eastern branch is higher than that at the western branch, which is consistent with the results of FATS. In addition, the water in the eastern branch flows into the western branch during the flood tide intermittently, as a result of the transfer of tidal energy from the eastern branch to the western branch. This happens due to the shorter branch of the eastern branch compared to the western branch.