FIELD OBSERVATION OF FINE SEDIMENT TRANSPORT PROCESS AROUND RIVER MOUTHS IN NORTH WESTERN JAVA ISLAND, INDONESIA

Yasuyuki Nakagawa, Kyushu University, y.nakagawa@civil.kyushu-u.ac.jp
A. Bagyo Widagdo, Agency for the Assessment and Application of Technology (BPPT), bagyo.widagdo@bppt.go.id
Masayuki Banno, Port and Airport Research Institute (PARI), banno-m@pari.go.jp
Gugum A. Gumbira, BPPT, gugum.gumbira@bppt.go.id
Taichi Kosako, PARI, kosako@pari.go.jp
Hitoshi Tamura, PARI, htamura@ipc.pari.go.jp
Dinar C. Istiyanto, BPPT, dinar.catur@bppt.go.id

INTRODUCTION

Understanding of transport processes of discharged sediment through the river in coastal area is crucial for prediction of coastal bathymetry evolution. In case that fine sediment is dominant in sedimentary system, the transport process becomes complicate with the formation of fluid mud, which may be an important role on the transport and distribution of muddy sediment.

The aim of this study is to elucidate the fine sediment dynamics, which may have a key role on the deformation of the deltaic topography around the estuary, in a tropical climate environment where experiences apparent seasonal variation of river discharge due to the wet and dry weather condition.

FIELD MEASUREMENT

The target site of the study is around the mouth of the Cipunagara river near the Patimban coast at the north west of Java island in Indonesia. At the monitoring points plotted in Figure 1, vertical profiles of salinity, turbidity were measured with the CTD censors of AAQ1183, the product of JFE Advantech Co., and an in-situ densimeter of XL-4, the product of Hydramotion Ltd., was used for the bulk density measurement through the water column including near bed fluid mud layer. Bottom sediment and suspended sediment sampling were also carried out and the current velocity measurement with the ADCP was also deployed at the same monitoring points. The field works were carried out in February and August, 2017, as wet and dry season survey.

RESULTS

Through the bulk density measurements, it reads around 1,000 kg/m^3 for fresh water and 1,020 kg/m^3 for sea water. In the near bed layer, the density increased up to 1,300 kg/m^3 through 1,400 kg/m^3 in the consolidated mud layer. Between the sea water and the consolidate mud layer, transient layer with the bulk density of 1,100 – 1,200 kg/m^3 are often observed in the muddy environment and it is defined as so called fluid mud layer (e.g. Whitehouse et al. 2000).

The measured profiles at the monitoring station at Stn B1, which is the nearest to the mouth of the branch of the Cipunagara Riv., are shown in Figure 2. It is noteworthy that three layers structure above the consolidated mud bed appears in the vertical profile of the bulk density in the wet or higher river discharged season, as indicated in Figures 2(a). The fresh water layer, however, does not appear in the dry season as in Figure 2(b) and fluid mud layer is thinner than that of measured in the wet season.

SUMMARY

In order to elucidate fine sediment transport process and resulting bathymetry evolutions, field surveys were carried out with monitoring of spatial distribution of suspended sediment and fluid mud in the estuarine system under a tropical climate environment with a wet and dry season. We successfully captured the difference between the wet and dry season in vertical structure of bulk density through the water column from the sea surface through consolidated mud bed. Observed data including the seasonal variation of fluid mud thickness can be applied for the modeling works of the fine sediment transport process in the target site, which is our future work.

Figure 1 – Location of target site and monitoring points

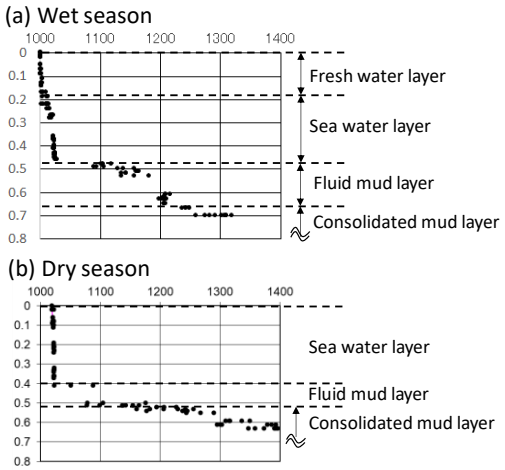

Figure 2 – Observed vertical profiles of bulk density at Stn B1 in (a) wet season and (b) dry season.

REFERENCES

Whitehouse, R., R. Soulsby, W. Roberts and H. Mitchener (2000): Dynamics of estuarine mud, Telford Publishing, 210p.