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Title	Characteristics of Suspended Sediment Transport off River Mouth and Inlet

(800 words)

The aim of this study is to investigate details of suspended sediment transport characteristics at two kinds of coastal features, i.e. an inlet of Hamana Lake and river mouth of Tenryu River. This study was performed in two methods, namely laboratory experiments and field measurements. An introductory investigation was conducted through several laboratory experiment scenarios. The experiments used two kinds of granular materials. The main step of this study was performed through a series of field measurements at the two locations. In the laboratory experiments, one of the materials used in the experiments was made up from iron slag to mimic a heavy density material. The laboratory experiments were conducted to see the suspension process of the two kind materials that further deformed the bed profiles. Meanwhile, focus of the field measurement was put on the suspended sediment movement by incorporating tidal currents, waves, and river discharges.

There are three scenarios of the laboratory experiments, i.e. plain bed experiment, cylindrical structures experiment, and slope bed-profile experiment. The iron slag was divided into four groups of grain size. For comparison, five types of natural sand were also investigated. The first main test of the sediment movement experiments was started to compare ripples forms condition of the iron slag to the natural sand groups. Results demonstrate that the iron slag ripple's height-length ratios have smaller portions compared to the natural sand groups in wave flume experiments. Another two scenarios of the laboratory experiments were conducted by deploying a cylindrical structure horizontally on the material pit and vertically in the middle of the pit. These were to see the effects of the material density on a pipeline structure and a slender pile scouring depths. Slender pile local scouring experiments show that in a small wave period (T = 1.2 s) the iron slag is effective to reduce the scouring depths. However, in a longer wave period experiment (T = 1.6 s), the frontal side of the pile tends to accumulate the material. Meanwhile, the backside of the pile bedforms shows that the iron slag is significant to reduce the scouring depths. These experiments reveal that the density of the material does contribute to the suspension process near the bed.

Secondly, the characteristics of the suspended sediment transport were investigated by conducting a series of field measurements. The field measurements were conducted into three steps. First step of the measurement was performed to investigate the effects of waves and tidal currents to the suspended sediment movement at two locations, i.e. off Tenryu River mouth and inlet of Hamana Lake. The results would clarify the role of the hydrodynamic force elements on the suspended sediment movement. The field measurements were proceeded to focus on hydrodynamically extreme events, such as storms and flood events. The last part of the investigation was addressed to study currents structure and the suspended sediment properties dynamic at the Tenryu river mouth.

The first step of the observation explains that the Suspended Sediment Concentration (SSC) at Hamana inlet point and Tenryu River mouth point give different responses to the tides and waves. Bed shear stresses of waves and currents were calculated separately to see the contribution of the elements to the bottom SSC. Results revealed that the inlet suspended sediment fluxes were more affected by tidal currents especially during ebb tide. On the other hand, suspended sediment fluxes at Tenryu River mouth were more affected by waves condition.

The field measurement focus was then addressed to see the effects of the extreme events around the river mouth of Tenryu River. Data used in this analysis were adopted from several extreme events that consist of storms and flood off Tenryu River in 2006 and 2007. The measurements consist of the observation of river discharge, river SSC, and bottom seabed SSC and hydrodynamic condition (waves and currents) coupled with other ancillary data such as precipitation rates and winds. There were five times of high wave events recorded, named as S1 to S5 events. The high wave events created suspension process throughout the wave boundary layers. One flood event recorded during the measurement shows that the effects of river high turbid water on the observed point SSC were verified. The storm events and the flood are potential to change the bottom morphology of the river mouth. Two times bathymetric measurements were performed before and after the biggest storm (S4) and a flood event in 2007 to see the morphological changes due to the extreme events. It was found that the storm and the flood created significant morphological changes around the river mouth. Based on bed profile data, some amount of bed material around wave breaking zone was eroded and deposition area was found about 500 m from shoreline to seaward direction.

Observations of the suspended sediment particle size revealed that the particle sizes tend to be classified as poor sorting particle, where the standard deviation of the particle bigger than 1. The skewness of particle size was mainly found at depositional environment where the particle size spectrum was tended to be in coarse size group.