Influence of hydrodynamics on sediment characteristics: comparison between two tidal flats

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Introduction

Interaction between hydrodynamics and sediment is a complex issue in tidal flat. The various tidal processes can influence the sediment transport (Winterwerp, 2011), and also the sediment behaves differently in settling and consolidation aspects (te Slaa *et al.*, 2013). In this study, combined with the methods of field measurements and laboratory tests, a series of experiments have been carried out in two different tidal flats, i.e. Kapelle bank in Western Scheldt, the Netherlands and the Chongming Dongtan in Yangtze River, China.

Methods

First, through arranging instrument in field to investigate the in-situ hydrodynamics, such as: velocity, wave, suspendered sediment concentration etc. Secondly, collect sediment of bed surface and carry out laboratory test to obtain the sediment characteristics, such as: water content, grain size distribution, and rheology etc. Finally, combined the results both in filed and laboratory, quantifying the influence of hydrodynamics of on sediment characteristics and behaviours.

Results

Field measurements

In this study, the result of the field measurement shows the flow and sediment processes in the tidal flat of Kapelle bank (as shown in Fig. 1). And it is a prerequisite to analyse the sediment characteristics. The rose diagram depicted was measured by an up-looking Nortek Aquadopp, the time interval is 300s, and the sampling positions were 1m above the bed. It shows that the sand component of the sediment close to the shore is more than the others. And the median diameter in west is larger than that in east. This may be caused by the flow and the sediment net transport during the flood and ebb.

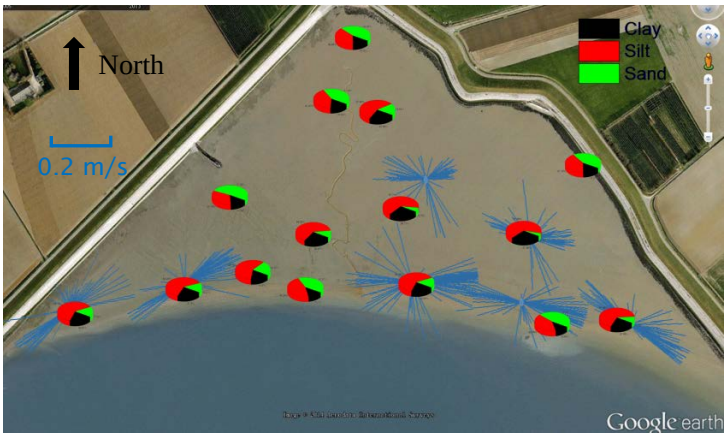

Fig. 1. The flow and sediment distributions in Kapelle bank (May 14, 2014 23:00-May 15, 2014 09:00).

Laboratory experiments

A series of experiments have been conducted to reveal the inherent properties of the sediment, for instance, the settling test of sediment in Kapelle bank has been carried out using the solution of the flocculant of BASF Zetag with the mass concentration 0.25g/L. The solution is mixed with the suspended sediment with the concentration of 60g/L in a cylinder which has the capacity of 250ml. With the time elapses, the settling interface between water and sediment then has been recorded to estimate the settling velocity of the sediment. It can be seen from Fig. 2 that the flocculant can

accelerate the settling when the concentration is less than 0.03g/L, then with the increase of the flocculant it can slow down the settling velocity. In addition, the corresponding experiments using the sediment of Chongming Island are in progress.

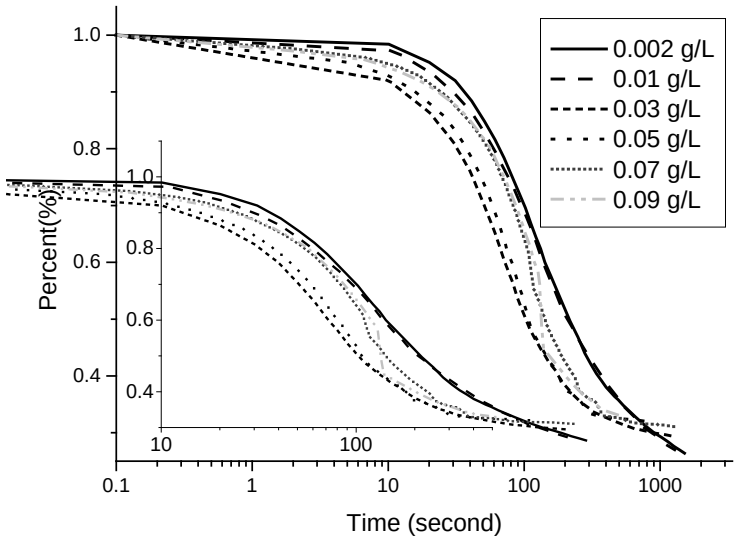

Fig. 2. The effects of different concentrations of the flocculant on sediment settling (Zetag 7587).

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