

Erosion Characteristics of Cohesive Sediment by Non-Cohesive Sediment

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Cohesive sediment is a mixture of clay particles, silt, (fine) sand, organic material and so on. The cohesive properties arise from electrochemical forces in the clay-water medium. Erosion rate of cohesive sediment has been investigated by many researchers. Most of them studied on erosion rate of cohesive sediment by clear water. However, in general, non-cohesive coarse material and cohesive material coexist in rivers. Fig. 1 shows the bank of the Mekong River in Vietnam. Some layers of the bank material are composed of cohesive material. As shown in Fig. 1, we can easily find the deposition layer of cohesive sediment in natural rivers. In this study, the erosion characteristics of cohesive sediment by both non-cohesive sediment and clear water are discussed.

Experimental setup is shown in Fig. 2. The experiments were carried out in the flume with 800 cm long, 15 cm wide and 25 cm deep. Flume tests are performed under various sediment supply conditions. In the flume tests, initial bed is composed of cohesive material with slope is 0.004 and non-cohesive coarse material is supplied on the cohesive material bed. The water discharge is 1.3 l/s and transport rate of the non-cohesive material is 0%, 25%, 50%, 100% and 150% of the equilibrium sediment transport rate, qb . The results indicate that, the bed degradation depth with sediment supply 25% qb and 50% qb are more than that without sediment supply (0% qb) and the erosion rate is decreased with increase in sediment discharge as shown in Fig. 3. After sediment supply more than 100% qb deposition of non-cohesive materials on the bed were occurred.

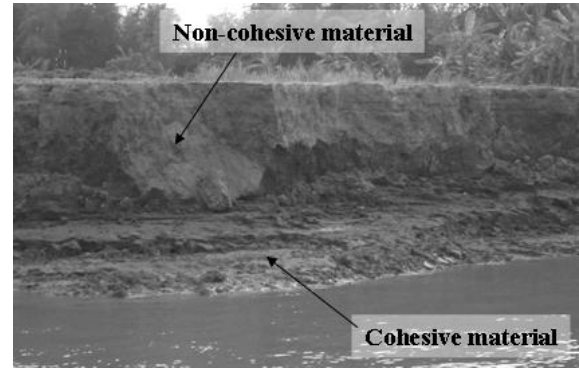


Fig. 1 A river with bed composed of both cohesive and non-cohesive materials (The Mekong River, Vietnam)

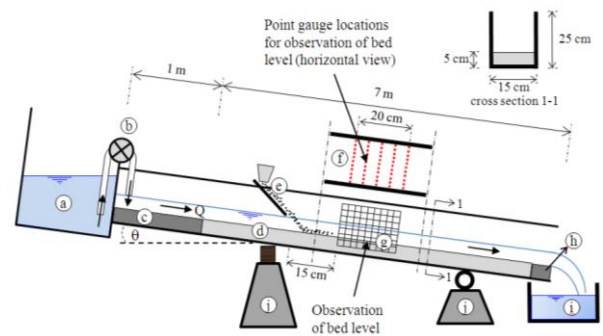


Fig. 2 Experimental setup (a. water tank, b. pump, c. rigid bed, d. cohesive sediment, e. sediment feeding location, f. horizontal view of cross sections, g. screen grid, h. downstream weir, i. downstream tank, j. tilting machine)

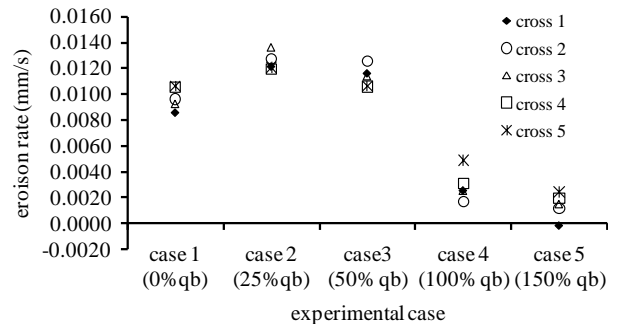


Fig. 3 Erosion rate on cohesive sediment by non-cohesive sediment