P50

Experimental Study on Deposition of Fine Particulate Organic Matter in relation to River Channel Morphology

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Knowledge on transport and deposition of fine particulate organic matter (FPOM) has been increasingly required for habitat management and restoration in lotic ecosystem. The deposition mechanism of FPOM is composed of falling process by settling velocity, physical filtering by bed material and biological filtering by organisms. This study aims to investigate relationship between FPOM deposition density and channel morphology using two types of pine pollen as FPOM analogue.

Method and Material

A set of channel morphology was formed by series of hydraulic experiments of small dam removal. Bed configuration, velocity distribution and water surface profile were measured. After stabilization of channel bed movement, we released two types of pine pollen at uppermost site, the floating type buoyant in water and the sinking type with 3.14 m/h of falling. Samples of deposited pollen particles were collected with bed material from bed surface at lattice sections (Fig. 1 and Fig. 2).

Result and Discussion

The bed morphology of ‘Case Initial’ could be characterized by backwater pool near small dam and inflow channel structure, and that of ‘Case 1’ showed alternate bar structure in alluvial channel. Deposition density of sinking type pollen was significantly higher in backwater pool than in inflow channel ($p<0.01$, t-test, Fig 1a). However, floating type pollen showed no significant difference between backwater pool and inflow channel in deposition density ($p=0.52$, Fig 1b).

On the other hand, the result of ‘Case 1’ showed that deposition density of floating type pollen was higher on the slope of alternate bar structure, whereas the sinking type pollen could be explained by the reduced flow velocity accelerating deposition ($r=-0.19$, Fig 2). These results suggest that falling process may contribute to deposition of FPOM in dammed pool condition, whereas physical filtering process influenced by turbulence and vertical mixing will critically occur in alternate bars structure with movable bed. In near future, we will interpret such FPOM deposition mechanism by means of model application modified or extended from sediment transport model.

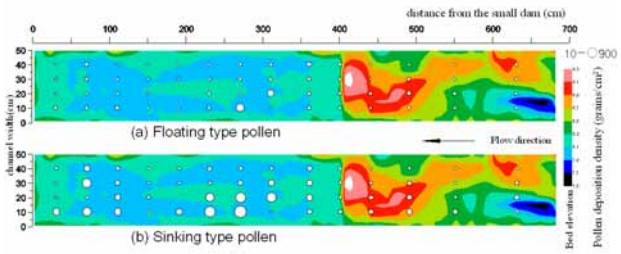

Fig.1 Relation of deposition density of pine pollen to bed configuration in Case Initial condition

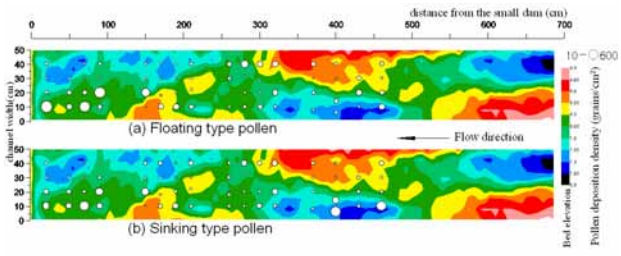

Fig.2 Relation of deposition density of pine pollen to bed configuration in Case 1 condition