

Hydraulic experiment on the sediment trapping effect of coastal vegetation on bore waves at Komatsu Beach, Chiba

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Coastal vegetation has the effect of controlling the generation of windblown sand from the sea and trapping it on the dune surface. In recent years, storm surges and guerrilla rains caused by giant typhoons have been increasing. The intrusion of waves into vegetated areas and the localized flow of water down the dune surfaces are feared to accelerate sediment discharge. Localized scour can destabilize the forest floor of coastal forests during tsunami events. Therefore, the sediment trapping effect of vegetation is an important knowledge for the maintenance of the forest floor and surrounding management roads.

However, the sediment trapping effect of vegetation on these events has not been quantified.

In this study, hydraulic experiments were conducted using actual forest floor samples to investigate the sediment trapping effect of vegetation on waves and currents. The five samples were taken from the dune zone of a coastal forest on the Komatsu coast of Chiba Prefecture. The wave conditions were bore wave and steady flow. The bore wave was assumed to be a storm surge and the tip of a tsunami, and two different wave heights were used. The steady flow was assumed to be the flow down the dune surface during the passage of a tsunami or during heavy rainfall. The bore wave was conducted for cases where the wave was generated multiple times.

The results showed that the amount of sediment transport decreased when the bore wave size was small and when the high coverage was used. When multiple bore waves were generated, the amount of sediment transport generally tended to decrease with each wave. The surface conditions of the samples indicated that the sediment decrease was not only due to the coverage, but also to the exposed rhizomes. However, in some cases where the coverage was small, the sediment transport increased in the second and third waves compared to the sediment transport in the first wave. This may be attributed to the development of scour due to the small coverage and the small amount of rhizomes in the ground. This trend was also confirmed in samples collected from many locations, including the Futtsu coast of Chiba Prefecture. This indicates that the presence or absence of rhizomes and the extent to which they are distributed underground have a significant effect on sediment discharge after the first wave. In the steady flow, scour was significantly developed in the exposed areas without vegetation. This suggests that the flow channel is more likely to be affected by the placement of vegetation than by the coverage or the amount of rhizomes.

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