

Research Trends and Results

Full-scale High Flow Rate Hydraulic Model Experiment using Local Ground Sample

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1. Background and Objectives

The NILIM aims to evaluate the effect and limit of disaster prevention / mitigation for nature and local infrastructure such as dunes and beach ridges. However, there is little knowledge concerning the response of dunes and beach ridges (including vegetation) to high flow rate like tsunami. Therefore, this study aimed to grasp the erosion process of the ground where vegetation has grown up, which can be verified only with field experiment.

2. Experiment method

Two types of specimens, an artificial broad-leaved forest and pine trees on a dune (with underbrush) as shown in Photo 1 below, were used in this experiment. Specimens used in this experiment were taken so as not to disturb the soil of the site containing the root systems of trees. (Photo 2, Left)

The specimens were placed in the high flow rate experimental channel and the high flow rate of approx. 7 m/s at maximum was repeatedly applied as shown in Photo 2, right, assuming tsunami, and the depth of erosion in the surface was measured.

3. Examples of experiment results

The surface of the specimens were divided into lattices to measure the variation of erosion depth with time in each lattice and compare the perpendicular distribution of erosion depth and the amount of root hair.



Photo 1: Locations of sampling Left: Artificial broad-leaved forest (Izumo-shi, Shimane), Right: Pine trees on the dune (Fukuroi-shi, Shizuoka)



Photo 2: Sampling (left) and flow experiment (right)

Erosion rate (gradient of the line graph) is small in the layer near the ground surface, and then trend of rapid progress in erosion is seen. The graph shows that erosion proceeds at the depth where the amount of root hair (bar graph) sharply falls, which is the same trend as in the result of the erosion experiments ¹⁾ conducted for slopes of levees.

4. Future outlook

We intend to increase the number of experiment samples to identify the effect and limit of dunes and beach ridges on tsunami.

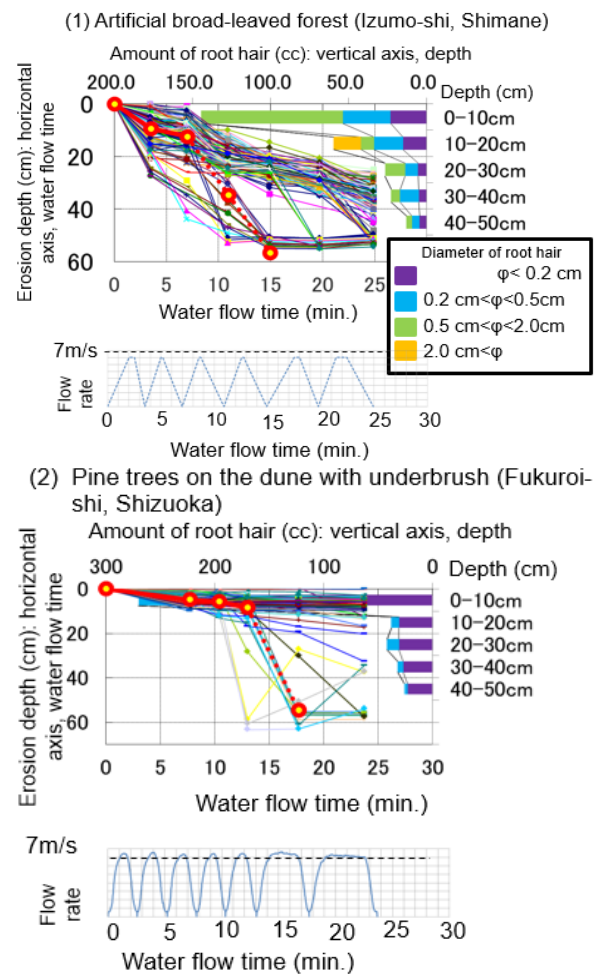


Figure: Extent of erosion, amount of root hair, and flow rate

See the following for details.

1) PWRI material, No. 3489 pp. 97-214