

A research of conserving Samejima shore by Bank of sand

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1. Motivation / purpose

The Change of Microtopography of Samejima Coast Caused by the Storm Surge Brought by Hagibis. Therefore, a sand fence was installed for the purpose of preserving the coast.

2. Hypothesis

Sand with a grain size of around 0.3 mm begins to move at wind speeds of 5~6 m/s. The wind direction during the study period with a maximum wind speed of 5 m/s or higher was mostly to the west. Therefore, installing sand fences perpendicular to the west is effective in preventing blowing sand and controlling beach erosion.

3. Methods and results

Compost fences were placed in the east-west (A), north-south (B), northeast-southwest (C), and northwest-southeast (D) directions, with a spacing of 600 cm between each. (Figure 1). Sandy sediments around the sediment fences were examined from July 19 to December 27.

3-1. Level surveying

Elevation differences at 30 points within a 300 cm x 300 cm area surrounding the sediment hedge were determined using an auto-level. (Figure 2) Based on the results, Cross-sectional drawings were made. (Figure 3) The total change in elevation at the 30 sites was considered as the amount of increase in sandy sediments. The contour and cross-sectional views of A and C, B and D are similar. The increase was -119 in A, -120 in B, -56 in D, and +25 in C.

3-2. Particle size analysis method

Sandy sediments from the surface layer on both sides across the sand fences were collected and examined for mean grain size using a sieve. (Figure 4) The average grain size of the sandy sediments in each sediment barrier was around 0.5 mm, showing a similar trend, ranging from medium- to coarse-grained sand.

3-3. Mineral analysis methods

The mineral composition of the sandy sediment collected on February 27 was examined by binocular stereomicroscopy. (Figure 5) Similar trends were observed, but the proportion of colorless minerals was higher than that of colored minerals in C.

4. Consideration

These results are shown in Table 1. This indicates that only C shows a different trend, especially in cross section and mineral composition. The reason for this is that the westerly wind impinges on B, which attenuates the wind force and increases the deposition of blown sand near C, thus reducing the erosive action.

5. Depositional process of sandy sediments in sediment hedge B

The sedimentation process was discussed based on the nature of the sandy sediments in B, which

affected C and differed from the hypothesized results.

5-1. Particle size analysis method

On December 27, the average grain sizes on the upwind and downwind sides were 0.58 mm and 0.46 mm, respectively, with a difference in average grain size of about 0.16 mm.(Figure6)

5-2. Luminance measurement using photographs of sandy sediments

Because the color of the sandy sediments differs between the upwind and downwind sides, they were photographed with a camera and their brightness was measured using the Makali astronomical image processing software. The windward side was 146 cd/m² and the leeward side was 156 cd/m².

5-3. Mineral analysis methods

Because of the difference in color brightness between the upwind and downwind sides, we assumed that there was also a difference in the type of minerals, so we conducted a mineral analysis. Colorless minerals such as quartz and feldspar are more abundant on the windward side, while colored minerals and rock fragments are more abundant on the leeward side.(Figure7)

5-4. Density measurement

Since 5-4, we assumed that the density would also differ, and measured the density using a specific gravity bottle. The densities on the upwind and downwind sides on December 27 were 1.86 g/cm and 1.83 g/cm, respectively.(Figure8)

5-5. Mass measurement

To compare the mobility of sandy sediments, the mass per unit cross-sectional area of a surface perpendicular to the wind was determined. The formula for determining mass is $(4/3) \times \text{radius} \times \text{density}$. The values were 1.43 g on the upwind side and 1.02 g on the downwind side, indicating that particles that were more difficult to move were deposited on the upwind side than on the downwind side.

5-6. Consideration

Coarse, black, and hard-to-move sand was deposited on the upwind side. On the other hand, fine, white, easy-to-move sand was deposited on the leeward side. This is due to the fact that the westerly winds carried the more mobile sand on the upwind side to the downwind side.

6. Conclusion

- (1) From Figure 5, sand fences perpendicular to the wind have the effect of depositing blowing sand on the windward side.
- (2) Among the sandy sediments, those that are easy to move are moved and deposited on the leeward side.
- (3) The accumulation effect on the downwind side can be increased by installing a series of these structures.

Keywords: Bank of sand, Sandy deposits, Sedimentation

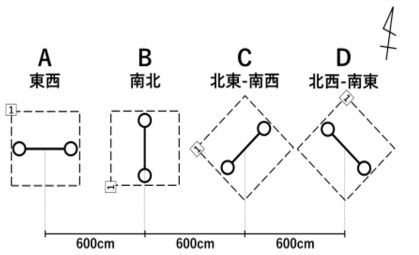


図 1

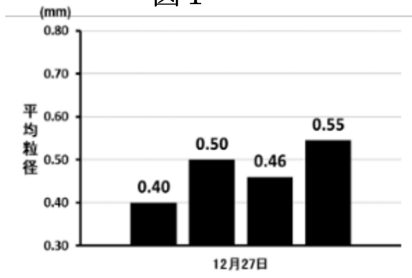


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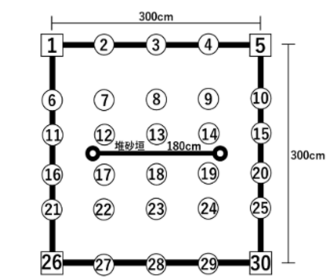


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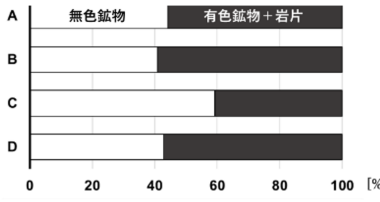


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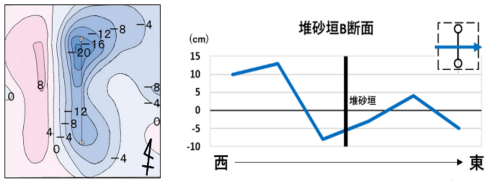


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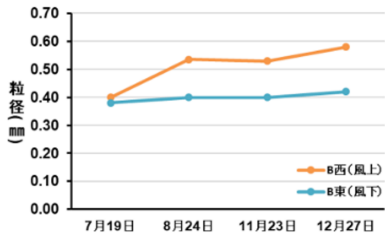


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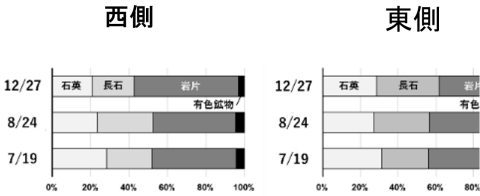


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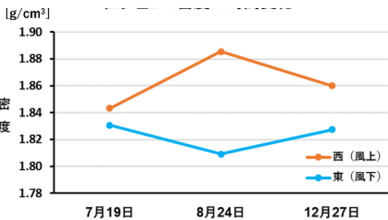


図 8

	A	B	C	D
設置方向	—		↘	↗
堆積変化量 (cm)	-119	-120	25	-56
堆砂堤断面				
平均粒径 (mm)	0.49	0.50	0.46	0.55
無色鉱物 (%)	44	41	59	43
有色鉱物+岩片 (%)	56	59	41	57

表1