Applicability of image analysis for assessing composition of disaster waste and characterization of flood sediments

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1. Background and objectives

In Japan, huge catastrophes, including the Great East Japan Earthquake in 2011 and Typhoon No. 10 flooding in East Japan in 2016, occur frequently. For promoting utilization of flood and tsunami sediments as geomaterials in recovery works, characteristics of such sediments and prompt assessment of waste composition are needed. A previous study applying image analysis by the HSV model indicated difficulty in classifying soils, woods and papers having a similar hue value (Maekawa et al. 2017). In this study, 1) comparison of physical and chemical characteristics of sediment caused by flooding of river and sediment caused by the tsunami, 2) the possibility of evaluation of disaster waste composition by image analysis which can shorten working time by indoor test.

2. Materials and methodologies

Physical, mechanical and chemical properties of flood sediments collected at five temporary storage yards in Iwate prefecture affected by the Typhoon No.10 in 2016. Image analysis was also conducted using six band pass filters having a unique wavelength. The Euclidean distance for each solid material was stochastically obtained from measuring the optical density on each mesh. The histogram of optical density, the transition of the average and standard deviation of optical density.

3. Main achievements

1) The particle density of flood sediments was between 2.4 and 2.6 g/cm^3, which is smaller than general inorganic soils. The ignition loss was approximately 15%, which is rather higher than that of recovered soils and tsunami deposits.
2) As shown in Fig. 1, many of flood sediments were composed of sand and fine grains, which implies high usability. Washing out of fine grains by percolation was confirmed in piled sediments.
3) No toxic metals exceeding the environmental standards were observed. Although the chloride and the boron concentrations, pH, and EC in coastal areas were relatively high, the values are small enough to be used as geomaterials.
4) The spectrum analysis on single materials revealed that three materials—soil, wood, and paper—have a similar spectrum. It was also confirmed that compaction of soils does not significantly affect the spectrum. And distribution of optical density is independent.
5) In mixed samples, as shown in Fig. 2, there is a possibility that there is a correlation between the wood content and the average optical density at any wavelength, and it is necessary to further verify.

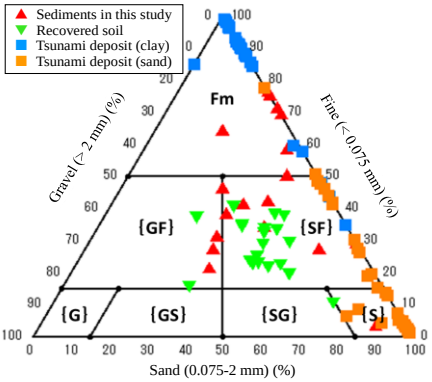

Fig. 1 Particle sizes of flood sediments and tsunami sediments

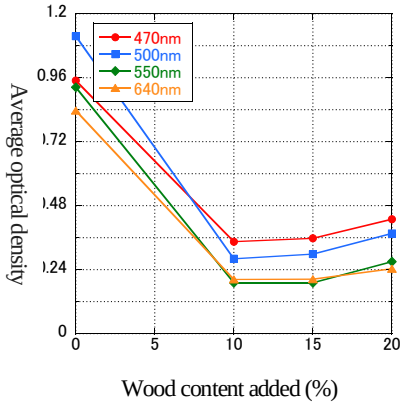

Fig. 2 Wood content added and optical density

REFERENCES

Maekawa, R., et al.: Okumura Corporation Annual Technical Report, 43, pp.57-62.