Experimental studies on log broom focusing on specific weight differences of log species

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INTRODUCTION

There are many experimental approaches, field investigations and numerical calculations for movement of woods in a clear water and debris flow. Watabe et al. (2013) examined experimentally about movement of driftwoods focusing on logs species, it was reported that conifers became a trigger of blockade because of rotational movement on the free surface of the flow and broadleaf tree was easy to be parallel to the main flow. While, the manual of technical standard for designing of sabo facilities against debris flow and driftwoods in Japan (2007) shows that log broom interval is set as less than 0.5 times of the maximum length of a log based on previous experimental data (Mizuyama et al., 1991). Setting of the interval is supposed that logs are floating driftwoods such as conifers, and the setting is not considered in case of submerged tree such as broadleaf tree.

In present study, data for difference of the number of trapped driftwoods due to logs species and photos for driftwoods movement are obtained by flume tests, and preferable interval of log broom taking into account differences of logs species is showed.

FLUME TESTS FOR DIFFERENCES OF LOGS CAPTURING DUE TO LOGS SPECIES

Trunk except roots and branches is used as driftwood model because we suppose the difference of driftwood movement can be represented by logs species. Debris flow with driftwoods is objective in present flume tests, and the debris flow is defined as flow with denser sediment concentration in comparison with bed load (Egashira et al., 1997). Flux sediment concentration, cf , is set by equilibrium concentration(= 0.012) for bed slope of 0.0451. It is supposed that debris flow is consisted of uni- form boulders, and the diameter is specified as 91.5mm (1.83mm in model scale of 1/50).

Figure 1 shows the plan view of captured driftwoods by the log broom works in case of conifers and broadleaf trees. Three kinds of log broom interval are supposed as 0.67 ld (length of log), 0.5 ld and 0.25 ld. Capture of driftwoods is affected by the clearance of log broom (e.g., Mizuyama et al., 1991). In case of conifers, it is likely to be captured on condition that the ratio of log broom interval (lb) to length of driftwood is less than 0.5. Broadleaf trees are easy to pass through log broom works even if the interval is set by the Japanese technical standard (2007). The preferable interval of log broom is discussed based on experimental data for broadleaf tree and so on.

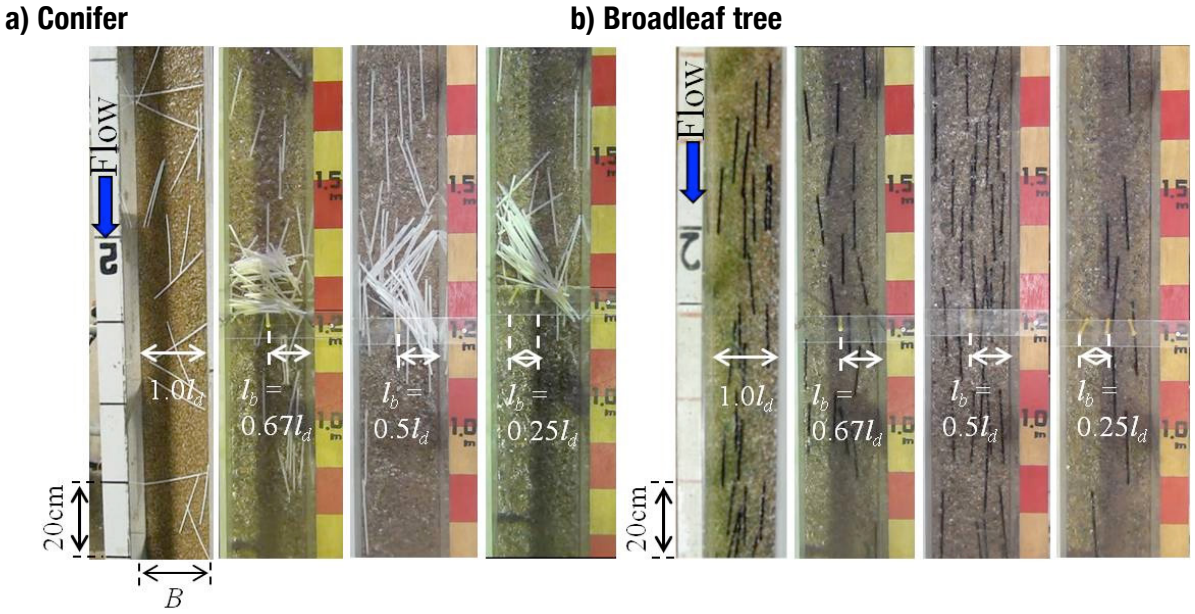
CONCLUSIONS

We proposed preferable setting of log broom interval taking into account differences of logs species, especially in case of broadleaf trees. Log broom interval had better to be set by logs species, and the interval for broadleaf trees is smaller in comparison with the conifer due to driftwood movement by difference of specific weight. Narrow interval of log broom is not desirable measure for broadleaf trees capture, and new type of works such that flow angle of broadleaf tree can change rotationally are proposed as preferable measure through flume data.

REFERENCES

- Watabe H., Itoh T. , Kaitsuka K., Nishimura S. (2013). Experimental studies on debris flow with logs focusing on specific weight difference of logs species, Journal of Mountain Science, 10(2), pp. 315-325.
- Mizuyama T., Ishikawa Y., Fukuzawa M. (1991). A study on mechanisms of movement and accumulation of floating logs and their countermeasures, Report of PWRI, Vol. 183-3, pp. 71-156 (in Japanese).

Nakagawa H., Takahashi T., Ikeguchi M. (1992). Numerical simulation of drift wood behavior, Annuals of Disaster Prevention Research Institute, Kyoto University, No. 35B-2, pp. 249-266 (in Japanese).
- Egashira S., Miyamoto K., Itoh T. (1997). Constitutive equations of debris flow and their applicability, 1st Int. Conf. on Debris-Flow Hazards Mitigation, ASCE(American Soc. Civil Eng.), pp. 340-349.
- National Institute for Land and Infrastructure Management (2007). Manual of Technical Standard for designing of Sabo facilities against debris flow and driftwoods in Japan, pp. 67.



B: Flow width, l_b: Log broom interval, l_d: Length of log

Figure1 Plan view of captured driftwoods by the log broom works in case of conifers and broadleaf trees

Figure 1. Plan view of captured driftwoods by the log broom works in case of conifers and broadleaf trees.

KEYWORDS

debris flow; Driftwood Specific weight; Log broom works; Flume test

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