Experimental study on transportation and accumulation of driftwoods during a large flood

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The accumulation of driftwood in the river channel is one of the causes of disasters. Therefore, elucidation of the behavior of driftwood, the position of sedimentation, and the behavior of re-location of driftwood accumulated in river channels is an important issue for planning disaster countermeasures.

A large flood exceeding the design discharge caused by 4 consecutive typhoons and fronts attacked the Tottabetsu River basin in August 2016. At that time, it was confirmed that a large amount of driftwood flowed down and accumulated in the river channel. After the flood, the location of driftwood and the specifications of the driftwood were investigated in detail.

Based on the survey results, a hydraulic model experiment with movable bed was conducted, and the accumulation characteristics and re-movement characteristics of driftwood were analyzed from the experimental results.

The examination section is 2.4km in length where the accumulation of driftwood at the 2016 flood was remarkable. There are two check dams (upstream dam; No. 2 dam, downstream dam; No.1 dam) in this section. The discharge used in the experiment was a simplified hydrograph of the August 2016 flood. Assuming that driftwood accumulates in the descending discharge period and relocates in the ascending discharge period, a hydrograph was used in which the pre-peak discharge period and the post-peak discharge period were interchanged. That is, a hydrograph was used that first reduced the discharge from the peak discharge and then increased the discharge to the peak discharge. In order to reproduce the riverbed configuration at the peak discharge, the peak discharge was flowed on the initial flat bed for 1 hour before giving this hydrograph. 19920 driftwoods, which were estimated to have accumulated in the study section at the time of 2016 flood, were supplied from the upstream end of the canal during the last 1 hour of the constant peak discharge period and during the descending discharge period of the hydrograph. The supply of driftwood was changed with time at the same ratio as the time change of the amount of bed load transport.  From the results of the field survey, the ratio of coniferous trees (relative density of 1 or less) to broad-leaved trees (relative density of 1 or more) was set to 1:9. The driftwood model used was determined based on the average dimensions obtained from the field survey (16 meters in length and 0.3 meters in diameter). Assuming that the driftwood will break due to re-movement, the length of half of the driftwood models was reduced to half, 8 meters.

From the experimental results, it was confirmed that coniferous trees with a specific gravity smaller than that of water tend to flow to the downstream end of the channel, while broad-leaved trees with a specific gravity larger than that of water tend to be deposited upstream or trapped by the No.2 weir of the Tottabetsu River. In addition, it was confirmed that during the ascending discharge period, it was re-transported due to the shifting thalweg and buried by the transported sediment from the upstream.