The relationships between rainsplash and surface flow on young Hinoki plantations

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Soil erosion on unmanaged Hinoki (Japanese cypress) plantations have been one of major environmental problems and the prediction of the sediment budgets is important issue. Without sufficient managements, the forest canopy tends to be closed, and the canopy closure prevents the growth of understory vegetations. So the forest floors are apt to be bare, and to be suffered from soil erosion. It is thought that the splash erosion is the dominant process on such stands (Miura, 2004). The previous researches (e.g. Miura et al.,2002, Kim et al.,2006) reported that ,in young Hinoki stands (16-40 years-old), eroded sediment tends to be generated in first half of young Hinoki stands rather than in latter half. These results show that the age of stands affects on the eroded sediments budgets. However the process that increases soil erosion in young stands is still unelucidated. Moreover the previous researches about splash erosion (e.g. Parsons et al., 1994) reported that the rainsplash varies temporally during rainfall due to the changes of soil surface conditions. Soil surface conditions are affected by the surface flow (Kinnell, 2005). Therefore, to elucidate the soil erosion processes on Hinoki plantations, it is important to clarify the relationship between rainsplash and surface flow. In this study, we measured the temporal variation of rainsplash and surface flow in two young Hinoki stands which differ in stands age each other.

The research was conducted in Terasawayama research forest of Shinshu university. The study site was covered by 36 yr-old stands (36s) and 21 yr-old stands(21s) of Hinoki with mean stand heights of 17 m and 9 m respectively. In both of them, the slope steepness was about 35 degree and their understory vegetations are poor. Splash sediment was collected in three 10 cm-diameter cups during seven storm periods. The raindrop kinetic energy was measured in each stands with Laser Drop-sizing gauges (LD gauges) by Nanko et al.(2006). A saltation erosion sensor and recording rain gauge were installed in each stand. 0.5m width and 2m long erosion plots attached with flush tank and water level recorder are also installed in each stands to record the surface flow.

The mean splash sediment in 36s and 21s was 1107g/ m^2 and 728g/ m^2, respectively. The mean raindrop KE in 36s and 21s was 21.0 J/ m^2/mm for three events and 16.9 J/ m^2/mm for two event respectively. These results show that The largest rainfall event occurred from 17 th to 19 th on July. For the 36s, in the early period of this event, although rainsplash was measured with corresponding to simultaneous rainfall intensity, surface flow was little. In latter period, both surface flow and rainsplash increased with rainfall intensity. One possible explanation of these results is as follows; the fine sediment detached in early period plugged the pores and the infiltration rate declined. Then the surface flow was generated and thin water layer were formed on soil surface. The increase of detachability due to forming of the muddy water layer accelerated the rainsplash. For the 21s, in contrast with the 36s, surface flow was measured in the both period of the event. This indicates that the decline of infiltration rate did not occur in 21s. In the early period, rainsplash was measured while surface flow was little. In the latter period, rainsplash increased with the increases of surface flow as like in 36s. However rainsplash count in early event is more than that in latter period. Comparing between 36s and 21s, although more rainsplash was measured with corresponding to simultaneous surface rather than no surface flow in 36s, more rainsplash measured with no surface flow in 21s. It was thought that difference of raindrop KE between 21s and 36s contributes to these resulets.