C11

Bedload yield in forest catchments with different histories of mass movement

○ Rieko Kamei, Roy C. Sidle, Fumitoshi Imaizumi, Sohei Kobayashi, Takashi Gomi

Although headwater streams represent the initiation of channel networks, drain the majority of the landscape, and comprise approximately 60 - 80 % of the channel length in mountainous terrain, less attention has been paid to headwater streams compared to larger streams. Since channels and hillslopes are strongly coupled in headwater systems, sediment supply (such as mass wasting) from adjacent hillslopes often directly enters the channel and alters channel morphology. In headwaters, large cobbles, boulders and woody debris create bed structure, which increases roughness and stores significant volumes of sediment. In-channel sediment stored in pools or behind such obstructions may control sediment transport in headwaters. Thus, it is clear that the interactions between hillslope processes and the channel as well as interactions within the channel continuum need to be better understood.

Sediment transport was investigated in four headwater streams (S5, S11, S12 and S17) in southern Nara prefecture, Japan, each of which has a different history of landslides. We surveyed sediment storage in channels and on hillslopes both in October 2004 and 2005. Precipitation, stream discharge and suspended sediment transport were measured throughout the year. Bedload sediment was sampled after every significant storm, then dried and sieved according to particle size. Also sediment sources in channels and on hillslopes were collected, dried and sieved as well as bedload sediment.

Bedload yield per unit area depends on: (1) peak discharge (Fig. 1); (2) effective peak discharge; and (3) the ratio of peak discharge to threshold discharge. The volume of effective runoff was poorly correlated to bedload yield. Both bedload transport and yield strongly depend on sediment storage in the catchments. Two streams where relatively much sediment was stored (S11: 253.5 m^3, S12: 187.2 m^3) produced greater than one order of magnitude more bedload sediment than the other two streams where less sediment was stored (S5: 12.5 m^3, S17: 79.1 m^3). Also, during most stroms, bedload transport in S11 and S12 were characterized by partial mobility and equal mobility, respectively; their grain-size proportions were characterized by similar or relatively high rates of finer materials compared with in- and near-channel deposits.

Fig. 1. Bedload yield versus peak discharge.