Geophysical Research Abstracts
Vol. 13, EGU2011-2012, 2011
EGU General Assembly 2011

Rain splash transport over steep hillslope; modeling of transport

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Soil erosion over steep forested hillslopes due to decrease of vegetation is one of the major environmental concerns in steep mountainous catchments. On inter-rill area of steep slopes, soil detachment and transport by rain splash and overland runoff are processes of soil erosion. We examined the contribution of erosion by rain splash in total sediment transport. For sparse ground cover rain splash and sheet wash contribution was variable which splash fraction in total sediment movement was in range of $2\% \sim 61\%$. Variation was due to changes in surface runoff protection effect and soil surface wetness condition which leaded to variation of detachability. Results suggest that splash detachment was not only an essential process in soil transport by overland flow, but also splash transport contributed to the sediment transport of steep forested hillslope.
A 1-D rain splash transport model was developed based on field observations and characteristics of the splash processes and empirical findings. The model was validated by field experiment data. Field-observed data were used to develop the splash detachment rate equation, probability densities for splash transport, and the maximum splash transport distance. Observed and estimated splash transport showed overall agreement, with some differences for small storm events or events with relatively low intensity, probably caused by variation of overland runoff depth and connectivity as well as differences in soil surface cohesion at various degrees of wetness. Results showed that overland runoff depth affected splash transport in heavy precipitation storm events. Our model can provide insights on the interactions among rainfall intensity, soil surface condition, soil wetness, and splash transport on forested hillslopes. Model can go through a distributed model.