The relationship between soil water behaviours and river runoffs: field observations and runoff analyses

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The soil water behaviours during rainfall or snowmelt events and their role on river runoffs are explored by field measurements of soil moisture and runoff analyses. The soil moisture on the slope of forest and grassland was monitored at 20 min intervals by 4 CH soil-moisture profilers and tensiometers in the Saromabetsu river basin (73% forest, 24% farmland, etc.), Hokkaido, Japan, in 2008 to 2010. Common to rainfall and snowmelt events, the whole layer (especially, 0-20 cm depth) in forest stored infiltrated water for a few days after events, and then return to the previous moisture level by gradual drainage. In grassland, the drainage after events was very weak except for the surface layer of 0-10 cm depth. The throughflow rate in the porous surface layer of forest and grassland was calculated for rainfall and snowmelt events, and then was compared with the surface runoff separated by the tank model. As a result, there existed the one-to-one correspondence between throughflow rate and surface runoff. The surface runoff from runoff analyses can thus occur actually as unsaturated throughflow in the soil surface layer.