Pipeflow suspended sediment dynamics and their contribution to stream sediment budgets in small rainforest catchments, Sabah, Malaysia

Abstract

Despite soil piping being increasingly reported from the humid tropics, quantitative assessments of the role of pipeflow in runoff generation and sediment supply in humid tropical catchments remain lacking. This paper assesses pipeflow and streamflow suspended sediment dynamics in small humid tropical rainforest catchments in Danum Valley, Sabah, Malaysian Borneo. Pipeflow and streamflow in two small catchments were continuously monitored between December 2002 and June 2004 using pressure-transducer probes behind V-notch weirs; suspended sediment was continuously monitored with turbidity probes. Monthly flow and sediment load data show that a single monitored pipe in one catchment accounted for 47.2% of a stream's discharge and 21.6% of the suspended sediment load over the monitoring period. Anecdotal evidence from unmonitored pipes suggests the total contribution from pipes to streamflow discharge and sediment loads may be much higher. In general, absolute monthly pipe and stream sediment yields increase with monthly rainfall and pipe or stream discharge. Fourteen storm event responses are considered in detail. Pipe and stream discharge-suspended sediment responses to storm events are rapid and are characterised by clockwise hysteresis. An inverse relationship between the percent contribution of sediment to streamflow from a monitored pipe and rainfall intensity was identified, indicating that in large, intense rainstorms other sediment sources (including slopewash and unmonitored pipes) become more important. Mechanisms of pipe discharge and suspended sediment generation are discussed and implications for future runoff, sediment and channel development models are briefly outlined.