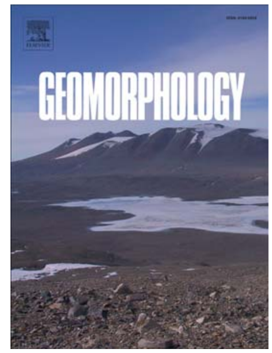

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Effects of episodic sediment supply on bedload transport rate in mountain rivers. Detecting debris flow activity using continuous monitoring

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ABSTRACT

Monitoring of sediment transport from hillslopes to channel networks as a consequence of floods with suspended and bedload transport, hyperconcentrated flows, debris and mud flows is essential not only for scientific issues, but also for prevention and mitigation of natural disasters, i.e. for hazard assessment, land use planning and design of torrent control interventions. In steep, potentially unstable terrains, ground-based continuous monitoring of hillslope and hydrological processes is still highly localized and expensive, especially in terms of manpower. In recent years, new seismic and acoustic methods have been developed for continuous bedload monitoring in mountain rivers. Since downstream bedload transport rate is controlled by upstream sediment supply from tributary channels and bed-external sources, continuous bedload monitoring might be an effective tool for detecting the sediments mobilized by debris flow processes in the upper catchment and thus represent an indirect method to monitor slope instability processes at the catchment scale. However, there is poor information about the effects of episodic sediment supply from upstream bed-external sources on downstream bedload transport rate at a single flood time scale. We have examined the effects of sediment supply due to upstream debris flow events on downstream bedload transport rate along the Yotagiri river, central Japan. To do this, we have conducted continuous bedload observations using a hydrophone (Japanese pipe microphone) located 6.4 km downstream the lower end of a tributary affected by debris flows. Two debris flows occurred during the two-years-long observation period. As expected, bedload transport rate for a given flow depth showed to be larger after storms triggering debris flows. That is, although the magnitude of sediment supply