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Issues in the calibration of an acoustic bedload sensor in mountain rivers, Japan

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The continuous transport of coarse bedload has previously been indirectly monitored in rivers and flumes, but has not yet been calibrated by comparison with continuously operating samplers. We have examined an acoustic system has been deployed immediately above a recording Reid (Birkbeck type) pit bedload sampler in several mountain rivers in Japan. The acoustic system consists of a hydrophone connected to a pipe set across a sill along the entire width of a concrete flume as well as an amplifier, filter and logger. We report on system calibration in the gravelly Nishi-takiga-tani Brook in the Rokko Mountains near Kobe and the Ashi-arai-tani Brook in the higher Hodaka Mountains. These respectively drain 1.5 km^2 of steep granitic terrain typified by low bedload fluxes and infrequent flow events and 6.5 of km^2 of steep erodible volcanics with elevated bedload yields which have been monitored since the 1980's. Sensor and sampler sensitivities are similar (about 50 g/s into the sampler). At higher flux correlation improves, acoustic response typically explaining 80% of the variance in flux. At very elevated fluxes the acoustic system ceases to respond either due to saturation or due to being covered by gravel sheets. An advantage of the acoustic system is that it continues to monitor bedload flux after the sampler fills, allowing continuous monitoring of bedload during long (several days) duration even in mountainous rivers with

high bedload yields.