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Measurements of bedload transport with piezoelectric bedload impact sensors (PBIS)

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Non-invasive techniques to continuously measure the rate of bedload transport in gravel bed rivers would be quite useful for both research and practice. Since 1986 measurements have been made with piezoelectric bedload impact sensors (PBIS) in several mountain torrents. Long-time measurements are available for the Erlenbach stream in Switzerland, where the the PBIS data can be compared with information on sediment loads deposited in a retention basin. A special calibration campaign was carried out in the Pitzbach mountain torrent in Austria in 1994 and 1995. The PBIS were installed upstream of a Tyrolean weir which serves as a water intake for a hydropower plant. Next to the intake, there is a sediment settling basin equipped with weighing cells and a water pressure sensor which allow sediment transport loads to be determined in 15 minute intervals. If the PBIS impulses are averaged over daily periods, there is a fairly good correlation between the number of impulses and the measured sediment load. The scatter between PBIS impulses and bedload volumes is much larger if the measurements are averaged over one hour intervals or when the original 15 minute values are considered. A comparison with the calibration measurements from the Erlenbach stream suggests that the general calibration relationship is quite robust, with a fairly constant exponent in the power function, while the coefficient appears to depend on site specific conditions.