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A calibration method for monitoring bedload transport rate using Japanese pipe-type hydrophone considering installation condition and aging

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Observation of bedload is quite important for understanding temporal and spatial variation of sediment transport in mountainous regions. In government-owned mountain watersheds in Japan, Japanese pipe-type hydrophones (Hydrotech Co., Ltd.) have been installed as a surrogate monitoring tool since about 2009 and continuous observations have been conducted. According to positive correlation between sound pressure and bedload transport rate, observed sound pressure is used to be integrated with respect to time and its value is converted into bedload transport rate using proportionality constant. However, it remains challenging to obtain precise bedload transport rate with high accuracy, because we should consider the difference of the way to fix the hydrophone on river bed among installed sites, deformation of steel pipe due to collision of sediment particles, and the difference of initial performance and aging of microphone. Hence, we have to calibrate frequently the proportionality constant. In this study, we investigate a calibration method which is easily conducted by engineers. Because it takes time and effort to obtain time integral of sound pressure, we try to calibrate the proportionality constant with the maximum sound pressure, which can be obtained easily.