



Passive acoustic inversion to estimate bedload size distribution in rivers

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The knowledge of sediment transport rate in rivers is related to issues like changes in channel forms, inundation risks and river's ecological functions. The passive acoustic method introduced here measures the bedload processes by recording the noise generated by the inter-particle collisions. In this research, an acoustic inversion is proposed to estimate the size distribution of mobile particles. The theoretical framework of Hertz's impact between two solids rigid is used to model the sediment-generated noise. This model combined with the acoustical power spectrum density gives the information on the particle sizes. The sensitivity of the method is performed and finally the experimental validation is done through a series of tests in the laboratory as well in a natural stream. The limitations of the proposed inversion method are drawn assuming the wave propagation effects in the channel. It is stated that propagation effects limit the applicability of the method to large rivers, like fluvial channels, in the detriment of mountain torrents.