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Particle tracking velocimetry method for continuous monitoring of bed load fluxes in experimental studies

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How to measure bed load transport rates in rivers and flumes remain a key challenge. Samplers are commonly used, but they so allow continuous monitoring. Acoustic and seismic sensors can provide high-frequency data, but they are based on proxies rather than direct measurements. Techniques based on image processing are alternative that we have been used for many years.

In this particular experimental study, bed load is continuously monitored at the flume outlet. Sediment is filmed on a white board which lit from above. The camera resolution is 659×494 pixels and the movie is taken at a frequency of 70 Hz. The images then go through a whole image analysis. The innovative feature is that images are processed automatically using a PTV algorithm. The analysis includes the following steps: image segmentation, object separation and object measurement. The PTV algorithm makes it possible to determine the velocity of the outgoing particles and the bed load transport rate and their grain size distributions.

Proper calibration is required for the algorithm to be fully operational and fully automatic. In addition, a fair amount of data storage is needed to record continuously over long periods.