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Inferences from the comparison of two non-intrusive methods for estimation of bedload transport

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Non-intrusive technologies for the in-situ measurement of river hydro-morphological features are increasingly popular in the scientific and practice communities due to their efficient and productive data acquisition. Our research team have successfully demonstrated through laboratory experiments and field measurements that, by combining acoustic mapping with image velocimetry concepts, we can characterize the planar dynamics of the bedform migration and eventually rates of bedload transport. The technique, labeled Acoustic Mapping Velocimetry (AMV), is currently transferred to field conditions using multiple-beam echo-sounders (MBES) and Acoustic-Doppler Current Profilers (ADCP) for producing acoustic maps and tracking the bedform dynamics.

A constant preoccupation of the research team during this transfer has been the validation of the AMV in field conditions. Such validation requires the use of identical input data and the availability of a similar capability measurement system in terms of measurement output, spatial and temporal coverage for the measurement. Fortunately, there is a similar system for estimation of bedload transport labeled Integrated Section Surface Difference Over Time (ISSDOT). The latter method has been developed and extensively tested by a research group of US Corps of Engineers. While the data inputs (acoustic maps) and the underlying principle (i.e., dune tracking) are the same as for AMV, ISSDOT is based on purely geometrical estimation of the bedload transports rates. The present paper described a comparison between AMV and ISSDOT applied to a set of repeated maps acquired in the Mississippi River. In the absence of a third measurement alternative to be used as benchmark, the paper draws inferences from the comparisons of the two instruments.