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Potentiality of bedload measures using Acoustic Doppler Current profiler technique

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Bedload discharge measurement in riverine environment is crucial to monitor and understand the morphological evolution of the riverbed and its interaction with existing and new infrastructures. Despite their relevance, bed load solid transport measures are most of time not available due to the difficulties in their acquisition.

The paper investigates the potentiality of Acoustic Doppler Current Profiler (ADCP) technique, well established for measuring discharge and flow velocity in a river, for the measure of bedload discharge in a more manageable way than the traditional ones.

A specific field campaign was organized at Boretto (Italy) cross section on the Po river where the riverbed sediment consists of uniform sand with a mean diameter of 0.4 mm. ADCP measures of bedload discharges were done at the same time as the ones acquired by traditional Helley Smith sampler.

The ADCP data are used in two different ways to obtain the value of the bedload solid discharge. The first approach computes the bedload discharge using the literature formulas where the shear velocities are computed by the logarithmic fit of the velocity profile given by the ADCP. The second approach uses the instrument Bottom Tracking function to obtain a measure of the sediment velocity on the river bed. The sediment velocity computed with this latter method is then used to calculate the bedload discharge with a kinematic model, whose parameters of active layer thickness and concentration are estimated using the Van Rijn model.

The comparison of traditional measures with the one based on the ADCP show comparable values of bed load discharges of the same order of magnitude.