

The investigation of sediment processes in rivers by means of the Acoustic Doppler Profiler

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Abstract The measurement of sediment processes at the scale of a river cross-section is desirable for the evaluation of many issues related to river hydro-morphodynamics, such as the calibration and validation of numerical models for predicting the climate change impacts on water resources and efforts of maintenance of the navigation channel and other hydraulic works. Suspended- and bed-load have traditionally been measured by cumbersome techniques that are difficult to apply in large rivers. The acoustics for the investigation of small-scale sedimentological processes gained acceptance in the marine community because of its ability to simultaneously profile sediment concentration and size distribution, non-intrusively, and with high temporal and spatial resolution. The application of these methods in true riverine case studies presents additional difficulties, mainly related to water depths and stream currents that limit sound propagation into water and challenge the instruments deployment, especially during floods. This article introduces the motivations for using the ADCP for sediment processes investigation other than for flow discharge measurement, summarizes the developed methods and indicates future desirable improvements. In addition, an application on the Po River in Italy is presented, focusing on the calibration of the existing software by means of ADCP recordings. The calibrated model will assist in planning the dredging activities to maintain the navigation channel and the intake of a pump station for irrigation that is periodically obstructed with a sandbar.

Key words sediment transport, rivers, Acoustic Doppler Current Profiler