



Assessment of the performance of acoustic Doppler velocimetry profilers for monitoring wall bounded flows

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Acoustic Doppler velocimetry profilers (ADVPs) are widely used in both experimental or field studies because of their robustness in velocity measurements. The acquired measurements do not only offer estimates of the local and instantaneous flow velocity at the interrogated measurement volume, but can also be further processed for the estimation of the bed surface shear stresses, thus finding a wide range of applications ranging from water engineering to geomorphology and ecohydraulics. Following Liu and Valyrakis (2017), this study aims to evaluate the performance of an ADVP in obtaining hydrodynamics measurements under fixed flow conditions, with various probe configurations. To this goal an robust search is conducted where ADVP probe settings are sequentially altered. A number of assessment criteria are used including qualitative observations, such as checking the shape of the velocity profile, as well as quantitative error metrics, including signal to noise ratio, correlations and number of spikes. Further, estimation of the bed shear stresses computed by means of using the log Law of the Wall and turbulent kinetic energy, allow obtaining a better understanding of the uncertainties involved and the importance of making a better informed choice with respect to the probe configuration settings. To that goal the methodology implemented herein, for a given flow, is presented as a generalized hierarchical framework which can find use from practitioners and researchers alike.

References

Liu D. and M. Valyrakis (2017), Evaluation of acoustic Doppler velocimetry (ADV) performance under various probe configurations, EGU General Assembly 2017, Vienna, Austria, 23-28 April 2017, id. 4176.