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Characteristics of flow around aquatic plants in natural conditions: experimental setup, challenges and difficulties

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ABSTRACT

Measurements of a 3D flow velocity field were conducted in lowland sandy bed river in Poland in two experiments during summer to check how reliable are data gathered with the new model of Acoustic Doppler Velocimeter (Vectrino Profiler) in proximity of aquatic plants. For the purpose of this study a special platform was built on which two such velocimeters were mounted. This allowed for simultaneous measurements of flow velocity in front of and behind a single patch of submerged aquatic plants. Since the experiments have been conducted in natural conditions with the use of laboratory equipment, a specific approach, setup and analysis of gathered data have been employed. Despite the promising readings of obtained data from the first measurements, the results showed unexpected shapes in mean velocity profiles. The second experiment showed good agreement of signals from both devices, but it also revealed major differences in data quality compared with the first experiment. Further analysis showed that only few of all cells from each 35- cells section, which are simultaneously recorded by Vectrino, contain data with good characteristics of signal. The main results of this study showed that use of the Vectrino Profiler in natural conditions requires each time different setup, more densely stacked sections in each profile and constant changes of velocity range during the experiment to achieve best results.