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## THE USE OF ACOUSTIC DOPPLER INSTRUMENTS FOR HIGH FREQUENCY STREAM DATA SAMPLING IN DENMARK

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### ABSTRACT

Recent advancements of acoustic Doppler techniques have made fast and precise measurement of stream water velocity and discharge possible. The ability to deploy Doppler current meters (DCM) permanently in streams enables continuous monitoring of dynamic flow processes. This has shown to be a great advantage for instance for detecting flow changes in hydraulically unstable streams. Furthermore, the Acoustic Doppler Current Profilers (ADCP) allow for fast measurements of stream discharge. However, despite the obvious advantages of the use of these different types of Doppler sensors, the large amounts of data and fast measurement procedures have led to a discussion of appropriate measurement times, number of repeated measurements and meaningful incorporation of these new types of dynamic data into traditional measurement procedures.

The purpose of this study has been to 1) investigate the usefulness of DCM velocity measurements for hydrograph calculation in tidally and backwater influenced streams and in hydraulic unstable streams, and 2) test the performance of the ADCP for discharge measurements in Danish small to medium sized streams.

Three different Danish small to medium sized streams were monitored with DCM sensors mounted permanently at the side of the streams. In addition, field campaigns were carried out in the streams, where multiple ADCP discharge measurements were conducted with different measurement durations at the same time as continuous velocity profiles were measured with fixed ADCP instruments. The DCM measurements of water velocities proved useful for adjusting the hydrograph according to hydraulic conditions. In addition, it was found that streams with average discharge less than 1 m<sup>3</sup>/s constitute the lower limit for ADCP measurements, and that smaller streams require a higher number of consecutive measurements than larger streams to obtain the same precision of the discharge estimate.



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