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Comparison of spatio-temporal resolution of different flow measurement techniques for marine renewable energy applications[1] VINCENT LYON, MARTIN WOSNIK, Center for Ocean Renewable Energy, University of New Hampshire — Marine hydrokinetic (MHK) energy conversion devices are subject to a wide range of turbulent scales, either due to upstream bathymetry, obstacles and waves, or from wakes of upstream devices in array configurations. The commonly used, robust Acoustic Doppler Current Profilers (ADCP) are well suited for long term flow measurements in the marine environment, but are limited to low sampling rates due to their operational principle. The resulting temporal and spatial resolution is insufficient to measure all turbulence scales of interest to the device, e.g., "blade-scale turbulence." The present study systematically characterizes the spatial and temporal resolution of ADCP, Acoustic Doppler Velocimetry (ADV), and Particle Image Velocimetry (PIV). Measurements were conducted in a large cross section tow tank (3.7m x 2.4m) for several benchmark cases, including low and high turbulence intensity uniform flow as well as in the wake of a cylinder, to quantitatively investigate the flow scales which each of the instruments can resolve. The purpose of the study is to supply data for mathematical modeling to improve predictions from ADCP measurements, which can help lead to higher-fidelity energy resource assessment and more accurate device evaluation, including wake measurements.

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