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Turbulence Measurements from a Moored Platform at Mid-Depth in a Swift Tidal Channel

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Results are presented from a turbulence experiment with a 3-m long streamlined floatation body, instrumented with velocity shear probes, fast-response thermistors, a 1 MHz Acoustic Doppler Current Profiler (AD2CP), and an Acoustic Doppler Velocimeter (ADV). The system was deployed over seven tidal cycles at mid-depth in a 30-m deep tidal channel in the lower Bay of Fundy, Canada. Peak flow speeds exceeded 2 m s^{-1}, and while 10-min time scale average speeds were similar between ebb and flood, the variances were markedly higher during flood.

Turbulent kinetic energy (TKE) dissipation rates measured with the shear probes exhibit a pronounced flood/ebb contrast: O(10^{-4}) W kg^{-1} peak values during flood, but lower by an order of magnitude during ebb. Dissipation rates follow u^3 scaling over a wide range of flow speeds between 0.5 and 2.5 m s^{-1}. Below 0.5 m s^{-1} an asymmetry in the mounting arrangement caused the floatation body to pitch upward, biasing the measured dissipation values high. The ADV on the platform registered mean speed – used to implement Taylor's hypothesis – which was corroborated with the platform-mounted ADCP.

Additional ADCPs were also deployed on a nearby bottom pod, sampling at turbulence resolving rates – up to 8 Hz. Comparisons between the shear probe and acoustic estimates of the TKE spectrum and dissipation rate – at comparable depths – are presented.