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Estimating friction velocity referring oxygen micro-profiles

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Three approaches for deriving friction velocity from near-bottom ADV measurements; Eddy Correlation (EC), Turbulent Kinetic Energy (TKE), and Inertial Dissipation (ID) methods were compared. As an independent assessment parameter, we used simultaneous oxygen micro-profiles recordings from within the diffusive boundary layer (DBL), that were compared with theoretical values as derived from the respective friction velocity estimates. Friction velocity values of the TKE method derived significantly higher theoretical oxygen concentration while the EC and the ID approach provided results that were not significantly different from the measured oxygen concentrations. Overall differences from measured oxygen concentration in the DBL were 0.2% for the EC method, 9.8% for the TKE method, and 0.7% for the ID method. The results suggests that the EC method is the best approach for estimating friction velocities though not significantly different from the ID method, while the TKE method was unreliable at the $\sim$70 m deep, relatively calm study site.