

# Flow Measurements in a Salt Marsh Tidal Channel using the Nortek Vector Velocimeter

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A Vector Acoustic Doppler Velocimeter was deployed in the middle of a tidal channel in a tidal salt marsh environment. The sensor was located 30 cm above the seabed and collected 12 min bursts. 58 Bursts of data were collected over two tidal cycles. Each burst started on the hour and on the half hour. Sampling frequency was 16 Hz, thus 11520 data points were collected per burst. Out of the 58 bursts the Vector was out of water during the following bursts: 1, 22 - 26 and 47 - 58. In addition to the hydrodynamic measurements suspended sediment concentration measurements were collected during the second tidal cycle using water pumped near the measurement location. This report provides a preview into some of the results of this test. Results are described in the captions below. Data processing methods are described in Voulgaris and Trowbridge (1998).

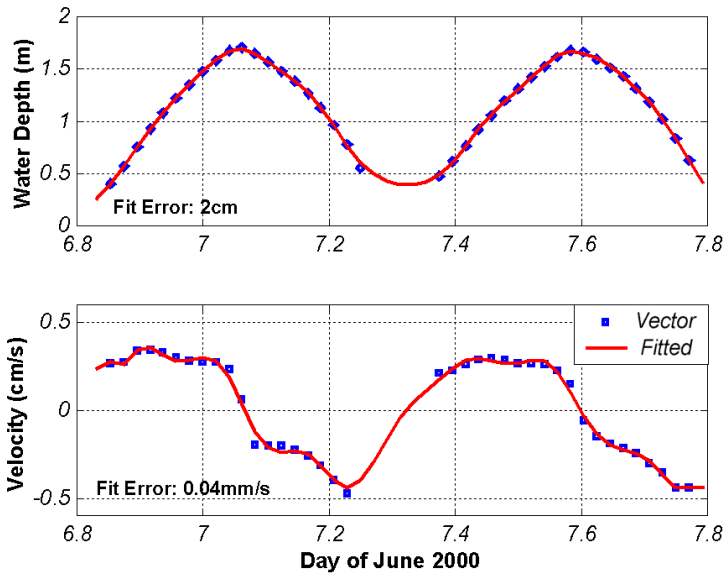


Figure 1. Top: Mean water depth as measured by Velocimeters pressure sensor (points) with a least square fit (line) of the most important diurnal, semidiurnal and M4 tidal frequencies. Bottom: Mean tidal current as measured by the Velocimeter at 30 cm above the channel bed (points) and fitted least-square line including diurnal, semidiurnal and higher (M4, M8) tidal harmonics.

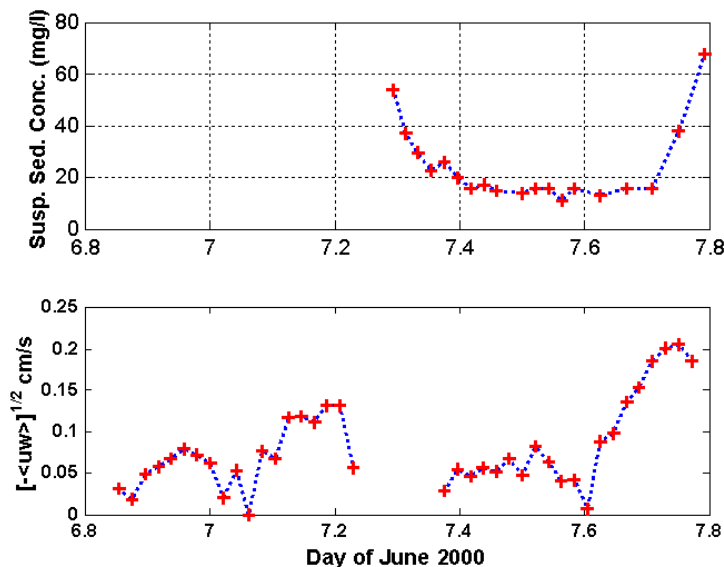


Figure 2. Top: Suspended sediment concentration (collected from pumped water samples) during the second tidal cycle of hydrodynamic measurements. Bottom: Shear velocity estimates calculated from the Reynolds stress ( $\langle uw \rangle$ ) estimates. It is characteristic that turbulence levels are higher during the ebb than flood tidal cycle.

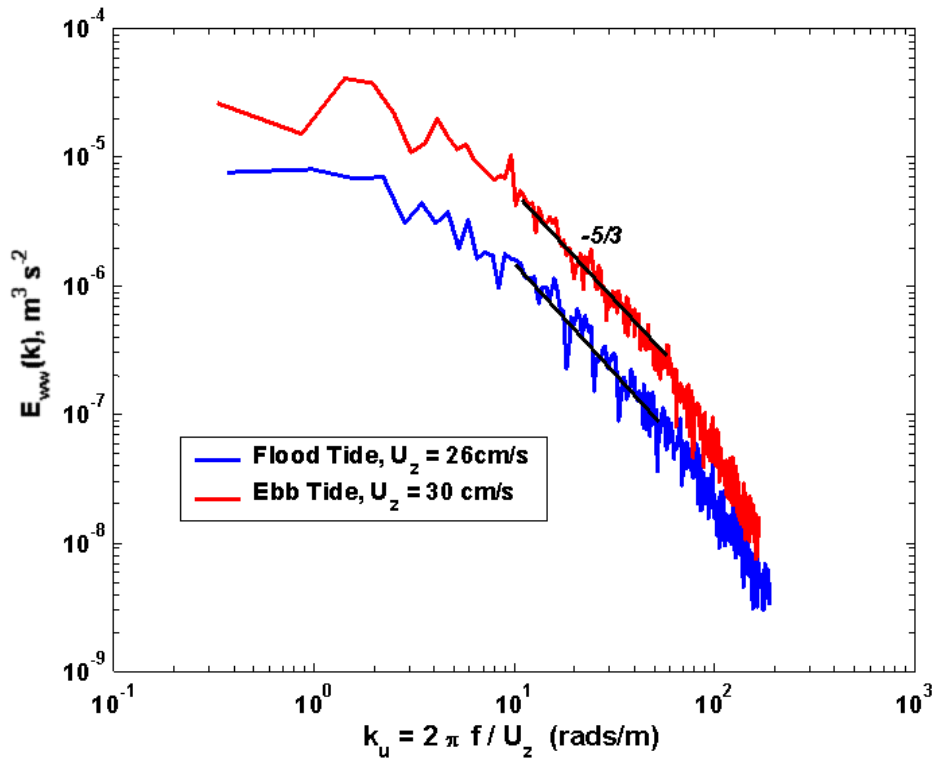


Figure 3. Turbulence wavenumber spectra of the vertical velocity for the same tidal elevation at the ebb and flood stage of the tide. The black lines indicate the characteristic  $-5/3$  slope of the inertial subrange region. To the right of the inertial subrange, the slope becomes steeper. This is the combined effect of viscous dissipation and spatial averaging due to the finite size of the sample volume.

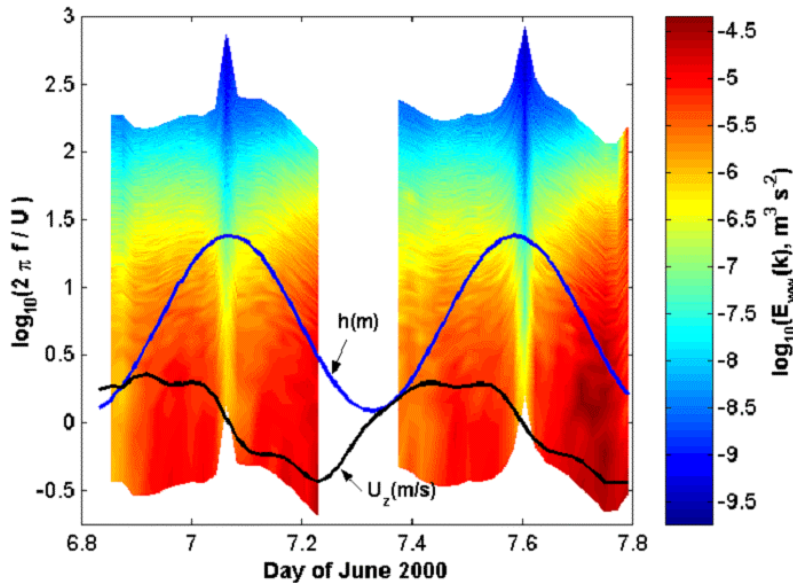


Figure 4. Summary diagram showing the mean water elevation ( $h$ ), mean downstream velocity ( $U_z$ ) and turbulence spectra of the vertical velocity component for the whole duration of the deployment. The vertical scale for the turbulence spectra is on the left, expressed as  $\log_{10}(m^{-1})$

Reference: Voulgaris, G. and J. H. Trowbridge, *Evaluation of the Acoustic Doppler Velocimeter (ADV) for Turbulence Measurements*, **J. Atmos. And Oceanic Technology**, **15**, 272-289, 1998.