Direct Measurement of Turbulence Properties by a BB-ADCP in Bottom Boundary Layer

R.T. Cheng, C.-H. Ling and J.W. Gartner

Water Resources Division, U.S. Geological Survey, Menlo Park, CA 94025 USGS
e-mail: rcheng@usgs.gov

Abstract.
Broad-band acoustic Doppler current profilers (BB-ADCPs), in high resolution modes, have been shown to be very effective for studies of turbulent mean flow properties in the marine bottom boundary layer. The BB-ADCP is capable of measuring the velocity distribution in the bottom boundary layer, providing abou 20-30 velocity points within 1.5 m from the sediment-water interface at a sampling rate slightly above 1 Hz. In this study, the potential of the high frequency sampling scheme of the BB-ADCP is explored. By saving single-ping velocity measurements, the turbulence properties of the bottom boundary layer can be extracte from these measurements.
Specifically, the high frequency velocity profiles are analyzed leading to direct measurements of turb properties of a bottom boundary layer in South San Francisco Bay, California. The objectives of this study are: 1) to explore techniques of measuring turbulence properties by a BB-ADCP; 2) to determine the Reynolds stress distribution in the bottom boundary layer from correlation of high frequency velo components; 3) to compare the Reynolds stress with the bottom boundary layer properties deduced conventional methods; and 4) to characterize the rate of vertical mixing in the water column base measurements.
This investigation is moderately successful; some limitations of this approach have been identified consideration of improvements.