

A Critical Analysis of the Application of a Single Frequency Acoustic Doppler Current Profiler to the Measurement of Suspended Sediment Fluxes in Rivers and Estuaries

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Determination of sediment flux is critical to many estuarine and river engineering and scientific applications. At the largest scale sediment flux controls the morphological evolution of the channel whilst at smaller scales it impacts on the design of ports and harbours and other engineering structures through its impact on siltation rates and hence the requirement for maintenance dredging.

Today Acoustic Doppler Current Profilers are widely used to measure the variation of flow field and although these instruments were primarily developed for the measurement of current profiles a number of workers have attempted to derive sediment flux estimates from inversion of the backscattered pressure field recorded by these instruments.

In this paper we evaluate the results of such an analysis using data acquired using a single frequency broadband Doppler Profiler. The instrument was deployed on a vessel running repeated transects across the Thames Estuary over two 25 hour periods on a Spring and Neap tide.

Suspended sediment concentration data determined from gravimetric analysis of water samples and profiles of the optical transmission and backscatter are compared against the estimates of suspended sediment load obtained from inversion of the backscattered acoustic pressure field measured by the ADCP and an error budget calculated the results of which we present here.