

Characterization of Sediment Dynamics Using Sediment Profile Imaging

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Introduction

Sediment profile imaging (SPI) was developed over two decades ago as a rapid reconnaissance tool for characterizing physical, chemical, and biological processes in both marine and freshwater sedimentary environments. The technology was originally designed in response to the shortcomings associated with traditional approaches for assessing impacts to benthic (bottom-dwelling) communities.¹ Both the technology and analysis methods have evolved considerably during this time, and applied in numerous surveys supporting navigation, water side development projects, and environmental assessments to evaluate surface sediment conditions in rivers, lakes, and ocean environments throughout the world.

Methods

Using an Ocean Imaging Systems Model 3731 sediment profile camera (SPI camera), images of the top 15-20 cm of the sediment bed (depending on composition of the material) can be collected for photographic interpretation in combination with plan view cameras attached to the SPI camera. Information is possible on sediment physical and biological characteristics, including aerobic and/or anaerobic conditions in surface sediments; sediment physical conditions; composition of the benthic community and evidence (if any) of disturbance gradients in the community; and, evidence indicating the depth of sediment bioturbation or other disturbance of the sediment column.

Examples from SPI surveys conducted in different freshwater and marine environments in the USA and Europe are shown to demonstrate the types of information that can be gathered using SPI technology.

An important goal for conducting a SPI survey is to support the characterization of physical, chemical, and biological conditions in the surface sediments and establish baseline conditions prior to remediation or other human disturbance of the sediments. A second important goal is to collect data on sediment stability and habitat characterization to support both

development of a site conceptual model and sediment remediation planning and engineering design. These and related goals are illustrated in case studies to illustrate the applicability of this technology.

Summary

The SPI system is a powerful tool for characterizing the upper 20 cm of sediment and presenting data to a highly variable audience in a convincing manner. Data collected using the SPI system as part of sediment investigation provides both the investigator and the engineer with highly reliable real time data for making decisions nearly concurrent with the data collection event.

References: [1] Germano (1995)