

Locating Groundwater Inflow Sites in Estuaries

Challenge

Groundwater inflow into estuaries and coastal areas is far more important than previously thought. Groundwater is capable of transporting contaminants into estuaries, and therefore the ability to detect, survey and localize groundwater inputs is essential for managing contaminant inputs to coastal waters. This project is developing technology to rapidly detect, map and localize groundwater inflow into rivers and estuaries to improve environmental monitoring and remediation assessment activities.



Science

Design

The characteristics of groundwater differ from those of surrounding estuarine water. Project researchers, therefore, set out to design software and hardware that would enable users to quickly and efficiently detect and record these differences. They designed a towed sensor system using a custom sled and boom (see photos above). The sled housed a pressure sensor, three temperature sensors at different depths and an inclinometer to maintain a consistent boom angle. Water samples were collected from the sled and pumped up to the boat where other sensors (e.g., pH, conductivity) monitor the samples.

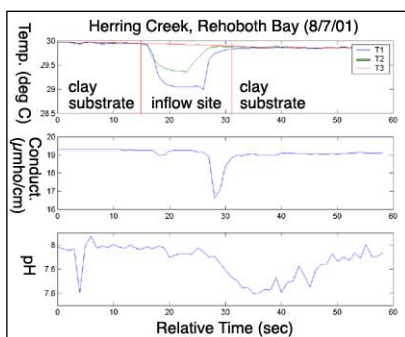


Results

- The technology was successful in detecting groundwater inflow sites in water as deep as 12 feet.

- The figure to the right shows results from a survey of an estuarine site in Delaware.

Notice the clear groundwater signature, especially in temperature (top graph) and conductivity (middle graph). (The three lines for temperature represent readings from the three thermistors, each at a different depth. The shallowest thermistor did not record the inflow site.) The conductivity and pH (bottom graph) results lag behind the temperature results because those sensors were located on the boat rather than on the sled.



Application

A More Flexible System

The system currently requires calm water and survey paths that are clear of obstacles. However, the system can be retooled to be operable in more challenging conditions.

Expand the Sensor Array

New sensors can be added to the system depending on the specific application. As more sensors are added, it becomes easier to differentiate groundwater from the estuarine water. Scientists from the US Geological Survey are considering adding several new sensors to this system for applications in Delaware and Virginia.

How-To Information

A CD-ROM with complete instructions on how to build and use the system (which includes custom-designed software) is currently being developed.

Project Essentials

Title: Measurement System for Localizing Groundwater Flows into an Estuarine Environment

Project Coordinator: Charles Sarabun John Hopkins Applied Physics Lab
(240) 228-5794
charles.sarabun@jhapl.edu

Start - End Date: 09/01/1999 - 09/01/2001

NERR Reserve(s): Chesapeake Bay, MD

CICEET Contact: Kalle Matso (603) 862-3508
kalle.matso@unh.edu