

Project Bulletin



In Situ Nutrient Monitoring in Estuaries

Challenge

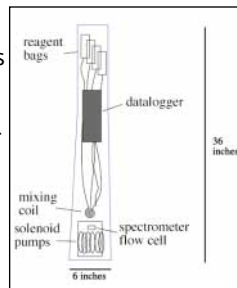
Inputs of nutrients to estuaries has grown with increasing population growth and the intensive use of fertilizers in agriculture. Excessive nutrient inputs result in algal growth and reduced oxygen conditions. To understand the processes involved with this problem, managers need to sample estuarine nitrogen levels so frequently that it would be cost prohibitive to use traditional sampling and lab analysis. This project is developing and evaluating a new in situ nitrogen sensor, the Digiscanner, which can be programmed to sample every hour and can be left in the field for up to 3 months.



Science

Design Concept

The digiscanner uses pumps to mix water samples and reagents. The mixture then passes through a flow cell spectrometer and the nitrate concentration is measured and recorded. The entire system is contained in a waterproof housing.

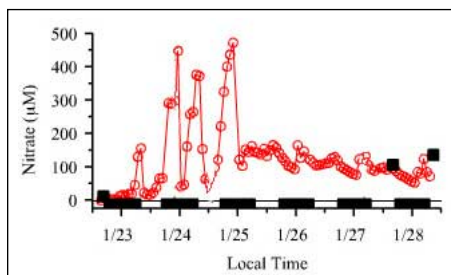


Field Tests

The Digiscanner has been successfully deployed at three national estuarine research reserves: Elkhorn Slough, CA, Weeks Bay, AL, and Apalachicola Bay, FL. Deployment times have been as long as 90 days with the instrument taking samples every hour.

The Value of High-Frequency Data

The data in the chart below are from samples collected by the Digiscanner (red circles) and by discrete hand sampling (black squares) in January, 2000 in a shallow pond in Elkhorn Slough, CA. By correlating this data with rainfall and tide data, researchers were able to isolate the source of the nitrate spikes on 1/24 and 1/25: in this case, the run-off from the surrounding agricultural fields.



Note that the spikes would have gone unnoticed by the discrete samples. And yet very few monitoring programs currently have the resources to sample more often than on a weekly basis. This underscores the potential importance of the Digiscanner to coastal/estuarine managers.

Application

In Situ Monitoring of Phosphorus

Project researchers have also adapted the Digiscanner technology to measure phosphorus, another significant nutrient for coastal management. To date, several successful deployments of the phosphorus Digiscanner have taken place off of the MBARI dock.

From Wet Chemistry to ISUS

The original Digiscanner is based on conventional wet chemistry principles. Project researchers built and tested "new generation" sensors based on In Situ Ultraviolet Spectrophotometer (ISUS) technology. So far, experiments show excellent agreement between the two technologies.

Commercial Development

MBARI has entered into a licensing agreement with YSI Inc, which will modify the Digiscanner and make it commercially available by fall of 2003 as the YSI 9600 Nitrate Monitor.

Project Essentials

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Start - End Date: 09/01/1998 - 09/01/2001

NERR Reserve(s): Elkhorn Slough, CA • Apalachicola Bay, FL •
Weeks Bay, AL

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