

Project Bulletin



In Situ Copper Monitoring in Rivers, Estuaries and Coastal Waters

Challenge

Copper has been identified as one of the most widespread human-generated pollutants in coastal waters. Trace amounts of copper in marine and estuarine environments are needed to maintain life processes. However, in high concentrations, copper can kill organisms such as scallops and clams, and adversely affect marine food webs and their productivity. With recent studies indicating a rise in copper concentrations, the need for in situ monitoring and source identification is increasingly apparent. This project is developing a sensor that utilizes a new technique called Long Pathlength Absorbance Spectroscopy (LPAS) for in situ monitoring of copper in aquatic environments.



Bayboro harbor, Florida

Science

The Sensor: SEAS-Cu

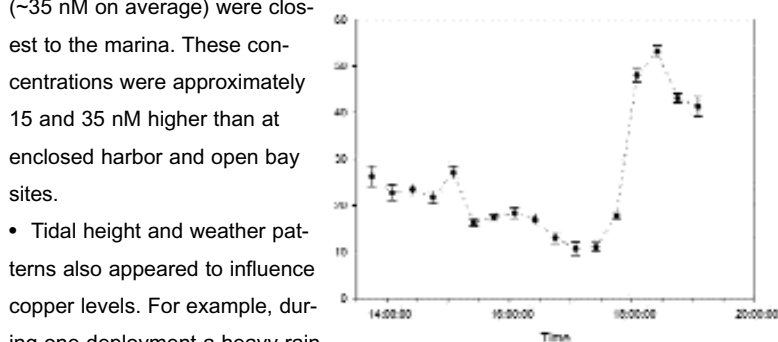
Researchers configured a previously constructed monitoring instrument to include the LPAS method for determining trace amounts of copper. Called the SEAS-Cu (Spectrophotometric Elemental Analysis System), this device pumps water samples into an airtight spectrophotometric chamber and introduces a reagent. The reagent binds with the copper and causes a color change that absorbs light. The amount of copper in the samples is determined by measuring the amount of light absorbed.



The SEAS-Cu Sensor

Preliminary Results

- The SEAS-Cu obtained time series measurements during deployments of up to 12 hours, in Tampa's Bayboro Harbor, located adjacent to a marina. Results revealed that the highest copper concentrations (~35 nM on average) were closest to the marina. These concentrations were approximately 15 and 35 nM higher than at enclosed harbor and open bay sites.



- Tidal height and weather patterns also appeared to influence copper levels. For example, during one deployment a heavy rain

was suspected to be responsible for an increase in copper. Bayboro Harbor is a receiving basin for urban run-off. Thus, the observed increase in copper is consistent with the expectation that copper concentrations might be influenced by weather events (see above figure).

Application

Faster, more accurate sampling

Traditional methods of assessing chemical concentrations in coastal waters require time-consuming manual sampling and analysis in the lab. The SEAS-Cu is portable, low cost and can take time-series measurements in situ. Analysis is instantaneous, allowing for immediate observation and assessment.

Adaptive Sampling

The SEAS-Cu system can measure numerous other chemicals and allows coastal managers to change the setting from one target chemical to another. Sampling can be altered in response to analysis results, giving operators the flexibility to change their sampling according to observations.

Project Essentials

Title: In-Situ Monitoring of a Reactive Metal in Riverine and Estuarine Mixing Zones

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