Bringing "Sound Science" to the Shore: A Ferry-Based Observing System for Long Island Sound

A NYSG research project, in partnership with the Bridgeport-Port Jefferson Steamboat Company and the National Weather Service, equipped a commercial ferry with a variety of sensors to monitor and collect data about the Long Island Sound as makes its daily transects. In real-time, the data is transmitted for use through the Sound Science Web site.

Hypoxia and Long Island Sound Health

For enclosed coastal water bodies like the Long Island Sound that have highly developed watersheds and are heavily impacted by human activities, water quality issues are a perennial concern. In such a situation, many water quality parameters become degraded to the point that the biological integrity of the Sound becomes stressed. Such trends lead to concerns about public health and the regional economy as well as wildlife diversity.

In order to deal with these issues, it is necessary to understand how the Long Island Sound system works and how human activities influence it. For example, an important environmental issue in the Long Island Sound is low dissolved oxygen or hypoxia. An important question to consider for the management of hypoxia is distinguishing the influence of natural and anthropogenic factors contributing to the development of hypoxia. In highly enriched systems, anthropogenic factors (e.g., nitrogen loading) play a direct role in the occurrence and severity of hypoxia events.

However, there is direct evidence that physical environmental processes such as climate variations and atmospheric forcing (e.g., air-sea heat, momentum and freshwater flux) also play a significant role in determining the frequency, duration and severity of hypoxia events through their effects on the development and breakdown of vertical stratification and exchange.

At the "Board the Barnum" event, the inaugural demonstration of the Sound Science Project, Dr. Duane Waliser (center) explains to researchers, agency partners and elected officials, how meteorological instruments collect data as the *PT Barnum* ferry transits Long Island Sound. Photo by John Griffin

A novel approach to data collection

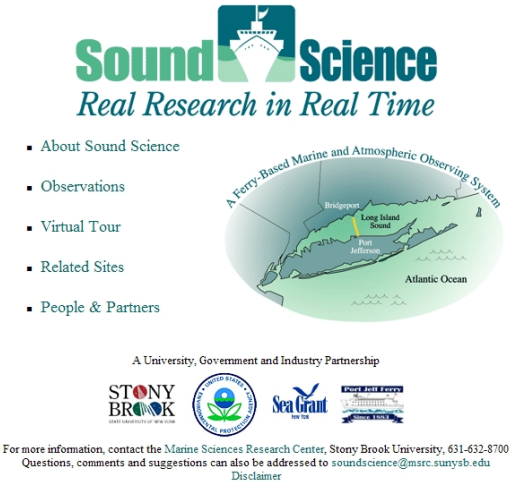
To address this question adequately, a long-term data set of climatic and water quality data would be useful. However, reliable long-term records of over-water atmospheric forcing and associated data have not been readily available for Long Island Sound

Study (LISS) modeling efforts. Such data are vital to better distinguishing natural versus anthropogenic influences on LIS water quality, and thereby making informed decisions concerning LIS water quality management. A novel data collection method, pioneered in both in the UK and South Carolina, is to use ferries as platforms to collect a variety of data that can be used to answer questions about what influences water quality. Such a system uses the continuous traveling of the ferries over a single route to collect data for a long-term period.

In the fall of 2001 a research team from the Marine Sciences Research Center (MSRC) at Stony Brook University set out to develop a ferry-based observing system for Long Island Sound and to initiate year-round sampling along a transect in the central Sound. The project was a collaborative effort with the Bridgeport-Port Jefferson Steamboat Co., National Weather Service, and was part of a joint project that had a similar component in Rhode Island through University of Rhode Island Graduate School of Oceanography and the Cross-Sound Ferry Services, Inc. The MSRC project involved outfitting one ferry, the *PT Barnum*, with a variety of sensors to monitor and collect data and transmit back to the university. Data was then made available to others for use through the website www.sunysb.edu/soundscience/main.html.

Sound Science: Real Research in Real Time

This project had a variety of impacts, accomplishments and benefits. After the initial start from this NYSG project, new funding from EPA was secured to continue the ongoing operation of the system. The initial EPA project funding was for $99,981 for 2004 – 2005. The observing system initiated and tested under this NYSG project now represents a flexible observing platform providing information relevant to LIS research and management objectives. It is highly complementary to other existing LIS observation systems which comprise of moored buoys and monthly ship surveys, and provides capabilities not offered by



Researchers and managers that visit the Sound Science Web site can get real-time data about the hydrological and atmospheric conditions of Long Island Sound.

either system alone including the support of instruments requiring periodic maintenance.

This work helped to develop and test a new prototype system to collect physical oceanographic data over a continuum, and the new system is being used to fill data gaps in the regional ocean monitoring network. The data from this observing system have become part of the National Data Buoy Center (NDBC) which has become an important outlet for ferry data products. This ferry observing platform is also a component of the Integrated Coastal Ocean Observing System (ICOOS). The data is made available to users through Mid-Atlantic Coastal Ocean Observing Regional Association and has potential to reach a wide audience of users.

Data is also made available to ferry passengers in the form of an on-board kiosk that displays current data along with information about the project. Located strategically near the purser's office, this user-friendly display has been educating ferry passengers since the project's launch in September 2003.

The over-water ferry-based observations are used by researchers at Stony Brook University, University of Connecticut, University of Rhode Island and others in studies of Long Island Sound heat budgets and stratification to better understand the factors involved in hypoxia formation.

The ferry observation system has helped with modeling efforts as well. The system provides consistent data collection, increased spatial and temporal coverage, data continuity, increased accuracy and precision (less human error), and cost efficiency. The National Weather Service has used the ferry data to help improve its regional weather forecasts. The refinement of LIS and weather models helps regional managers and agencies to make important decisions critical to the regional environment and economy.

Students

Sea Grant Scholar Travis Baggett graduated with a Master's degree in 2005 and is now employed at Balance Hydrologics, Berkeley, California.

Publications

Baggett, T.J. 2005. A Multi-Decadal Time Series of Heat and Momentum Fluxes for the Long Island Sound. Masters thesis, Marine Sciences Research Center, Stony Brook, NY. 49pp.

Bennouna, Y.S. 2002. The establishment of a historical data analysis for the: Port Jefferson Ferry Project. MS Thesis, Stony Brook University, Stony Brook, NY.