

# AQUARIUS Water Quality Analysis Case Study:

## Exploring and Manipulating Mass Data with Efficiency and Simplicity

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Dr. Susan Libes, Waccamaw Watershed Academy



## Background

"With AQUARIUS," Says Dr. Susan Libes, Director of the Waccamaw Watershed Academy, "it is so easy to manipulate huge amounts of data. All I have to do is drag a toolbox onto the whiteboard, put in a little math formula and wire it up." For over 18 months, she has been using AQUARIUS software in her work at Coastal Carolina University, researching the causes for low oxygen in the ocean off the city of Myrtle Beach. Monitoring a pair of continuous water quality sensors, deployed at different depths, she can compare water quality readings and determine vertical stratification in the water column at that site.

AQUARIUS software has transformed the way she works with time-series data. "It's really a fantastic tool for data exploration," she says. "For example, you don't always know which time scale will be of the greatest interest. With AQUARIUS, it is easy to adjust the scale—to shift from seasonal to daily to hourly—very quickly." Freedom to explore has changed the way she approaches the data. "You start looking at the data with one question in mind, and as you are answering that question, you observe something else going on. That leads to another set of questions. And because it just takes a second to readjust the time scales, you can answer those questions as well."

Before she found AQUARIUS, she did the best she could with Microsoft Excel. However, "I wouldn't even attempt these things in Excel. AQUARIUS has empowered me to do so much more data

exploration than I could have undertaken if I was stuck using Excel. I'm not aware of any other software on the market that does what AQUARIUS does."

## Effective Data Management and Data Correction Archival

The quantity of data she handles is far beyond the intended use of an office spreadsheet. "When you have 15 minute records for six or more parameters, the data will kill you. I had exceeded Excel's capacity, and I had no good way of graphing this huge amount of data." She was forced to make decisions about what data to graph and how, "And

if I was wrong, I had to go back and start from scratch." AQUARIUS makes far better use of her valuable time. "With AQUARIUS I have all the data right at my fingertips. I never have to prune data or make decisions about which part of the data I should manipulate. I really like that."

Last summer, the water column that she was monitoring went anoxic—measuring zero oxygen from the surface to the bottom—and her monitoring became critical, she says. "We were frantically trying to sample and keep up with data management. I attribute AQUARIUS to my being able to keep up with it—I could just jam data in there."

With AQUARIUS, it takes a few mouse-clicks to apply data correction to thousands of samples (She is careful to clarify that she does not apply offsets or fill in gaps, she merely removes anomalous data, such as when a sonde pops out of the water due to wave action.) "I use the threshold tool to reject values below a finite threshold, or, depending on the parameter, I might use rate as a criterion. Then I go back and overlay the corrected dataset on the raw dataset. I automate the process, and it only takes seconds." The fact that AQUARIUS saves an audit trail of the data and her actions on it, is essential. "This is an APA certified lab, so audit trails are a big thing for us."

## On-the Fly Generation of Publication Quality Charts

Because Dr Libes' research is used for reports, funding applications, and presentations, she requires high-quality graphs and charts. "Charting in AQUARIUS is fantastic," she says. "I have tremendous control over the way a chart looks. They're very professional-looking and I can generate a publication-quality JPEG or TIFF file that anyone can import and view."

She brings AQUARIUS, in her laptop computer, to meetings and workshops, and uses it to generate graphics and statistics. "I can plug in a projector and do real-time data manipulation, creating graphs or statistics. It's like I'm doing an experiment with the data, live in the workshop, because AQUARIUS is so







user-friendly about moving piles of data around.” The people who see her charts and visualizations, are impressed, she says, “They look at it and say ‘you know, I really gotta get myself a copy of that software.’”

## Custom Matlab-based Toolbox

Dr Libes has also used the Custom Toolbox, with the help of a colleague with Matlab skills. “There are some complex mathematical manipulations that I don’t want to do myself. So we followed the instructions from Aquatic Informatics, and now we have a toolbox that takes water temperature, salinity and pressure information to compute water density. It wasn’t a difficult process at all.”

She adds, “Another great thing about Aquatic Informatics is the support staff. Whenever I’ve called I’ve gotten immediate assistance. They really know how to use the software. Plus, they’re really patient.”

## The Future for Coastal Carolina’s Marine & Wetland Studies and AQUARIUS

At this point, Dr Libes has more projects in mind than she has time for, and all involve AQUARIUS. “I would like to put my AQUARIUS data online at my project website. And there’s another project with years and years of data—discrete data samples that we take twice a month. I want to merge those datasets with data we acquire from the AQUARIUS portal that provides USGS staging station data.”

“And I have other plans, other ways I want to use AQUARIUS. It not just to improve efficiency, really—it’s because AQUARIUS makes it possible for me to do things with data that otherwise would be impossible. Without AQUARIUS, I just flat out couldn’t do them.”

## Solution Highlights

- Powerful, flexible exploration of massive quantities of water quality data
- Easy merging of time-series data with different time scales
- Quick creation of publication-quality charts
- Data can be manipulated and visualized in real time



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