Buoyed by technology

A UVic geographer floats two portable ocean observatories off Vancouver Island's west coast

Graduate students Heather Mitchel (left) and Kate Dillon complete maintenance of one of the buoys.

by Jennifer Cador

Every hour, like clockwork, University of Victoria geography professor Dr. Olaf Niemann gets an email from the ocean. Not from a friend on a cruise ship or a co-worker in the field, but from the ocean itself, essentially, telling him how it's doing.

One could be forgiven for thinking Niemann's aquatic correspondence sounds a bit like an episode from the *Twilight Zone*—but science fiction it is not. The truth is, Niemann's leading research on coastal waters is made possible by two high-tech buoys on the west coast of Vancouver Island, one in Clayoquot Sound and the other in Kyoquot Sound, that are specially equipped to measure a multitude of physical conditions just above and below the surface. They are mini wonders unto themselves—portable ocean observatories that can be deployed anywhere without the need for a lot of expensive infrastructure.

Remote sensing technology, as it is known, gives scientists around-the-clock monitoring ability and that, according to Niemann, is the beauty of it.

"With most oceanographic work, you go out on a boat and collect point measurements, but it only gives you a snapshot in time. But coastal processes change quickly. The buoys are out there continuously, recording 24/7, and they transmit that information back to the lab."

Using digital technology, data transmission takes place by email. The buoys are outfitted with their own IP addresses, just like home computers, along with sensors to measure many factors, including light, wind direction, humidity, temperature, salinity, chlorophyll, and currents. They sample twice an hour, then send the average of that information directly to Niemann.

Axys Technologies in Sidney partnered in the project to develop the data logging capabilities.

Master's student Stephanie King, working with the Clayoquot buoy, says preliminary results have surprised her. "I was expecting the water to be really well-mixed—more or less the same all over, because the tide just rips through there like a spoon stirring a bowl. But I'm finding a lot of patchiness. I think you really need that detailed view of what's happening from the buoy to get a clear picture."

While there are other, larger oceanographic monitoring systems based on the ocean floor—notably the new VENUS and NEPTUNE cabled observatories led by UVic—this is the only system of its kind on the West Coast that looks at shallow, surface waters. Ultimately, the data is measuring the health of our intricate coastal ecosystem, an area about which remarkably little is known considering its importance to humans and wildlife.

"Coastal waters represent nurseries for most fin fish. The kelp and sea grass beds are areas where fish go to hide from predators before they go to open water. The coast may look beautiful, but the water may not have sufficient nutrient levels and quality to sustain certain populations of fish."

Ecosystem health is of intense interest to many, including those in the aquaculture industry and in coastal communities. King notes that Tofino residents can immediately see the advantages of the buoys, while Niemann points out their usefulness as low-cost water quality monitors for the province. In fact, the applications are almost endless.

"We could put any sort of sensor on there, only limited by depth of pocketbook. You could have acoustic sensors; you could put cameras on if you want. What's really innovative about it is the data logger technology and the ability to communicate back and forth electronically."

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The buoy sites were chosen for specific reasons. The Clayoquot buoy was deployed to support long-term research into habitat use by marine mammals. The Kyuquot buoy was positioned to support an experimental aquaculture operation, run by UVic geographer Steve Cross.

In addition to emailed data, the buoys store the measured information in hard copy in the form of a flashcard located inside. While the two buoys were installed last year to test the technology, true data collection began this summer.

The buoys measure and report in real time. As a result, scientists can observe changes as they happen, such as when conditions are ripe for algal blooms.

The project is being funded with a $350,000 grant from the National Research Council, and was created in partnership with Axys Technologies in Sidney.

UVic researchers were awarded more than $82 million in outside research grants and contracts in 2005/06, nearly tripling in the past six years.