

New hi-tech instruments are revealing a detailed picture of the sea off the Northwest coast.

Words Edwin Colyer

Photograph Guy Woodland

SENSORS OF THE SEA

Andy Lane leans over the side of the RV Prince Madog and hauls back his sampling bottles. The sea spray hits his face as the boat turns across the swell and heads back for Anglesey after a two-day research cruise in Liverpool Bay.

The ship is scheduled to go out only every six weeks or so. Thanks to wireless technology and the internet, day to day monitoring is automated. Tens of thousands of data readings are taken each day by the Coastal Observatory group of the Proudman Oceanographic Laboratory (POL).

The coastal observatory monitors conditions in Liverpool Bay (the region of sea between Anglesey and the Mersey and Ribble estuaries out towards the Isle of Man) using a range of hi-tech gadgetry. The data, covering everything from tides, water temperature and salinity, plug into several mathematical models that help to forecast sea conditions in the bay.

On Hilbre Island at the mouth of the River Dee, an X-band radar measures the height and direction of waves and water depths, with a range of about 5 km. The innovation here is not only the radar, but also the webcam mounted on the radar tower. "The webcam basically lets us observe what the sea state is like around the island in real time," says Phil Knight, a colleague of Andy's at the observatory. "We can then compare the images with what the radar tells us about wave heights and the movement of sandbanks. You can also pan and zoom with the webcam so people have used it for all sorts of things - including looking at the wildlife."

The images and radar data are sent digitally via a wireless network receiving station at Hoylake, where they are made available to the lab over a broadband internet link.

The observatory is about to install a high frequency radar in two sites on the North Wales coast and at Formby Point. These will have a range of about 100 km and should provide more accurate data for the lab, with information on



the size and direction of waves and sea surface currents.

The researchers control all these instruments from the warm comforts of the new POL headquarters, right next to the University of Liverpool's Department of Earth Sciences. They hope that similar technical wizardry will soon let them collect readings from the sea bed in real time too.

The problem with sea-bottom analysis is that it is extremely difficult to send readings to the surface using radio waves because water absorbs the signal. However, the observatory uses devices that incorporate an acoustic modem. This apparatus codes the data into pulses of sound that travel through the water and are detected by a hydrophone (like an underwater microphone). "In the past our underwater devices had to store all the data on board," says Andy, "and we'd have to go and pull them up every so often. Today they relay the data to a surface buoy and we can access the information during our research cruises. But we haven't stopped there. We're also working with a system that

important to check that what is actually happening on the sea is what our models have predicted."

"Setting up the models has been a large part of our work since we began in 2001," explains Andy. "We have been working out how to run them in real time and include meteorological information and river data. New sampling equipment and collaborations with other laboratories will eventually enable us to test models that predict concentrations of nutrients and plankton, which support the ocean's food chain."

The main partners of the coastal observatory are the Met Office and the Environment Agency. Each day the Met Office runs POL modelling software to provide forecasts up to 48 hours in advance. The resolution of the model is usually about 12 km, but this will increase to about 1.5 km in the Irish Sea and as fine as 100 m in Liverpool Bay.

The Environment Agency, meanwhile, uses POL model results for flood alerts along the Northwest coast and North

MORE INFORMATION:

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simply uses the buoy as a relay station: the surface buoy uses satellite communication to get the data back to land."

So what happens to all this data when it reaches its destination at the British Oceanographic Data Centre, hosted by POL? "We're interested in the processes in coastal seas," says Phil, "trying to understand water behaviour and its effects on - and also how it is affected by - our weather, climate and human activity."

"The pilot project will provide information for our routine forecasting models. The observatory is an operational oceanography facility that constantly gathers information so we can interpret them to see changes in the ocean as they happen. Real time data collection and interpretation is

Wales. Longer-term analysis of the results will help them assess future requirements of coastal flood defences.

While the observatory's activities make an essential contribution to flood forecasting and longer-term environmental planning, the project was founded with the public in mind too. All the data, forecasts and model results are openly available on the observatory's website. You can find out the surface salinity at Southport, the direction of sea currents around the Isle of Man and the height of the tide at Larne in Northern Ireland.

So even if no-one goes out to sea for another two months, at least the public can log on to see if it's a perfect day to be out on the waves.

