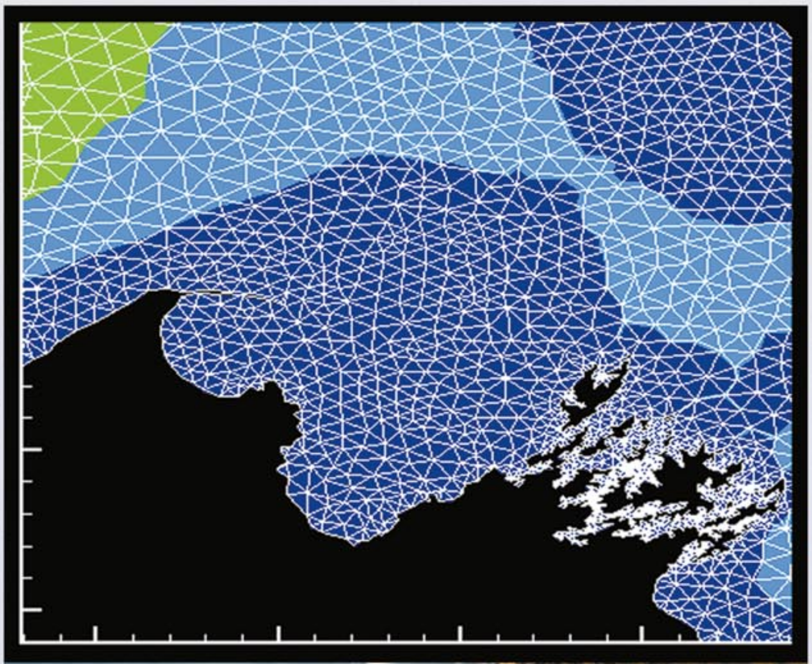


Tide forecast at the click of a mouse

Instead of scanning the tide tables in the newspaper, you can now visit NIWA's website, dial in the exact location you are interested in, and get the tide details on the spot. NIWA's new tide model is being used extensively to forecast the heights of tides and currents for a wide variety of applications. These include all sorts of recreational purposes, such as boating, fishing, and swimming, correcting for the tide during hydrographic surveys, and looking for potential sites for tidal power generation. The model has even been used to help kayakers and swimmers crossing Cook Strait plan their departure times so they made use of the tidal currents rather than fought them.

The model was used to calculate the strength and timing of the 13 most important tides for New Zealand at 32 000 locations in the Exclusive Economic Zone. For the site you are interested in we get the information from the nearest three locations and combine that with the contributions from all 13 tides to give the tide height or current.

For tide forecasts anywhere in the EEZ, go to www.niwa.co.nz/services/tides

Coasts & Oceans

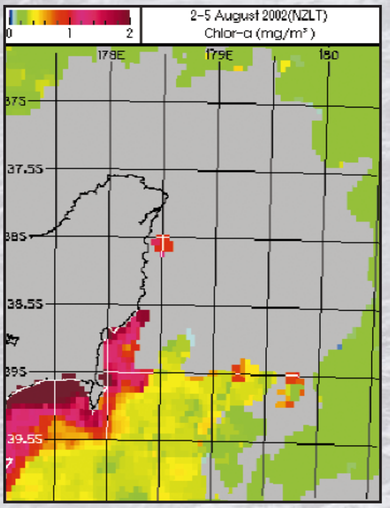
Small waves can have big effects

The small waves kicked up each afternoon by sea breezes may appear harmless, but that is not always the case. NIWA scientists studying sediment transport in Auckland's Tamaki River estuary have shown that these waves can generate currents as strong as those produced on open coastlines by decent-sized ocean waves just before they break.

This research will help us predict the movement of sediment in shallow sandy bottomed coastal waters and mudflats. It is part of a new focus on the very shallow waters around estuary fringes, which are valuable sources of kaimoana and are frequently threatened by pollution and the spread of mangroves.

Satellite shows flood's muddy path

The Waiapu and Waipaoa Rivers on the east coast of the North Island have the highest and third highest rates of sediment discharge in New Zealand. They rank among the world's muddiest rivers. They also attract widespread attention because of the effect their muddy discharges have on the ocean and seabed. In extreme floods these rivers carry so much mud that the water is forced beneath the sea surface, and forms a fluid mud layer on the seabed. This layer, which can be up to 2 m thick, smothers plants and animals, and substantially alters the ecosystem.



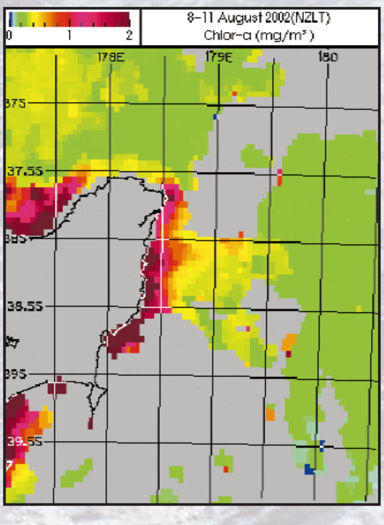
Tagging the ocean

Scientists have long struggled to get meaningful information about the ocean surface. The ocean is in a constant state of motion, so how can you be sure you are measuring the same piece of water? NIWA has overcome this problem by developing a new technique that uses the gas sulphur hexafluoride, instead of a dye, to trace a patch of water in the ocean. The gas is dissolved and spread over an area of ocean up to 50 km^2. The evolving tracer patch is then mapped at the surface and at different depths. Conditions in the patch can be manipulated, and the resulting biological and chemical changes can then be monitored and compared with the water outside the patch.

NIWA used this technique very successfully in the ocean northwest of Bounty Island to examine what influences the availability of nutrient iron for the growth of phytoplankton, and how it affected productivity in the Southern Ocean. Future uses of the gas tracer include studying the production of gas from living organisms in the oceans, and the exchange of gas between ocean and atmosphere. It will also be used in coastal waters to determine how long water remains around mussel farms, and how this affects water quality.

Cliff Law analysing a trace of SF6 in a seawater sample.

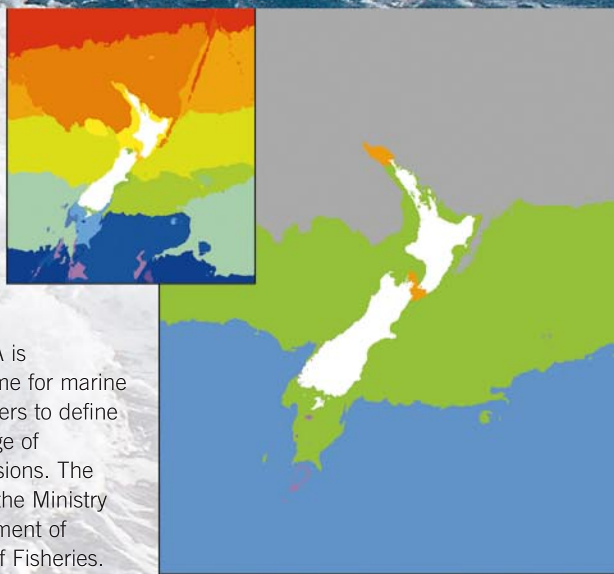
These events can be detected by satellite, which is what happened during the flood of 6–8 August 2002. NASA's SeaWiFS ocean colour sensor is designed to measure the concentration of chlorophyll (and therefore phytoplankton) in the open ocean. In this coastal situation, however, NIWA scientists expect that the apparently high chlorophyll levels the satellite recorded near the mouths of the two rivers were probably caused partly by sediment from the flood rather than chlorophyll. Further research using more advanced processing of SeaWiFS data to determine both sediment and chlorophyll concentrations will explore the potential of using satellites to help understand how sediment from floods disperses.



Mapping the marine environments

Managing the seas around New Zealand presents a unique set of challenges, not least of which is that the detailed maps we take for granted on land simply are not available for the sea. To overcome these difficulties NIWA is developing a classification scheme for marine environments that allows managers to define regions within the EEZ for a range of planning and management decisions. The system has been developed for the Ministry for the Environment, the Department of Conservation, and the Ministry of Fisheries.

The classifications are based on physical attributes of the environment, such as sea surface temperature, depth, tidal mixing, freshwater input, bottom type and shape, ocean fronts, upwelling, and eddies. For example, the figure shows the distinct environment in the Cook Strait region that is associated with high tidal velocities. Biological resources of interest to managers are broadly correlated with these attributes. The particular scheme used depends both on the amount of information available and its application – more detailed information allows us to subdivide environments into smaller and more distinctive regions.



When we classify the marine environment by 20 different characters instead of 5, the complexity of the EEZ increases substantially.