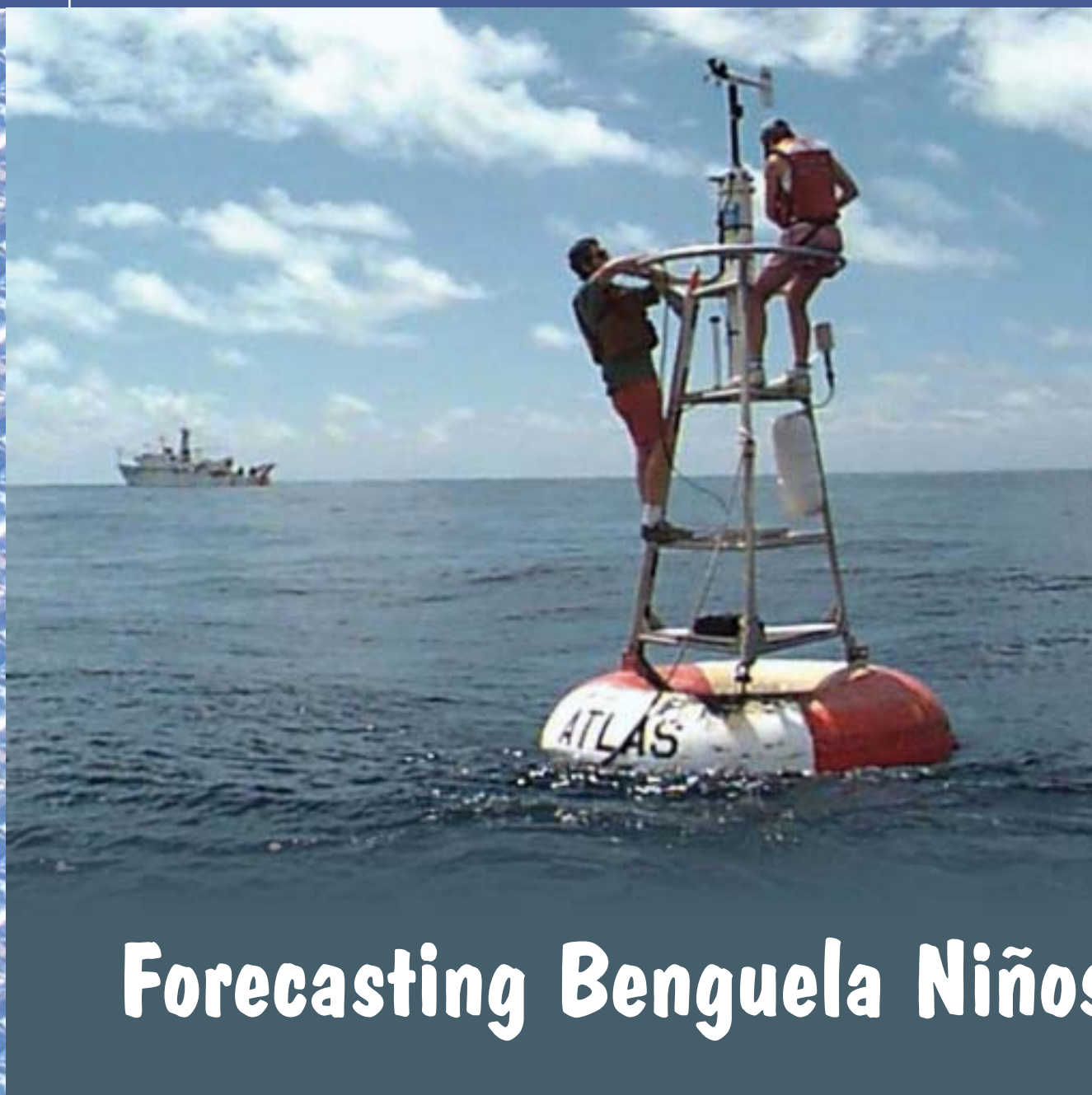




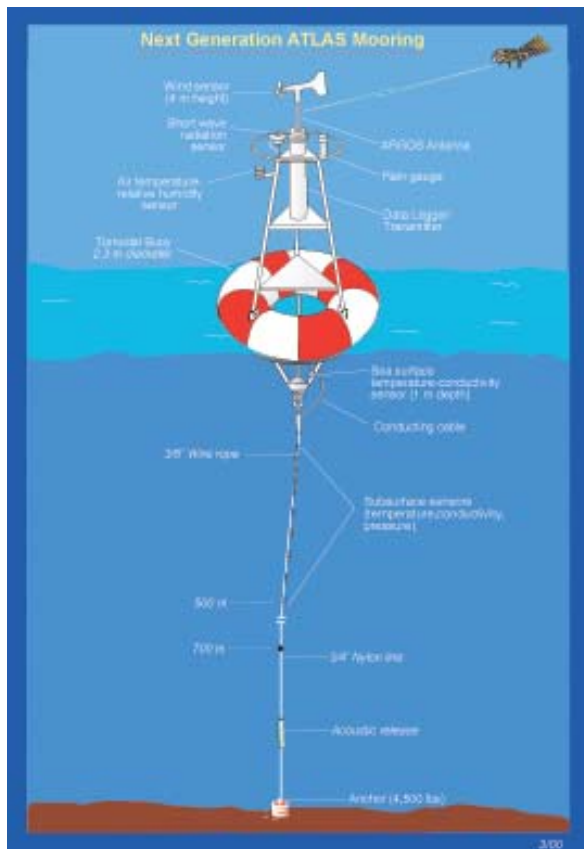
Forecasting Benguela Niños

Benguela Niños occur when warm seawater from the equator moves along the southwest coast of Africa towards the South Pole and penetrate the cold upwelled Benguela Current. To determine what effect these Benguela Niños have on weather patterns and rainfall over southern Africa, Sue Matthews spoke to researchers at the University of Cape Town.

Benguela Niños have much the same effect on weather as their more famous namesake on the Pacific coast of South America. Just as oceanic warming due to El Niño brings heavy rain to Peru and

neighbouring parts of Chile, Benguela Niños cause floods along the coast of Angola and Namibia as warm water from the tropical Atlantic Ocean is advected southwards into the northern Benguela region.

“It’s important to develop an early warning system for Benguela Niños, yet we know very little about how they work,” says Mathieu Rouault, who last year completed a WRC-funded study on the role of the



An ATLAS mooring system costs in the region of \$50 000 and must be recovered and replaced every year for routine maintenance.



Launching an ATLAS instrumented buoys

oceans in southern Africa's rainfall.

"Satellites can't give all the information we need, and numerical models don't integrate all the phenomena happening in the region. There are a handful of drifting buoys in the south-east Atlantic, but they only measure surface pressure. We need an observing system that can tell us what's going on in the ocean, because if we understand the mechanisms behind the development of Benguela Niños, we can improve the forecasting."

ATLAS BUOYS

Nowadays, El Niño is fairly well understood, and it's possible to predict the onset of an event up to six months in advance. This can be largely attributed to the array of 70 ATLAS instrumented buoys de-

ployed in the Pacific Ocean during the early 1990s. The observing system was developed as part of the TOGA research programme to understand the ocean processes governing the El Niño Southern Oscillation (ENSO) phenomenon.

Later it was decided to extend the observing system into the tropical Atlantic Ocean. France, Brazil and the USA took on the task of developing PIRATA – the Pilot Research Moored Array in the Tropical Atlantic – which consists of 12 ATLAS buoys moored in the area between 15°N and 10°S.

Three extensions to this observing system have since been proposed, one of which is the south-east extension (SEE). This would entail installing two ATLAS buoys in the tropical waters off Angola. Dr

Rouault is chairman of the PIRATA-SEE committee, and recently conducted a feasibility study on the extension for the Benguela Current Large Marine Ecosystem (BCLME) programme. The programme is a joint initiative of South Africa, Namibia and Angola that was kick-started with funding from the Global Environment Facility (GEF).

"Benguela Niños have a big impact on fisheries, which is why the BCLME programme is interested in the PIRATA extension," he explains.

WARM SEAWATER

During the 1995 event, for example, the entire coast from Angola's Cabinda Province to central Namibia was covered by abnormally warm water – in places up to 8°C above average – to a distance of

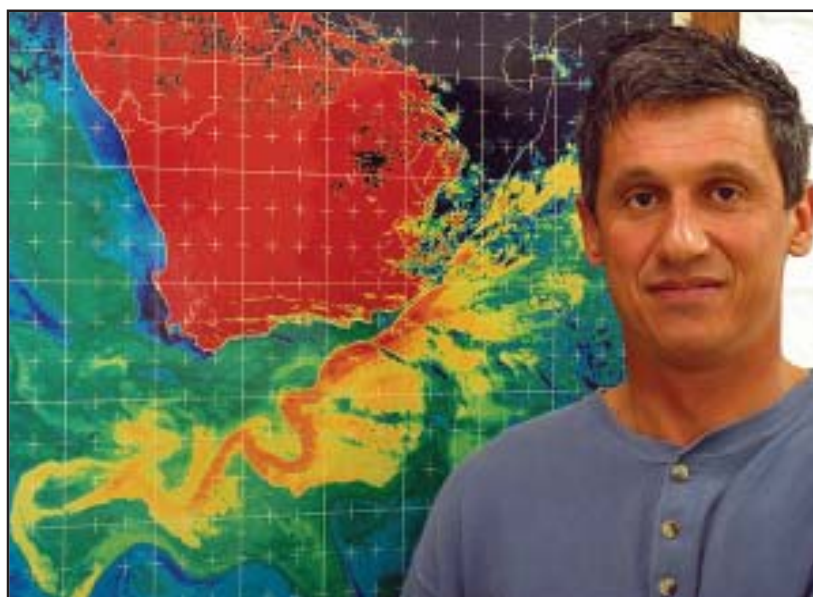
more than 300 km offshore. The effect was disastrous. Sardine, horse mackerel and silver kob died *en masse*, while those sardine that managed to escape the warm water by moving south were heavily fished by the Walvis Bay fleet. Hake migrated offshore, and the anchovy stock, already at a low level, collapsed completely. The seal population was almost halved after many adult seals succumbed to starvation, and the entire cohort of pups either died or aborted.

Clearly, it would be wise to adjust fishing quotas in the run-up to a Benguela Niño, but to do this some advance notice is required. And this is the ultimate objective of PIRATA – to enable resource prediction in the adjacent countries, whether it be for water, agricultural or fisheries resources.

The ATLAS buoys monitor a host of oceanographic and meteorological parameters. A typical mooring includes an anemometer (wind speed), air temperature and humidity probe, pyranometer (short wave radiation), rain gauge, combined temperature/salinity sensors at the surface and at 20, 40 and 120 m depth, temperature sensors at 60, 80, 100, 140 and 180 m depth, as well as temperature/pressure sensors at 300 and 500 m depth.

The data are transmitted to shore via satellite and are available in near real-time on the Internet and the World Meteorological Organisation's Global Telecommunication System. Apart from helping scientists to learn more about how variations in sea temperatures, winds and other climate variables affect the tropical Atlantic region, the data can be used in ocean and weather prediction models, and to validate measurements derived from satellite remote sensing.

Each ATLAS mooring costs in the



Dr Mathieu Rouault from the Department of Oceanography, UCT, is chairman of the PIRATA-SEE committee.

region of \$50 000 and must be recovered and replaced every year for routine maintenance. A five-year PIRATA-SEE project would cost \$600 000 for two moorings, but Dr Rouault has recommended initially conducting a year-long demonstration project involving only one mooring without meteorological instruments. This is largely to allow the risk of vandalism to be assessed.

"Vandalism has been a problem for PIRATA," he admits. "Sometimes it's just the wind vane that is stolen, but fishermen probably also damage the mooring when their gear gets tangled in it."

If the PIRATA-SEE project proves to be a success, however, Dr Rouault is hopeful that a similar kind of observing system can ultimately be deployed in the Indian Ocean.

"Our WRC project indicated that the Indian Ocean is more important to southern Africa's weather than the Atlantic," he says. "We've shown that the increase in extent and intensity of droughts over the

last 30 years is linked to a warming of the Indian Ocean, probably due to a slight change in the frequency and duration of El Niños. On a more local scale, the Agulhas Current has a big impact on coastal weather extremes, because evaporation results in high levels of water vapour in the air above it. This moisture can be advected to the coast to feed storms and tornadoes."

"Nevertheless, there are a lot of advantages to initially doing an extension of an existing array of moorings, and joining an international initiative like PIRATA. They'll help us in training technicians and calibrating the sensors, and we will be able to obtain tried and tested moorings at a relatively low cost. If we can show that the region is capable of maintaining one or two moorings, we'll be much more credible by the time we're ready to tackle the Indian Ocean. It's not likely that we'd be able to put any moored instrumentation in the Agulhas Current though – it's so powerful that an ATLAS mooring wouldn't last a day!" 