NEWS

Buoy damage blurs El Niño forecasts

Missing data from the eastern Pacific Ocean may hinder predictions of this year's event.

More than half a dozen oceanographic buoys are missing in action in the eastern Pacific Ocean. The US National Oceanic and Atmospheric Administration (NOAA) has dispatched a ship to fix the malfunctioning buoys, which are part of the 55-strong Tropical Atmosphere Ocean (TAO) array that monitors the ocean and atmosphere.

But the data void has left climate modellers uncertain about the strength of this winter's El Niño — which occurs when warm waters shift east across the Pacific, bringing rain and extreme weather.

Fishermen, storms and boat collisions often knock buoys in this region out of commission. The upcoming El Niño adds "more urgency than usual", says Arun Kumar, branch chief at NOAA's Climate Prediction Center in Camp Springs, Maryland.

Among other things, the TAO array tracks the 20° C thermocline, a boundary between warm surface and cool deep waters that ranges from about 140 metres deep in the western Pacific to 40 metres deep in the eastern Pacific. Shifts up and down in the thermocline's location can indicate the magnitude of an incipient El Niño or a La Niña, the cold phase of the climate oscillation.

Because changes to the thermocline are more pronounced in the shallower waters of the eastern Pacific, the buoys there provide "an important chunk of data from a region where the signals tend to be very large during El Niño and where the models depend on the data to forecast accurately", says Michael McPhaden, an oceanographer at NOAA's Pacific Marine Environmental Laboratory in Seattle, Washington. "We are at a critical point in El Niño — everyone realizes we have to get those buoys up and working."

The two lines of buoys in the fish-rich region of the eastern Pacific have a history of being tinkered with, and for each of the past four major El Niño events, there have been at least five missing. "But 2009 is exceptional," says McPhaden.

Some of the closest buoys are about a week's sail from the coast. Fishermen often tie up to a buoy and drag it off to the side, then sweep their nets through the water to catch the fish that gather there. Past repair trips have found sliced mooring lines, fishing nets tangled on the instruments and bullet holes on the buoys themselves — and sometimes, no buoys left at all, says Shannon McArthur, the TAO project manager at the National Data Buoy Center in Mississippi.

The buoy array needs regular maintenance.

NOAA NATIONAL DATA BUOY CENTER

In one instance, a buoy stopped transmitting temperature and other data, but it continued to relay its position — allowing scientists to watch as it drifted for a day, then took off at high speed to land at Puntarenas, Costa Rica, probably taken aboard a ship. McArthur will describe this and other details of buoy vandalism at the Oceans '09 meeting in Biloxi, Mississippi, from 26 to 29 October.

Half of the 14 TAO buoys that are strung along two mooring lines, along the longitudes of 95° west and 110° west, have stopped transmitting in the past eight months. The research vessel *Wecoma* set off on 4 September from Newport, Oregon, to fix them — a job that could take a month. The cost of replacing or fixing buoys depends on their location and how much monitoring equipment they carry, says McArthur. NOAA spends an estimated US$1 million each year to repair the array.

And although lines of buoys are scheduled for maintenance every six months, this year the swathe in the eastern Pacific slipped two months behind that schedule. McArthur says that repairs aren't late, but that financial and other logistical concerns can sometimes affect scheduled maintenance. A NOAA effort is under way to calculate costs for the buoy-operating community at large, he says, but it's difficult to quantify vandalism's impact on data.

Meanwhile, forecasters are scrambling to work out how the missing data will affect their El Niño predictions. In August, NOAA predicted a mild El Niño this autumn that will strengthen through the winter, but other models forecast a more extreme event.

"Because of the missing moorings, the forecasting system must now rely more heavily on the other observing systems," says Magdalena Balmaseda, a senior scientist at the European Centre for Medium-Range Weather Forecasts in Reading, UK, who has published on the lack of redundancy in data-collecting systems in the Pacific (M. Balmaseda and D. Anderson *Geophys. Res. Lett.* **36**, L01701; 2009).

For now, forecasters are patching in data from buoys farther to the west to try to improve predictions in the eastern Pacific. Balmaseda says that the data problem can be worse when altimeter instruments aboard satellites stop working, as happened in August 2008. For now, she says, "we still have hope". ■

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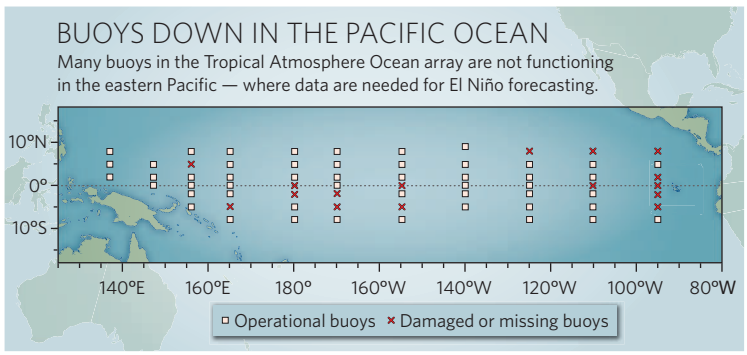

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