FACT SHEET EPA drops BOB on Kerry!

Summary
On Thursday, 13 January 2005, an Environmental Protection Agency (EPA) Baby Ocean Buoy (BOB) was dropped into Hervey Bay by a Queensland Rescue helicopter (see figure 1). It is a Legrangian buoy which means that it gathers information as it moves with the tides and currents (rather than from a fixed position). Queensland Rescue is part of the Queensland Department of Emergency Services' Counter Disaster and Rescue Services' Division. The purpose of the deployment was to record storm waves generated by cyclone Kerry as it approached the Queensland coastline in an area not covered by the EPA's network of moored wave buoys. After the cyclone threat had passed, BOB was recovered on 17 January using the Burnett Heads Volunteer Marine Rescue(VWR) vessel.

Figure 1 – Bell 412 helicopter (courtesy Dept. Emergency Services).

Cyclone Kerry had been present in the Coral Sea for several days, and was slowly starting to move towards the central Queensland coastline (see figure 2). With the possibility that the cyclone could come close to Hervey Bay it was important to record information on the large waves it was likely to generate. Studying large wave events provides a greater understanding of coastal processes generally, and also assists the EPA to make better coastal planning decisions.

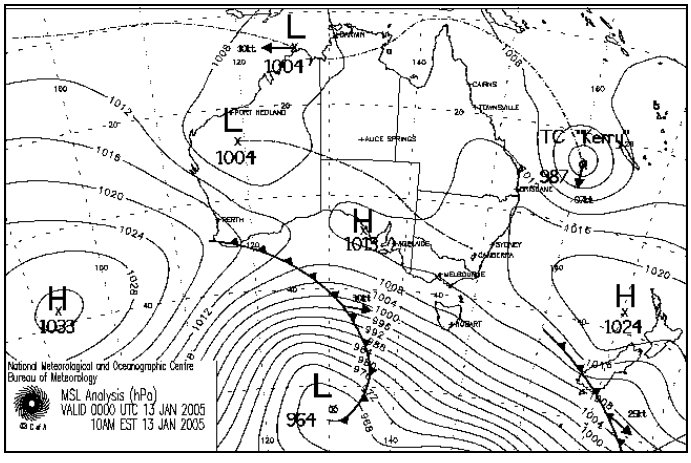

Figure 2 – Synoptic situation 13 January 2005 (courtesy of BoM).

The closest of the EPA's fleet of moored Datawell Waverider buoys were located 220km north, at Emu Park, and 210km south, off Mooloolaba.

It was therefore necessary to undertake a rapid deployment of BOB in Hervey Bay. Unlike the moored wave buoys, BOB is a Datawell 0.4m diameter Waverider buoy that drifts with the currents, collecting wave information and storing it to a data logger on board. Conventional deployment from a boat was not possible as waves from the cyclone were already too rough for safe operations.

As part of the close working relationship between the Department of Emergency Services (DES) and the EPA, DES provided a Rescue Services' Bell 412 helicopter so that BOB could be deployed. The helicopter used GPS to locate the deployment site and dropped BOB into the water from a height of about 10 metres at 1430hrs on 13 January. BOB was then free to drift with the prevailing currents within Hervey Bay, recording information on wave conditions at its location, and storing this information on an internal data logger every 30min.

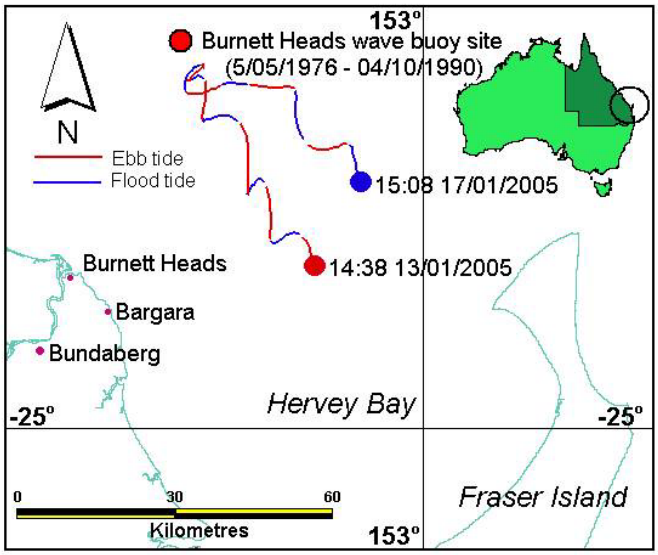

Figure 3 – Drift track of the BOB.

Recovery
BOB has a relatively short operational life of about two weeks (due to power requirements). However, this was more than sufficient as cyclone Kerry weakened and moved away from the coast, no longer posing a threat. As a result, a recovery mission was carried out on the 17 January using the Burnett Heads Volunteer Marine Rescue vessel (see figure 4). Portable radio receiving equipment was used to obtain a transmission signal from BOB (which included its position). A GPS receiver was then used to direct the VMR vessel to BOB where it was recovered and transported back to the Coastal Services office. The stored data from BOB was then transferred to computer and the results processed (see figure 5).

Figure 4 – recovering the BOB.

Conclusions

This was the first time that BOB had been used, and the first time that a DES helicopter was involved in the deployment. The exercise effectively proved that BOB, deployed from a helicopter in the path of an approaching cyclone, is able to collect valuable storm wave information which would otherwise had been impossible to collect using conventional vessel deployment techniques (because of the safety issues in rough seas).

From figure 3 it can be seen that BOB travelled about 40km northwest of its deployment site, to be near the site where the EPA had recorded wave conditions from 5 May 1976 to 4 October 1990. Late on 15 January BOB drifted back in a general southeasterly direction to be approximately 17km northeast of its deployment position when it was recovered.

The average depth of water over which BOB drifted was 25 metres. Tide ranges during the period varied from about 2.5m on 13 January to 1.5m on 17 January.

Figure 5 displays time series plots of the wave heights, periods and directions recorded by BOB. The figure also shows a plot of the tides recorded at the EPA's storm tide gauge at Burnett Heads. From the figure, it is clear that sea conditions were roughest at the time of the deployment, and eased from then on. The fluctuations of the peak wave period (Tp) values in the plot indicate that two sets of wave conditions prevailed, particularly on the 14 and 17 January (one being localised seas from the south with wave periods less than 6 seconds on 14 January (supported by wind recordings from Hervey Bay), and the other generated by cyclone Kerry producing swell waves from the east with periods in excess of 6 seconds). Tides throughout the period appear to have conformed to normal meteorological conditions.

Acknowledgements

The EPA would like to acknowledge the valuable assistance provided by the Department of Emergency Services and the Burnett Heads Volunteer Marine Rescue.

Coastal erosion

During the life of cyclone Kerry, gales and rough seas were reported along a large section of the Queensland coastline. Beaches in the Mackay region were particularly affected, and some erosion was reported. Channel Seven Bundaberg reported on 17/01/2005 that although cyclone Kerry may not have hit Wide Bay hard, the low it created caused some problems for the turtle eggs at Mon Repos. Volunteers moved thousands of eggs during the week to prevent them being damaged by beach erosion.

Web links

Queensland Rescue
http://www.emergency.qld.gov.au/aviation/default.asp
Bureau of Meteorology
http://www.bom.gov.au
Burnett Heads VMR
http://www.vmraq.org.au/org.asp?oid=290
Datawell
http://www.datawell.nl
EPA fact sheets
http://www.epa.qld.gov.au/waves/wave_monitoring_publications/

Additional information on waves and tides can be obtained on-line at the following EPA web pages:

www.epa.qld.gov.au/waves
www.epa.qld.gov.au/tides

Glossary

Hsig	The significant wave height (in metres), defined as the average of the highest one third of the zero up-crossing wave heights in a 26.6 minute wave record. Hsig is frequently used by meteorologists, oceanographers and coastal engineers. It is based on the concept that smaller (least significant) waves should be ignored from the observations as they have little influence on wave processes generally.
Hmax	The maximum zero up-crossing wave height (in metres) in a 26.6 minute record.
Tz	The average of the zero up-crossing wave periods (in seconds) in a wave record.
Tp	Wave period at the peak spectral energy (in seconds). This indicates the period of those waves producing the most energy in a wave record.
Direction	The direction that peak wave period (Tp) waves are coming from (in ° Magnetic). In other words, where waves with the most wave energy are coming from.
Predicted tide	Tide expected to occur under average meteorological conditions. Tide predictions are typically based on previous observed tide readings gathered over a long period (usually one year or more). The sun, moon and earth are not in the same relative position from year to year. Accordingly, the gravitational forces that generate the tides, and the tides themselves, are not the same each year.
Observed tide	Tide actually recorded by the storm tide gauge.
Non-tidal residual	The residual is the difference between the predicted and the observed tide height. The tidal predictions are prepared for average weather conditions. Observed tides include the tide itself, and the height variations (residuals) that result from the effects of the weather on the height of the sea level. The residuals serve to measure storm surge during severe (cyclonic) weather conditions.

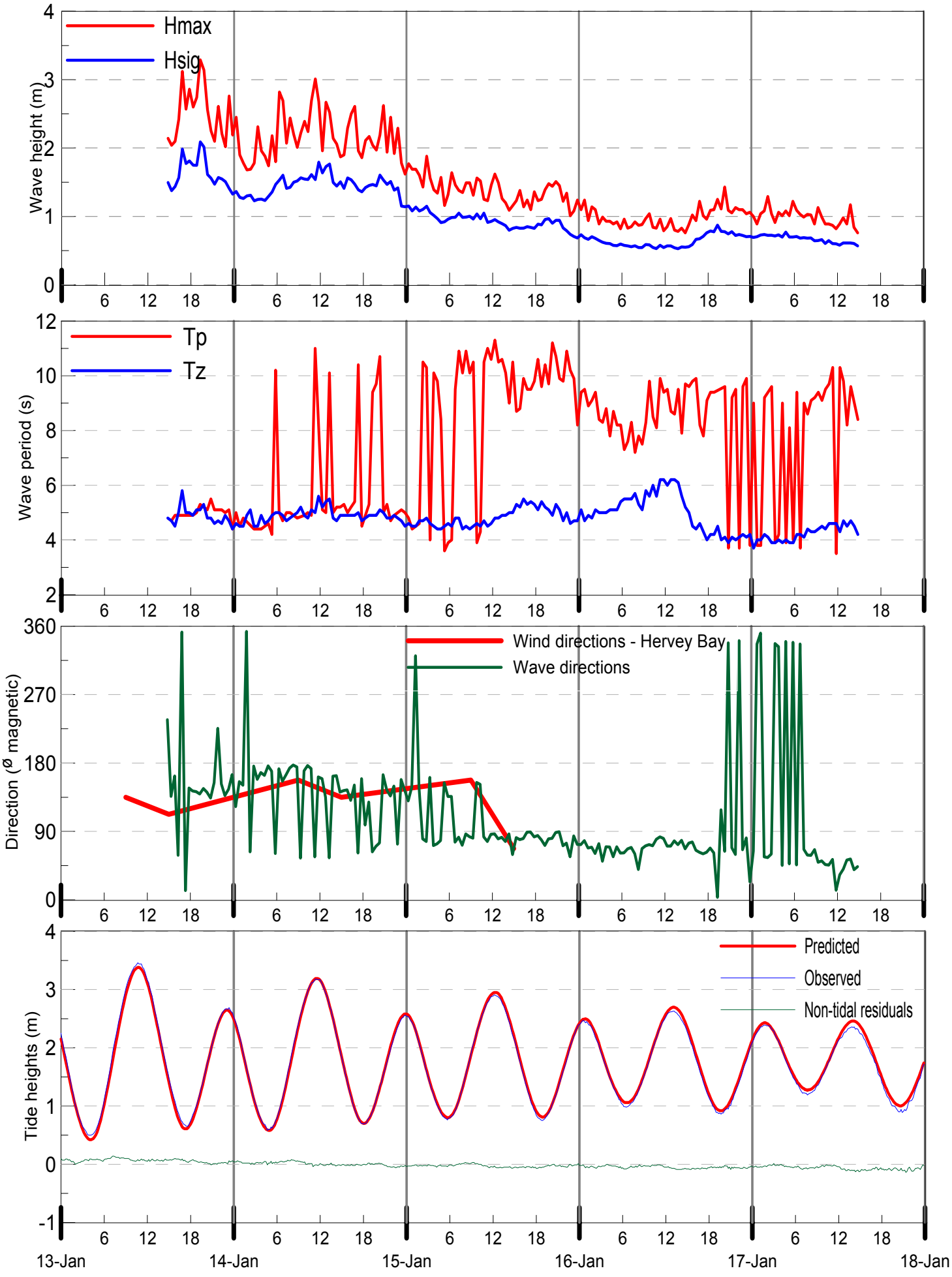

Figure 5 – Time series plots 13–17 January 2005.