

BOB's bash with Nathan

Baby ocean buoy wave data, Coastal Impacts Unit DSITI

Severe Tropical Cyclone (TC) Nathan meandered off the east coast of far north Queensland from 8 March 2015, eventually reaching landfall about 90 km north-north west of Cooktown on 20 March. Initially TC Nathan approached the coast on March 12 coming within 70 km of Cape Melville before turning and heading back out to sea. It turned once more on March 16 and intensified to reach landfall north of Cape Flattery as a category 4 cyclone. TC Nathan continued to track west through to the Gulf of Carpentaria, across the Northern Territory and in to the Indian Ocean.

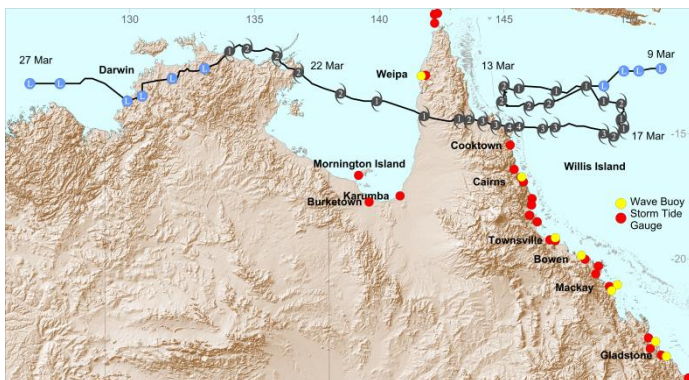


Figure 1 – TC Nathan track map

To monitor wave conditions near the cyclone, a portable wave buoy suitable for quick deployment was sent to Queensland Fire and Emergency Services (QFES) in Cairns.



Figure 2 – BOB prior to helicopter deployment

The Baby Ocean Buoy (BOB) is a Datawell 0.4 m waverider buoy capable of drifting with the currents while collecting wave information and transmitting it to DSITI via satellite. Based on the prevailing northerly currents and predicted path of TC Nathan, BOB was deployed by the QFES helicopter near Cairns Reef (about 145 km north of Cairns) at 18:00 on 18 March with the intention of drifting BOB as close to TC Nathan as possible.



Figure 3 – Drift track of BOB and TC Nathan

On 20 March, BOB came within 20 km south of TC Nathan as the system neared the coast some 220 km north of the Cairns waverider buoy. The buoy drifted north initially at about 2 km/hr. As the radius of maximum winds approached the fringe of the Great Barrier Reef, the buoy accelerated to 10 km/hr, to come ashore about 9 km west of Cape Flattery at 05:00 20 March.

Table 1 Wave height and period of BOB and the Cairns buoy

	<i>BOB</i>	<i>Date / Time</i>	<i>Cairns</i>	<i>Date / Time</i>
Hmax (m)	9.60	20/03 02:00	2.93	20/03 03:00
Hsig (m)	5.06	20/03 02:00	1.64	20/03 04:30
Tp (sec)	9.79	20/03 03:00	10.41	19/03 20:00
Tz (sec)	7.38	20/03 03:30	5.02	20/03 03:00

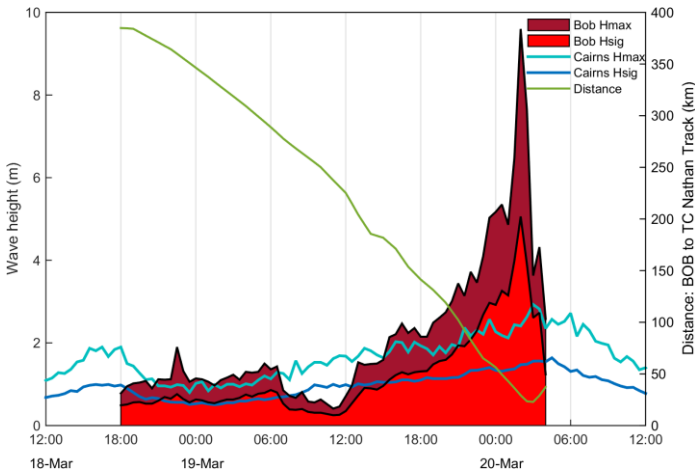


Figure 4 – Wave height from BOB and the Cairns buoy

At the commencement of BOB’s journey, measured significant (Hsig) and maximum (Hmax) wave heights were comparable to the wave heights measured at the Cairns wave monitoring buoy, being of the order of 0.6 m and 1.1 m respectively.

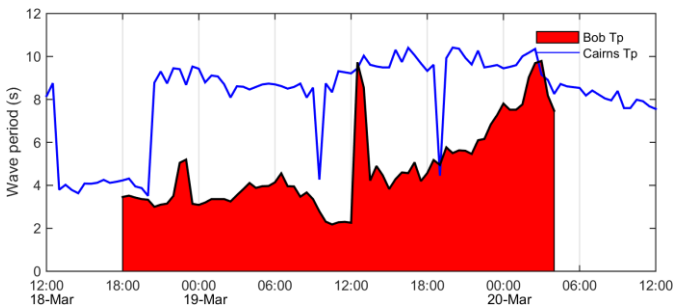


Figure 5 – Wave period of BOB and the Cairns buoy

The peak wave period (Tp) was also comparable at the commencement of BOB measurements (about 3.5 seconds), but the Cairns buoy shifted to a longer period of 8 to 10 seconds.

Spectral analysis of BOB data showed two predominant wave forms: a southerly sea and a north-easterly swell. This was also observed in the Cairns and Townsville wave data. As BOB drifted closer to the cyclone, the swell became more predominant, shifting to a more easterly direction.

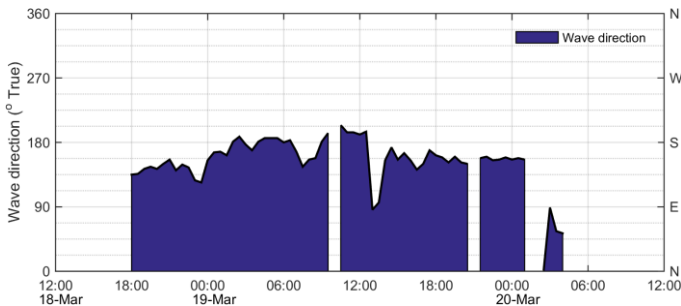


Figure 6 – Wave direction from BOB

As BOB passed over Boulder Reef (approximately 5 m depth) around 09:30 on 19 March, there was a reduction in measured wave heights and an increase in the peak wave period resulting from the reef blocking the short-period waves.

Onwards from when BOB was within 170 km of TC Nathan, rapid increases in wave height and wave period were observed. BOB was closest to the cyclone at 03:30 on 20 March, where just prior at 02:00 the largest wave height of 9.6 m was recorded when the buoy was about 30 km south of the cyclone off Cape Flattery. This is considerably larger than the maximum wave height of 2.93 m measured at the Cairns buoy.

Had BOB not been deployed it would not be known that TC Nathan was producing waves three times the size measured at Cairns.



Figure 7 – BOB as first spotted from the helicopter

BOB was eventually recovered by Coastal Impacts Unit staff on 10 April with the assistance of Helicopter Solutions. The buoy was found nestled within a small cavern on the beach.

The data collected by BOB provides a better insight into cyclone generated wave growth within the Great Barrier Reef lagoon, as well as wave interaction with individual reefs. Such information will provide for better coastal planning and emergency management.

Further information

Additional information about storm tide and wave monitoring data for TC Nathan can be found in the *Severe Tropical Cyclone Nathan* fact sheet.

Additional information about DSITI’s storm tide and wave monitoring networks can be found on the Queensland Government webpages:

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