February 2014

Tropical Cyclone Dylan

Storm tide and wave monitoring data

On Tuesday, 28 January 2014, the Bureau of Meteorology declared a cyclone watch for a developing tropical low in the Coral Sea off the Queensland east coast. After Tropical Cyclone (TC) Dylan formed on 30 January, it continued to move in a southerly direction gradually intensifying and crossing the coast as a category 2 cyclone close to Hideaway Bay at approximately 03:30, Friday 31 January. Data from DSITIA storm tide and wave monitoring networks was made available via the public website and State Disaster Coordination Centre to inform disaster managers about prevailing wave conditions and storm tide levels.

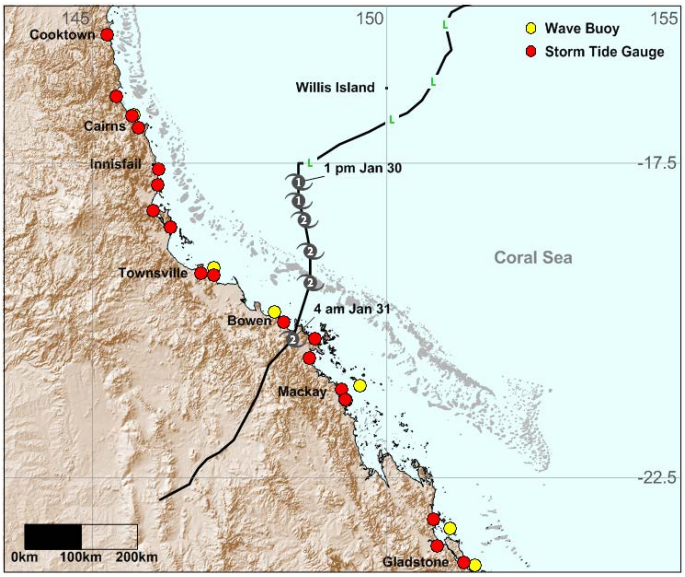

Figure 1 – TC Dylan Track Map (Data courtesy of BoM)

Event timing significance

Typically as a cyclone approaches the coast, ocean water levels rise as a result of strong onshore winds and reduced barometric pressure. This rise or 'storm surge' is additional to the predicted tide level, hence the stage of the tidal cycle has a considerable influence on the total water level at any particular location. The peak storm surge generally occurs when the cyclone crosses the coast, and the highest storm tide occurs when the peak surge coincides with the high tide. Although TC Dylan was only a category 2 cyclone when it crossed the coast on a low tide, it still posed a significant threat to communities vulnerable to coastal inundation because the prevailing high tides were near or at their highest predicted levels for the year. Consequently, storm tide levels exceeded the normal tidal range and the Highest Astronomical Tide (HAT) level on the high tides before and after landfall due to smaller, more persistent storm surge levels.

DSITIA storm tide gauge network

DSITIA operates a network of 31 storm tide gauges along the Queensland coastline capable of recording real time water levels during extreme events. The storm surge component and atmospheric pressure for selected sites is shown in Figure 2 relative to the cyclone crossing time.

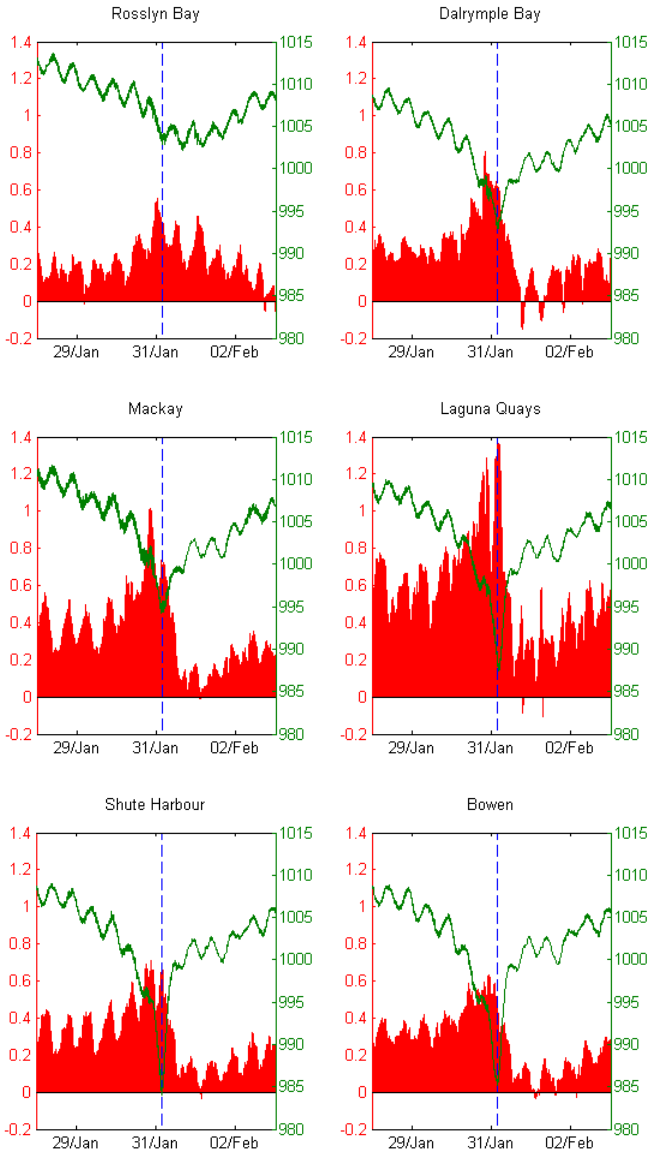

Figure 2 – Surge (m) & atmospheric pressure (hPa)

The effect of the surge at Shute Harbour is shown in Figure 3. The peak storm surge occurred at low tide; however, the pre- and post- crossing storm surge in addition to the existing tide levels caused a total water level above the HAT level near the time of predicted high tides.

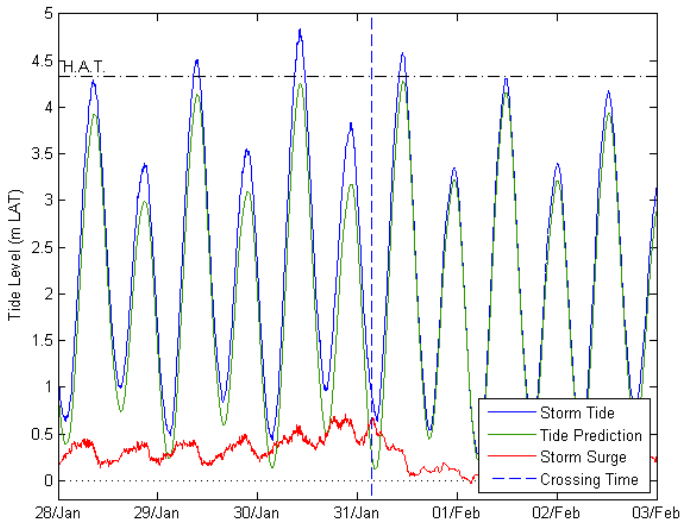

Figure 3 – Shute Harbour storm tide

Validated historical storm tide maxima for selected DSITIA sites are shown in Table 1 along with the year when storm tide recording began at each location.

Table 1 – Historical storm tide maxima

Site	Record Start	Hist. Max Storm Tide (mLAT)	HAT (mLAT)
Rosslyn Bay	2001	5.20	5.14
Dalrymple Bay	1998	7.26	7.14
Mackay	1975	6.82	6.58
Laguna Quays	2006*	6.70	6.30
Shute Harbour	1976	4.64	4.33
Bowen	1986*	4.10	3.73

** Previous DSITIA recordings have not been validated.*

The archived storm tide maxima for these locations are only slightly above HAT implying that past storm events recorded by DSITIA have occurred and/or peaked at times when the predicted tide level was not already close to or at its maximum. Comparison of the historical storm tide levels and those measured during TC Dylan (Table 2) indicate that new record levels were observed due to the prominent high tide around the event.

Table 2 – TC Dylan, measured storm tide maxima

Site	Date / Time	Max Storm Tide (mLAT)	Max Storm Tide (mHAT)
Rosslyn Bay	31 Jan, 09:21	5.38	0.24
Dalrymple Bay	31 Jan, 11:01	7.36	0.22
Mackay	30 Jan, 10:42	6.91	0.33
Laguna Quays	30 Jan, 10:50	6.73	0.43
Shute Harbour	30 Jan, 10:07	4.84	0.51
Bowen	30 Jan, 09:25	4.16	0.43

Relative to HAT, the largest storm tide associated with TC Dylan occurred slightly south of the crossing location at Shute Harbour, likely due to clockwise rotation of the system creating maximum onshore winds in this area.

DSITIA wave monitoring network

DSITIA operates a network of 14 wave monitoring stations along the Queensland coastline measuring wave heights, periods, direction and water temperature. Significant wave height data captured during TC Dylan (Figure 4) indicated that for adjacent sites there was an increase in wave height leading up to the time when the system made landfall along with a clear decrease in wave height as the cyclone crossed the coast and moved further inland. The exception being Emu Park station where the effect was less pronounced due to its geographic separation from the system.

Table 3 – Individual and significant wave height ranking

Site	Hmax (m)	Rank	Hsig (m)	Rank
Emu Park	6.67	#4	3.46	#3
Mackay	9.98	#1	5.02	#2
Hay Point	7.04	#1	3.74	#2

Wave conditions recorded at DSITIA stations during TC Dylan were identified as record maximum individual wave heights (Hmax) at Mackay and Hay Point and also as the fourth highest wave recorded at the Emu Park site. High ranking significant wave heights (Hsig) were also recorded at these sites as a result of TC Dylan (Table 3).

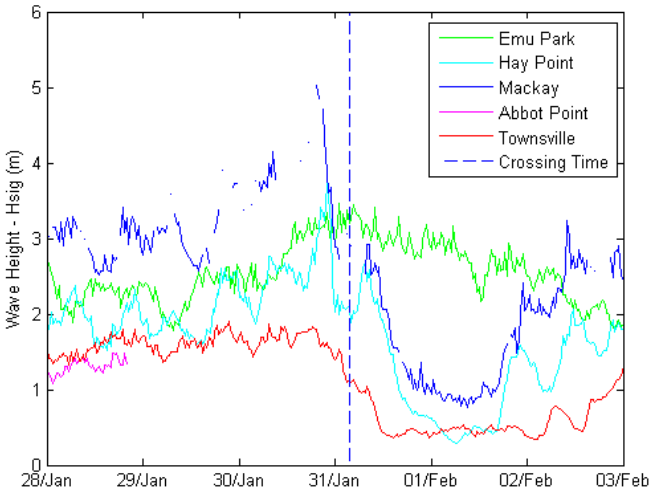

Figure 4 – Significant wave height

Further information

Additional information about DSITIA'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