Severe Tropical Cyclone Marcia

Storm tide and wave monitoring data, Coastal Impacts Unit DSITI

On 18 February 2015 the Bureau of Meteorology (BoM) declared a cyclone watch for a developing tropical low in the Coral Sea off the coast of north Queensland. The low initially tracked eastward before turning south west and developing into Tropical Cyclone (TC) Marcia on 18 February 2015. TC Marcia took a south-westerly path while intensifying to cross the coast as a category 5 at Shoalwater Bay at approximately 08:00 (EST) 20 February. TC Marcia continued to track south over the following days, deteriorating to a low and then travelling off-shore from south east Queensland. Data from DSITI's storm tide and wave monitoring networks were made available via the pubic website and State Disaster Coordination Centre to inform disaster managers about prevailing wave conditions and storm tide levels.

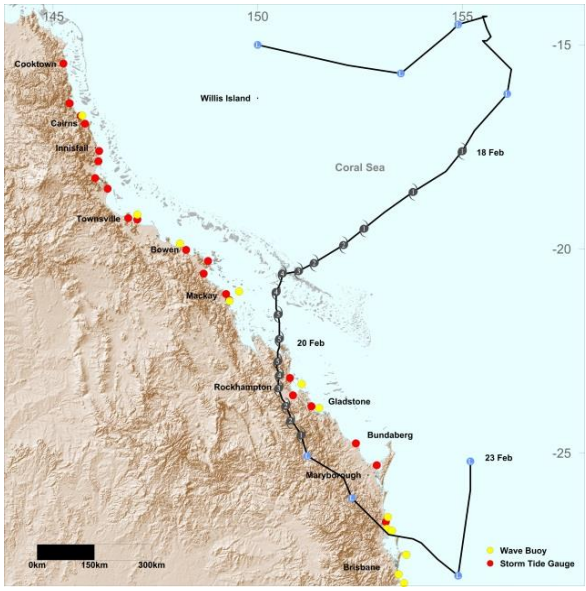

Figure 1 – TC Marcia track map

TC Marcia crossed the coast as a category 5 during an incoming tide (Figure 3) and during a period of king tides occurring on 19 February from Hay Point to Gladstone.

DSITI storm tide monitoring network

Typically as a cyclone approaches the coast, ocean water levels rise as a result of strong onshore winds and reduced barometric pressure. This rise in water level is known as storm surge and can cause inundation and flooding of coastal areas. The destructive capacity of a storm surge significantly depends on the height of the tide at the time the cyclone crosses the coast, and wave setup produced by increased wave heights. The combined water level from these three processes is referred to as a "storm tide".

DSITI operates a network of 34 storm tide gauges along the Queensland coastline capable of recording real time water levels during extreme events. The storm surge (measured water level less predicted tide) and atmospheric pressure for selected sites affected by TC Marcia are shown in Figure 2.

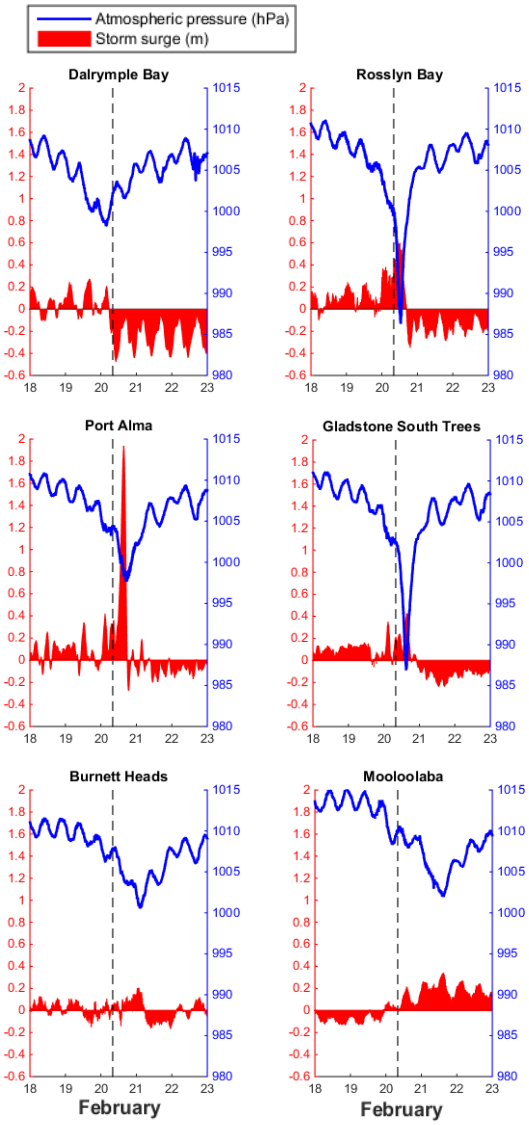

Figure 2 – Storm surge and atmospheric pressure

Queensland Government

Figure 2 shows surges of 0.6 m and 2 m at Rosslyn Bay and Port Alma respectively as the cyclone continued to travel southwards about 30 km inland of these sites. The northward facing shallow bay shape of the Fitzroy River makes Port Alma susceptible to amplified surges.

Negative surges were recorded as TC Marcia travelled further south and the wind direction changed from onshore to offshore as illustrated in Figure 3.

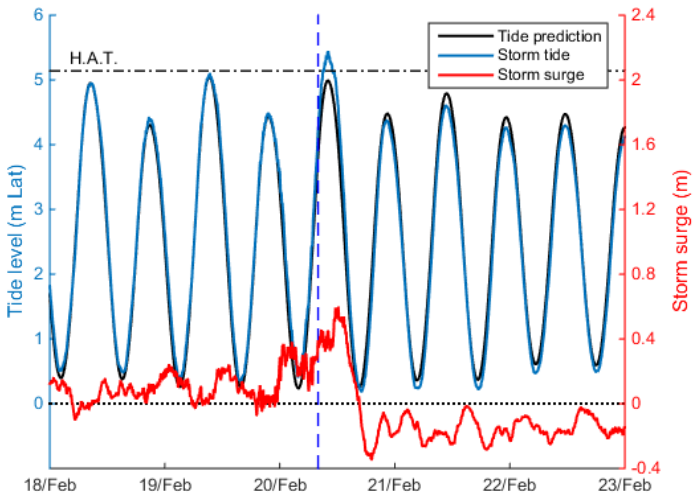

Figure 3 – Rosslyn Bay storm tide

A storm tide above highest astronomical tide (HAT) was observed at Rosslyn Bay (Figure 3) on a high tide when TC Marcia was inland near Rockhampton. This coincided with the peak tide. The largest surge was recorded at Port Alma but occurred near low tide.

Table 1 – Historical storm tide

Site	Date	Hist. Max Storm Tide (m LAT)	Hist. Max Storm Tide (m HAT)
Dalrymple Bay	1981	7.26	0.12
Rosslyn Bay	1989	5.20	0.06
Port Alma	1979	5.87	−0.11
Gladstone	1979	4.78	0.15
Burnett Heads	1981	3.79	0.12
Mooloolaba	1979	2.42	0.25

Table 2 – TC Marcia storm tide

Site	Date / Time	Max Storm Tide (m LAT)	Max Storm Tide (m HAT)
Dalrymple Bay	19 Feb, 11:03	6.96	−0.18
Rosslyn Bay	20 Feb, 10:01	5.44	0.30
Port Alma	20 Feb, 10:34	5.93	−0.05
Gladstone	20 Feb, 10:00	4.72	0.09
Burnett Heads	19 Feb, 8:50	3.59	−0.08
Mooloolaba	19 Feb, 8:50	2.20	0.03

Table 1 displays historical maximum recorded storm tide levels at relevant DSITI sites and Table 2 displays the maximum storm tide levels measured during TC Marcia. Three sites showed storm tide above HAT with the largest occurring at Rosslyn Bay. New record maximum storm tide levels were measured at Rosslyn Bay and Port Alma.

DSITI wave monitoring network

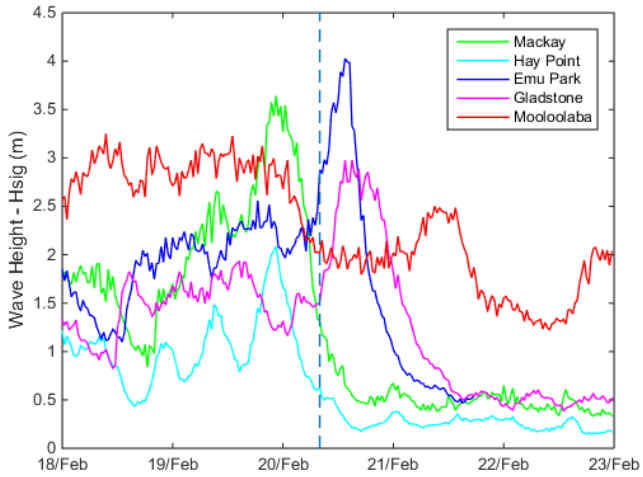

Figure 4 – Significant Wave height (Hsig)

Wave height data captured during TC Marcia (Figure 4) indicates that for the buoys closest to the cyclone the increase in wave height is more pronounced. As TC Marcia tracked south, consistent and consecutive peaks are noticed as the system travelled near to these buoy locations; with a lesser peak at Mooloolaba, the most southerly of the selected sites, where the system had deteriorated to a low in this area.

Table 3 – Maximum and significant wave height rankings

Site	Hmax (m)	Rank	Hsig (m)	Rank
Mackay	5.88	-	3.64	#7
Emu Park	6.97	#3	4.03	#1
Gladstone	5.50	#4	2.98	#3

Waves recorded at DSITI stations were identified as the third highest maximum wave height (Hmax) at Emu Park and the forth highest at Gladstone. Mackay and Gladstone also recorded high ranking significant wave heights (Hsig) and Emu Park measured a new highest recorded significant wave height.

Further information

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