Tropical Cyclone Alfred

Storm Surge and Wave data

Tropical Cyclone Alfred developed in the northern Coral Sea on Monday, 23 February 2025. Alfred slowly moved south while developing into a severe tropical cyclone. The cyclone then slowed while deteriorating to a category 2 cyclone off Brisbane on 02 March. TC Alfred then turned westward towards the Queensland coast, still moving slowly, and crossed over the Moreton Bay islands on the night of 07 March before moving north to near Caloundra as a tropical low system. Ex-tropical Cyclone Alfred crossed the Queensland coast on 08 March, north of Caloundra.

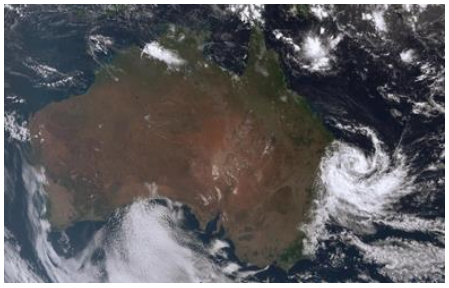

Figure 1 Satellite image of TC Alfred off the southeast Queensland coast, 07 March 2025. From www.bom.gov.au

TC Alfred brought wind gusts of up to 100 km/h to the Bay islands and southern Moreton Bay coast prior to crossing the mainland. After crossing the mainland, Ex-TC Alfred brought significant rainfall, with falls of up to 600 mm, to the southeast Queensland coastal and inland areas.

Figure 2 Track map of tropical cyclone Alfred as it approached the Queensland coast. From www.bom.gov.au.

TC Alfred was situated off the southeast Queensland coast for 5 days and the wave climate developed to generate significant wave heights up to 07 m and maximum wave heights up to 14 metres.

Wave data

Table 1 Highest significant wave height (Hs), highest maximum wave height (Hmax), top ten waves rank, and data length.

Site	Max H_s (m)	Max H_{max} (m)	Rank, record length
Tweed Offshore	7.58	13.91	1, 5 years
Tweed Heads	5.41	10.05	5, 30 years
Bilinga	4.87	8.32	1, 4 years
Palm Beach	5.58	10.36	1, 8 years
Gold Coast	4.16	7.47	10+, 38 years
Brisbane	6.44	11.51	10+, 48 years
North Moreton Bay	3.87	7.14	5, 15 years
Caloundra	3.55	7.75	1, 12 years
Mooloolaba	4.30	7.82	10+, 25 years
Wide Bay	5.08	9.16	1, 5 years

Wave heights were observed to be the largest reported in the southeast Queensland region in over 10 years. Offshore of Tweed Heads, the largest wave was 13.91 m, the highest in the site's 5-year record. At the Gold Coast sites of Bilinga and Palm Beach, the highest waves were 8.32 m and 10.36 m and ranked number one in the 4- and 8-year records, respectively. To the north of Moreton Bay, the Caloundra buoy recorded the largest wave in 12 years, at 7.75 m, while the North Moreton Bay buoy recorded a wave that ranked fifth in its 15 years of operation, at 7.14 metres. The longer records of Mooloolaba, Brisbane and Gold Coast, with 25 to 48 years of data, didn't rank in the top 10 waves. Notably, the Gold Coast buoy had a catastrophic failure on 05 March and may have missed any record-breaking waves.

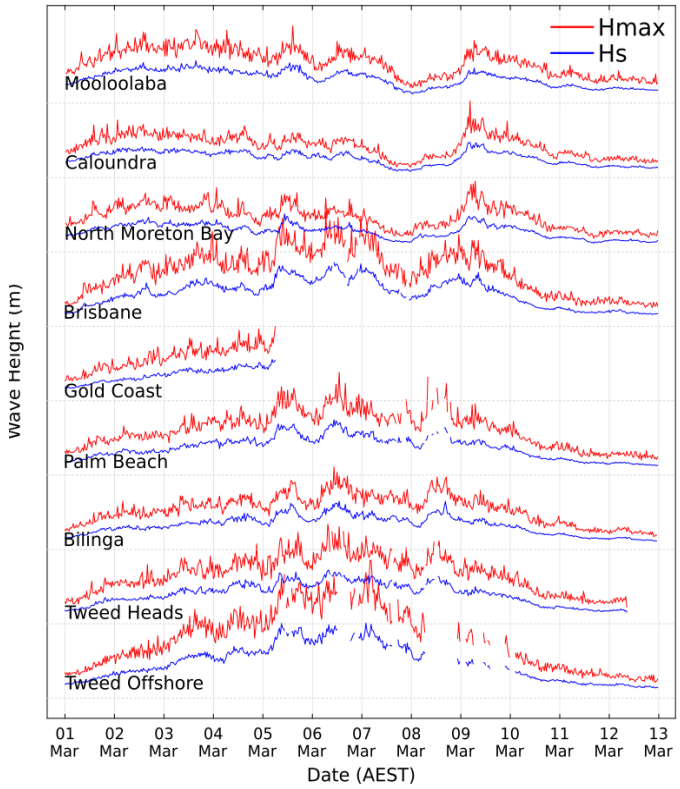

Figure 3 Wave height at the southeast Queensland sites, as Maximum wave height (H_{max}) and significant wave height (H_s).

Storm Surge data

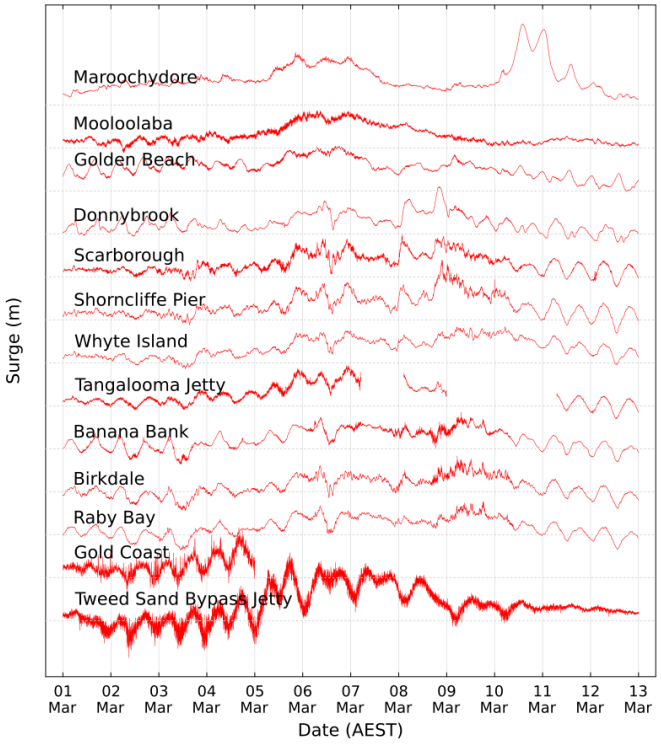

Figure 4 Storm surge measured by DETSI storm tide gauges along the southeast Queensland coast.

Storm surges of 0.39 to 0.94 m were reported in the storm tide gauge network, and levels exceeded the Highest Astronomical Tide (HAT) level at Shorncliffe Pier by 0.02 m and in the Maroochy River (Maroochydore) by 0.12 metres. The tides were in lower neap tides during Alfred's passage. The storm tide gauge at the Gold Coast had a catastrophic sensor failure on 05 March and hence may have missed the largest surge and storm tide of the event.

Table 2 Maximum storm surge, storm tide height, and storm tide height above Highest Astronomical Tide.

Site	Max surge level (m)	Storm tide height (m)	Max storm tide above HAT (m)
Tweed Sand Bypass jetty	0.79	2.12	−0.10
Gold Coast	0.58	1.94	−0.06
Raby Bay	0.39	2.78	−0.24
Tangalooma	0.47	2.51	−0.09
Brisbane River mouth	0.42	2.72	-0.06
Birkdale	0.42	2.70	−0.25
Shorncliffe	0.70	2.82	0.02
Scarborough Boat Harbour	0.49	2.55	−0.10
Golden Beach	0.53	1.56	−0.03
Maroochydore	0.94	1.67	0.12
Donnybrook	0.55	2.47	−0.05
Mooloolaba	0.44	2.18	−0.03

Read more

Storm tide explained

https://www.qld.gov.au/environment/coasts-waterways/beach/storm/storm-explained

Waves explained

https://www.qld.gov.au/environment/coasts-waterways/beach/monitoring/waves

Queensland Government