

HARDEN UP

QUEENSLAND



CASE STUDY: Tropical Cyclone Winifred, 1986

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Winifred crossed the coast with a radar eye diameter of 41 km just south of Innisfail. The worst affected areas were between Babinda and Tully. Instrumentation at Cowley Beach, which was near the southern eye wall at landfall, showed the maximum 10 min average wind was between 68 knots and 83 knots. Further to the north the maximum gust at Cairns was 64 knots. Central pressures of 958 hPa were observed at both Cowley Beach and South Johnstone. Some extreme wind effects were observed to the north in the westerly winds. A house severely damaged on a 70 m ridge north of Innisfail was calculated (By James Cook Uni) to have been hit a 145 knot gust.

Other structural Damage: Innisfail- 190 houses damaged ranging from extensive to minor; Mourilyan 20 houses unroofed every other house damaged 12 vessels sunk in harbour; South Johnstone- 30 houses unroofed 50 damaged; El Arish - one house destroyed, 15 unroofed and most others damaged; Babinda - 16 buildings (shops, churches, houses) damaged severely, 50 houses unroofed and 500 houses in district damaged; Silkwood -25 houses severely damaged 25 partly damaged ;Mirriwinni-50 houses damaged; Kurrimine Beach- 25 houses severely damaged 51 partly damaged; Cairns - 5 houses unroofed and 10 damaged; Millaa Millaa- 12 houses damaged 150 to 300 farm buildings damaged; Malanda -30 houses damaged 20 farm buildings severely damaged.

A near record flood occurred in the Herbert River and a major flood occurred in the Tully River. The total cost of Damage reached 130 million 1986 dollars of which \$87M was agricultural damage. There were 3 deaths two from wind effects and one drowning.

Mean Sea Level analyses

The genesis of *Winifred* occurred just off the coast near Cairns and it reached tropical cyclone intensity at 1800UTC 29 January 1986 (between the top two panels in Figure 1). It then moved towards the south southeast toward Holmes Reef and that AWS was reporting 50knot east north east winds at 1100UTC 31 January (lower right frame Figure 1). This was about the time the cyclone turned back towards the coast and Figure 2 covers the 24 hour period leading up to its striking the coast. Over this period it formed an eye on satellite imagery which became clearer as it moved towards the coast signifying intensification up to landfall.

The eye as viewed from both Cairns and Townsville radars is shown at landfall in Figure 3. In Figure 4 the track of the eye is shown leading up to landfall. The view of *Winifred's* eye from space is shown in Figure 5.

Storm Tide

There was a 1.75 metre storm surge on the tide gauge at Clump Point which was 1.8m above Australian Height Datum (AHD). There was severe beach erosion caused by *Winifred* and Figure 6 shows the erosion at Kurrimine Beach. A beach survey to determine heights of debris washed up by the storm surge from *Winifred* combined with wave run up was carried out. The results are shown in Figure 7. The debris levels were 2.8metres above AHD at Kurrimine Beach and 2.6metres at both Mission Beach and Hull Heads.

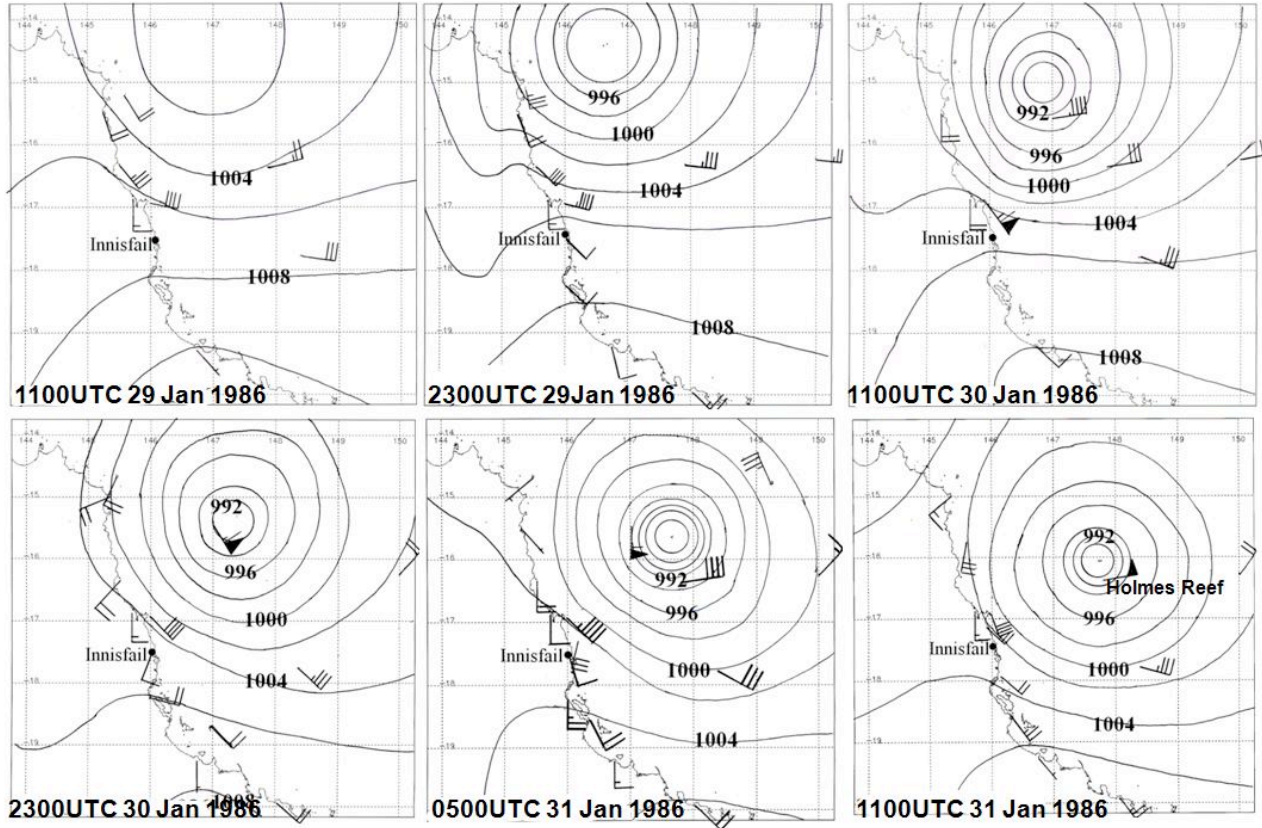


Figure 1 Mean sea level pressure analyses with wind observations from 1100UTC 29 January 1986 to 1100UTC 31 January 1986.

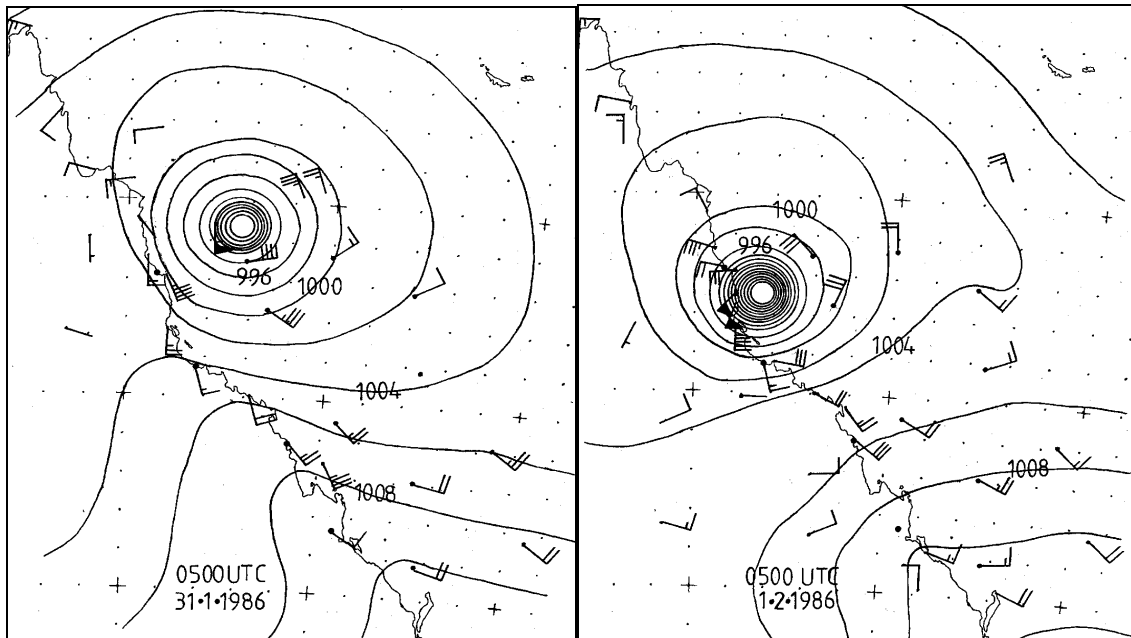
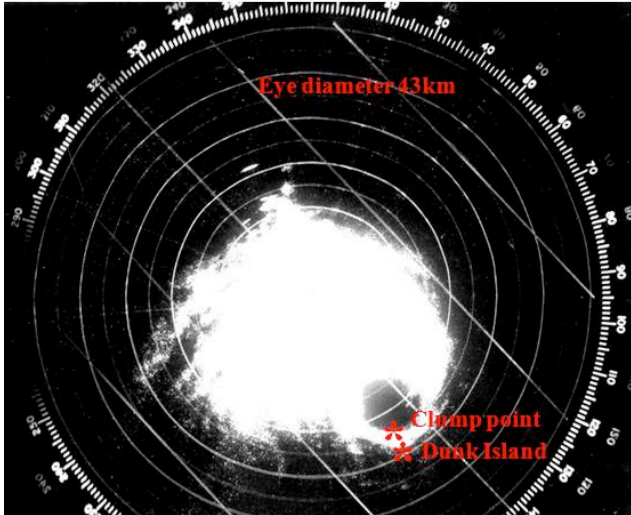


Figure 2 Mean sea level pressure analyses with wind observations from 0500UTC 31 January 1986 to 0500UTC 1 February 1986.

Cairns radar Elev 0°
0815UTC 1.2.1986 range 120nm



Townsville radar Elev 0°
0830UTC 1.2.1986 range 240nm

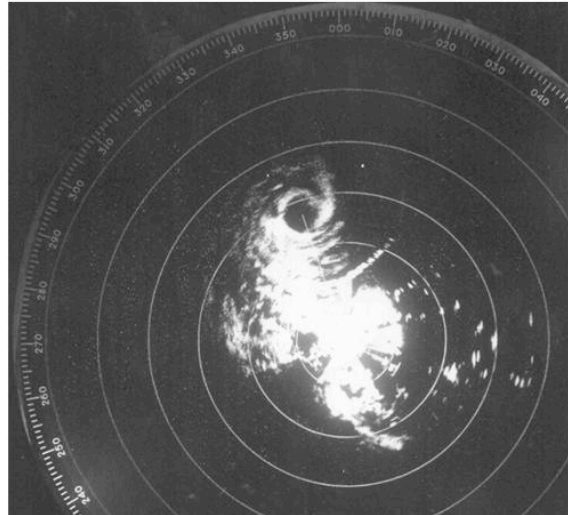


Figure 3 Radar images of Winifred at landfall from Cairns radar (left) and Townsville radar (right).

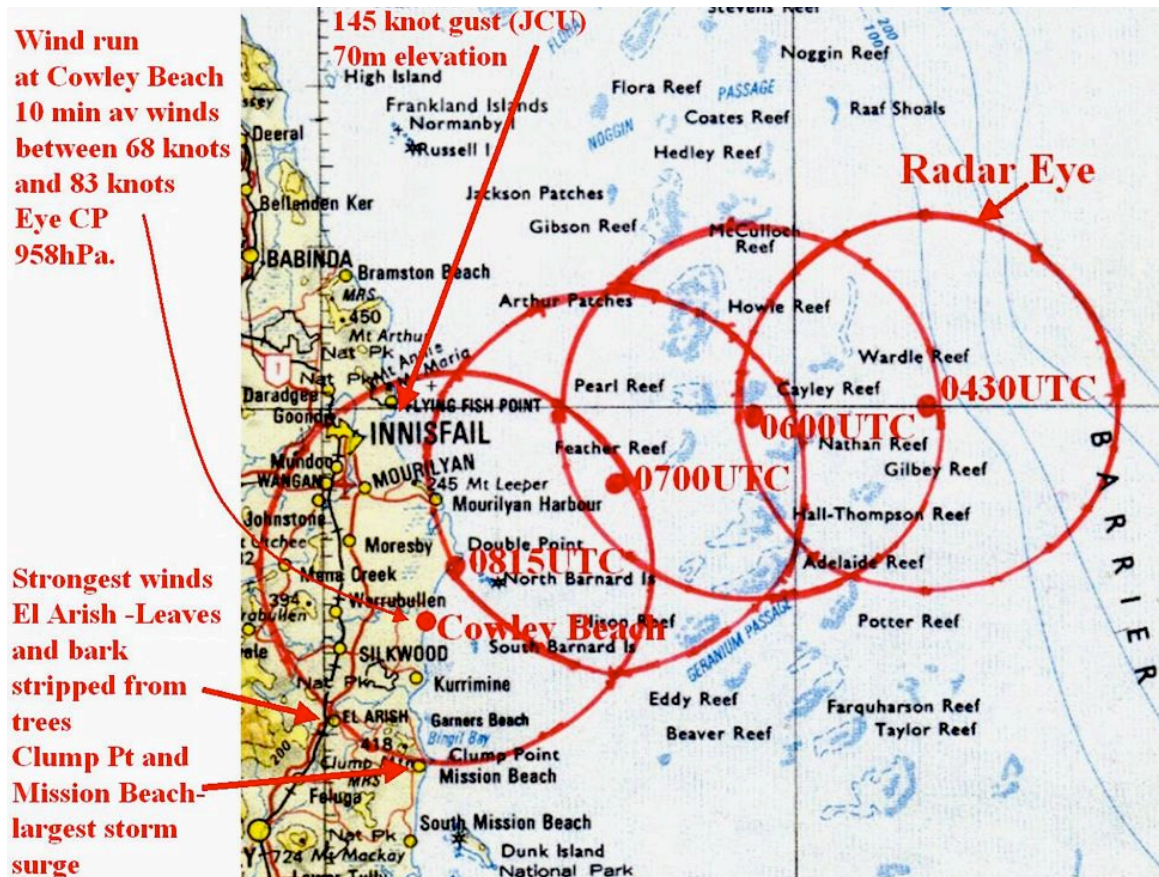


Figure 4 Track of the eye of *Winifred* leading up to landfall.

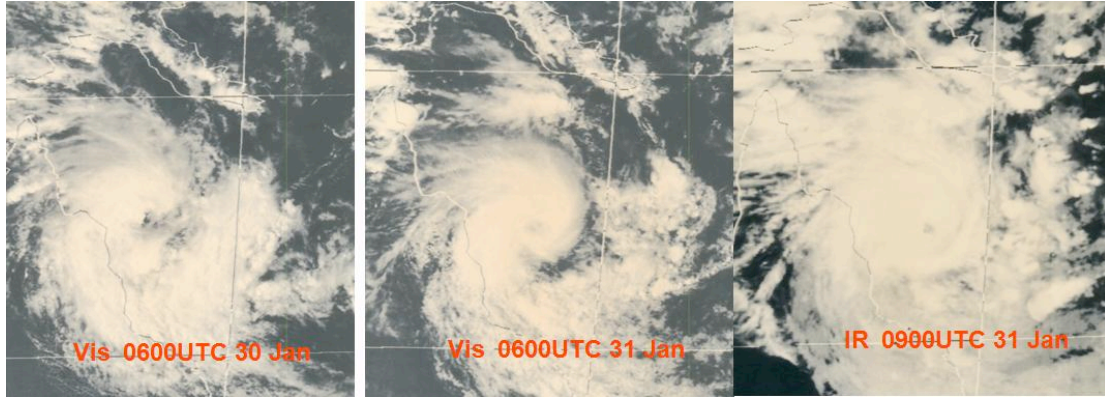


Figure 5 Satellite images show the eye forming in Tropical Cyclone Winifred over a 27hour period.

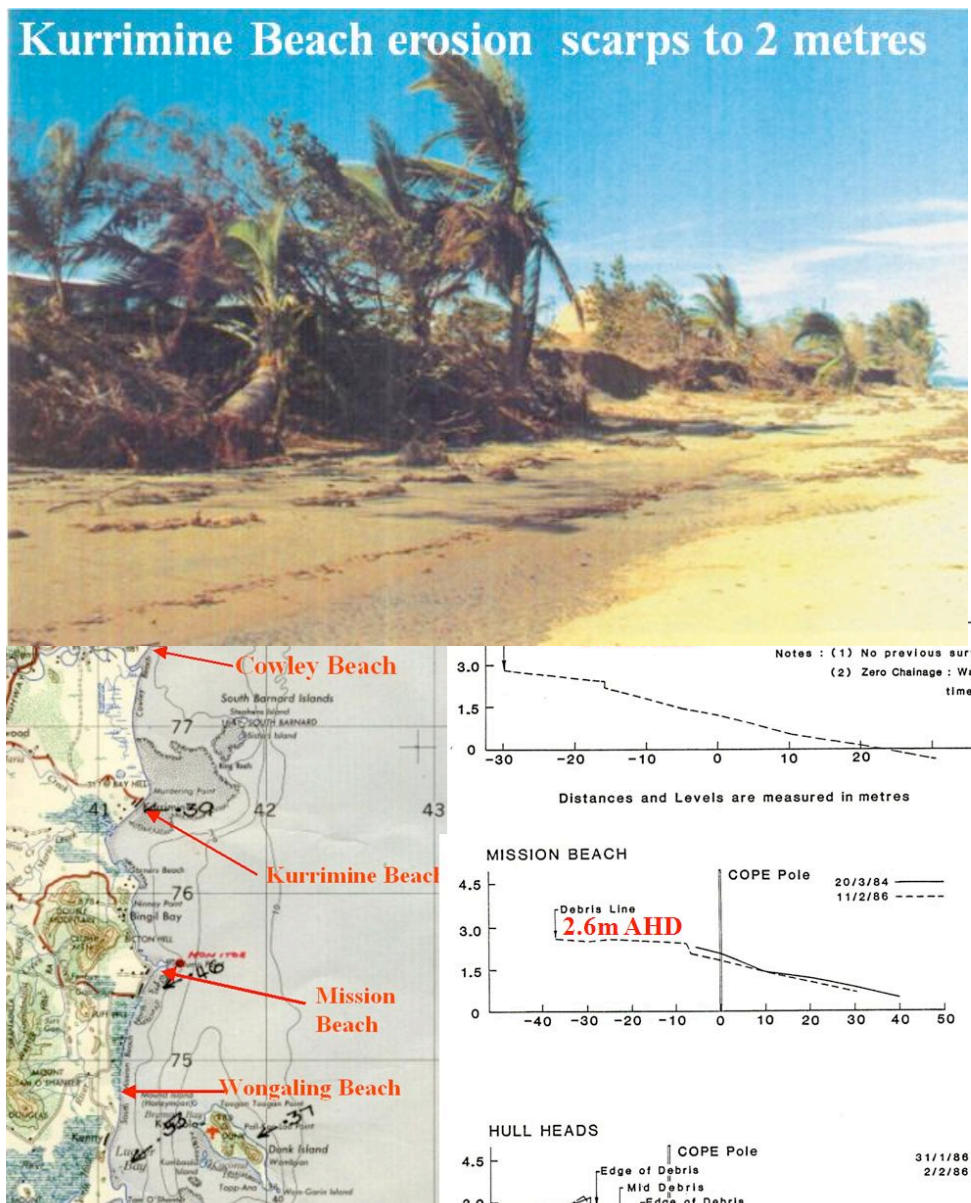


Figure 6 Beach erosion caused by tropical cyclone *Winifred* at Kurrimine Beach.

Figure 7 Results of Beach debris surveys to determine maximum storm surge and run up from tropical cyclone Winifred.