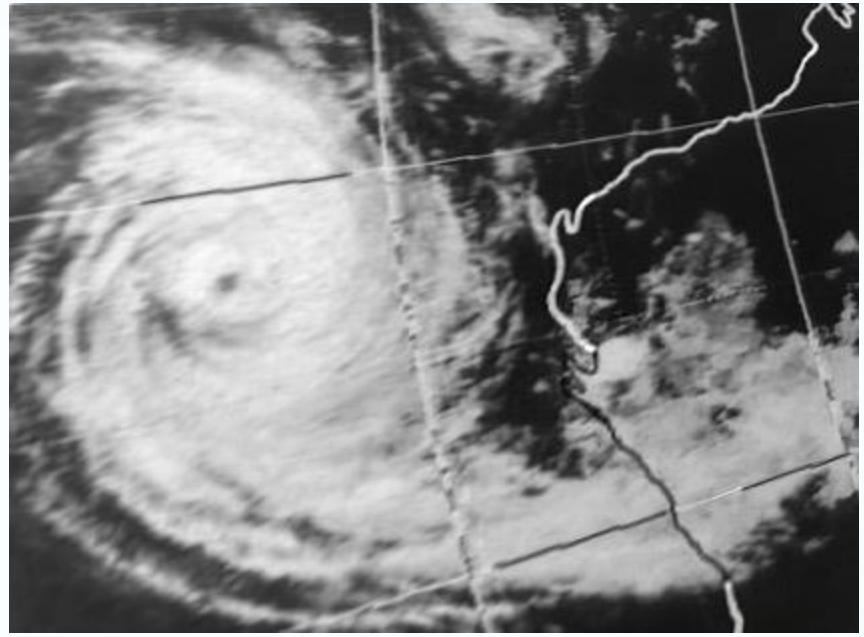
A compound event – fires and a tropical cyclone – TC Alby, April 1978

- TC Alby - meteorology
- TC Alby – winds and rain
- TC Alby – wind waves and fire
- TC Alby – all that unusual?

We acknowledge the original custodians of the land, the Wadjak and Wardandi people of the Noongar nation

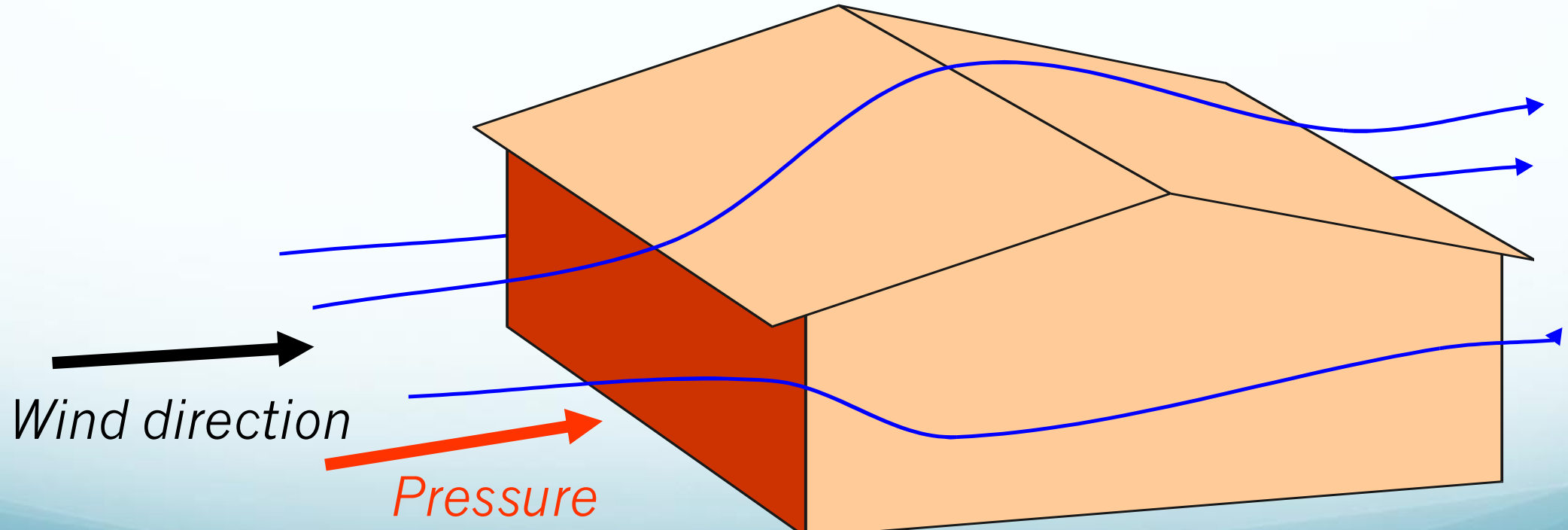
Tropical cyclones

- Strong winds
- Heavy rain – flooding
- Storm surge – coastal erosion and flooding

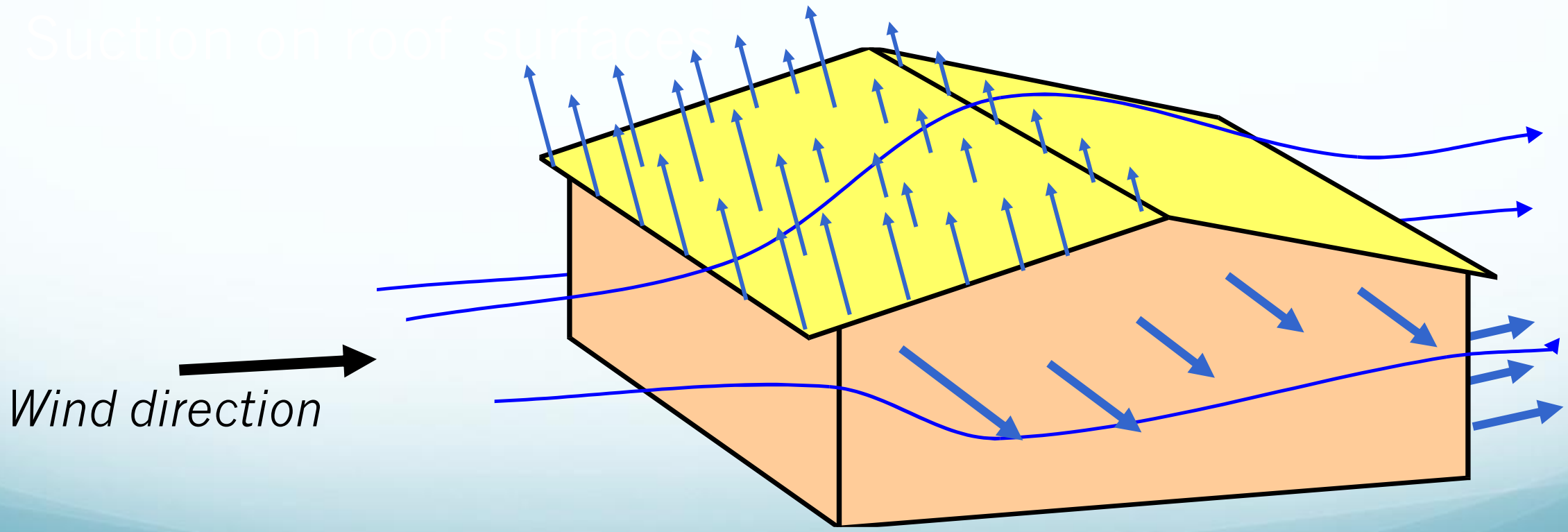


Wind can make roofs fly

Pressure on windward walls



Suction on roof, side walls, leeward walls



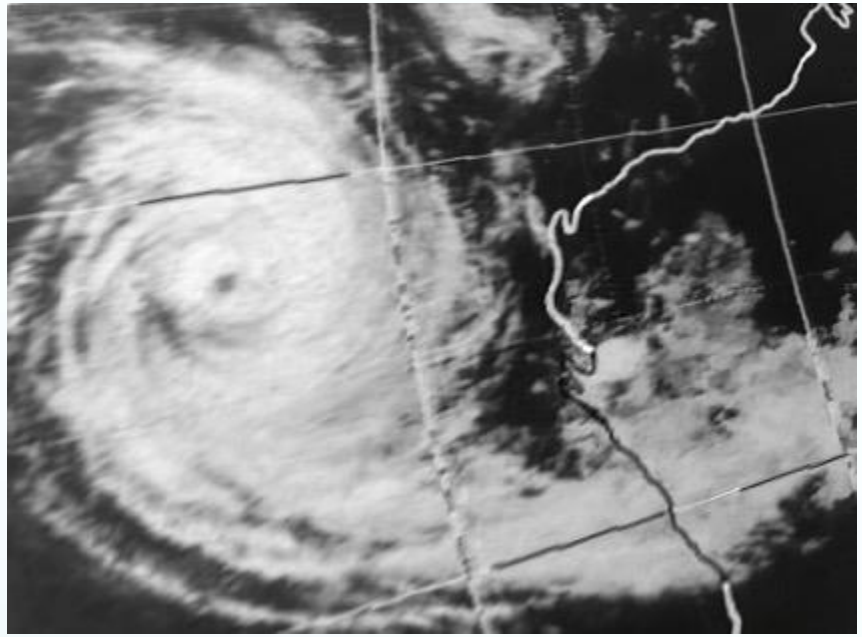
Cyclone damage

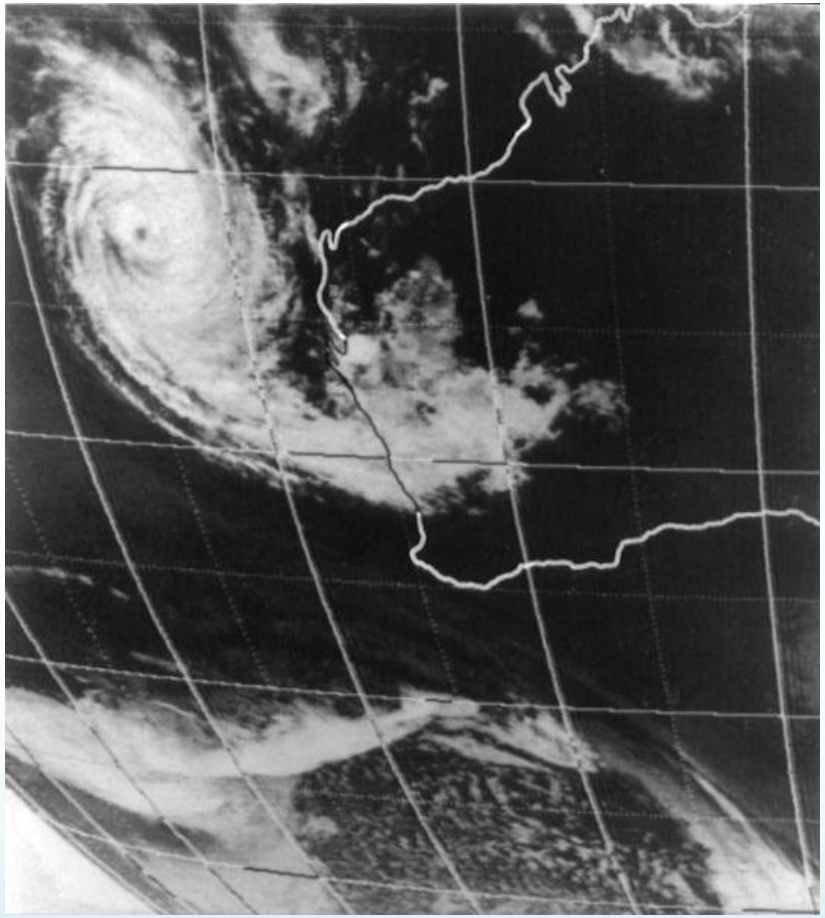
- Wind damage
- Flooding
- Surge damage

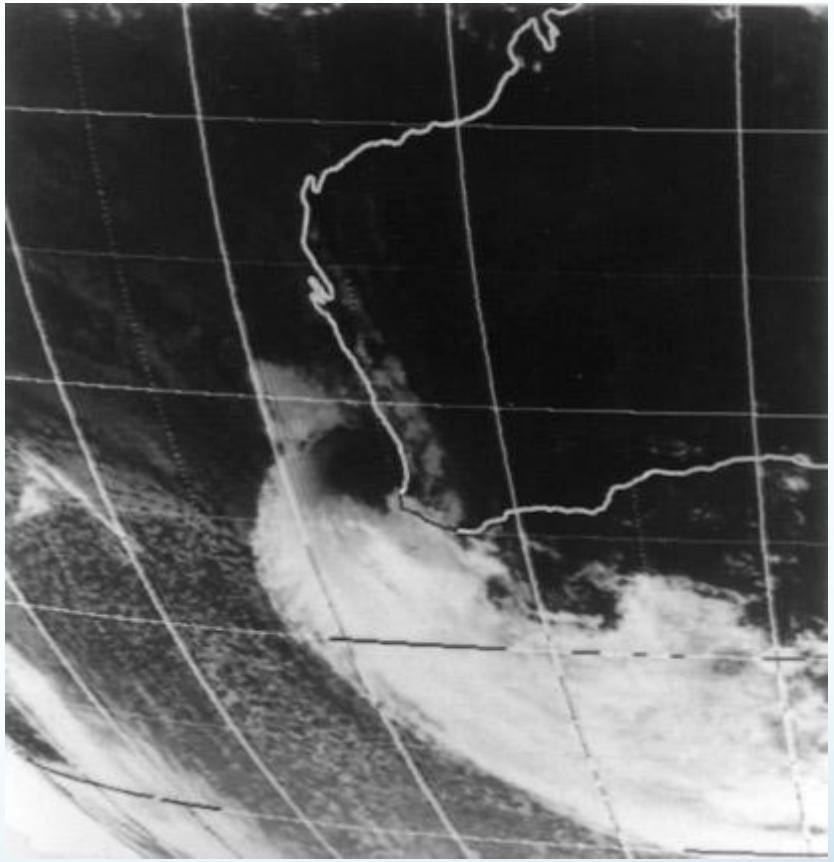
TC Alby - meteorology

- Developed as tropical low in Timor Sea on 27 March 1978
  - Tracked parallel to Pilbara coast slowly intensifying
- Declared TC Alby on 29 March north of Exmouth
- Continued intensifying to achieve Cat 5 east of Exmouth on 2 April
  - Central pressure 930 hPa, peak winds estimated at 205 km/h
  - Turned to SE and interacted with cold front
- Forward speed rapidly accelerated
  - To 50 km/h on 3 April
  - To 90 km/h on 4 April
  - Underwent extra tropical transition
- Passed 100 km from Cape Leeuwin
  - Still gave 150 km/h gusts at Albany

Extratropical transition

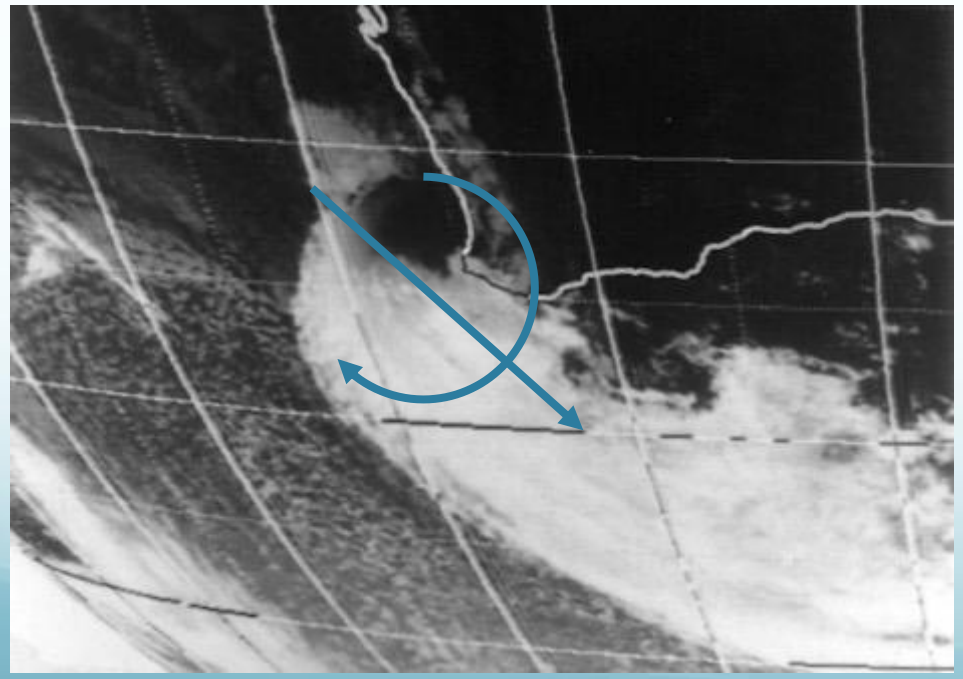


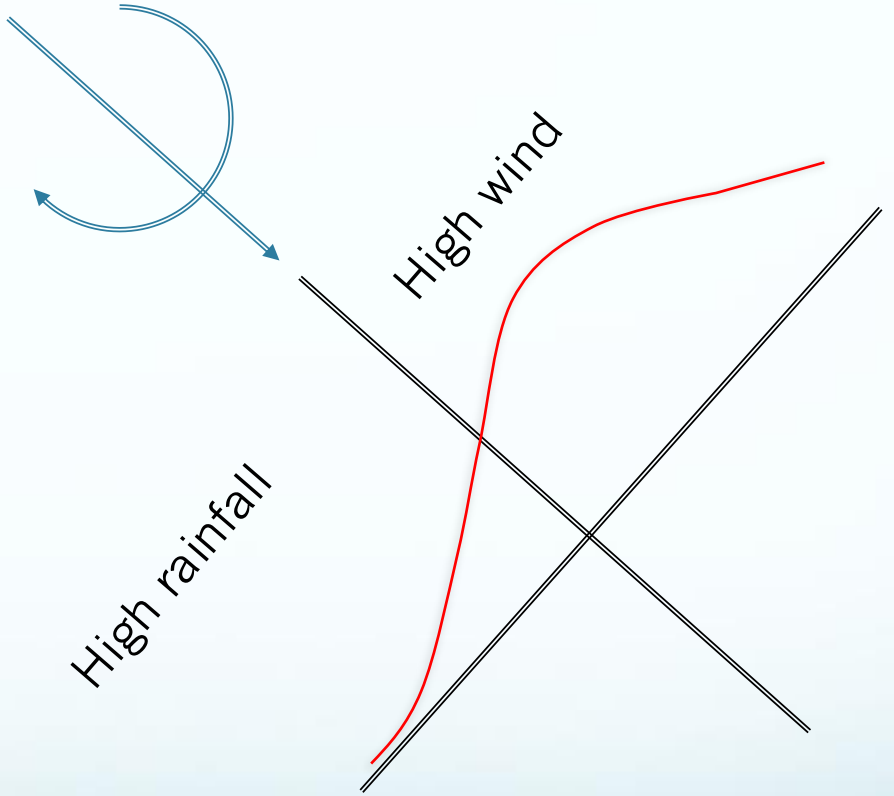




Extratropical transition

- Accelerating forward speed
- Rotation maintained
- Asymmetry with rain on right side





TC Alby – wind and rain

- Perth data
  - 130 km/h (third highest gust in record and highest for April)
  - < 15 mm rain
  - Strongest winds from NW
- Wind speed
  - Working stress design for 158 km/h. Buildings should have been within design factors of safety.
- Rain
  - Very low daily rainfall

TABLE 2

VALUES OF REGIONAL BASIC DESIGN WIND VELOCITIES (m/s) FOR MAJOR CENTRES FOR VARIOUS RETURN PERIODS

Centre	Velocity (m/s) for return period (yr)				Comments (See also Note 4)
	5	25	50	100	
Adelaide	33	40	42	45	West Beach Airport anemometer. Fairly reliable record.
Alice Springs*	33	44	48	53	
Bowen	—	—	—	—	Maximum velocity (5 years of records) 52 m/s.
Brisbane	34	45	50	54	Amberley Airport anemometer, only 'fairly reliable'
Broken Hill	26	30	32	34	Short record.
Broome	33	41	45	48	Reliability uncertain.
Cairns†	29	40	45	49	
Canberra	32	36	38	39	Airport anemometer topographically shielded in basin. Fairly reliable record.
Carnarvon*	31	41	45	49	
Ceduna	33	38	40	42	
Charleville	30	38	41	44	Fairly reliable record.
Cloncurry	30	36	38	40	
Cocos Island	31	41	45	48	
Daly Waters*	32	42	45	49	Short record.
Darwin	33	44	49	53	Airport anemometer.
Forrest*	34	45	49	53	Short record including one very high maximum (now Category 1).
Geraldton	34	42	46	49	Fairly reliable record.
Giles	29	34	36	38	Fairly reliable record.
Hobart	34	39	41	43	Airport anemometer.
Kalgoorlie	31	35	37	38	
Korumba	25	28	30	31	Short record.
Lae	21	24	25	26	
Launceston	33	38	40	42	Fairly reliable record.
Leigh Creek	34	43	47	51	Fairly reliable record.
Lord Howe Island	40	48	51	54	
Meekatharra	33	40	43	46	Fairly reliable record.
Melbourne	32	37	39	41	
Mildura	27	31	33	34	Fairly reliable record.
Mt Gambier	31	38	39	42	
Norfolk Island	33	38	39	41	
Nowra	34	42	44	47	
Onslow*	38	54	60	67	
Oodnadatta*	30	38	40	43	
Perth	35	42	44	47	Observatory anemometer, reliability uncertain.
Point Henry*	34	40	42	45	
Port Hedland*	32	41	45	48	Fairly reliable record.
Rockhampton†	33	43	47	53	
Sale (East)	32	36	38	39	
Spencers Creek	41	44	46	47	Short record.
Sydney	34	41	44	47	Richmond Airport anemometer.
Thursday Island	31	37	39	41	Fairly reliable record.
Townsville	30	42	46	51	
Wagga	33	41	45	48	
Williamtown, N.S.W.	35	45	49	52	Fairly reliable record.
Willis Island	37	51	58	63	
Woomera*	32	40	43	46	
Wyndham	33	39	41	44	Short record.

Perth 35 42 44 47 Observatory anemometer, reliability uncertain.
Point Henry* 34 40 42 45
Port Hedland* 32 41 45 48 Fairly reliable record.

JAMES COOK UNIVERSITY AUSTRALIA

CYCLONE TESTING STATION

TC Alby wind, waves and fire

- Wind – caused some (hundreds) roof damage and loss, many fallen trees

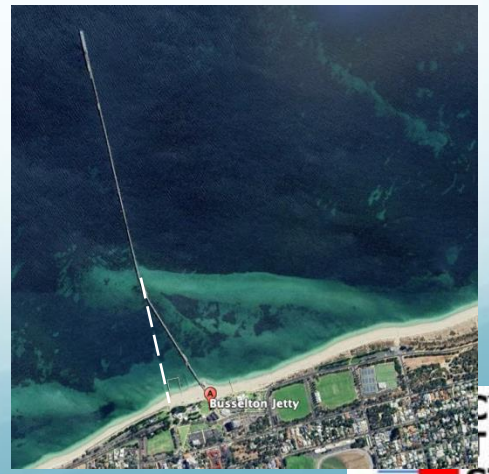
- Storm surge
  - Onshore wind pushes water into land
  - Low air pressure lifts sea surface
  - Combination gave surge that flooded low lying areas particularly in Bunbury Geographe area (surge ~ 1.1 m on full tide)

Bunbury (100 homes)

Busselton

TC Alby wind, waves and fire

- NW winds in Perth on elevated sea water level
  - Component onto shore mined dunes
  - Component parallel to shore removed sand
- At Busselton
  - Waves broke over deck of jetty

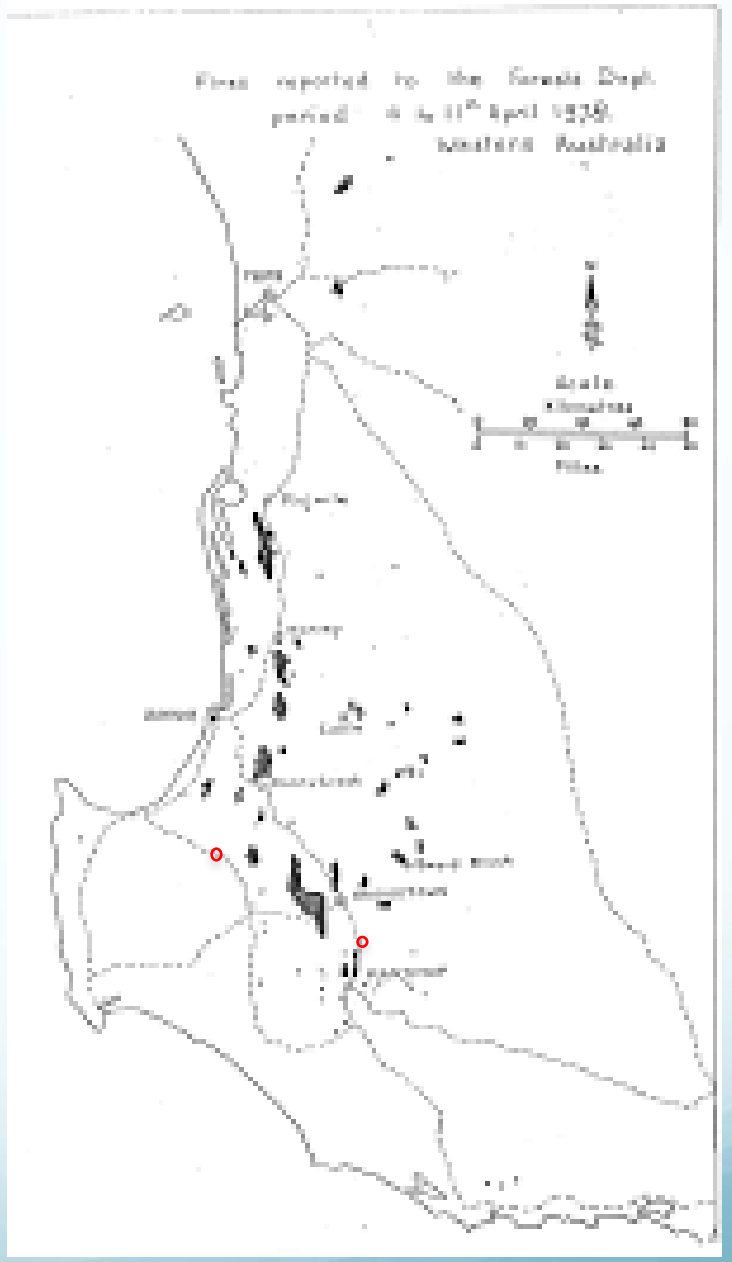


JAMES COOK UNIVERSITY AUSTRALIA

CYCLONE TESTING STATION

TC Alby wind, waves and fire

- 92 Bushfires reported
  - 114,000 ha lost
  - Two towns destroyed – Jarrahwood and Yornup
  - Many sawmills lost (~20)
  - Fire movement reported as 5 km/h to 10 km/h
  - Containment took 1000 firefighters 6 days (2 deaths)



TC Alby - fires

- Very strong winds with gusts > 130 km/h
- Little to no rain
- End of summer (vegetation dry)
- Points of ignition – burning bark in hardwood mills, some agricultural burning-off

TC Alby - fires

- Burned more than 100 structures
- Burned timber mills (154,400 m3 of timber lost)
- Fires led to stock losses – 10,000 sheep, 500 cattle
- Burned 1300 km of fences
- Two deaths fighting the fire – tree fall in Mt Barker, bulldozer accident in Manjimup

Yornup Mill (©WA Newspapers)

Albany (©WA Newspapers)

TC Alby – unusual?

Bureau of Meteorology

- Cyclones affecting SW can be intense fast-moving systems (> 70 km/h)
- Left quadrants less cloud (little to no rain).
- Previous cyclones in SW dry and caused wildfires (Feb 1937)

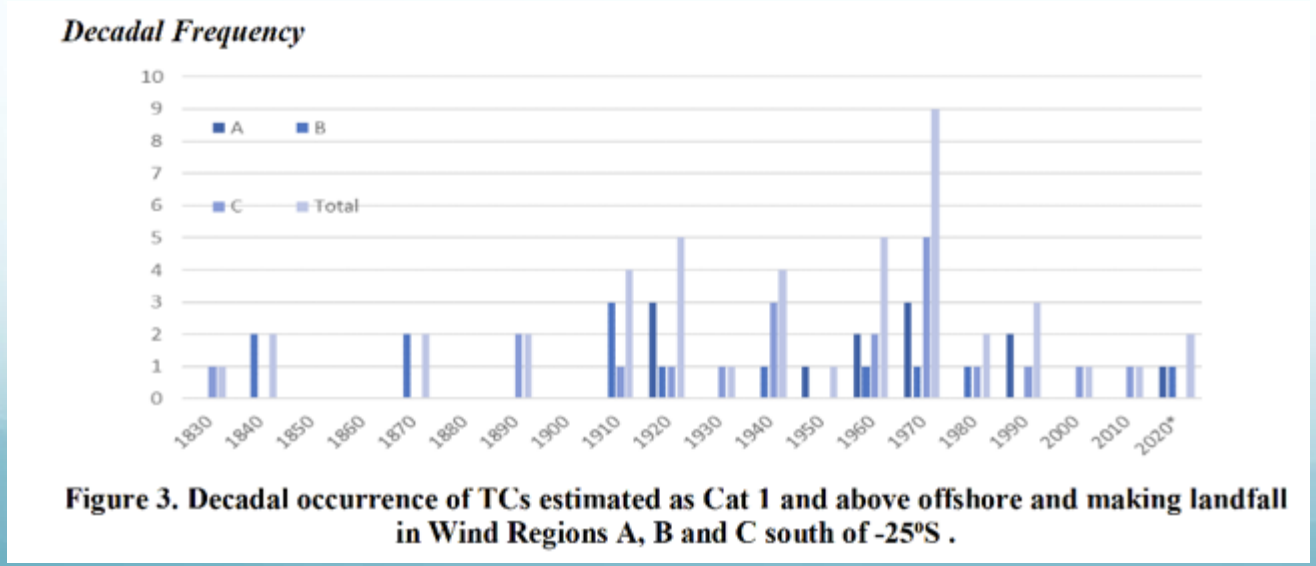


Figure 3. Decadal occurrence of TCs estimated as Cat 1 and above offshore and making landfall in Wind Regions A, B and C south of -25°S .

From: Aldridge and Christensen (2024)

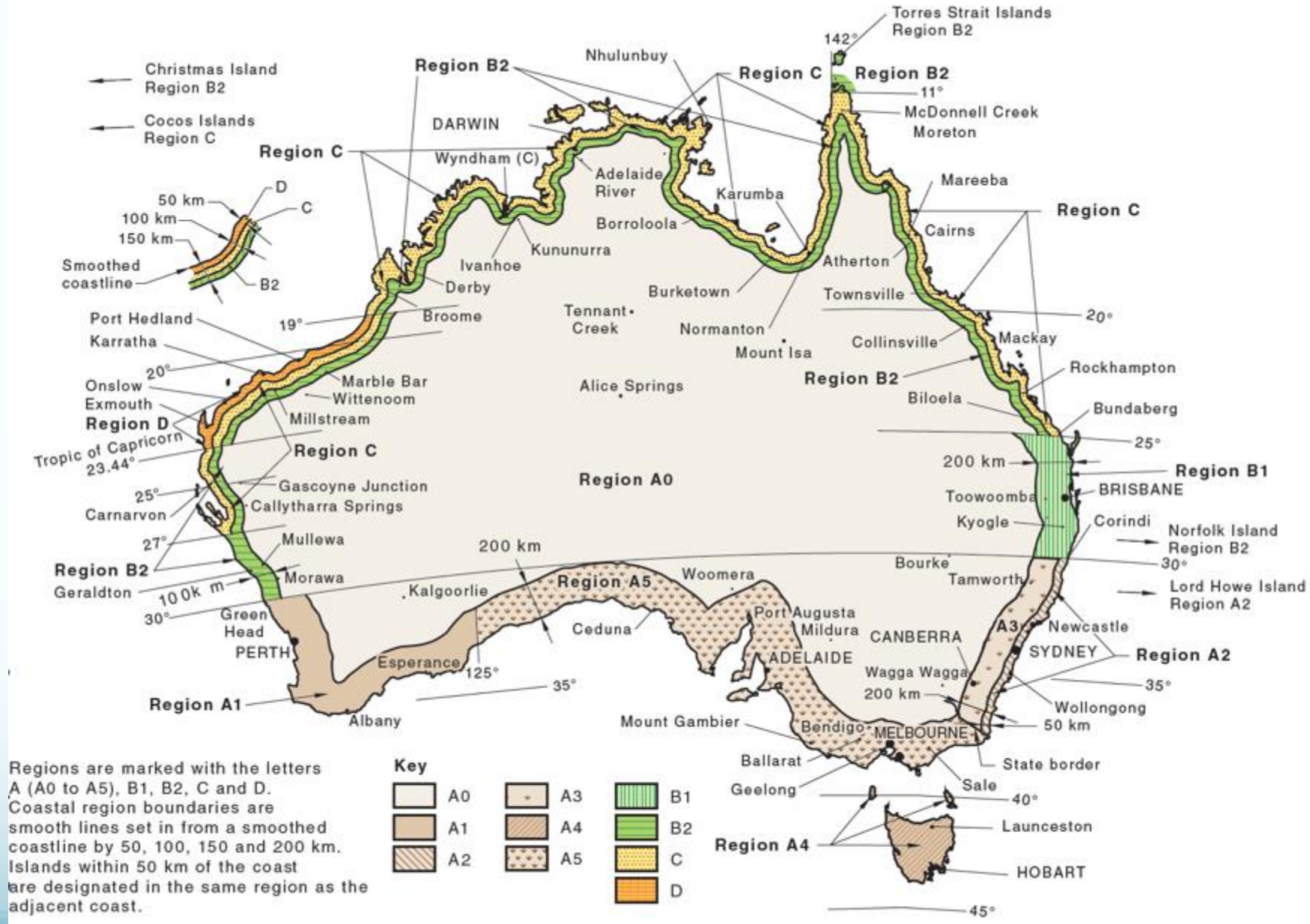
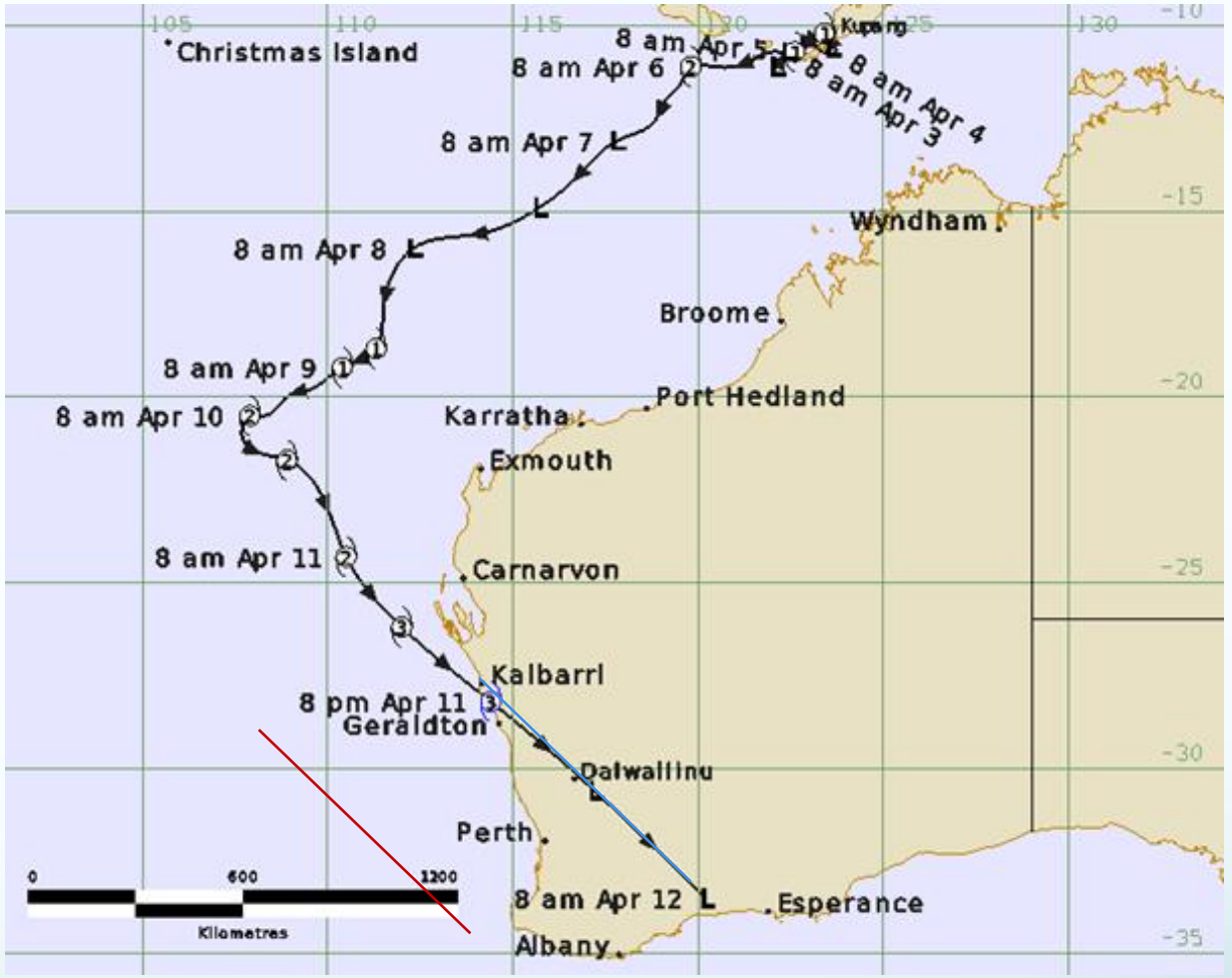


Figure 3.1(A) — Wind regions — Australia [A2]

TC Alby vs TC Seroja

TC Alby April 1978



TC Seroja April 2021

JAMES COOK UNIVERSITY AUSTRALIA

CYCLONE TESTING STATION

Conclusions

- Extratropical cyclones can have strong winds and be dry on left side.
- TC Alby produced 130 km/h gusts and little rain in SW WA
- Caused compounding effects – wind, surge, fire
- Not unusual, will happen again

JAMES COOK UNIVERSITY AUSTRALIA

CYCLONE TESTING STATION