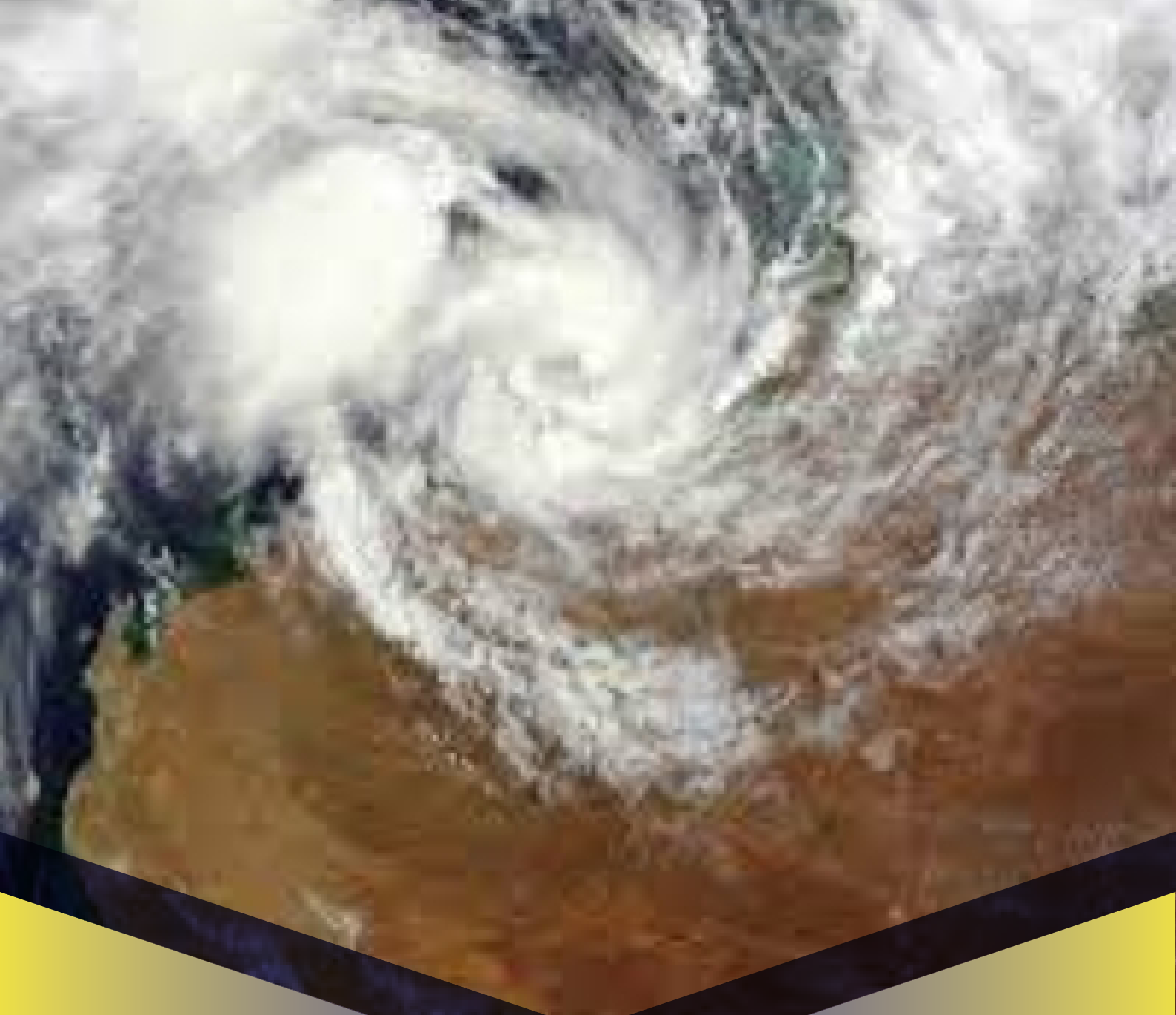




TROPICAL CYCLONE ILSA: HOW WESTERN AUSTRALIA DODGED THE BULLET

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Following the record-breaking Tropical Cyclone (TC) Freddy (RF, 2023), which thankfully stayed well offshore of Australian lands, this year's cyclone season ended with an unexpected bang, this time much closer to home.

TC Ilsa made landfall on the Pilbara coast between Port Hedland and Broome as a category 5 (i.e., maximum intensity) on April 13 just before midnight local time.

A QUICKLY ARMED BOMB

Originating as a tropical storm 500 km north of Darwin on April 5, it moved towards Western Australia (WA) and reached TC strength on April 11 400 km north of Broome (Figure 1).

TC Ilsa then slowly drifted towards Port Hedland, intensifying to a Category 5 TC on April 13 just 150 km offshore of Port Hedland. At its peak intensity, TC Ilsa broke the 10-minute sustained wind speed record for a TC making landfall in Australia, with 218 km/h, observed on Bedout Island.

The record was previously held by TC George in 2007 (194 km/h). Maximum wind gust speeds of 297 km/h observed on Bedout island were, however, exceeded by the 407 km/h wind gust speed record during cyclone Olivia in 1996 on Barrow Island.

Ilsa was able to reach Category 5 quickly because sea-surface temperatures were above 26.5 degrees and the relatively low wind shear in the atmosphere allowed it to maintain a continuous vertical structure.

Despite being inhabited by only 15 000 people, according to 2021 Census data, Port Hedland is the highest tonnage port in Australia, exporting mainly iron ore from the nearby Pilbara region mines and being an important platform for offshore gas fields and livestock exports.

Once offshore of Port Hedland, TC Ilsa started to drift towards the south-east and eventually made landfall late on April 13h near the town of Pardoo, 100 km east of Port Hedland.

Despite experiencing some gale force winds (i.e., above 64 km/h sustained winds), Ilsa stayed far enough away from Port Hedland to avoid category 5 storm winds of more than 200 km/h impacting the commercially vital port installations. Ilsa weakened rapidly after making landfall, being downgraded to a weak category 2 cyclone 24 hours later, tracking close to the mining town of Telfer.

On April 24, Ilsa lost its TC status and was downgraded to a tropical storm just before reaching the Northern Territory.

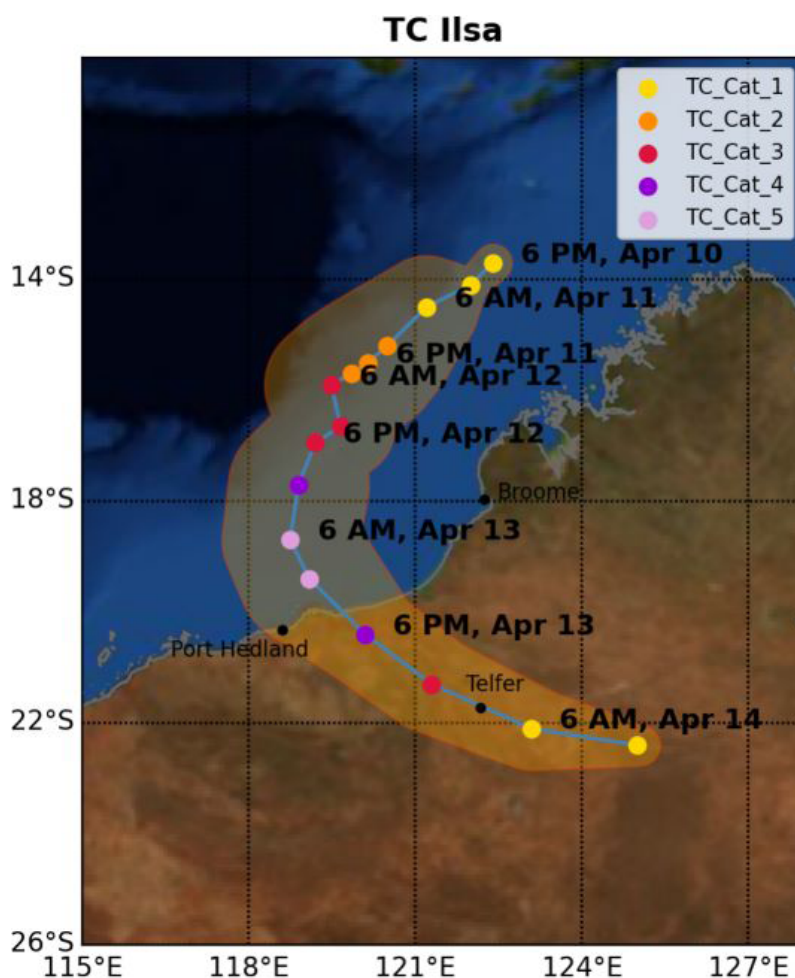


Figure 1: Track from Tropical Cyclone Ilsa (data from the Bureau of Meteorology). The radius of gale force winds is shown in orange. Time is in UTC.

SPARSELY POPULATED PILBARA MINIMISES DAMAGE TOLL

Despite its record strength, TC Ilsa tracked along a scarcely populated region of the Pilbara. The only significant damage was reported at the Pardoo Roadhouse, a popular business along the Great Northern Highway.

The business suffered almost complete destruction, estimated at \$4M, as it needs to be totally rebuilt (Figure 2; ABC News).

Further inland, remote communities including Panmu and Warrawagine station reported minor damage due to winds and fallen trees. No fatalities or injuries have been reported, thanks to a number of evacuation plans followed by caravan parks and towns such as Wallal Downs station and Telfer.

All port activities in Port Hedland were put on hold for 24 hours on April 13 and were resumed the following day. Early loss estimates of TC Ilsa, calculated using a set of most similar tracks and intensity from Risk Frontiers' CyclAUS stochastic model 50,000-year event set, indicate that the total financial damage likely ranges from \$4M to \$26M.



Figure 2: Devastation incurred at Pardoo Station. (ABC News: Pardoo Roadhouse and Tavern).

A DIRECT HIT COULD INCUR BILLIONS IN DAMAGE

The relatively small losses observed in the wake of TC Ilsa highlight the importance of storm tracking over storm intensity for estimating potential damage.

A study showed that, for the period 1970-2015, the severity of TCs has no correlation with number of fatalities (Coates et al., 2017). Of the 192 total fatalities reported from 1970 to 2015 due to TCs, 71 were suffered during TC Tracy, which directly hit Darwin in 1974 as a Category 4 storm.

The last event to hit Port Hedland was TC Rusty, which made landfall at the same location as Ilsa in 2013 as a category 3. However, due to its slow-moving approach towards landfall, 39 hours of gale force winds and very high

rainfall amounts were experienced in Port Hedland. This forced the evacuation of 26 ships and 330 residents, a prolonged closure of the airports and all port operations and a loss of power for 3000 households.

While TC Rusty early loss estimates amounted to \$10M, this did not include the loss of revenue from the prolonged closure of industrial activities including an 86-hour closure of the port which was estimated at ~\$500M (2013, The Australian). In contrast, the loss of revenue from the 24-hour port closure during TC Ilsa was quickly offset by a record 2.817 million tonnes shipped out the following day (Pilbara Port Authority, 2023).

Figure 3 shows an example of an ensemble of TC tracks similar to TC Ilsa (red) derived from Risk Frontiers' stochastic event set that can be used for early-loss estimations.

While the median total loss of this ensemble is in the order of \$10M, the yellow track was a clear outlier with a total loss in the order of billions of dollars.

A close inspection of the yellow track shows that this stochastic event reaches category 5 while only 30 km away from Port Hedland, causing most of the total loss within the Port Hedland postcode area, before tracking east and making landfall near Pardoo. This clearly demonstrates the sensitivity of TC losses to the exact track of severe storms, despite their extreme intensity.

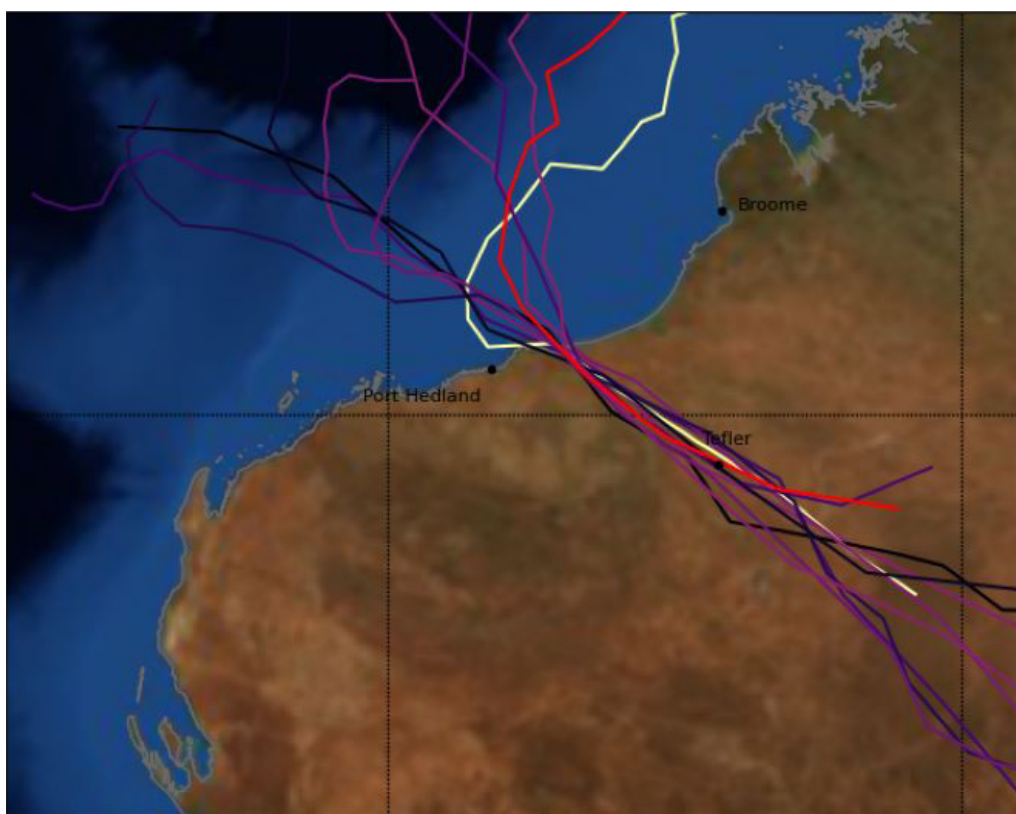


Figure 3: Example of an ensemble of 10 stochastic cyclone tracks derived from Risk Frontiers' cyclone model (CyclAUS) with similar tracks to TC Ilsa's (red), making landfall as a Category 4 or 5 near Pardoo. The yellow line indicates the track of a cyclone incurring billions in total losses as it passes much closer to Port Hedland.

CONCLUSION

TC Ilsa marks the (likely) end of a below average tropical cyclone season activity with a reminder that even in the context of decreased frequency, Australian communities remain highly vulnerable to tropical cyclones, whose damage can vary exponentially depending on their eventual paths. Although TC Ilsa reached a remarkable intensity and broke the record for highest sustained winds for storms making landfall in Australia, at 218 km/h, ensuing losses will likely remain small. This is largely due to the remote nature of the Pilbara region hit by the cyclone. Had Ilsa entered Australian territory 100 km to the west, the impact could have been much greater.

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