

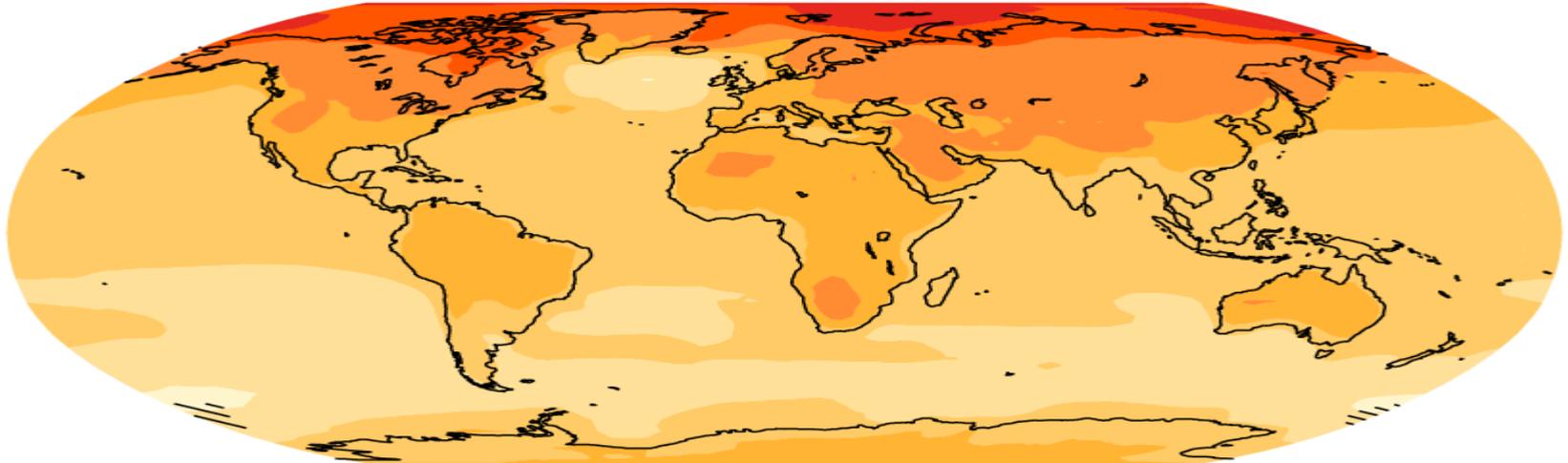
**A Push for Climate Engineering? Some Key Questions for Risk Mitigation
and Adaptation Policy in Indonesia**

2nd International Conference of IMC/ICEST – UNDANA 2020

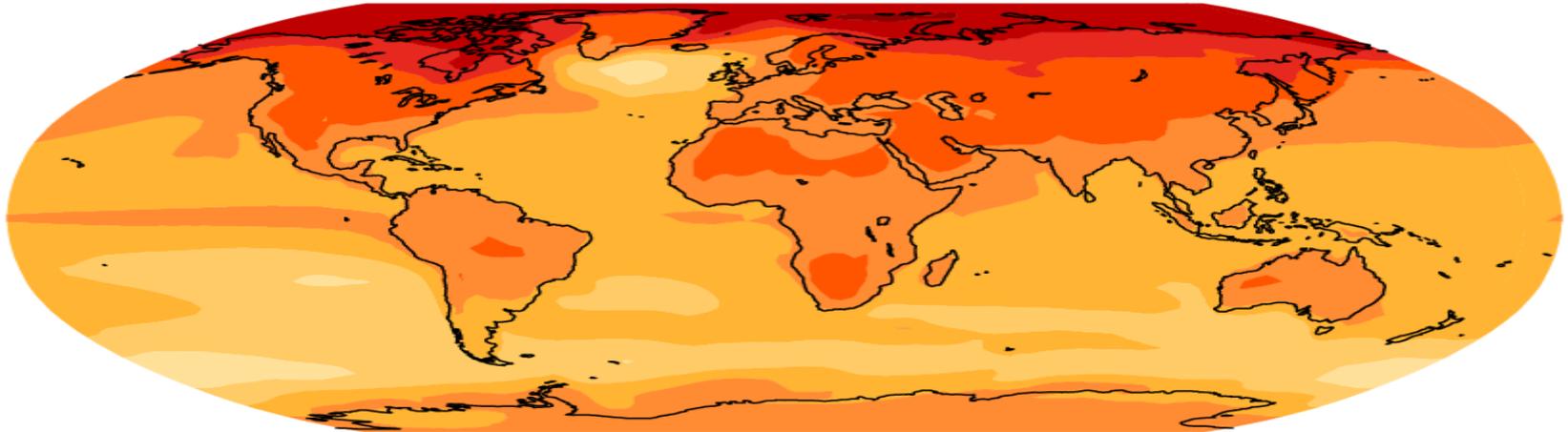
Dr. Ing. Jonatan A. Lassa
Emergency and Disaster Management
Charles Darwin University

Rising temperature and heat Stress

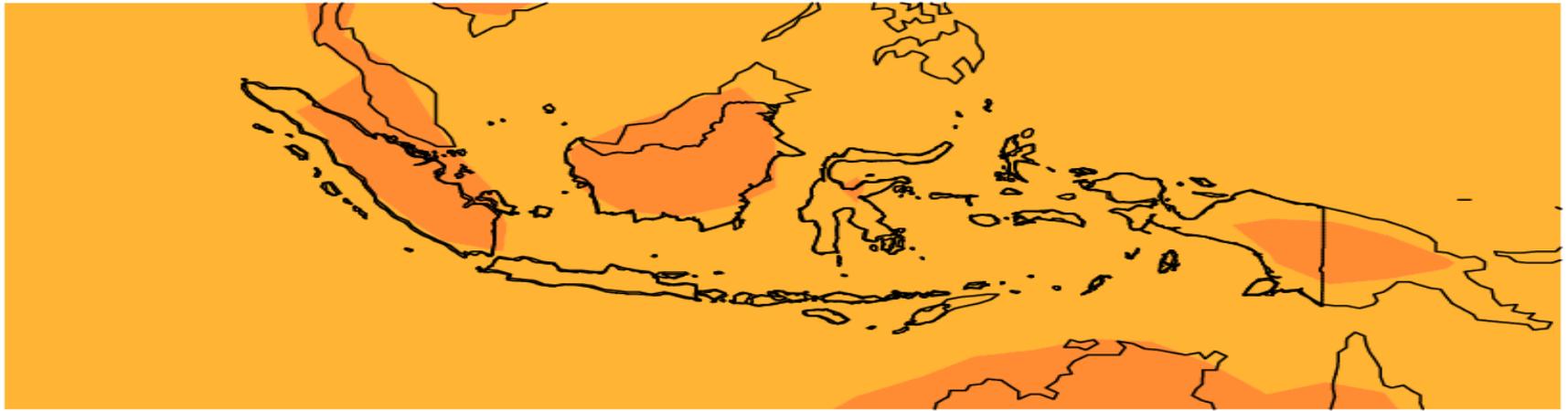
mean rcp60 temperature 2050-2070 minus 1986-2005 Jan-Dec AR5 CMIP5 subset



mean rcp60 temperature 2081-2100 minus 1986-2005 Jan-Dec AR5 CMIP5 subset



mean rcp85 temperature 2050-2070 minus 1986-2005 Apr-Sep AR5 CMIP5 subset



mean rcp85 temperature 2080-2100 minus 1986-2005 Apr-Sep AR5 CMIP5 subset

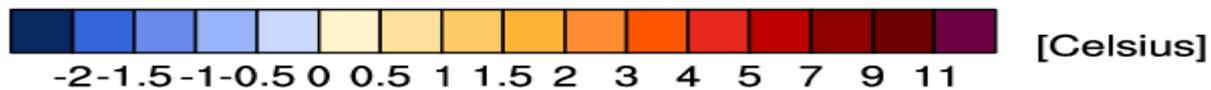
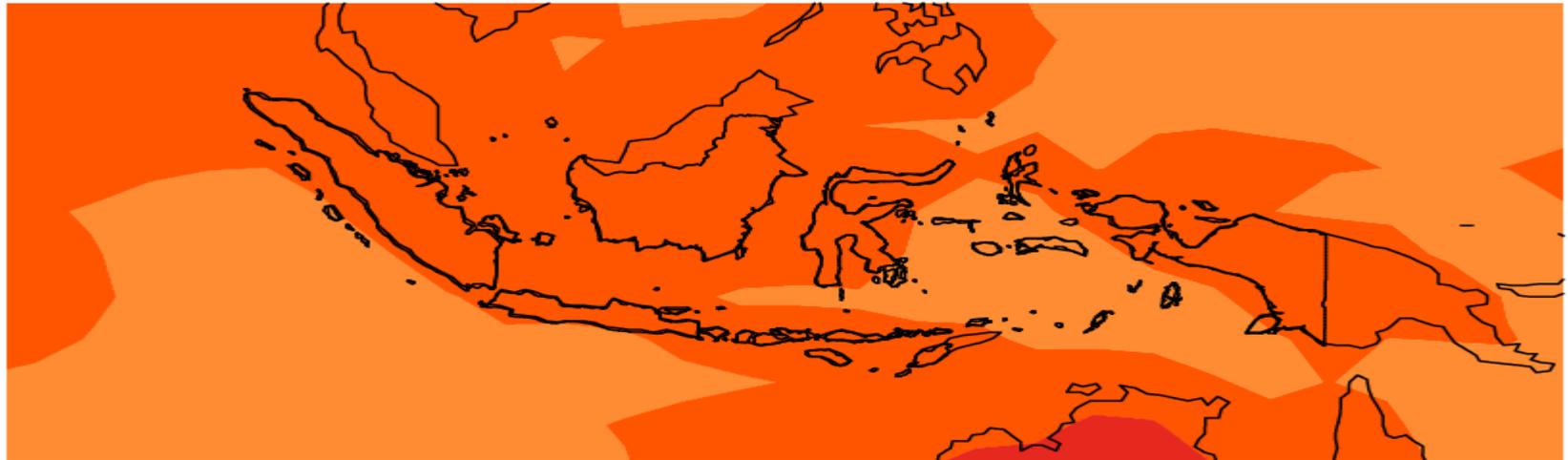




Photo Credit: Hendry, Shelter Cluster Sulteng



BAGIKAN: 786 Huntara di Sulawesi Tengah Belum Berpenghuni

Home / Properti / Hunian

786 Huntara di Sulawesi Tengah Belum Berpenghuni

Kompas.com - 18/08/2019, 18:00 WIB

BAGIKAN:

[Komentar](#)



<https://news.detik.com/berita/d-4666322/tak-ditempati-korban-gempa-3000-huntara-di-palu-dan-sigi-kosong>

Tak Ditempati Korban Gempa, 3.000 Huntara di Palu dan Sigi Kosong

M Qadri - detikNews

Kamis, 15 Agu 2019 10:38 WIB

[1 komentar](#)



SHARE



Huntara di Sulawesi Tengah untuk para korban bencana. (Foto: M Qadri/detik.com)

Palu - Ribuan bilik hunian sementara (huntara) di Palu dan Sigi, Sulawesi tengah (Sulteng), tak berpenghuni. Menurut Balai



In general, there is increase in time to stay in transitional shelters internationally. What about Indonesia? In Palu, after 2 years, some are still in Huntara. Heat stress: mental health of children and women



Community solutions to heath stress

Questions:

What can engineering and science communities do to help communities (IDPs as well as farmers) adapt to heat stress?

What can engineering and science communities do to help crops and agriculture sectors in general adapt to heath stress?

**And the wind blows – extremely
blows**

Cyclone tracks - Australia [beta]

 This is a product developed as part of the Pacific Climate Change Science Program

Tropical Cyclones

Current Cyclones

Cyclone Outlooks

Previous Cyclones

Cyclone tracks - Australia

Cyclone tracks - Southern Hemisphere

Cyclone tracks - Western North Pacific

Reports

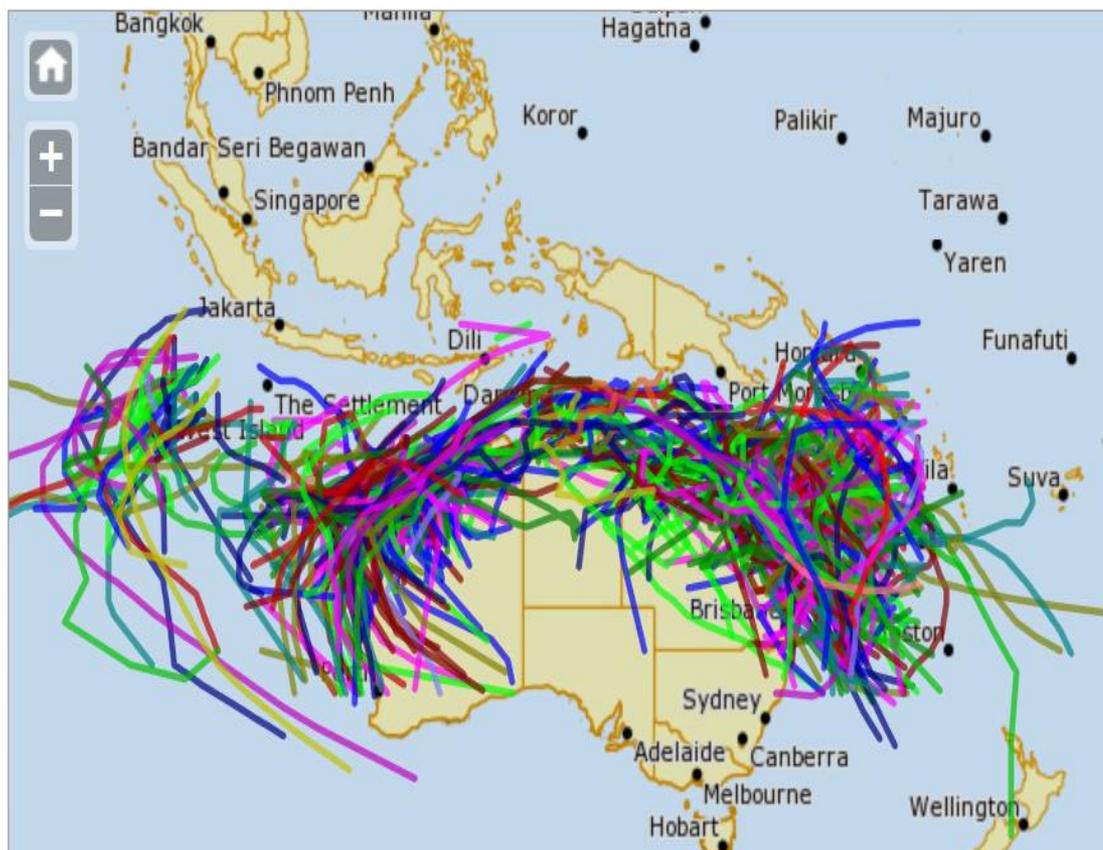
WA cyclones

NT cyclones

Qld cyclones

NSW cyclones

Cyclone Climatology



Tracks

Reference layers

when

multi-season

seasons:

1966 / 1967

1967 / 1968

1968 / 1969

1969 / 1970

1970 / 1971

presets:

latest

where

what

Search

Visible cyclones: 421 / 421

Season 1906 / 1907

Unnamed - 1

Season 1907 / 1908

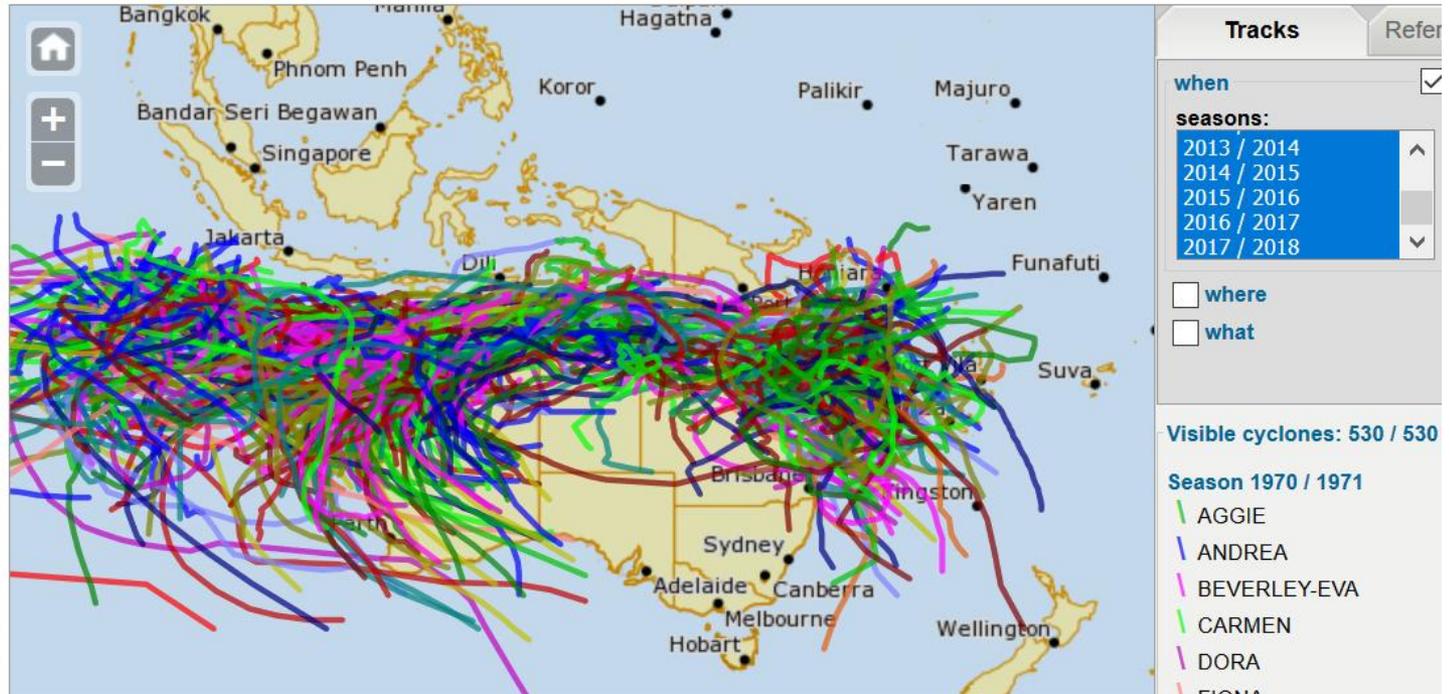
Unnamed - 2

Unnamed - 3

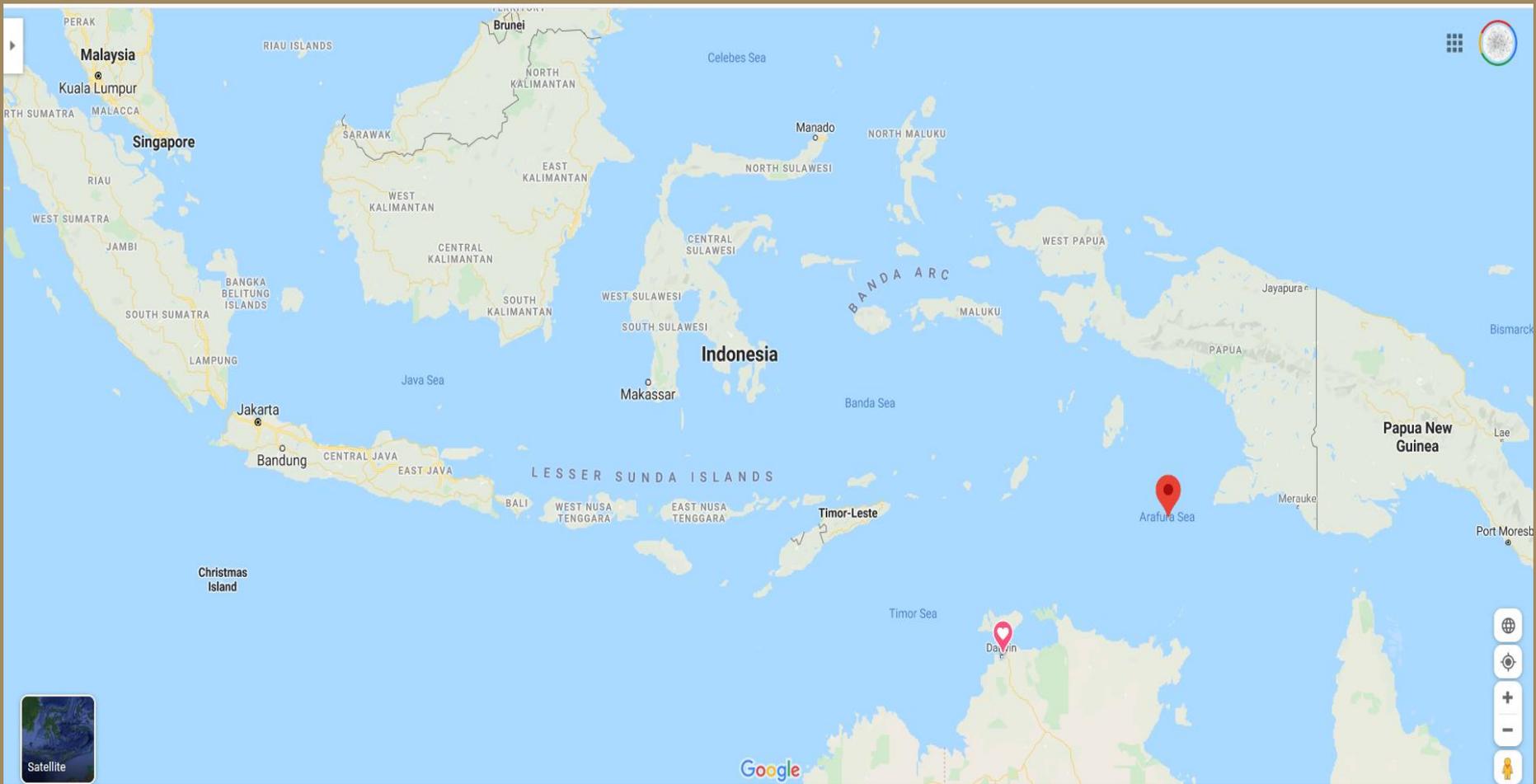
Cyclone Trends Australia 1900-1970: 5-6 events per year

Cyclone tracks - Australia [beta]

 This is a product developed as part of the Pacific Climate Change Science Program



Cyclones History Australia 1970-2017: 11-12 events per year



Cyclone Breeding Grounds



Tropical cyclones and climate change

Kevin J.E. Walsh,¹ John L. McBride,² Philip J. Klotzbach,³ Sethurathinam Balachandran,⁴ Suzana J. Camargo,⁵ Greg Holland,⁶ Thomas R. Knutson,⁷ James P. Kossin,⁸ Tsz-cheung Lee,⁹ Adam Sobel¹⁰ and Masato Sugi¹¹

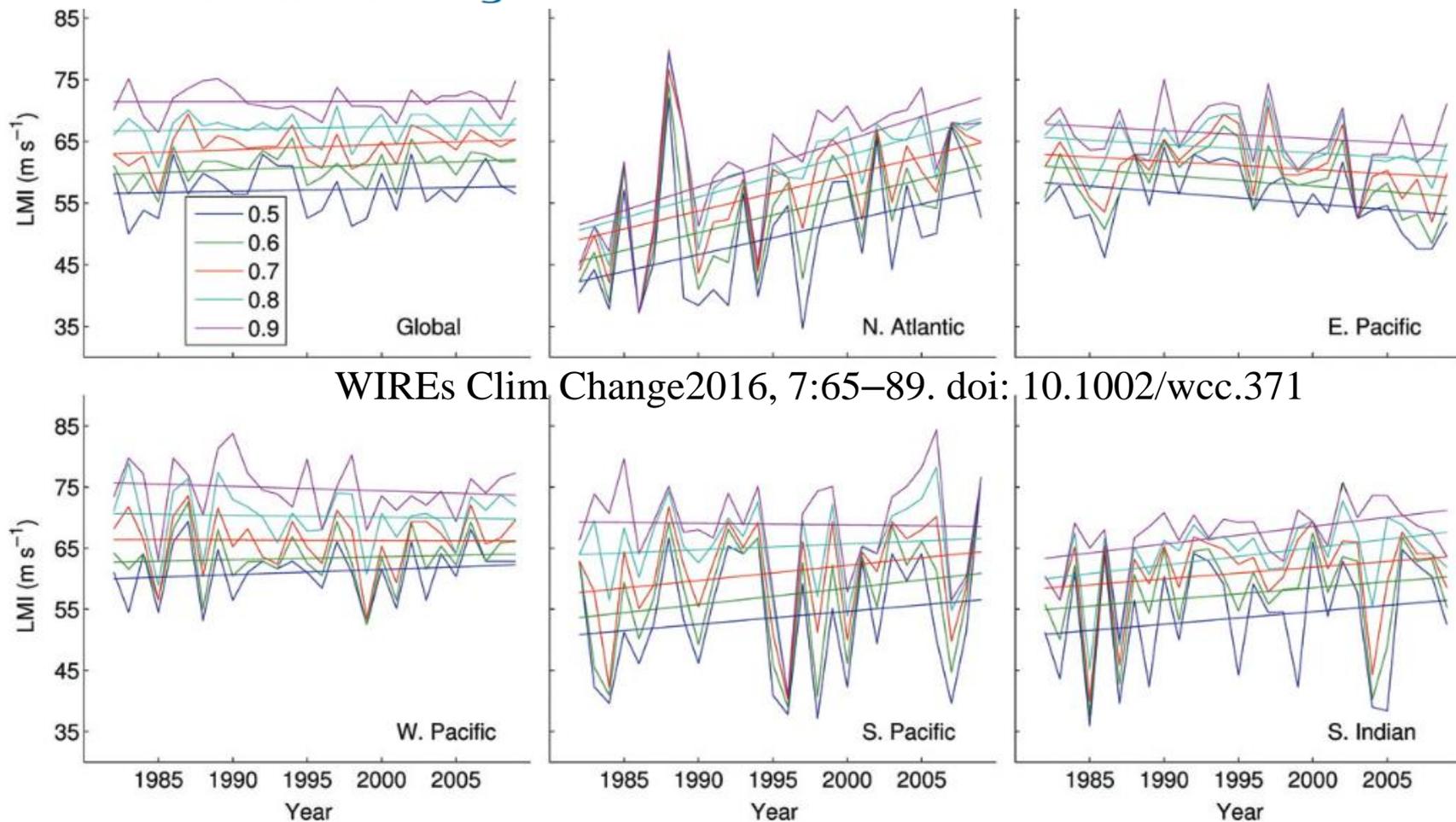


FIGURE 1 | Plots of quantiles (mean to 0.9) of the lifetime maximum intensity (LMI) of storms in the various tropical cyclone formation basins, from a homogenized satellite-based analysis of tropical cyclone intensity (1982–2009). (Reprinted with permission from Ref. 3 Copyright 2013 American Meteorological Society)

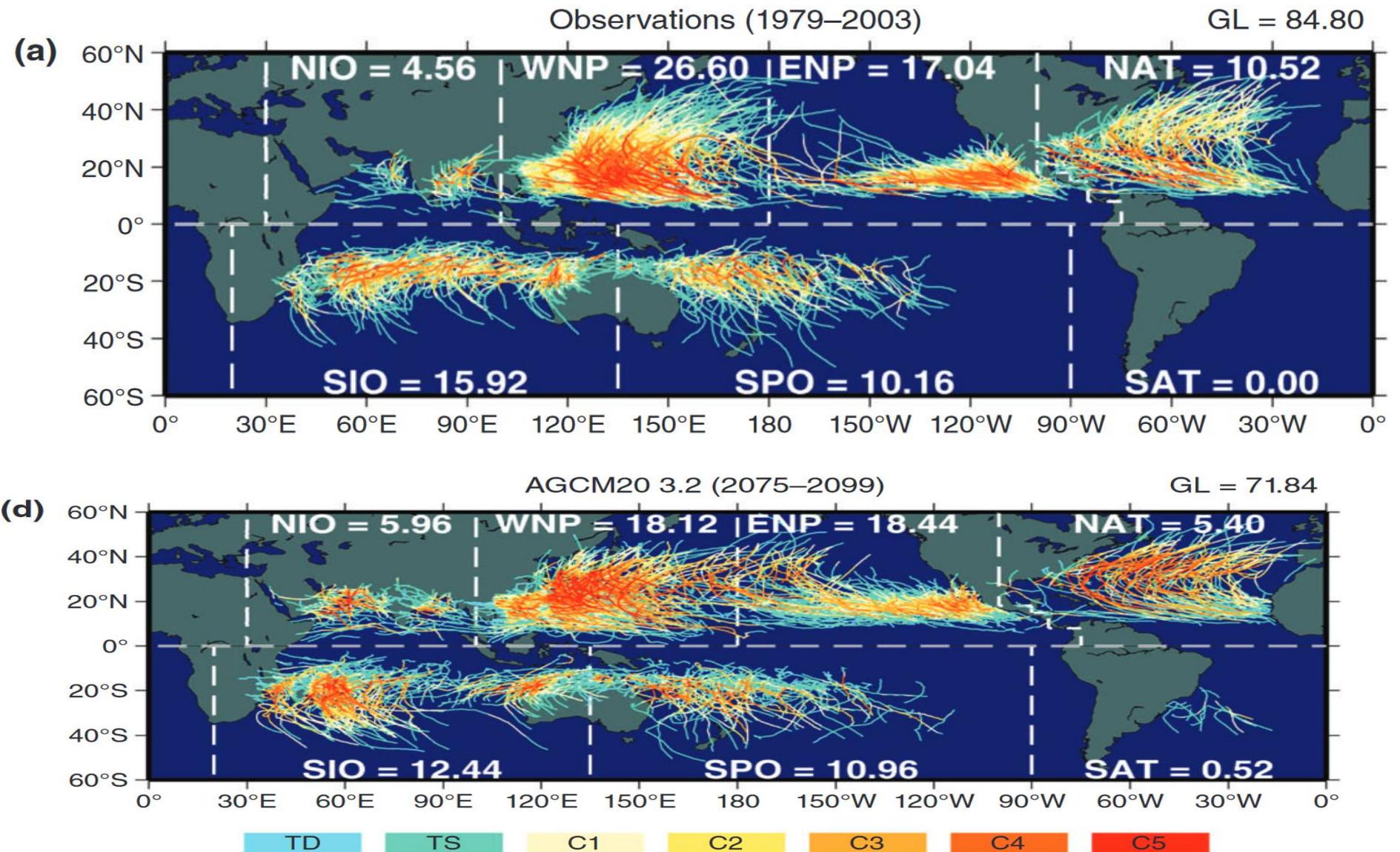
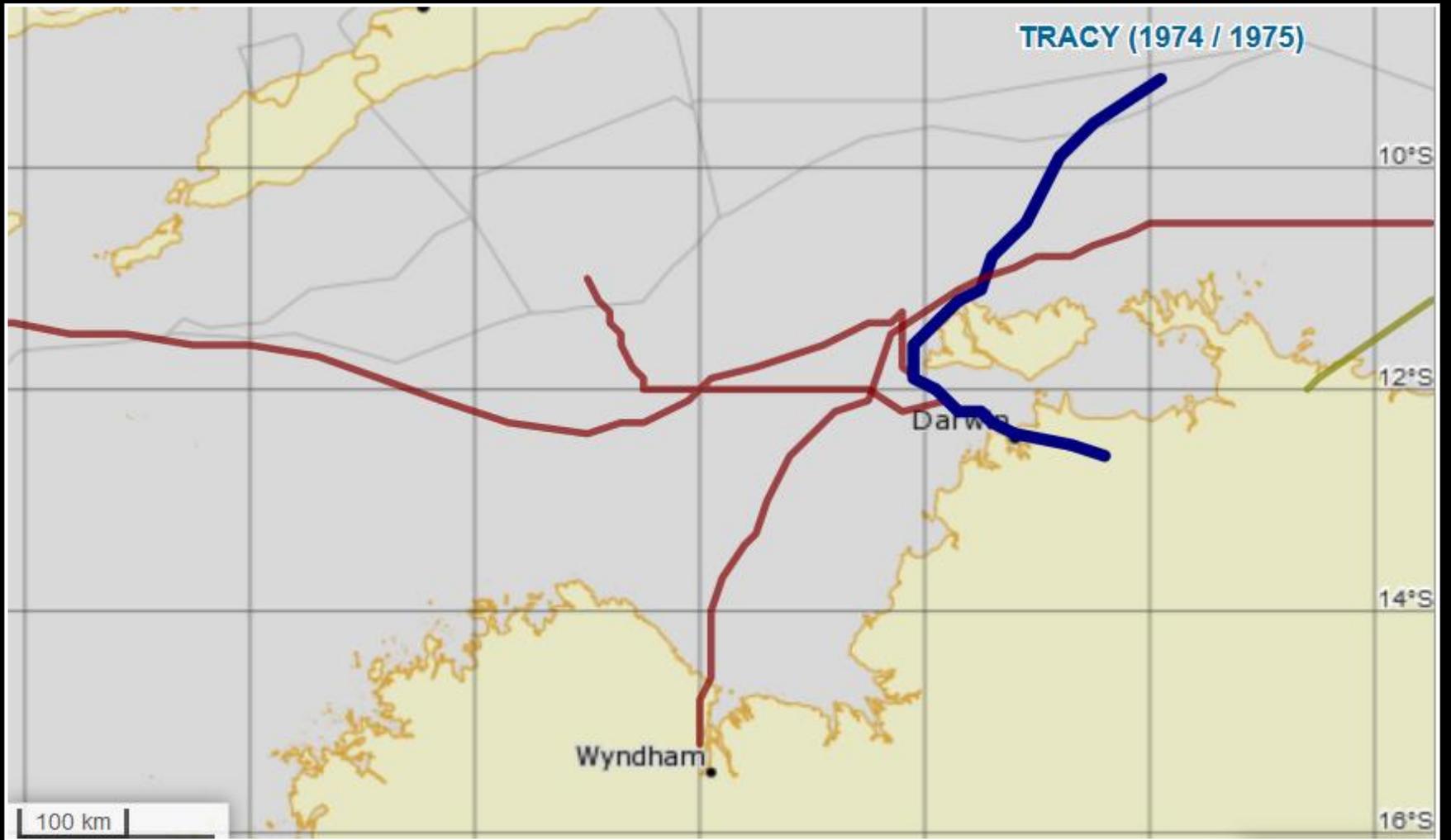


FIGURE 4 | Global distribution of TC tracks during all seasons from 1979 to 2003 for (a) observations, (b) and (c), two current climate TC simulations, and (d) the global warming projection using the same GCM as for (c). The numbers for each basin show the annual mean number of TCs. TC tracks are colored according to the intensities of the TCs as categorized by the Saffir–Simpson hurricane wind scale (e.g., tropical depression [TD], tropical storms [TSs], and TC category C1–C5). (Reprinted with permission from Ref. 19 Copyright 2012 American Meteorological Society)



Cyclone Tracy Tracks 1974



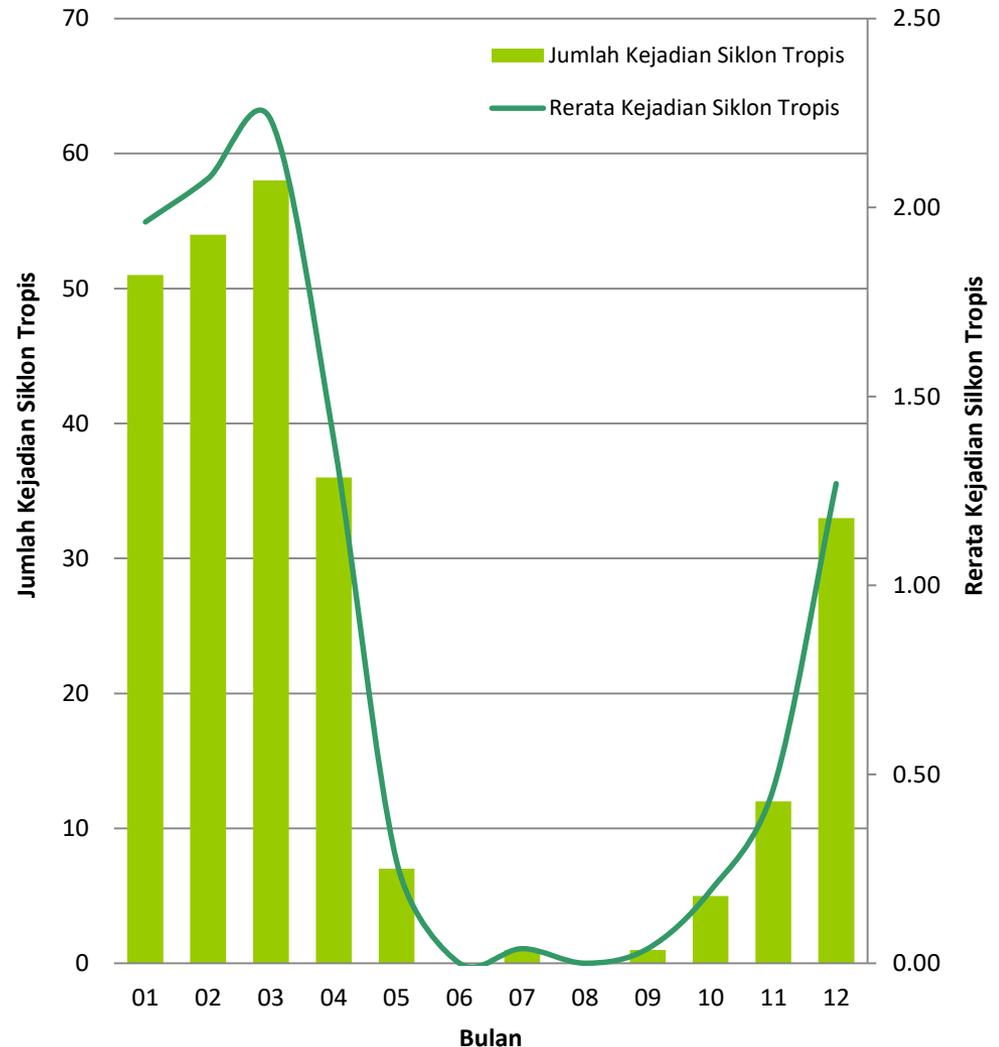
Cyclone Tracy on 25 December 1974
Formed: 21 December 1974;
Dissipated: 26 December 1974
Highest winds 10-minute
sustained: 175 km/h (110 mph)
1-minute sustained: 205 km/h (125
mph) Gusts: 240 km/h (150 mph)



Bidgee 2008 Three House Girders twisted during Tropical Cyclone Tracy on 25th December 1974.

JUMLAH DAN RATA-RATA KEJADIAN SIKLON TROPIS WILAYAH PERAIRAN SEBELAH SELATAN DEKAT INDONESIA* (BMKG)

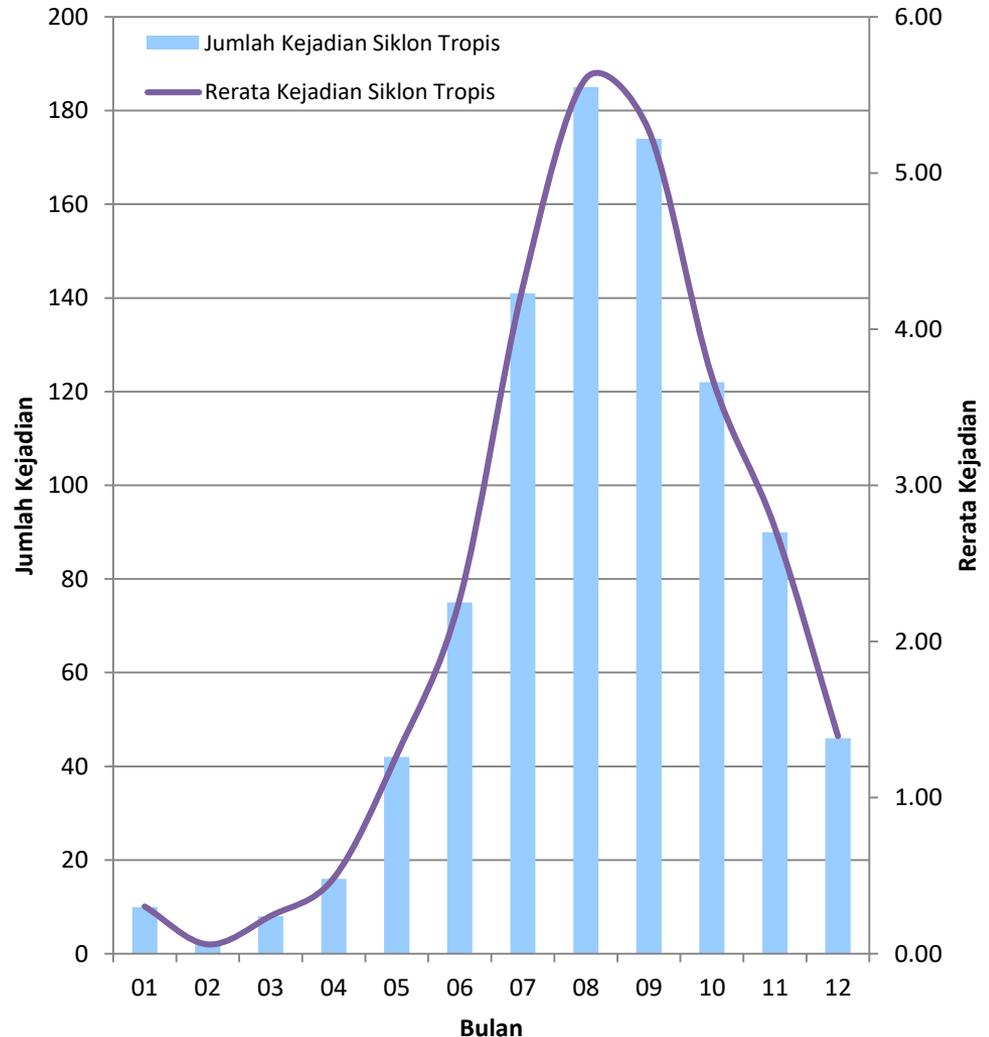
BULAN	JUMLAH	RATA-RATA
JAN	51	1.96
FEB	54	2.08
MAR	58	2.23
APR	36	1.38
MEI	7	0.27
JUN	0	0.00
JUL	1	0.04
AGS	0	0.00
SEP	1	0.04
OKT	5	0.19
NOV	12	0.46
DES	33	1.27



*data tahun 1984 – 2012 wilayah 0-40S 90-145E

JUMLAH DAN RATA-RATA KEJADIAN SIKLON TROPIS WILAYAH PERAIRAN SEBELAH UTARA DEKAT INDONESIA* (BMKG)

BULAN	JUMLAH	RATA-RATA
JAN	10	0.30
FEB	2	0.06
MAR	8	0.24
APR	16	0.48
MEI	42	1.27
JUN	75	2.27
JUL	141	4.27
AGS	185	5.61
SEP	174	5.27
OKT	122	3.70
NOV	90	2.73
DES	46	1.39



*data tahun 1977 – 2012 wilayah 0-40N 90-145E

Waspada! Siklon Tropis Lili Tumbun di Laut Timor

Kamis, 9 Mei 2019 16:39



Meningkatnya pemberitaan soal Siklon di NTT

Travel

Akomodasi

Kuliner

Destinasi

Shopping

Ticketing

siklon

Semua Pos Kupang

Sekitar 188 hasil (0.15 detik)

Urutkan menurut:

Waspada! **Siklon** Tropis Lili Tumbuh di Laut Timor - Pos Kupang

<https://kupang.tribunnews.com/.../waspada-siklon-tropis-lili-tumbuh-di-laut-timor>



9 Mei 2019 ... Berdasarkan pantauan BMKG Kamis (9/5/2019) sekitar pukul 10.00 WIB Bibit **Siklon** Tropis 93S mengalami penguatan si
Dilabeli Pos Kupang

Waspada! Bibit **Siklon** Tropis di Laut Banda Makin Kuat, Berpeluang ...

<https://kupang.tribunnews.com/.../waspada-bibit-siklon-tropis-di-laut-banda-makin-kuat-berpeluang-terjadi-di-ntt>



8 Mei 2019 ... Petugas penyelamat membersihkan jalan dari puing-puing yang disebabkan oleh angin kencang **siklon** tropis Mangkhut d
Baggao di ...
Dilabeli Pos Kupang

Siklon dalam rekaman media di Indonesia – Observasi 4 tahun

Waspada! Bibit Siklon Tropis di Laut Banda Makin Kuat, Berpeluang Terjadi di NTT

Rabu, 8 Mei 2019 14:58



↶ lihat foto



New Cyclone Breeding Grounds: Laut Banda?

Diposting : 5 January 2020 07:43

Rumah Gempa Roboh Dihempas Angin

Khairil Anwar - Bali Tribune

Share on Facebook Share on Twitter +



NTT: Dampak Siklon di Gliting, Sikka



What can engineering and science communities do to help communities (IDPs as well as farmers) adapt to heat stress?
What can engineering and science communities do to help crops and agriculture sectors in general adapt to heath stress?

Diterjang Ombak Setinggi 6 Meter, Penahan Dermaga Kolbano Ambrol

Kompas.com - 29/04/2017, 16:15 WIB

BAGIKAN:



Membangun Infrastruktur Maritime?



Penahan Dermaga Kolbano di Desa Kolbano, Kecamatan Kolbano, Kabupaten Timor Tengah Selatan (TTS), NTT, ambrol akibat di hantam gelombang setinggi enam meter yang melanda wilayah itu. Nampak Anggota DPRD NTT Jefry Unbanamak (baju putih) sedang meninjau lokasi kerusakan. (Foto: Kompas.com)



**And then tordanos come – Yes
tordano risk in Indonesia!**

puting beliung



Semua Pos Kupang

Sekitar 4,490 hasil (0.19 detik)

Urutkan menurut: I

Tag: **puting beliung** - Pos Kupang

<https://kupang.tribunnews.com/tag/puting-beliung>



Berita dan foto terbaru **puting beliung** - **Puting Beliung** Terbangkan Atap Rumah Onisius di Tanaduen. Dilabeli Pos Kupang

BREAKING NEWS - Puluhan Rumah Warga di Malaka Rusak ...

<https://kupang.tribunnews.com/.../breaking-news-puluhan-rumah-warga-di-malaka-rusak-dihantam-angin-puting-beliung>



10 Feb 2020 ... terdapat 35 rumah warga yang rusak diterjang **puting beliung** yang berada di Dusun Nuau dan Debnaruk serta satu p

Media Lebih Sensitive Pada Puting Beliung



bantu korban angin puting beliung ...
bengkulu.antaranews.com



Angin Puting Beliung Ancam Cirebon
m.ayocirebon.com



Angin Puting Beliung | BPBD Provinsi NTB
bpbd.ntbprov.go.id



Viral Puting Beliung Terj...
liputan6.com



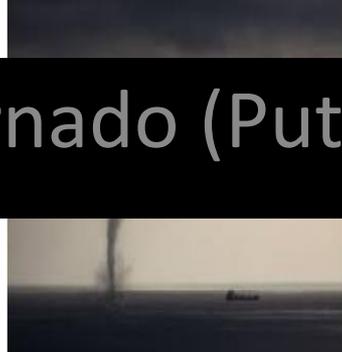
Angin Puting Beliung T...
hariannusa.com



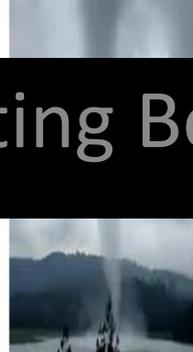
Disapu Angin Puting Beliung, 10 Warung ...
fin.co.id



Dilanda Angin Puting Beliung
m.ayocirebon.com



Puting Beliung di Laut Alamiah Halaman ...
sains.kompas.com



Puting Beliung Terjang 1...
nasional.tempo.co



Kenali Tanda-tanda Alam Munculnya ...
m.ayobandung.com



Angin Puting Beliung di...
kumparan.com

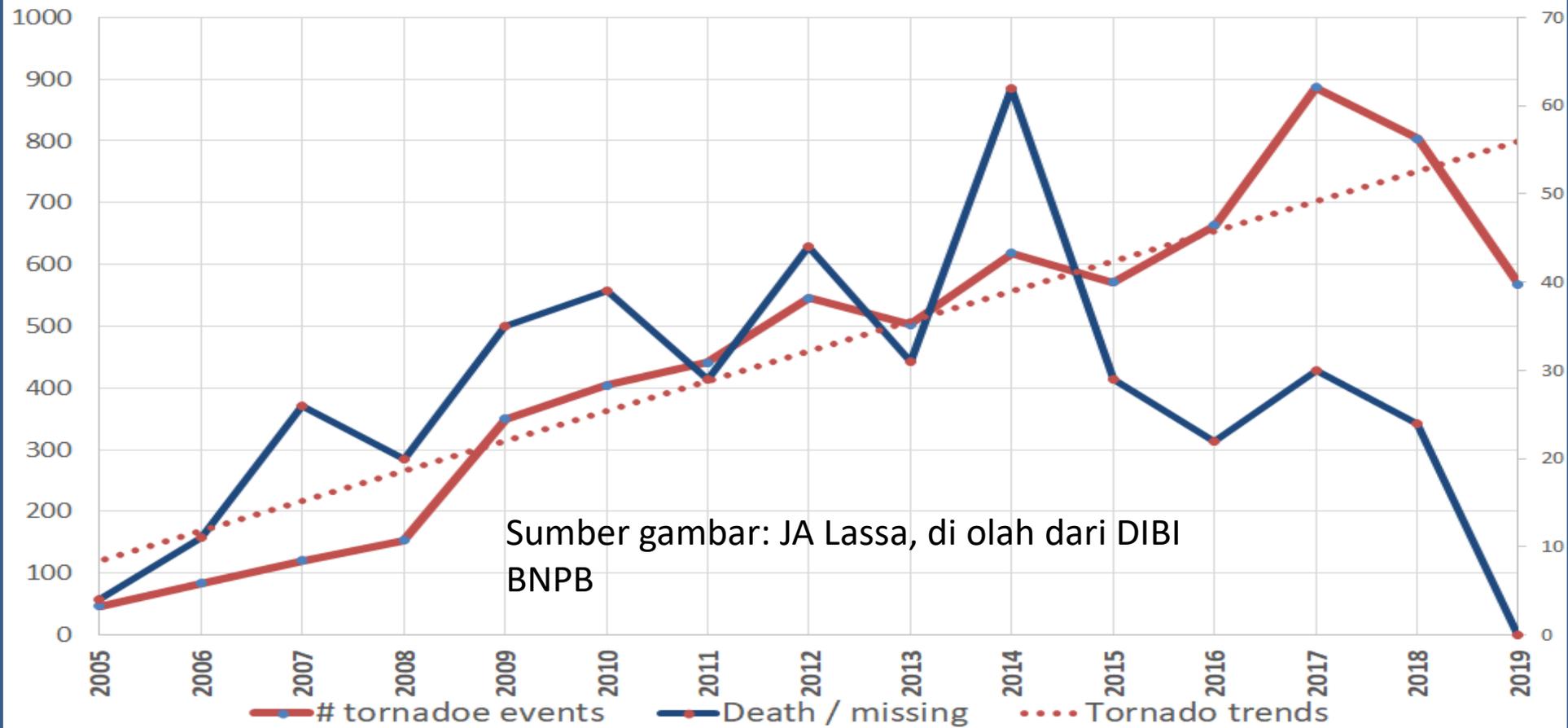


Angin Puting Beliung Rusak 157 Rumah di ...
republika.co.id

Tornado (Puting Beliung di Indonesia



Recorded tornado events in Indonesia



Recorded tornado events in Indonesia





Angin Puting Beliung Mampir Pati Satu ...
radarkudus.jawapos.com

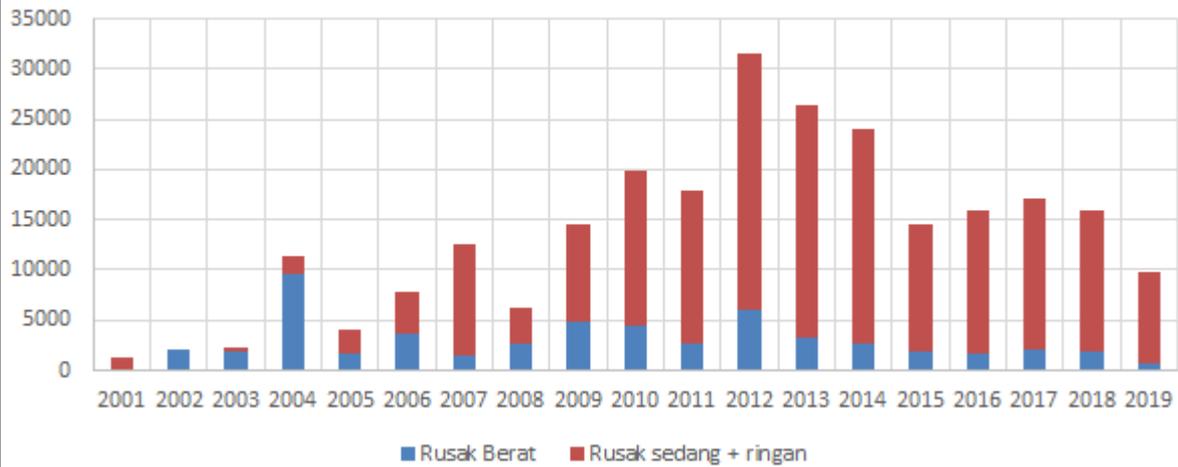


Puting Bel ...
news.detik



Rumah Rusak Diterjang Puting Beliung ...
timlo.net

Trend kerusakan rumah akibat puting beliung



Rusak Akibat Puting Beliung di Sidoarjo ...
detak.co



Puting ...
nasion



uting Beliung ...



Puting Beliung Rusak 17 Rumah di Mamuju...
republika.co.id



Rumah Rusak Akibat Puting Beliung ...
tribunnews.com



Rumah Rusak Diterjang Puting Beliung ...
onlinemetro.id



Angin Puting Beliung Rusak Belasan ...
balipusanews.com



Diterpa Puting Beliung, Empat Rumah ...
radarmojokerto.jawapos.com



Rusak Disapu Puting Beliung ...
news.okezone.com



Puting Beliung Terjang Soppeng Sulsel ...
news.detik.com



Puting Beliung Rusak 189 Rumah di ...
republika.co.id



Bencana Angin Puting Beliung Hancurkan Rumah Warga di Kabupaten Sikka

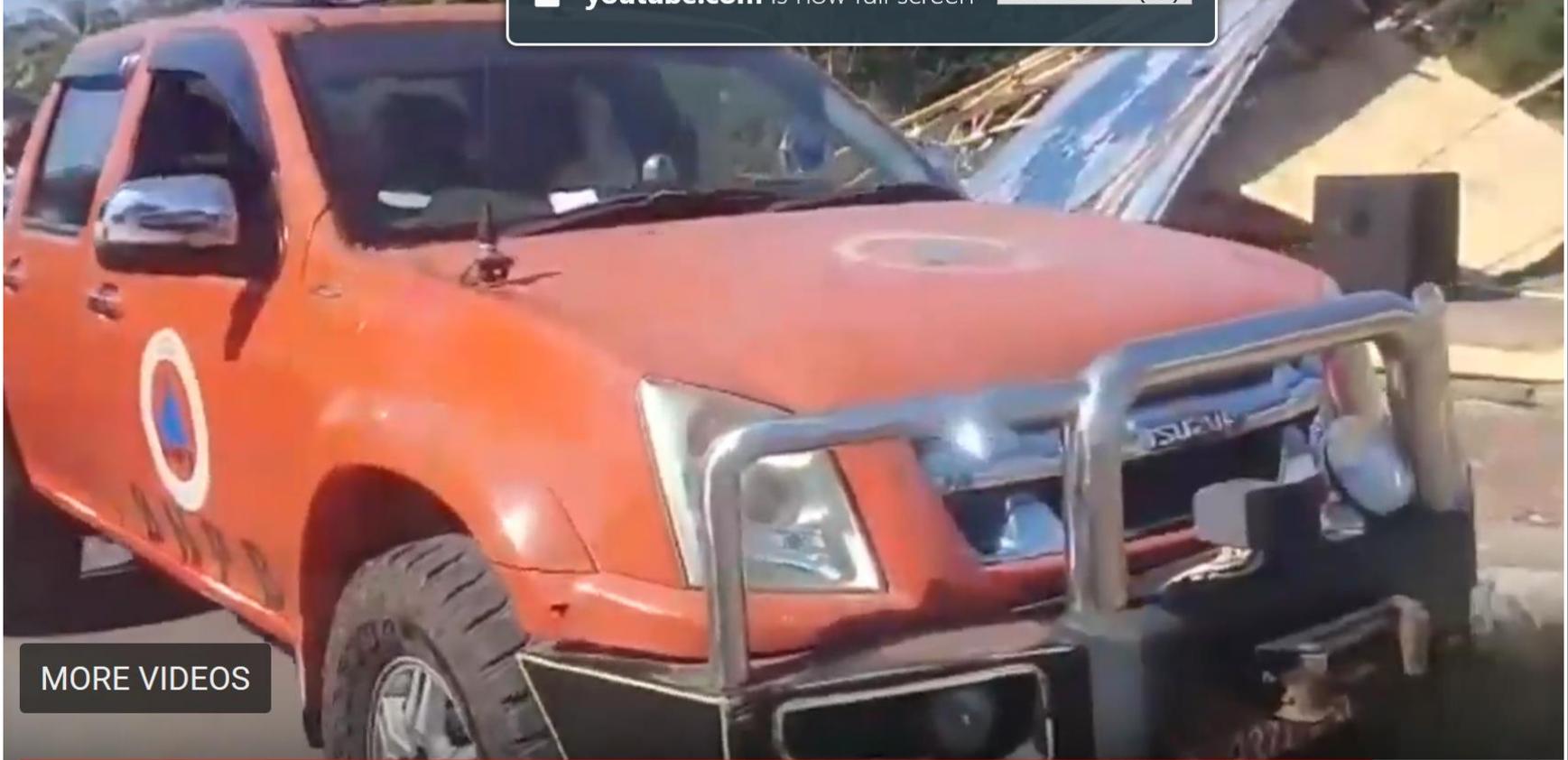


Watch la



youtube.com is now full screen

Exit Full Screen (Esc)



MORE VIDEOS



Dampak Putting Beliung: Kelompok Ekonomi Lemah Menanggung dampak yang lebih besar!

PERATURAN PEMBEBANAN INDONESIA UNTUK GEDUNG 1983

BAB - 4 BEBAN ANGIN

Pasal 4.1. PENENTUAN BEBAN ANGIN

Beban angin ditentukan dengan menganggap adanya tekanan positif dan tekanan negatif (isapan), yang bekerja tegak lurus pada bidang-bidang yang ditinjau. Besarnya tekanan positif dan tekanan negatif ini dinyatakan dalam kg/m^2 , ditentukan dengan mengalikan tekanan tiup yang ditentukan dalam Pasal 4.2. dengan koefisien-koefisien angin yang ditentukan dalam Pasal 4.3.

Pasal 4.2. TEKANAN TIUP

- (1) Tekanan tiup harus diambil minimum 25 kg/m^2 , kecuali yang ditentukan dalam ayat-ayat (2), (3) dan (4).
- (2) Tekanan tiup di laut dan di tepi laut sampai sejauh 5 km dari pantai harus diambil minimum 40 kg/m^2 , kecuali yang ditentukan dalam ayat-ayat (3) dan (4).
- (3) Untuk daerah-daerah di dekat laut dan daerah-daerah lain tertentu, di mana terdapat kecepatan-kecepatan angin yang mungkin menghasilkan tekanan tiup yang lebih besar dari pada yang ditentukan dalam ayat-ayat (1) dan (2), tekanan tiup (p) harus dihitung dengan rumus:

$$p = \frac{V^2}{16} \text{ (kg/m}^2\text{)}$$

$V=20 \text{ m/s}$

$V=72 \text{ km/hr?}$

Lalu harus bagaimana?

SNI

Standar Nasional Indonesia

SNI 1727:2013

Beban minimum untuk perancangan bangunan
gedung dan struktur lain



26.5 Zona bahaya angin

26.5.1 Kecepatan Angin Dasar

26.5.2 Wilayah Angin Khusus

26.5.3 Perkiraan kecepatan angin dasar dari data iklim daerah

26.5.4 Pembatasan

Tornado belum diperhitungkan dalam mengembangkan distribusi kecepatan-angin dasar.

**Australian tropical cyclone
intensity scale**

Category	Sustained winds	Gusts
Five	>107 kt >198 km/h	>151 kt >280 km/h
Four	86–107 kt 158–198 km/h	122–151 kt 226–280 km/h
Three	64–85 kt 118–157 km/h	90–121 kt 167–225 km/h
Two	48–63 kt 89–117 km/h	68–89 kt 126–166 km/h
One	34–47 kt 63–88 km/h	49–67 kt 91–125 km/h

F SCALE

- F0 • 40–72 mph (64–116 km/h)**
- F1 • 73–112 mph (117–180 km/h)**
- F2 • 113–157 mph (181–253 km/h)**
- F3 • 158–207 mph (254–332 km/h)**
- F4 • 208–260 mph (333–419 km/h)**
- F5 • 261–318 mph (420–512 km/h)**

Tornado Fujita Scale

- light damage**
- moderate damage**
- considerable damage**
- severe damage**
- devastating damage**
- incredible damage**

EF SCALE (U.S.)

- EF0 • 65–85 mph (105–137 km/h)**
- EF1 • 86–110 mph (138–178 km/h)**
- EF2 • 111–135 mph (179–218 km/h)**
- EF3 • 136–165 mph (219–266 km/h)**
- EF4 • 166–200 mph (267–322 km/h)**
- EF5 • over 200 mph (over 322 km/h)**

IS YOUR HOUSE PREPARED FOR A CYCLONE?

ADVICE FOR THE HOMEOWNER



Government of Western Australia
Department of Housing and Works



This brochure was prepared by
the Cyclone Testing Station
with support from them
Territory, Queensland and
Western Australia governments.



1. AIM

This brochure has been prepared for you, the homeowner, to create awareness of the main causes of cyclone damage to houses. It highlights maintenance issues that you may need to address to ensure your house is in good condition in readiness for the cyclone season. It also provides an overview of key areas in and around your house that may require protection to reduce the risk of cyclone damage.

2. WHAT IS A CYCLONE?

Every year between November and April, coastal areas within cyclonic regions C and D are at risk of being hit by cyclones. Check with your local council if your house is located within one of these cyclonic regions.

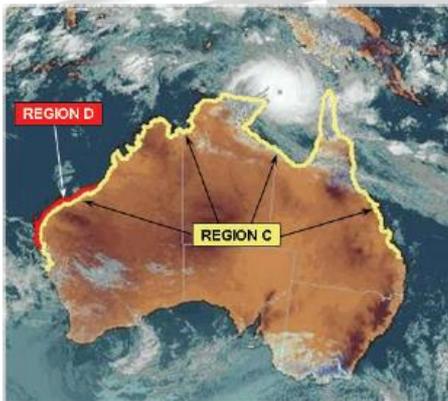


Image showing Cyclone Monica from April 2006 and highlighting coastal areas of Australia within cyclonic regions C and D. Image from Bureau of Meteorology.

A cyclone is a violent storm characterised by strong winds rotating around a calm centre. It can produce destructive winds and bring heavy rain causing flooding and, in some events, cause a storm surge (i.e. a rapid rise in sea level).

Strong winds, heavy rain and flying debris created during a cyclone can cause extensive damage to your house. However, the risk of damage can be minimised if you take a proactive approach to protecting your house.

3. DAMAGE FROM CYCLONIC WINDS

A review of past reports on cyclone damage to houses in Australia shows that the most common types of damage observed were:

- Damage due to failure of corroded fasteners, connector plates, roof battens and other components.
- Damage caused by failure of rotten timbers.
- Garage doors being blown in or out.
- Roofs being blown away in whole or in part.
- Collapse of unreinforced masonry walls.
- Damage to inadequately built housing in exposed locations such as hills and sea frontages.
- Flying debris breaking doors and windows, resulting in further damage from water leakage and strong winds.
- Doors and windows blown open due to inadequate fixing to walls or inadequate locks.
- Damage to ceilings and walls due to water leakage.
- Failure of attachments such as guttering, fascias and eaves.
- Damage due to fallen trees.

4. MAINTAINING YOUR HOUSE

One of the most important actions you can take to protect your house is to maintain it in good condition. Your house may be at risk of cyclone damage if house elements are



Little transformation in formal sectors

Floods disrupts cargo inspection!

SUARA CARGO

Berita Seputar Cargo, Logistik dan Transportasi

Banjir Hambat Inspeksi Peti Kemas di Pelabuhan Tanjung Priok

By [suaracargo](#) -
Feb 11, 2015



- Delays in physical inspection
- Disruptions of flow of receiving and delivery
- Cost
- Additional cost of energy and labor

Some optimism: Interaction of cyclones, floods and droughts in Southern Cost of Timor – Community solution



What can engineering communities in Eastern Indonesia do to address the issue?

Figure: © PMPB Kupang





//Emergency Response Organisation (ERO)//

One ASEAN
One Response

Hazard monitoring is getting better. Remote sensing technology have become more available.

**But why the progress in heaven barely impacts on the ground?
So what makes our home and infrastructure become more vulnerable?**

What can be done to make our assets become more resilient?

Do we need a Climate (change) Engineering Science?