

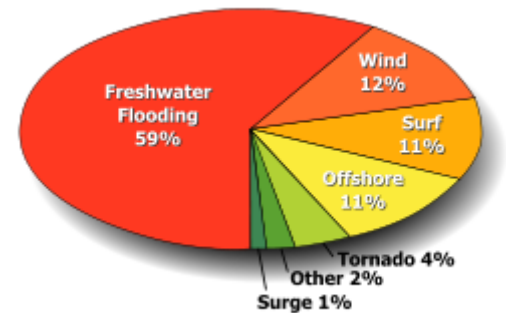
Effects of tropical cyclones

The main effects of tropical cyclones include heavy rain, strong wind, large storm surges at landfall, and tornadoes. The destruction from a tropical cyclone depends mainly on its intensity, its size, and its location. Tropical cyclones act to remove forest canopy as well as change the landscape near coastal areas, by moving and reshaping sand dunes and causing extensive erosion along the coast. Even well inland, heavy rainfall can lead to mudslides and landslides in mountainous areas. Their effects can be sensed over time by studying the concentration of the Oxygen-18 isotope within caves within the vicinity of cyclones' paths being very hazardous to people's life.

After the cyclone has passed, devastation often continues. Standing water can cause the spread of disease, and transportation or communication infrastructure may have been destroyed, hampering clean-up and rescue efforts. Nearly two million people have died globally due to tropical cyclones. Despite their devastating effects, tropical cyclones are also beneficial, by potentially bringing rain to dry areas and moving heat from the tropics poleward. Out at sea, ships take advantage of their known characteristics by navigating through their weaker western half.

When a cyclone hits it causes PST hazards. PST is an acronym standing for Primary, Secondary and Tertiary. A primary hazard involves destructive winds, debris and storm surge. Secondary hazards include flooding and fires. Tertiary hazards include spikes in prices of food and other necessities, as well as long term hazards like waterborne diseases.

Leading Causes of Tropical Cyclone Deaths in the U.S. 1970-1999



Source: Edward Rappagood—Chief, Technical Support Branch, Tropical Prediction Center

Pie graph of American tropical cyclone casualties by cause from 1970–1999

Contents

At sea

- North American colonization
- Shipping

Upon landfall

- Strong winds
- Storm surge
- Heavy rainfall
- Tornadoes

Deaths

- United States

Reconstruction and repopulation

Effects on natural resources

- Geomorphology
 - Coastal ridges
 - Limestone cave stalagmites
- Landscapes

See also

References

At sea

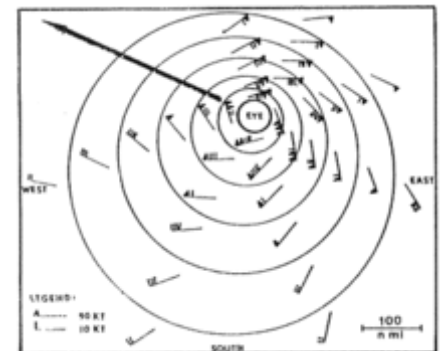
A mature tropical cyclone can release heat at a rate upwards of 6×10^{14} watts.^[1] Tropical cyclones on the open sea cause large waves, heavy rain, and high winds, disrupting international shipping and, at times, causing shipwrecks.^[2] Generally, after its passage, a tropical cyclone stirs up ocean water, lowering sea surface temperatures behind it.^[3] This cool wake can cause the region to be less favorable for a subsequent tropical cyclone. On rare occasions, tropical cyclones may actually do the opposite. 2005's Hurricane Dennis blew warm water behind it, contributing to the unprecedented intensity of Hurricane Emily, which followed it closely.^[4] Hurricanes help to maintain the global heat balance by moving warm, moist tropical air to the mid-latitudes and polar regions.^[5] Were it not for the movement of heat poleward (through other means as well as hurricanes), the tropical regions would be unbearably hot.

North American colonization

Shipwrecks are common with the passage of strong tropical cyclones. Such shipwrecks can change the course of history,^[6] as well as influence art and literature. A hurricane led to a victory of the Spanish over the French for control of Fort Caroline, and ultimately the Atlantic coast of North America, in 1565.^[7] The *Sea Venture* was wrecked near Bermuda in 1609 which led to the colonization of Bermuda^[8] and provided the inspiration for Shakespeare's *The Tempest*.

Shipping

Mariners have a way to safely navigate around tropical cyclones. They split tropical cyclones in two, based on their direction of motion, and maneuver to avoid the right segment of the cyclone in the Northern Hemisphere (the left in the Southern Hemisphere). Sailors term the right side the **dangerous semicircle** since the heaviest rain and strongest winds and seas were located in this half of the storm, as the cyclone's translation speed and its rotational wind are additive. The other half of the tropical cyclone is called the **navigable semicircle**^[9] since weather conditions are lessened (subtractive) in this portion of the storm (but are still potentially quite hazardous). The rules of thumb for ship travel when a tropical cyclone is in their vicinity are to avoid them if at all possible and do not cross their forecast path (crossing the T). Those traveling through the dangerous semicircle are advised to keep to the true wind on the starboard bow and make as much headway as possible. Ships moving through the navigable semicircle are advised to keep the true wind on the starboard quarter while making as much headway as possible.^{[10][11]}



The **dangerous semicircle** is the upper-right corner, with the arrow marking the direction of motion of a Northern Hemisphere storm. Note that typhoons, etc. are asymmetrical, and *semicircle* is a convenient misnomer.

Upon landfall

The most significant effects of a tropical cyclone occur when they cross coastlines, making landfall then it destroys ships and lives.

Strong winds

Strong winds can damage or destroy vehicles, buildings, bridges, personal property and other outside objects, turning loose debris into deadly flying projectiles. In the United States, major hurricanes comprise just 21% of all land falling tropical cyclones, but account for 83% of all damage.^[12] Tropical cyclones often knock out power to tens or hundreds of thousands of people, preventing vital communication and hampering rescue efforts.^[13] Tropical cyclones often destroy key bridges, overpasses, and roads, complicating efforts to transport food, clean water, and medicine to the areas that need it. Furthermore, the damage caused by tropical cyclones to buildings and dwellings can result in economic damage to a region, and to diaspora of the population of the region.^[14]

Storm surge

The storm surge, or the increase in sea level due to the cyclone, is typically the worst effect from landfalling tropical cyclones, historically resulting in 90% of tropical cyclone deaths.^[14] The relatively quick surge in sea level can move miles/kilometers inland, flooding homes and cutting off escape routes. The storm surges and winds of hurricanes may be destructive to human-made structures, but they also stir up the waters of coastal estuaries, which are typically important fish breeding locales.

Heavy rainfall

The thunderstorm activity in a tropical cyclone produces intense rainfall, potentially resulting in flooding, mudslides, and landslides. Inland areas are particularly vulnerable to freshwater flooding, due to residents not preparing adequately.^[15] Heavy inland rainfall eventually flows into coastal estuaries, damaging marine life in coastal estuaries.^[16] The wet environment in the aftermath of a tropical cyclone, combined with the destruction of sanitation facilities and a warm tropical climate, can induce epidemics of disease which claim lives long after the storm passes.^[14] Infections of cuts and bruises can be greatly amplified by wading in sewage-polluted water. Large areas of standing water caused by flooding also contribute to mosquito-borne illnesses. Furthermore, crowded evacuees in shelters increase the risk of disease propagation.^[14]



Flooding in Port Arthur, Texas caused by Hurricane Harvey. Harvey was both the wettest and costliest tropical cyclone in United States history.

where the annual rainfall can range from practically nothing with no cyclones to over 1,000 millimetres (39 in) if cyclones are abundant.

Tornadoes

The broad rotation of a land falling tropical cyclone often spawns tornadoes, particularly in their right front quadrant. While these tornadoes are normally not as strong as their non-tropical counterparts, heavy damage or loss of life can still occur. Tornadoes can also be spawned as a result of eyewall mesovortices which persist until landfall.^[20]

Deaths

During the last two centuries, tropical cyclones have been responsible for the deaths of about 1.9 million people worldwide. It is estimated that 10,000 people per year perish due to tropical cyclones.^[22] The deadliest tropical cyclone was the 1970 Bhola cyclone which had a death toll of anywhere from 300,000 to 500,000 lives.



The aftermath of Hurricane Katrina in Gulfport, Mississippi. Katrina was the second-costliest tropical cyclone in United States history.

Although cyclones take an enormous toll in lives and personal property, they may be important factors in the precipitation regimes of places they affect and bring much-needed precipitation to otherwise dry regions. Hurricanes in the eastern north Pacific often supply moisture to the Southwestern United States and parts of Mexico.^[17] Japan receives over half of its rainfall from typhoons.^[18] Hurricane Camille averted drought conditions and ended water deficits along much of its path,^[19] though it also killed 259 people and caused \$9.14 billion (2005 USD) in damage.

On the other hand, the occurrence of tropical cyclones can cause tremendous variability in rainfall over the areas they affect: indeed cyclones are the primary cause of the most extreme rainfall variability in the world, observed in places such as Onslow and Port Hedland in subtropical Australia

United States

Before Hurricane Katrina, the average death rate for tropical cyclones in the United States was decreasing. The main cause of storm-related fatalities was shifting away from storm surge and towards freshwater flooding.^[24] However, the median death rate per storm had increased through 1979, with a lull during the 1980–1995 period. This was due to greater numbers of people moving to the coastal margins and into harm's way. Despite advances in warning strategies and reduction in track forecast error, this increase in fatalities is expected to continue for as long as people migrate towards the shore.^[25]

Deaths per year from tropical cyclones	
Australia	5 ^[21]
United States	25 ^[22]
East Asia	740 ^[23]
Globally	10000 ^[22]

Reconstruction and repopulation

While tropical cyclones may well seriously damage settlement, total destruction encourages rebuilding. For example, the destruction wrought by Hurricane Camille on the Gulf coast spurred redevelopment, greatly increasing local property values.^[19] Research indicates that the typical hurricane strike raises real house prices for a number of years, with a maximum effect of between 3 percent to 4 percent three years after occurrence.^[26] However, disaster response officials point out that redevelopment encourages more people to live in clearly dangerous areas subject to future deadly storms. Hurricane Katrina is the most obvious example, as it devastated the region that had been revitalized after Hurricane Camille. Many former residents and businesses do relocate to inland areas away from the threat of future hurricanes as well.



Aerial image of destroyed houses in Tacloban, following Typhoon Haiyan

In isolated areas with small populations, tropical cyclones may cause enough casualties to contribute to the founder's effect as survivors repopulate their place. For example, around 1775, a typhoon hit Pingelap Atoll, and in combination with a subsequent famine, reduced the island's population to a low level. Several generations after the disaster, as many as 10% of Pingelapese have a genetic form of color-blindness called achromatopsia.^[27] This is due to one of the survivors of the depopulation brought on by the typhoon having a mutated gene, which the population bottleneck caused to be at a higher-than-usual level in succeeding generations.^[27]



Hurricane Isabel (2003)'s effect on the North Carolina Outer Banks

Effects on natural resources

Geomorphology

Tropical cyclones reshape the geology near the coast by eroding sand from the beach as well as offshore, rearranging coral, and changing dune configuration onshore. Their rain water gets absorbed into stalagmites within caves, creating a record of past tropical cyclone impacts.

Coastal ridges

Waves and storm surges accompanying tropical cyclones erode undersea sands, erode shell deposits, break off corals from near shore reefs in their paths, and carry all this detritus landwards in a rolling wave of material that is deposited onshore, above highest astronomical tide as a ridge of sand, shell and coral.^[28] For example, each severe tropical cyclone (i.e. Category 4–5 on the Saffir-

Simpson scale) crossing northeast Australia's tropical coastline since the last significant change in sea levels (about 5000 years ago) has 'emplaced' such ridges within the coastal landscape forming, in some places, series of ridges and a geomorphological record of highest magnitude cyclones hitting the coast over 3000 – 5000 years.^[29]

Eyewitness accounts verify ridges of this kind are formed by severe tropical cyclones and two clear examples cited are the 18 kilometres (11 mi) long, 35 metres (115 ft) wide, 3.5 metres (11 ft) high coral shingle ridge deposited on Funafuti Atoll (Central South Pacific) by Cyclone Bebe in October 1972, and the large coral shingle ridge deposited on Jaluit Atoll (Marshall Islands) by Typhoon Ophelia in January 1958. In tropical northeast Australia, an intense tropical cyclone hit in March 1918 (crossing over the town of Innisfail), at which time there were eyewitness accounts of a 4.5 metres (15 ft) to 5.1 metres (17 ft) high ridge of pumice being deposited by that cyclone's surge as it crossed the coast.^[28]

Limestone cave stalagmites

When tropical cyclones cross land, thin layers of calcium carbonate of 'light' composition (i.e. unusual isotopic ratio of Oxygen-18 and Oxygen-16) are deposited onto stalagmites in limestone caves up to 300 kilometres (190 mi) from the cyclone's path.^[29]

As the cloud tops of tropical cyclones are high and cold, and their air is humid – their rainwater is 'lighter'. In other words, the rainfall contains significantly higher quantities of unevaporated Oxygen-18 than other tropical rainfall. The isotopically lighter rainwater soaks into the ground, percolates down into caves, and, within a couple of weeks, Oxygen-18 transfers from the water into calcium carbonate, before being deposited in thin layers or 'rings' within stalagmites. A succession of such events created within stalagmites maintain a record of cyclones tracking within a 300 kilometres (190 mi) radius of caves going back centuries, millennia, or even millions of years.^[30]

At Actun Tunichil Muknal cave in central Belize, researchers drilling stalagmites with a computer- controlled dental drill accurately identified and verified evidence of isotopically light rainfall for 11 tropical cyclones occurring over a 23-year period (1978–2001).^[30]

At the Chillagoe limestone caves in northeast Australia (130 kilometres (81 mi) inland from Cairns) researchers identified and matched evidence of isotopically light rainfall with 100 years of cyclone records, and from this have created a record of tropical cyclones from 2004 back to 1200 A.D. (an 800-year record).^[29]

Landscapes

Severe tropical cyclones defoliate tropical forest canopy trees, remove vines and epiphytes from the trees, break tree crown stems, and cause tree falls. The degree of damage they do along their paths, at a landscape level (i.e. > 10 kilometres (6.2 mi)), can be catastrophic yet variable and patchy.^[31] Trees break at 42 m/s, regardless of size and type.^{[32][33]} Stripping trees and scattering forest debris also provides fuel for wildfires, such as a blaze that lasted three months in 1989 and burned 460 square miles (1,200 km²) of forest that had been stripped by Hurricane Gilbert.^[34]

- Wind velocity gradients or horizontal wind shear (size of cyclone, the intensity of cyclone, proximity to the cyclone, and local scale cyclonic convection effects).
- Degree of exposure (windward exposure, leeward acceleration, or local topographic sheltering/shading); and
- Ecosystem species composition and forest structure

Assessments of cyclone damage done to tropical rainforest landscapes in northeast Australia, have produced the following typology for describing and 'mapping' the variable impacts they have along their paths, as follows:^[35]

1. **Severe and extensive** closest to the centre of cyclone: impact appears to be multidirectional and is evidenced by crowns of most trees having been broken, smashed or windthrown
2. **Severe and localised** closer to the cyclone centre than its edge: direction of the destructive winds is clearly identifiable, and severe canopy disruption is limited to the windward aspect of these forested areas
3. **Moderate canopy disturbance** closer to cyclone edge than its centre: most of the tree stems are still standing, with only some tree falls, and most of the damage is the defoliation of the canopy and branch breakage;
4. **Slight canopy disturbance** closest to cyclone edge: occasional stem fall or branch breakage, with most of the damage consisting of loss of foliage on the forest edges only subsequently followed by leaf damage and heavy leaf litter falls.

See also

- [Tropical cyclones and climate change](#)
- [List of wettest tropical cyclones by country](#)

References

1. National Oceanic & Atmospheric Administration (August 2000). "NOAA Question of the Month: How much energy does a hurricane release?" (https://web.archive.org/web/20060221063725/http://www.noaa.gov/questions/question_082900.html). NOAA. Archived from the original (http://www.noaa.gov/questions/question_082900.html) on 2006-02-21. Retrieved 2006-03-31.
2. David Roth and Hugh Cobb (2001). "Eighteenth Century Virginia Hurricanes" (<http://www.wpc.ncep.noaa.gov/research/roth/va18hur.htm>). NOAA. Retrieved 2007-02-24.
3. Earth Observatory (2005). "Passing of Hurricanes Cools Entire Gulf" (https://web.archive.org/web/20060930235454/http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17164) National Aeronautics and Space Administration Archived from the original (http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17164) on 2006-09-30 Retrieved 2006-04-26.
4. Franklin, James (July 12, 2005). "Tropical Storm Emily Discussion No. 8, 5:00p.m. EDT" (<http://www.nhc.noaa.gov/archive/2003/dis/al172003.discus.016.shtml>) National Hurricane Center Retrieved 2006-05-02.
5. "Living With an Annual Disaster" (https://web.archive.org/web/20060324112949/http://www.zurich.com/main/productsandsolutions/industryinsight/2005/july2005/industryinsight20050711_004.htm) Zurich Financial Services. July–August 2005. Archived from the original (http://www.zurich.com/main/productsandsolutions/industryinsight/2005/july2005/industryinsight20050711_004.htm) on March 24, 2006 Retrieved 2006-11-29.
6. Edward N. Rappaport and Jose Fernandez-Partagas The Deadliest Atlantic Tropical Cyclones, 1492–1996. (<http://www.nhc.noaa.gov/pastdeadly.shtml>) Retrieved on 2008-01-01.
7. Sun-Sentinel. Hurricane timeline: 1495 to 1800. (<http://www.sun-sentinel.com/news/weather/hurricane/sfl-hc-history-1495to1800,0,3354030.html>) Retrieved on 2007-10-03.
8. Peter Linebaugh and Marcus Rediker The Wreck of the Sea-Venture. (https://web.archive.org/web/20070926034027/http://www.clairehope.btinternet.co.uk/PDFs/LinebaughRediker_seaventure.pdf)
9. American Meteorological Society "AMS Glossary" (<https://web.archive.org/web/20090723195128/http://amsglossary.allenpress.com/glossary/search?id=dangerous-semicircle1>) Glossary of Meteorology. Allen Press. Archived from the original (<http://amsglossary.allenpress.com/glossary/search?id=dangerous-semicircle1>) on 23 July 2009. Retrieved 27 October 2012.
10. The Pennsylvania State University Lesson 21: Weather. (<http://dolphin.upenn.edu/~nrotc/ns301/lesson21.pdf>) Retrieved on 2007-05-26. Archived (<https://web.archive.org/web/20071129132949/http://dolphin.upenn.edu/~nrotc/ns301/lesson21.pdf>) November 29, 2007, at the Wayback Machine
11. *Typhoons and Hurricanes* (<https://www.youtube.com/watch?v=039BZr1QDTQ>). United States Navy 1971.
12. Chris Landsea (1998). "How does the damage that hurricanes cause increase as a function of wind speed?" (<https://web.archive.org/web/20070309223502/http://www.aoml.noaa.gov/hrd/tcfaq/D5.html>) Hurricane Research Division. Archived from the original (<http://www.aoml.noaa.gov/hrd/tcfaq/D5.html>) on 2007-03-09. Retrieved 2007-02-24.
13. Staff Writer (2005-08-30). "Hurricane Katrina Situation Report #11" (http://www.oe.netl.doe.gov/docs/katrina/katrina_083005_1600.pdf) (PDF). Office of Electricity Delivery and Energy Reliability (OE) United States Department of Energy. Retrieved 2007-02-24.
14. James M. Shultz, Jill Russell and Zelde Espinel (2005) "Epidemiology of Tropical Cyclones: The Dynamics of Disaster, Disease, and Development" (<http://epirev.oxfordjournals.org/cgi/content/full/27/1/21>). Oxford Journal Retrieved 2007-02-24.
15. Rappaport, Ed (May 2006). "Inland Flooding" (http://www.nhc.noaa.gov/HAW2/english/inland_flood.shtml) National Hurricane Preparedness Week. National Hurricane Center Retrieved 2006-03-31.
16. South Florida Water Management District (2005-10-11). "Editorial Perspectives" (https://web.archive.org/web/20070517125537/http://mysfwmd.gov/portal/page?_pageid=2814%2C19613298%2C2814_19613515&_dad=portal&_schema=PORTAL). Archived from the original (https://web.archive.org/web/20070517125537/http://mysfwmd.gov/portal/page?_pageid=2814,19613298,2814_19613515&_dad=portal&_schema=PORTAL) on 2007-05-17. Retrieved 2007-05-17.

17. National Oceanic and Atmospheric Administration 2005 Tropical Eastern North Pacific Hurricane Outlook (http://www.cpc.ncep.noaa.gov/products/Epac_hurr/Epac_hurricane.html) accessed May 2, 2006
18. Whipple, Addison (1982). *Storm*. Alexandria, VA: Time Life Books p. 54. ISBN 0-8094-4312-0
19. Christopherson, Robert W (1992). *Geosystems: An Introduction to Physical Geography* New York: Macmillan Publishing Company pp. 222–224. ISBN 0-02-322443-6
20. Atlantic Oceanographic and Meteorological Laboratory Hurricane Research Division (2006-10-04). "Frequently Asked Questions: Are TC tornadoes weaker than midlatitude tornadoes?" (<https://web.archive.org/web/20090914103006/http://www.aoml.noaa.gov/hrd/tcfaq/L6.html>). NOAA. Archived from the original (<http://www.aoml.noaa.gov/hrd/tcfaq/L6.html>) on 2009-09-14 Retrieved 2006-07-25.
21. Christopher J. Ryan (December 1993) *Costs and benefits of tropical cyclones, severe thunderstorms and bushfires in Australia*. (<http://www.springerlink.com/content/v17253057708615/>) Retrieved on 2007-05-18.
22. Robert F. Adler (June 20, 2005). *Estimating the benefit of TRMM tropical cyclone data in saving lives* (<http://ams.confex.com/ams/pdfpapers/91358.pdf>) Retrieved on 2007-05-18.
23. Mark Saunders and Paul Rockett (2001) *Improving typhoon predictions*. (<http://tsr.mssl.ucl.ac.uk/docs/GlobalReinsuranceArticle.pdf>) Archived (<https://web.archive.org/web/20070103223530/http://tsr.mssl.ucl.ac.uk/docs/GlobalReinsuranceArticle.pdf>) 2007-01-03 at the Wayback Machine Retrieved on 2007-05-18.
24. National Weather Service Southern Region Headquarters. *Did you know?* (<http://www.srh.weather.gov/floods/images/flood.PDF>) Archived (<https://web.archive.org/web/20070508223853/http://www.srh.weather.gov/floods/images/flood.PDF>) 2007-05-08 at the Wayback Machine Retrieved on 2007-05-18.
25. Anthony Arguez and James B. Elsner (April 11, 2001) *Trends in U.S. Tropical Cyclone Mortality During the Past Century*. (<http://myweb.fsu.edu/jelsner/temp/HTML/Research/papers/mortality/mortal.html>) Retrieved on 2007-05-18.
26. Federal Reserve Bank of Dallas, *The Impact of Hurricanes on Housing Prices: Evidence from US Coastal Cities* October 2010 (<http://www.dallasfed.org/assets/documents/research/papers/2010/wp1009.pdf>)
27. Val C. Sheffield (2000). "The vision of Typhoon Lengkieki" (http://www.nature.com/nm/journal/v6/n7/full/nm0700_746.html). *Nature Medicine* pp. 746–7. Retrieved 2007-05-25.
28. Nott, J.F. (2003) "Intensity of Prehistoric Tropical Cyclones", *Journal of Geophysical Research* 108(D7) (http://www.tesag.jcu.edu.au/staf/jnott/abstracts/JGR_paper.pdf) Archived (https://web.archive.org/web/20070830142042/http://www.tesag.jcu.edu.au/staf/jnott/abstracts/JGR_paper.pdf) 2007-08-30 at the Wayback Machine
29. Nott, J.F: "Global Climate change and the tropical cyclone palaeo-record in Australia" *Paper Delivered to Cyclone Science Seminar, James Cook University 27 September 2007*
30. Frappier, A.B. et al. (2007) "Stalagmite stable isotope record of recent tropical cyclone events", 'Geology', 35(2): 111–114]
31. Turton, S.M. and A. Dale (2007) *A preliminary assessment of the environmental impacts of Cyclone Larry on the forest landscapes of northeast Queensland, with reference to responses to natural resource management issues in the aftermath*, *Journal Report Submitted to the Australian Bureau of Meteorology* 2 (<http://www.wettropics.gov.au/res/downloads/cyclone/TurtonDaleReport2007.pdf>) Archived (<https://web.archive.org/web/20071129132950/http://www.wettropics.gov.au/res/downloads/cyclone/TurtonDaleReport2007.pdf>) 2007-11-29 at the Wayback Machine
32. <http://journals.aps.org/pre/abstract/10.1103/PhysRevE.93.023001>
33. <http://physics.aps.org/synopsis-for/10.1103/PhysRevE.93.023001>
34. *Natural Hazards of North America* (map). National Geographic Society July 1998.
35. Unwin, G. L., Applegate G. B., Stocker G. C. & Nicholson D. I. (1988) "Initial effects of tropical cyclone Winifred on forests in north Queensland", *Proceedings of Ecological Society of Australia* 15: 283–296

Retrieved from 'https://en.wikipedia.org/w/index.php?title=Effects_of_tropical_cyclones&oldid=831466549

This page was last edited on 20 March 2018, at 19:04.

Text is available under the [Creative Commons Attribution-ShareAlike License](#); additional terms may apply. By using this site, you agree to the [Terms of Use](#) and [Privacy Policy](#). Wikipedia® is a registered trademark of the [Wikimedia Foundation, Inc.](#), a non-profit organization.