A new world record wind gust: 253 mph in Australia's Tropical Cyclone Olivia

By: Dr. Jeff Masters, 5:34 PM GMT on January 27, 2010

The 6,288-foot peak of New Hampshire's Mount Washington is a forbidding landscape of wind-swept barren rock, home to some of planet Earth's fiercest winds. As a 5-year old boy, I remember being blown over by a terrific gust of wind on the summit, and rolling out of control towards a dangerous drop-off before a fortuitously-placed rock saved me. Perusing the *Guinness Book of World Records* as a kid, three iconic world weather records always held a particular mystique and fascination for me: the incredible 136°F (57.8°C) at El Azizia, Libya in 1922, the -128.5°F (-89.2°C) at the "Pole of Cold" in Vostok, Antarctica in 1983, and the amazing 231 mph wind gust (103.3 m/s) recorded in 1934 on the summit of Mount Washington, New Hampshire. Well, the legendary winds of Mount Washington have to take second place now, next to the tropical waters of northwest Australia. The World Meteorological Organization (WMO) has announced that the new world wind speed record at the surface is a 253 mph (113.2 m/s) wind gust measured on Barrow Island, Australia. The gust occurred on April 10, 1996, during passage of the eyewall of Category 4 Tropical Cyclone Olivia.

Figure 1. Instruments coated with rime ice on the summit of Mt. Washington, New Hampshire. Image credit: Mike Theiss.

Tropical Cyclone Olivia

Tropical Cyclone Olivia was a Category 4 storm on the U.S. Saffir-Simpson scale, and generated sustained winds of 145 mph (1-minute average) as it crossed over Barrow Island off the northwest coast of Australia on April 10, 1996. Olivia had a central pressure of 927 mb and an eye 45 miles in diameter at the time, and generated waves 21 meters (69 feet) high offshore. According to Black *et al.* (1999), the eyewall likely had a tornado-scale mesovortex embedded in it that caused the extreme wind gust of 253 mph. The gust was measured at the standard measuring height of 10 meters above ground, on ground at an elevation of 64 meters (210 feet). A similar mesovortex was encountered by a Hurricane Hunter aircraft in Hurricane Hugo of 1989, and a mesovortex was also believed to be responsible for the 239 mph wind gust measured at 1400 meters by a dropsonde in Hurricane Isabel in 2003. For reference, 200 mph is the threshold for the strongest category of tornado, the EF-5, and any gusts of this strength are capable of causing catastrophic damage.

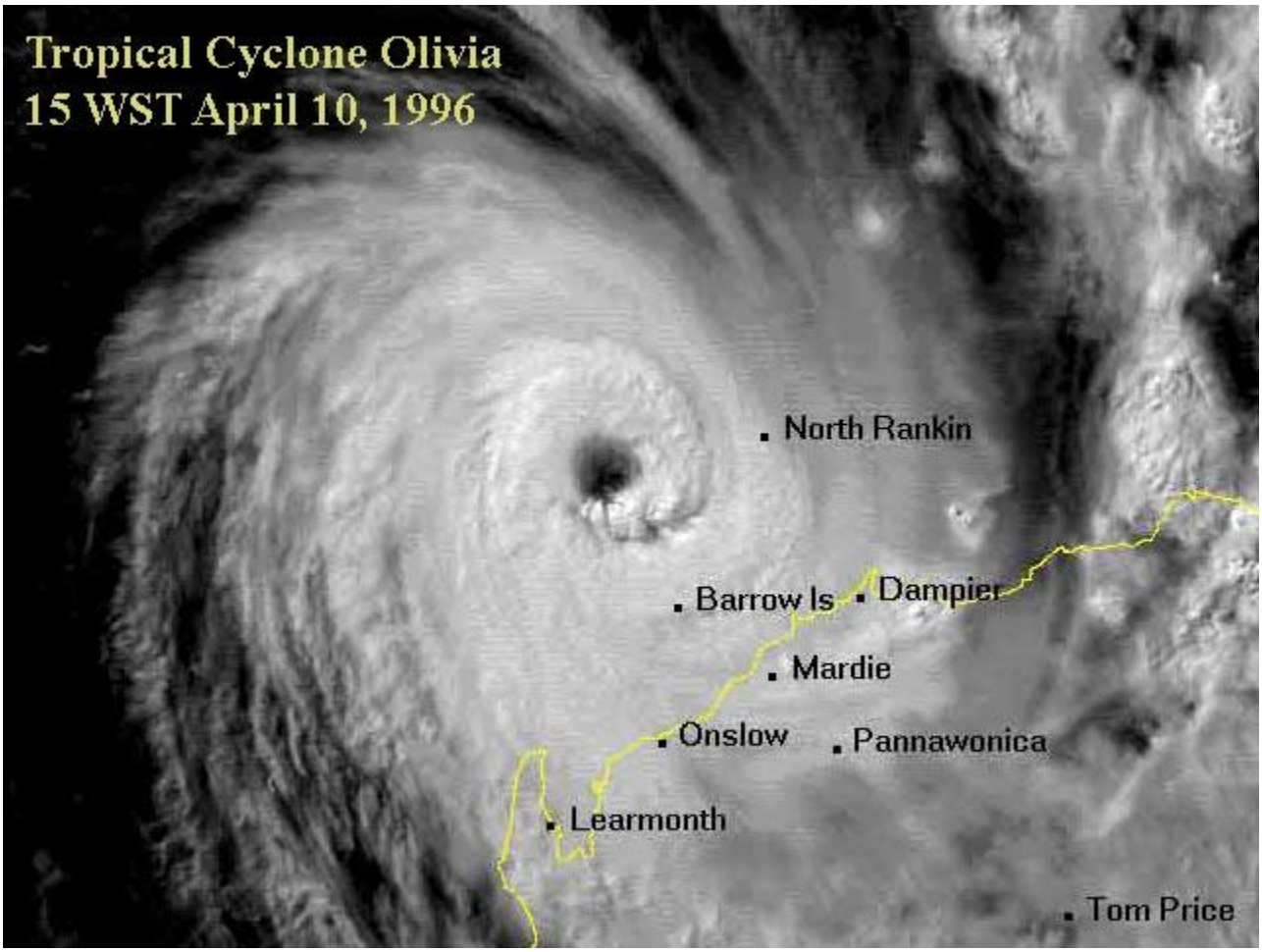

Figure 2. Visible satellite image of Tropical Cyclone Olivia a few hours before it crossed Barrow Island, Australia, setting a new world-record wind gust of 253 mph. Image credit: Japan Meteorological Agency.

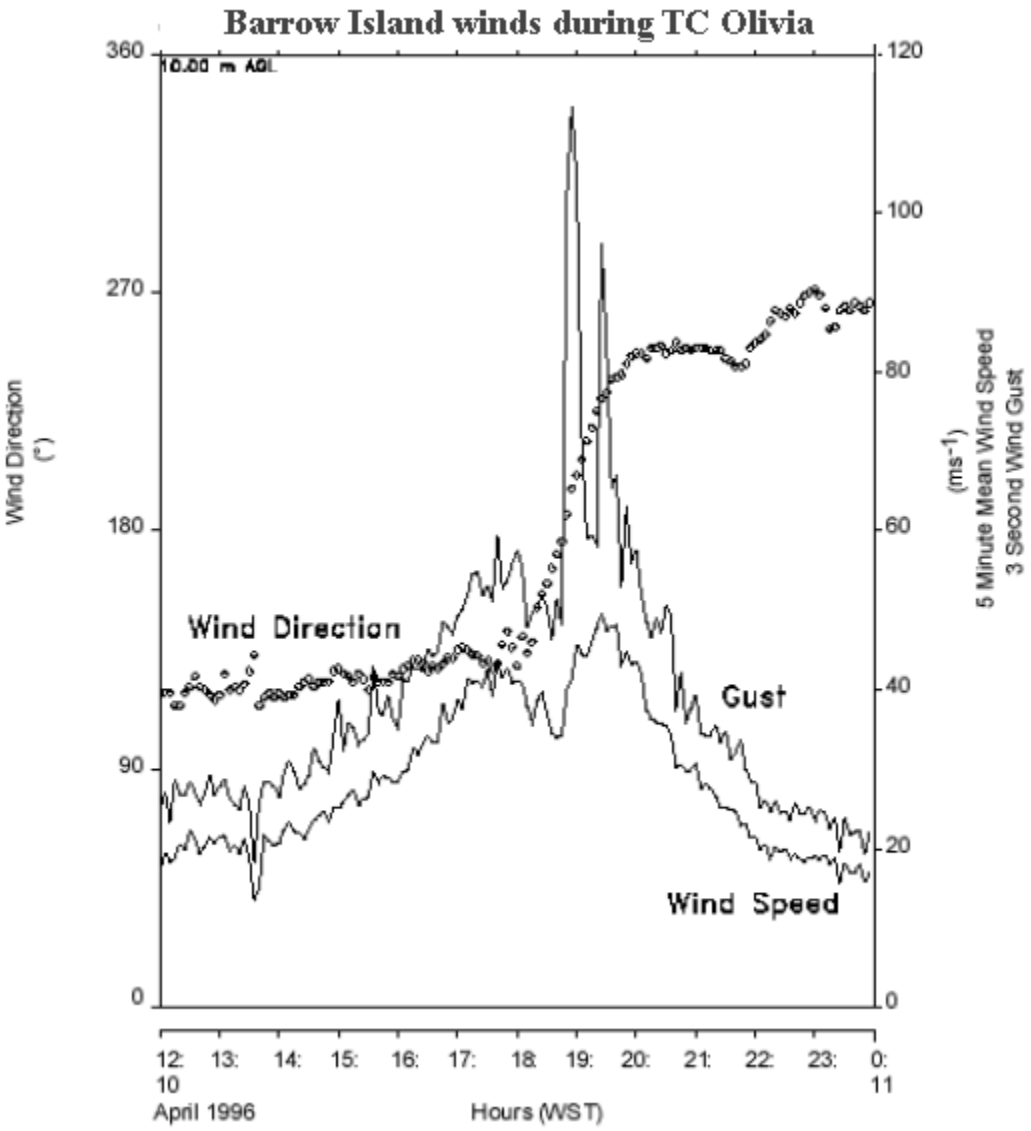

Figure 3. Wind trace taken at Barrow Island, Australia during Tropical Cyclone Olivia. Image credit: Buchan, S.J., P.G. Black, and R.L. Cohen, 1999, "The Impact of Tropical Cyclone Olivia on Australia's Northwest Shelf", paper presented at the 1999 Offshore Technology Conference in Houston, Texas, 3-6 May, 1999.

Why did it take so long for the new record to be announced?

The instrument used to take the world record wind gust was funded by a private company, Chevron, and Chevron's data was not made available to forecasters at Australia's Bureau of Meteorology (BOM) during the storm. After the storm, the tropical cyclone experts at BOM were made aware of the data, but it was viewed as suspect, since the gusts were so extreme and the data was taken with equipment of unknown accuracy. Hence, the observations were not included in the post-storm report. Steve Buchan from RPS MetOcean believed in the accuracy of the observations, and coauthored a paper on the record gust, presented at the 1999 Offshore Technology Conference in Houston (Buchan *et al.*, 1999). The data lay dormant until 2009, when Joe Courtney of the Australian Bureau of Meteorology was made aware of it. Courtney wrote up a report, coauthored with Steve Buchan, and presented this to the WMO extremes committee for ratification. The report has not been made public yet, and is

awaiting approval by Chevron. The verified data will be released next month at a World Meteorological Organization meeting in Turkey, when the new world wind record will become official.

New Hampshire residents are not happy

Residents of New Hampshire are understandably not too happy about losing their cherished claim to fame. The current home page of the Mount Washington Observatory reads, *"For once, the big news on Mount Washington isn't our extreme weather. Sadly, it's about how our extreme weather--our world record wind speed, to be exact--was outdone by that of a warm, tropical island".*

Comparison with other wind records

Top wind in an Atlantic hurricane: 239 mph (107 m/s) at an altitude of 1400 meters, measured by dropsonde in Hurricane Isabel (2003).
Top surface wind in an Atlantic hurricane: 211 mph (94.4 m/s), Hurricane Gustav, Paso Real de San Diego meteorological station in the western Cuban province of Pinar del Rio, Cuba, on the afternoon of August 30, 2008.
Top wind in a tornado: 302 mph (135 m/s), measured via Doppler radar at an altitude of 100 meters (330 feet), in the Bridge Creek, Oklahoma tornado of May 3, 1999.
Top surface wind not associated with a tropical cyclone or tornado: 231 mph (103.3 m/s), April 12, 1934 on the summit of Mount Washington, New Hampshire.
Top wind in a typhoon: 191 mph (85.4 m/s) on Taiwanese Island of Lanyu, Super Typhoon Ryan, Sep 22, 1995; also on island of Miyakojima, Super Typhoon Cora, Sep 5, 1966.
Top surface wind not measured on a mountain or in a tropical cyclone: 207 mph (92.5 m/s) measured in Greenland at Thule Air Force Base on March 6, 1972.
Top wind measured in a U.S. hurricane: 186 mph (83.1 m/s) measured at Blue Hill Observatory, Massachusetts, during the 1938 New England Hurricane.

References

Buchan, S.J., P.G. Black, and R.L. Cohen, 1999, "The Impact of Tropical Cyclone Olivia on Australia's Northwest Shelf", paper presented at the 1999 Offshore Technology Conference in Houston, Texas, 3-6 May, 1999.

Black, P.G., Buchan, S.J., and R.L. Cohen, 1999, "The Tropical Cyclone Eyewall Mesovortex: A Physical Mechanism Explaining Extreme Peak Gust Occurrence in TC Olivia, 4 April 1996 on Barrow Island, Australia", paper presented at the 1999 Offshore Technology Conference in Houston, Texas, 3-6 May, 1999.

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World: Maximum Surface Wind Gust (3-Second)

Record Value	113.2 m/s (253 mph; 220 kt)
Date of Record (DMY)	1055 UTC 10 / 4 [April] / 1996
Length of Record	1932-present
Instrumentation	heavy duty three-cup Synchrotac anemometer
Geospatial Location	Barrow Island Australia [20°40'S, 115°23'E, elevation: 64m (210ft)]

References

WMO Evaluation Panel of experts in charge of global weather and climate extremes within the WMO Commission for Climatology (CCl)consisted of the following experts: Dr Pierre Bessemoulin, MeteoFrance and President of CCl; Dr Tom Peterson, NOAA National Climatic Data Center; Dr Blair Trewin, Australian Bureau of Meteorology; Dr Jose M. Rubiera Torres, Cuban Instituto de Meteorología; Dr John (Jack) Beven, USA National Hurricane Center; Dr John King, British Antarctic Survey; Dr Randy Cerveny, Arizona State University and CCl Rapporteur of Climate Extremes.

Discussion

In "A review of extreme wind gusts at Barrow Island during Tropical Cyclone Olivia, 10 April 1996" by Joe Courtney and Steve Buchan: "The Barrow Island anemometer was a heavy duty three-cup Synchrotac anemometer positioned 10 m above ground level and 64 m above sea level, mounted on a mast as

shown in Figs. 3 and 4. The mast was a cyclone-rated Hills telescoping 10m tower comprising 2 x 4.5m sections with a 1m mast extension. Each section was guyed with 3 x 6mm stainless steel wires.

The instrument was sited towards the centre of the island about 4 km from the coast to the southeast and about 7 km inland from the south southwest, the direction of the strongest wind gusts. The instrument is well exposed in all directions, the site is slightly elevated above the surrounding reasonably level terrain and the vegetation is very low.

The instrument was in good working order and was regularly inspected with comparisons made against a hand-held anemometer. The instrument was owned by WAPET, which has since been transferred to Chevron. Maintenance was performed by WNI Science and Engineering (now known as MetOcean Engineers). Synoptic data was ingested into the Bureau of Meteorology system for forecasting and climate applications.

The peak wind gust measurement was one of five extreme gusts during a series of 5-min time periods. Gusts of 199, 220 and 202 knots (369, 408, 374 km/h) were measured followed by a series of four lower values (minimum of 114 knots (211 km/h)) which were then followed by two more extreme gusts of 187 and 161 knots (347 and 298 km/h) in the 5-min time intervals. The elapsed time between gust maxima was 30 min, representing a scale of 8 nm (15 km) compared to the eye diameter of 40 nm (75 km). The 5-min average winds showed maxima and a minimum at the same time periods as the gusts. The pattern and scales suggests that a mesovortex was imbedded in the already strong eyewall mean winds (5-min mean maximum wind = 95 knots (176 km/h)). The extreme gusts represented extreme gust factors of 2.27-2.75, nearly twice the average gust factor throughout the storm of 1.33.

This clearly suggests that some process other than mechanical turbulence is important during this period.

Previous record: 231 mph (372 km/h)at Mt. Washington, New Hampshire, USA