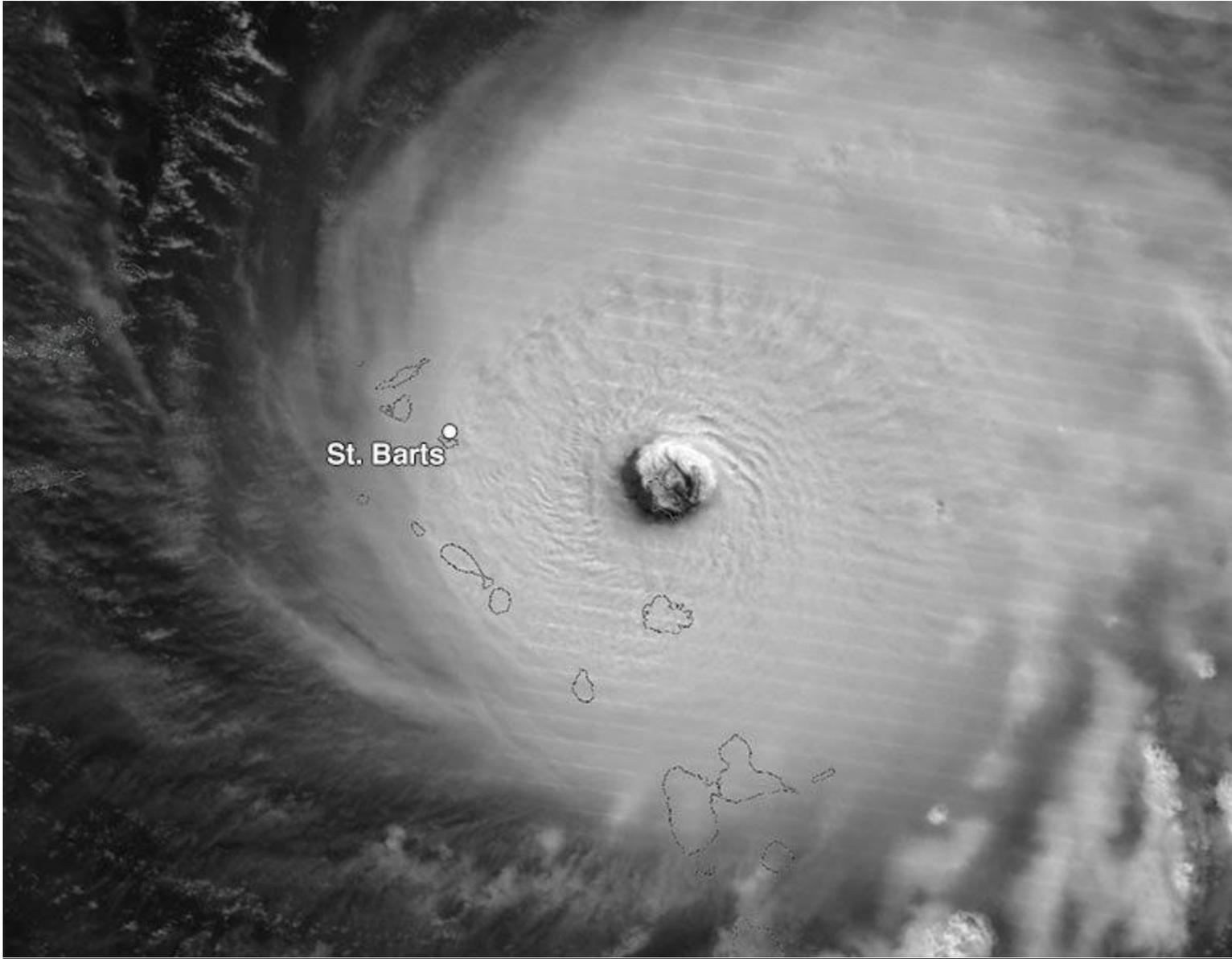


A 199 mph Wind Gust in Irma: a Personal Weather Station Record

Dr. Jeff Masters · January 30, 2018, 3:28 PM EST



Above: Hurricane Irma as seen in moonlight by the VIIRS instrument on the Suomi satellite at approximately 3 am EDT Wednesday, September 6, 2017. Barbuda was in the southeastern part of Irma at this time, and Irma was headed west-northwest towards St. Barts. The eye of Irma passed over St. Barts about three hours after this image was taken (radar loop here). Puerto Rico is visible at the left of the image. Image credit: NASA.

Hurricane Irma smashed through the Leeward Islands in the early morning hours of September 6, 2017, as a catastrophic Category 5 hurricane with 185 mph winds. Irma clobbered the islands of Barbuda, Saint Barthélemy (commonly called St. Barts), Saint Martin/Sint Maarten, and the British Virgin Islands at peak strength, making it the

strongest Atlantic landfalling hurricane in recorded history. As typically occurs during a Cat 5 landfall, wind measurements during eyewall passage were hard to find, since the storm destroyed the measurements sites and/or knocked out their power. The highest winds at an official site during Irma's passage were on Barbuda, where a NOAA National Ocean Service station reported sustained winds of 118 mph (190 km/h) with a gust to 155 mph (249 km/h) at 12:54 am EDT September 6, before the instrument failed.



Figure 1. Serge Brin's personal weather station (PWS) on St. Barts (ISAINTBA3), after Hurricane Irma had severed the 21-foot pole housing the anemometer. The view is to the northwest from the north coast of St. Barts. Image credit: Serge Brin.

However, Serge Brin, owner of a Weather Underground personal weather station (PWS) on St. Barts (ISAINTBA3), wrote me to report that he received a direct hit by Irma, but his PWS stayed up during passage of the front eyewall and a portion of the

back eyewall, before flying debris severed the pole housing the anemometer. Before failing, the station measured the highest wind gust ever recorded by a PWS on the Weather Underground network: 199 mph (320.3 kph). It is quite rare to see a wind gust measurement this high; in fact, there have only been **four** reliably measured wind gusts in world history stronger than that. The world record wind gust is 253 mph at Barrow Island, Australia, during Tropical Cyclone Olivia in 1996. The second highest wind speed ever measured was 231 mph (370 km/hr) on the top of Mt. Washington, New Hampshire, on April 12, 1934, during passage of an extratropical storm. Third place is a 211 mph gust in Cuba during Hurricane Gustav in 2008, and the fourth highest wind gust on record was the 207 mph gust measured in Greenland at Thule Air Force Base on March 6, 1972.

The instrument that measured the 199 mph gust in Irma was a Davis Vantage Pro II. This instrument has a 200 mph (322 kph) design limit to its wind speed measurements, so it is quite possible that the actual winds were higher. Mr. Brin reported: "*Just after the big gust, the counter suddenly went to zero for about thirty seconds, then, normal operation resumed. Does this malfunction indicate exceeding of the capacity of the anemometer? The question remains!*" Peak sustained winds over a 30-minute period at Mr. Brin's PWS site were 106 mph (170.6 kph). These must be increased by a significant factor to convert to the 1-minute average sustained winds that the National Hurricane Center uses.

However, keep in mind that this sensor would should ideally undergo wind tunnel testing at these wind speeds to verify these wind measurements. For example, the official NHC report on Category 5 Hurricane Andrew's landfall in South Florida had this information (thanks go to Bryan Norcross for alerting me to this info):

"The strongest gust reported from near the surface occurred in the northern eyewall a little more than a mile from the shoreline at the home of Mr. Randy Fairbank. He observed a gust of 184 kt (212 mph) moments before portions of a windward wall failed, preventing further observation. The hurricane also destroyed the anemometer. To evaluate the accuracy of the instrument, three anemometers of the type used by Mr. Fairbank were tested in a wind tunnel at Virginia Polytechnic Institute and State University. Although the turbulent nature of the hurricane winds could not be replicated, the results of the wind tunnel tests suggest that the gust Mr. Fairbank observed was less than 184 kt and probably near 154 kt (177 mph). Of course, stronger gusts may have occurred there at a later time, or at another site. Damage at that location was significantly less than the damage to similar structures located about 2 miles south of this neighborhood, implying even stronger winds than observed at this location." The instrument was mounted at about 30 feet high, but it was in a residential neighborhood meaning there was fairly high roughness (a limiting factor) but also unknown Bernoulli effects (possible enhancing factor).

ND

N

NW

NE

km/h

320

W

SW

SE

19 km/h

Figure 2. Image of the console display of Serge Brin's personal weather station on St. Barts ([ISAINTBA3](#)) during the passage of Hurricane Irma, when the anemometer recorded a 320.3 kph (199 mph) wind gust. Image credit: Serge Brin.

A few caveats to the measurement: standard wind measurements at airports are done at a height of 10 meters (33 feet) above flat ground. The ISAINTBA3 instrument was on a 21-foot high mast above ground, so it measured a lower wind speed than if it had been at the standard 33-foot height above ground level. However, the station was situated on a bluff at 50 feet elevation overlooking the ocean; this exposure likely increased the winds above what a measurement station on flat ground would have seen. The bluff faced to the northwest towards the ocean, and the peak winds were measured when the front eyewall of Irma was bringing north-northwest winds directly from the ocean to the site. The minimum pressure measured at the site during passage of the eye was 916 mb--the same as that recorded at the St. Barts airport. Mr. Brin estimated a storm tide of 10 to 12 feet, and the calm of the eye lasted almost one hour and a half. He heard his roosters singing outside during the calm of the eye. His house was damaged, but not excessively.



Figure 3. A door hinge embedded in a tree behind Serge Brin’s house on St. Barts, after passage of Hurricane Irma. Image by Serge Brin.

Mr. Brin had this to say about the experience; *“My weather station will be rebuilt before the next hurricane season, even stronger than before ! I have been interested in hurricanes since I was ten, with the passage of hurricanes David and Frederic in 1979, and in 1995, Luis had allowed me to see the power of destruction that could generate a powerful hurricane.”* A huge thanks go to Serge for sharing his data and experience with us! The National Hurricane Center plans to mention the measurement in their final report on Irma, though the gust will not be classified as an official measurement.

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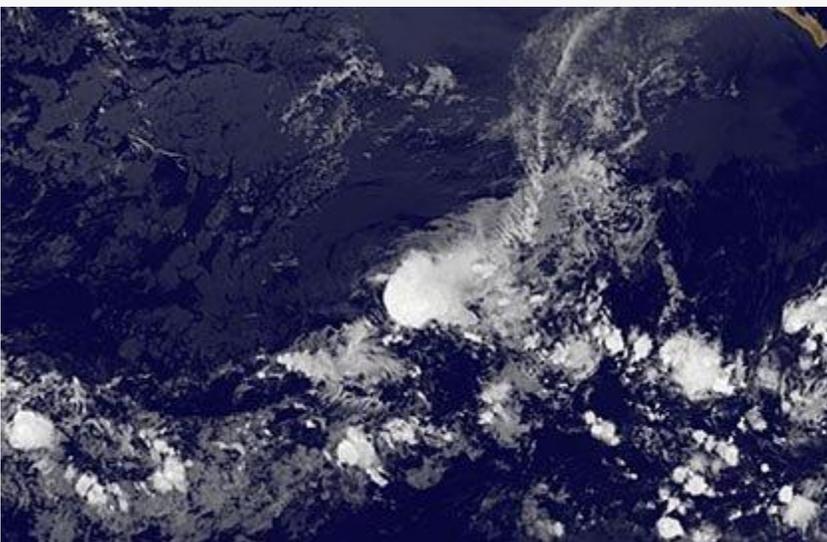
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