iCyclone Chase Report

storm	**Hurricane IAN**		
location	**Punta Gorda, Florida, USA | Georgetown, South Carolina, USA**		
date	**28-30 September 2022**		
chasers	**Josh Morgerman, Erik Fox**	**author**	**Josh Morgerman**

Overview

Hurricane IAN struck the W coast of Florida on the afternoon of 28 September, and then the coast of South Carolina on the afternoon of 30 September 2022.

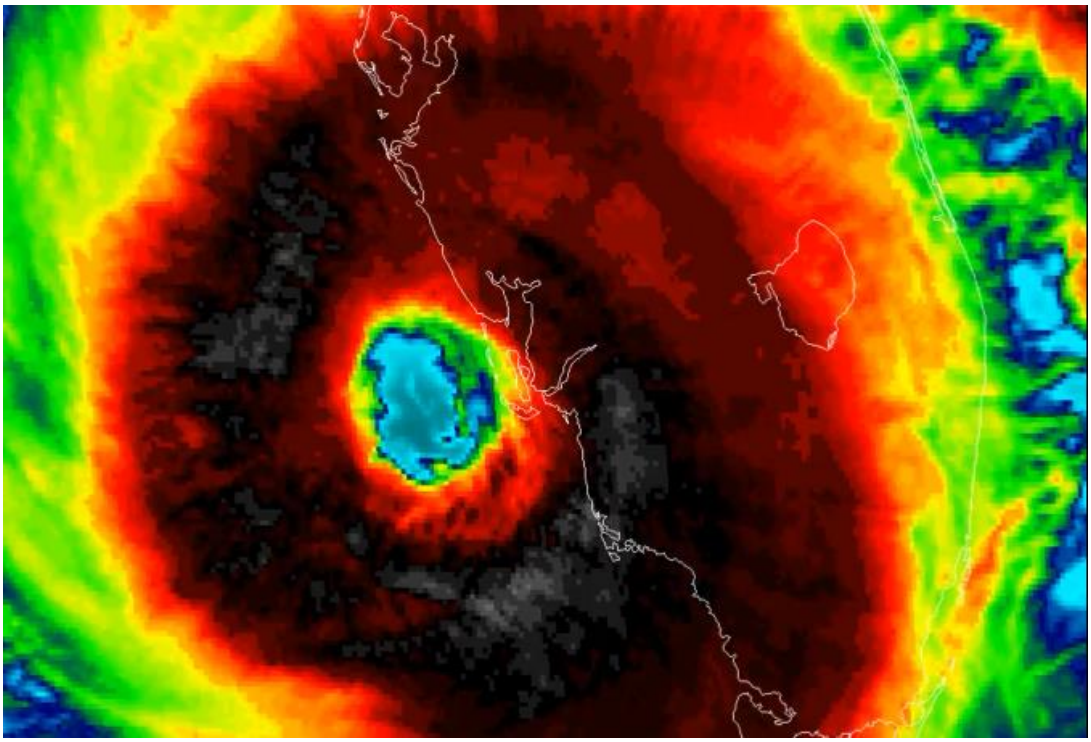
The author was in both impact zones to observe the cyclone's passage and collect data. **Highlights:**

Florida, USA – 28 September

- The author was in **Punta Gorda (26.9385N 82.0527W),** near the landfall point.
  - The **eye** passed over this location from **~4:00 to ~5:48 pm EDT.** It was very windy until ~4:30 pm, by which time conditions had calmed considerably.
  - Minimum sea-level pressure recorded here was **951.2 mb at 4:23 pm (2023Z).** This was during the passage of the eye.
- Another device in **North Port (27.0414N 82.2249W)** measured a minimum of **964.8 mb at 4:17 pm EDT (2017Z).** This spot was ~15 n mi NW of the hurricane's center at its closest approach.
- Another device in **Ruskin (27.7147N 82.3869W)** measured a minimum of **994.9 mb at 4:59 pm EDT (2059Z).** This spot was ~48 n mi NW of the hurricane's center at its closest approach.

South Carolina, USA – 30 September

- A device in **Georgetown (33.3661N 79.2827W),** near the landfall point, measured a minimum of **981.2 mb from 2:37 to 2:41 pm EDT (1837Z to 1841Z)**—suggesting landfall occurred about 30 minutes later than the NHC's operational estimate (2:05 pm).
- A device in **Charleston (32.7810N 79.9652W),** down the coast and far SW of the landfall point, measured a minimum of **991.6 mb at 11:43 am EDT (1543Z).**



Locations

The author documented Hurricane IAN’s landfalls in two states, two days apart.

Florida

Chase Location A—Punta Gorda

The author observed the passage of the hurricane—and collected data—at **26.9385N 82.0527W.** This location is the SpringHill Suites by Marriott Punta Gorda Harborside, a seaside hotel next to the US Highway 41 bridge to Charlotte Harbor. The NHC’s operational (advisory) track indicates this location was close to (less than 4 n mi from) the track of the hurricane’s center—and it went squarely through the hurricane’s eye.

Sensor Location B—North Port

Before positioning at Location A (and before the hurricane struck), the author deployed a data sensor at **27.0414N 82.2249W.** This location is the Hampton Inn & Suites North Port, ~15 n mi NW of the hurricane’s center at its point of closest approach and ~11 n mi NW of Location A. This location went through the hurricane’s NW eyewall and stayed just outside the eye.

Sensor Location C—Ruskin

Also before the hurricane, the author deployed a data sensor at **27.7147N 82.3869W.** This location is the Holiday Inn Express & Suites Ruskin**,** ~48 n mi NW of the hurricane’s center at its point of closest approach and ~50 n mi NNW of Location A. This location stayed just outside the hurricane’s large core.

Figure 1 shows IAN’s track across Florida. **Figure 2** is a zoomed-in view. The **Chase Location (A)** (**purple star**) and **Sensor Locations (B, C)** (**blue, black stars**) are marked.

Figure 1: Chase Map—Florida Landfall

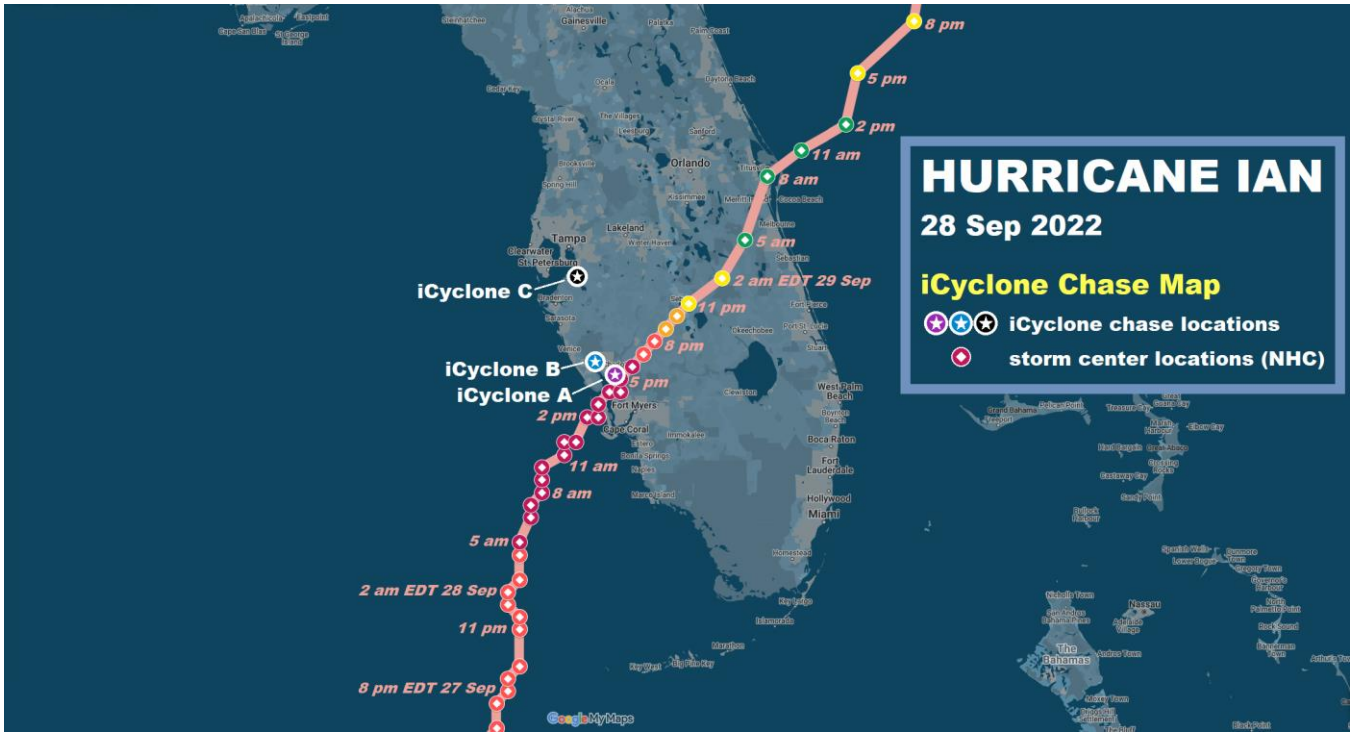
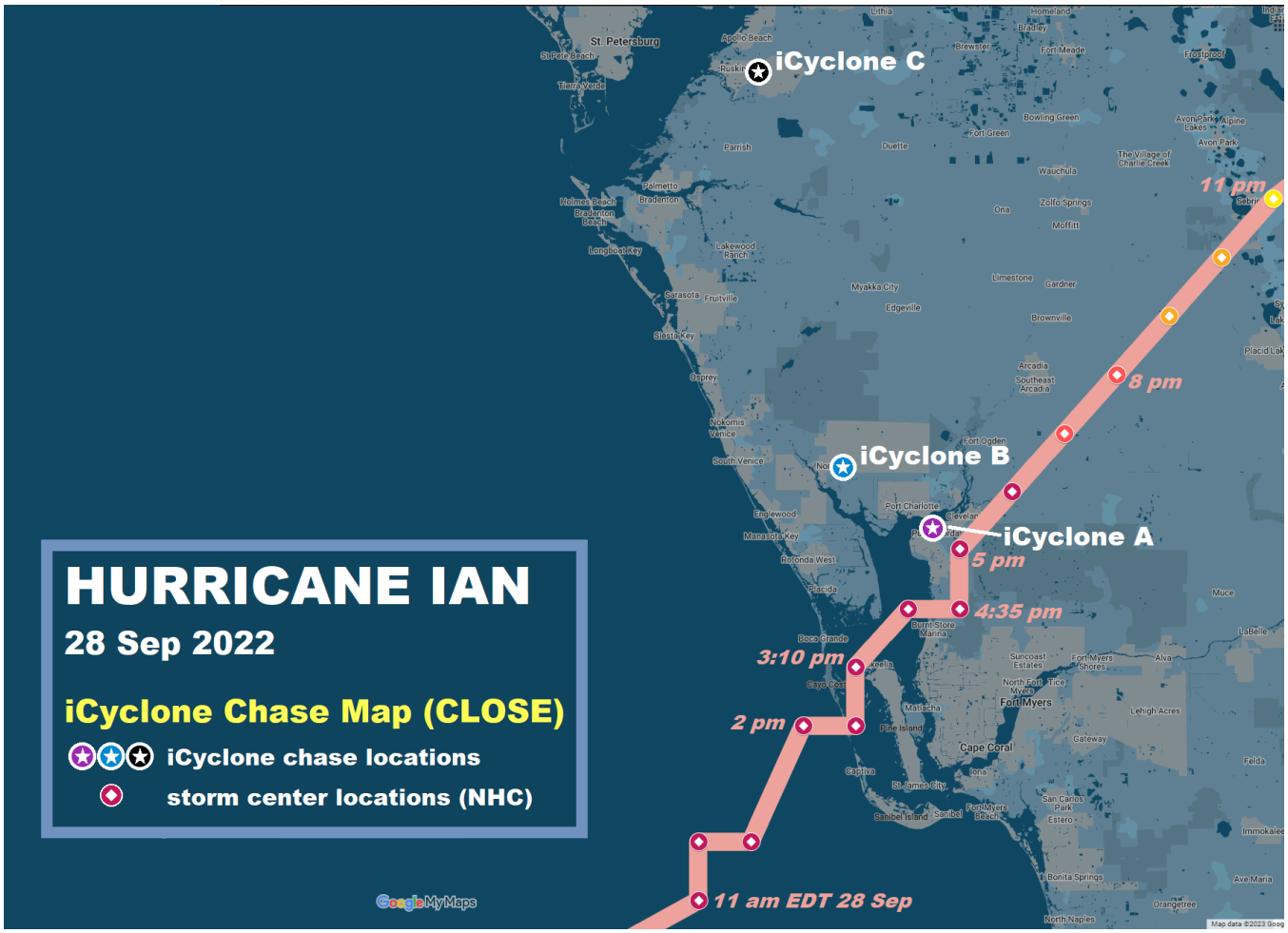


Figure 2: Chase Map—Florida Landfall (CLOSE)



ICYCLONE CHASE REPORT

South Carolina

Chase Location A—Georgetown

As IAN approached the coast, the author deployed a data sensor at **33.3661N 79.2827W.** This location is a storefront on Front Street in the heart of Historic Georgetown, very near the hurricane's landfall point.

Sensor Location B—Charleston

Earlier in the morning, the author deployed a data sensor at **32.7810N 79.9652W.** This location is the Holiday Inn Charleston-Riverview, ~50 n mi SW of the hurricane's landfall point. Radar images and surface data suggest this location was lashed by the vigorous left side of the cyclone's broad core.

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Figure 3 shows IAN's track into South Carolina. **Figure 4** is a zoomed-in view. The **Chase Location (A)** (**purple star**) and **Sensor Location (B)** (**blue star**) are marked.

Figure 3: Chase Map—South Carolina Landfall

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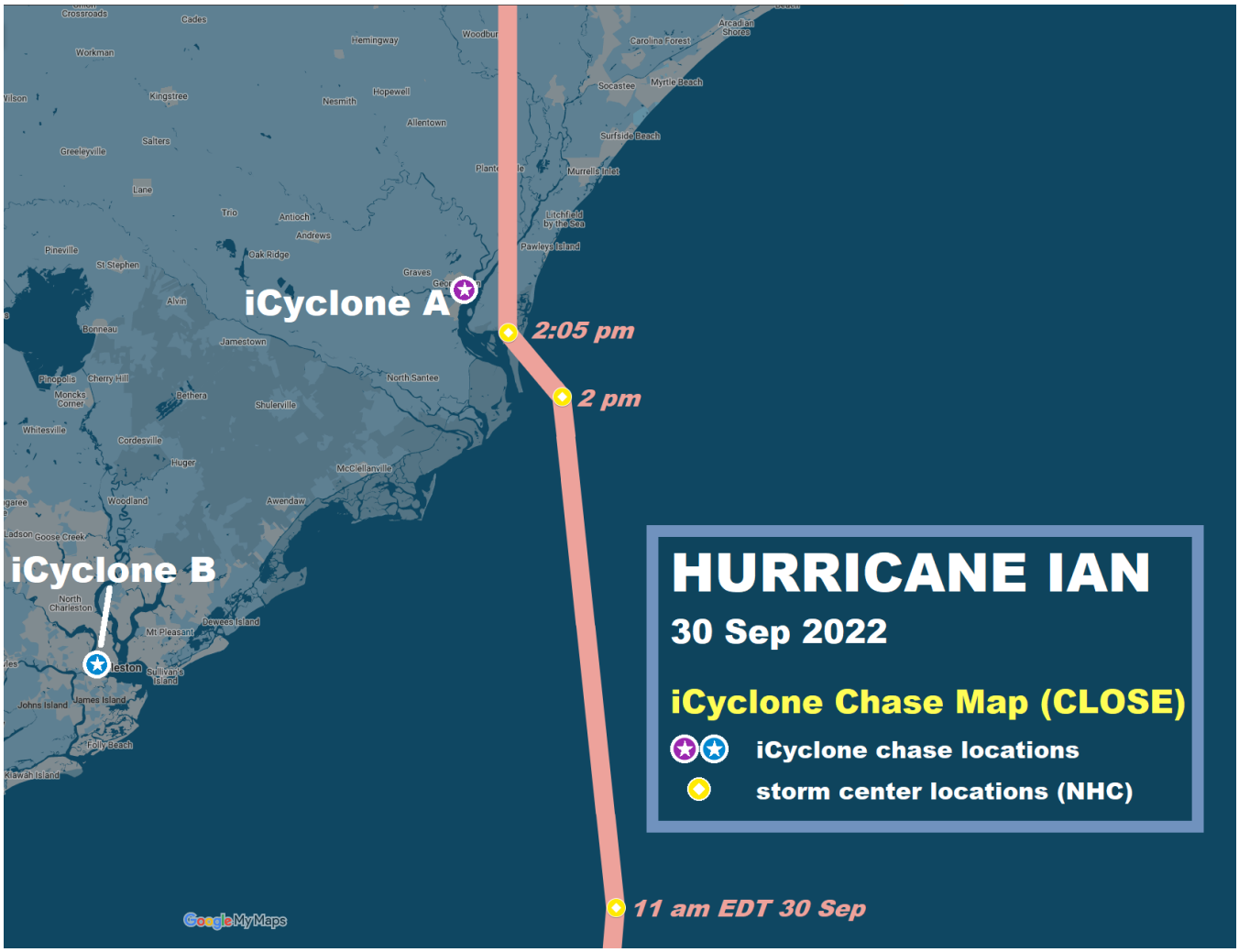
Figure 4: Chase Map—South Carolina Landfall (CLOSE)



Data & Observations—Florida

Punta Gorda (Location A)

The author rode out the hurricane at the Punta Gorda location (**26.9385N 82.0527W**), over which the hurricane's eye passed.

Setup & Calibration

The author deployed a Kestrel 4500 on the second floor of a hotel. The reference altitude was 21 ft, which is the estimated ground elevation of **6 ft,** plus additional height to account for the device being on a countertop in a second-floor room.

The author was able to estimate this ground elevation visually, since the hotel was very close to the water. But there's some degree of uncertainty:

- Later, the author derived a slightly higher elevation of 9 ft using a pressure altimeter—however, it was in very turbulent conditions (which affect the pressure sensor) and might not be reliable.
- Geographer James Hyde estimated 13 ft using online elevation data, but that seemed high to the author based on his visual assessment.

Given the above, it's possible the ground elevation may have been a little higher than the 6 ft that was assumed for calibration. However, this discrepancy would have had a negligible impact on the pressure readings—likely ~0.1 or so, which is well within the accuracy range of the instrument (+/- 1.5 mb). Therefore, the data are considered representative sea-level pressure readings.

The sampling rate for the device was one reading every 30 seconds (2/min).

Minimum Pressure & Observations

The minimum pressure of **951.2 mb** was measured at **4:23 pm EDT (2023Z) 28 Sep,** in IAN's eye.

Front Side

The core of the hurricane reached this location a little after 2 pm EDT. There was some lightning and loud thunder—an odd sound in a hurricane. The most severe conditions seemed to occur from about 2:25 to around 4 pm. Because of the direction of the wind, tides appeared to be below normal—as if the water had pulled out into the harbor, exposing the seabed and the pilings holding up the piers.

Eye

The eye reached this location at about 4 pm EDT. While the rain mostly stopped, winds were still very strong until around 4:30 pm, by which time they'd slackened off to a breeze. IAN's eye was not clean and sharply defined; instead, it was broad and "messy." The sky remained grey the entire time, with periods of drizzle and turbulence. The tide remained low.

Backside

The backside of the IAN's eyewall struck suddenly at about 5:48 pm EDT. Winds seemed stronger—and the rain heavier—**after** the passage of the eye, and powerful winds continued well past dark.

A marked shift in the wind direction following the eye meant the flow was now **onshore,** with storm surge smashing a boat up against the seawall and water coming up onto the grounds of Laishley Park. That said, Punta Gorda didn't get the massive storm surge that devastated cities further down the coast, like Fort Myers Beach.

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Figure 5 (below) visualizes the complete air-pressure data from this location.

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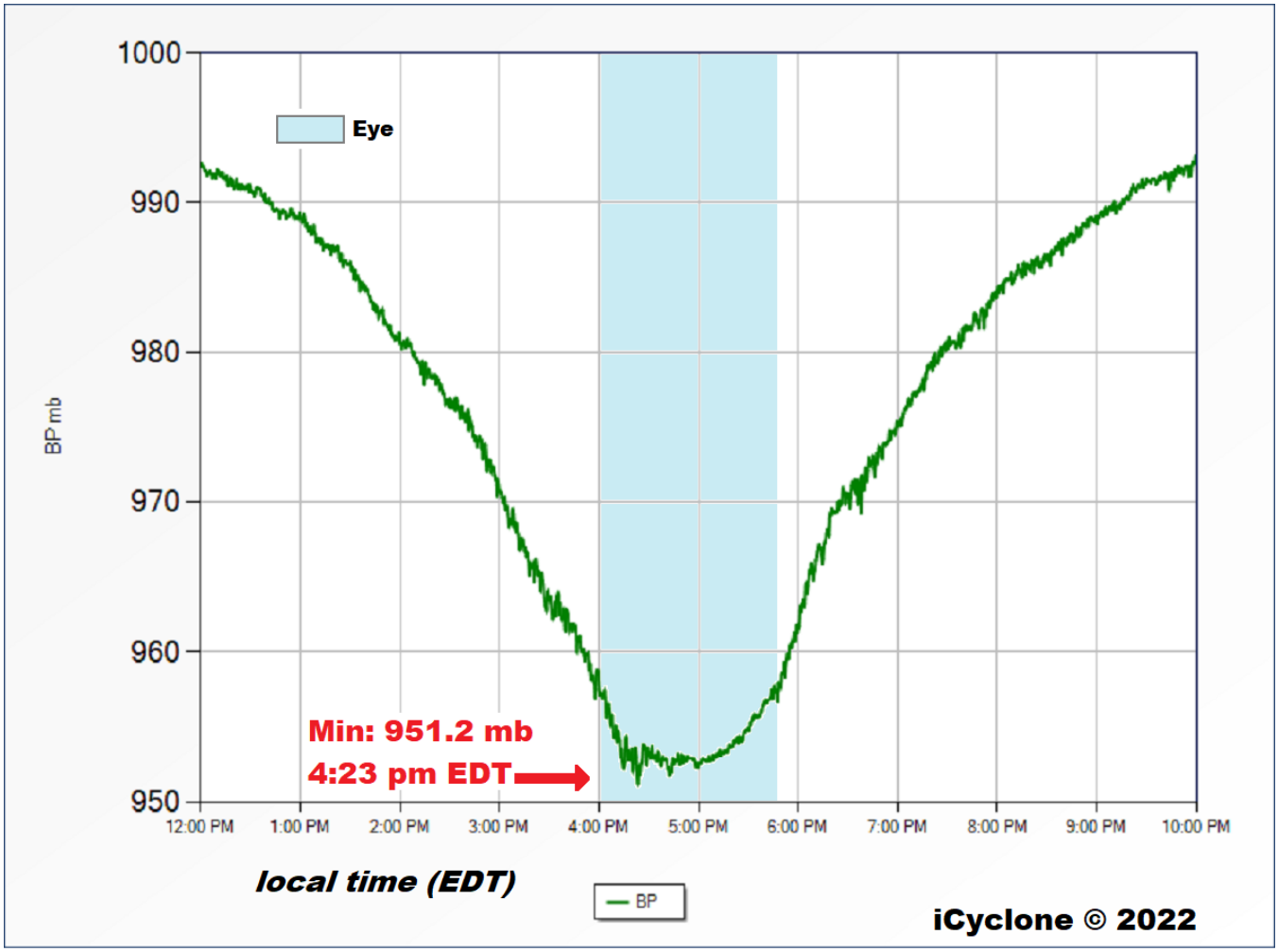
Figure 5: Barogram—Punta Gorda, Florida (Location A)

The minimum value of 951.2 mb occurred at 4:23 pm EDT (2023Z) 28 Sep, as the eye passed over Punta Gorda. The eye's passage is indicated in blue—however, the eye was not sharply defined, and these start and end times should be considered approximate.



HURRICANE IAN: 28 Sep 2022

Punta Gorda, Florida, USA

26.9385N 82.0527W – ref el 6 ft

North Port (Location B)

The author deployed a device at this location (**27.0414N 82.2249W**) before the hurricane. This location went through the hurricane's NW eyewall and stayed just outside the eye.

Setup & Calibration

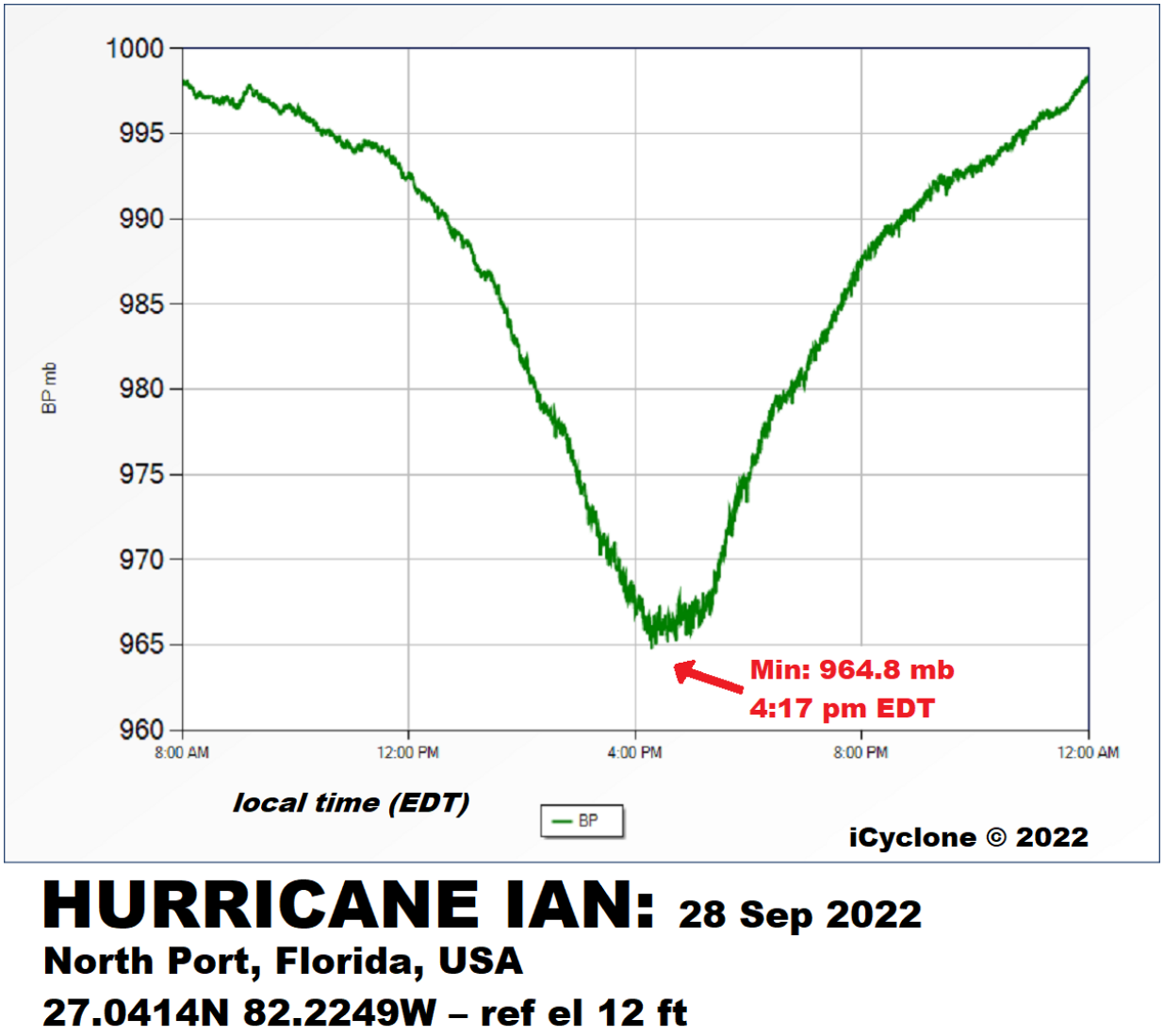
The author placed a Kestrel 4500 on the fourth floor of a hotel. The reference altitude was 41 ft, which is the ground elevation of **12 ft** (estimated by geographer James Hyde), plus additional height to account for the device being on a bathroom countertop in a fourth-floor room.

The sampling rate for the device was one reading every 30 seconds (2/min).

Minimum Pressure

The minimum pressure of **964.8 mb** was measured at **4:17 pm EDT (2017Z) 28 Sep.**

Figure 6: Barogram—North Port, Florida (Location B)



Ruskin (Location C)

The author deployed a device at this location (**27.7147N 82.3869W**) before the hurricane. This location stayed just outside the hurricane's large core.

Setup & Calibration

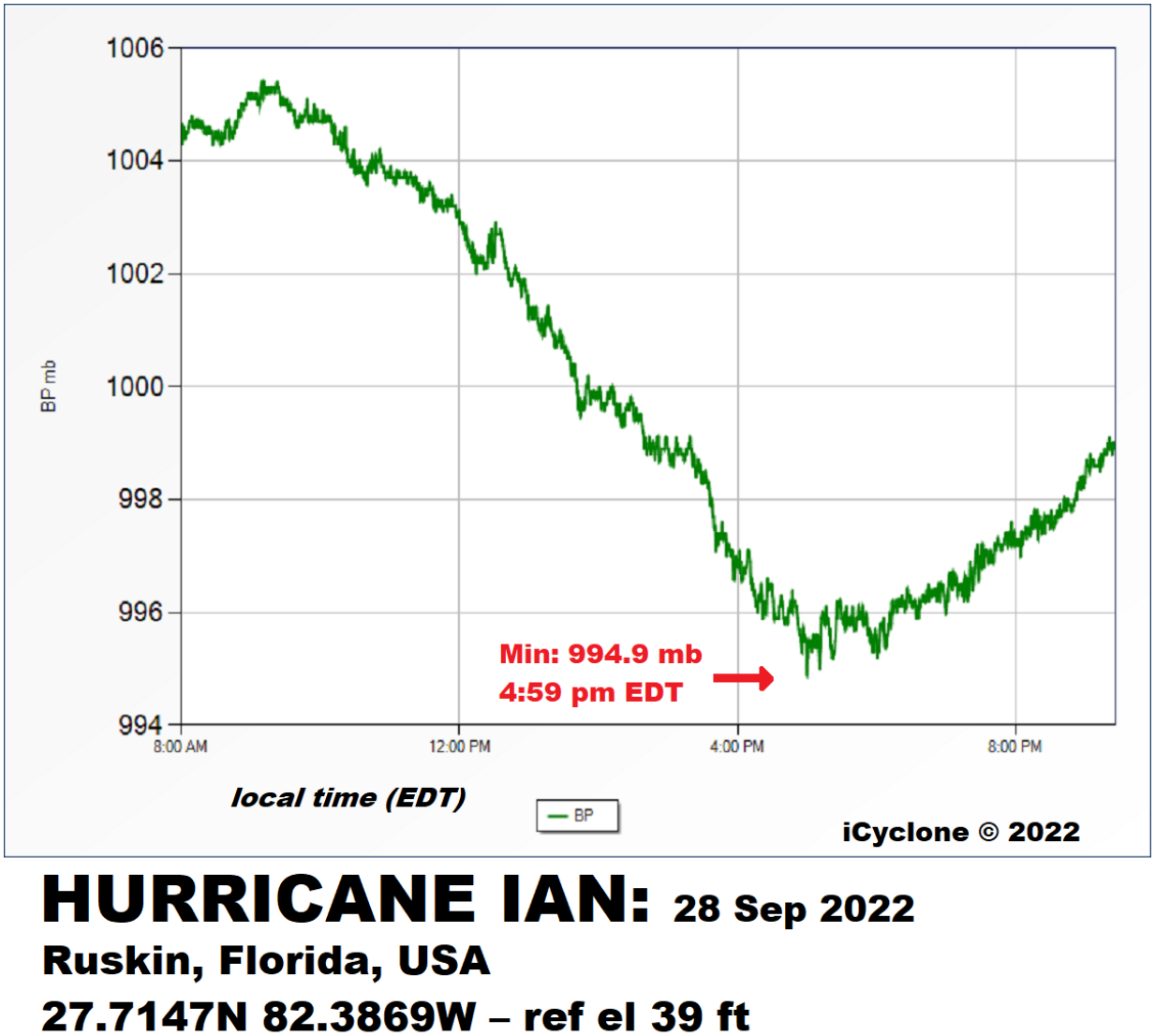
The author placed a Kestrel 4500 on the first floor of a hotel. The reference altitude was 42 ft, which is the ground elevation of **39 ft** (estimated by geographer James Hyde), plus additional height to account for the device being on a night table in a first-floor room.

The sampling rate for the device was one reading every 30 seconds (2/min).

Minimum Pressure

The minimum pressure of **994.9 mb** was measured at **4:59 pm EDT (2059Z) 28 Sep.**

Figure 7: Barogram—Ruskin, Florida (Location C)



Core Gradient

The air-pressure data can be used to derive air-pressure gradients in Hurricane IAN's core.

Calculated Between Points

Air-pressure readings recorded simultaneously at different locations in the hurricane can be used to calculate precise gradients.

At exactly **4:23:30 pm EDT,** the three locations recorded these values:

- **Location A** (in eye). **951.2 mb**
- **Location B** (in NW eyewall). **965.9 mb**
- **Location C** (just outside eyewall). **996.0 mb**

Locations A and **B** are 11 n mi apart. The difference in pressure between these points (14.7 mb) yields an average gradient of **~1.34 mb/n mi across 11 n mi.**

Locations A and **C** are 50 n mi apart. The difference in pressure between these points (44.8 mb) yields an average gradient of **~0.90 mb/n mi across 50 n mi.**

Please note that these values do not represent peak gradients in this cyclone—or anything close. Both of these gradients cover large distances. Gradient is not uniform across distance in a hurricane: it gets steeper as you get closer to the inner eyewall, then flattens out in the eye. Therefore, **gradients over smaller distances in the inner eyewall were certainly much steeper than these values.**

Calculated Over Time at a Single Point (Location A—Punta Gorda)

The cyclone's forward speed was used to calculate how much time it took for each nautical mile of the cyclone to pass a sensor's fixed location. Gradients were then calculated by noting the change in pressure across these 1-n-mi samples of the cyclone:

1. Per the 5 pm EDT NHC advisory, IAN was moving at **7 kt** when the most rapid pressure changes were occurring at Location A.
2. This forward speed suggests a sensor's fixed location sampled **1 n mi** of the cyclone every **8.5714 minutes (60 minutes/7 n mi)**.
3. 8.5714 mins = 8.5 mins x **1.0084.**
4. Therefore, pressure changes over 8.5-minute periods multiplied by 1.0084 are assumed to **approximately** represent pressure differences across 1-n-mi samples of the cyclone.

Applying this methodology, the data from Location A in Punta Gorda (which went through the hurricane's eye) show the following peak gradients:

- **Front Side (as center approached): ~3.8 mb/n mi** (derived from a **3.8-mb drop** over 8.5 minutes, starting **4:05:30 pm EDT**).
    - This peak gradient was observed just inside the eye, near the volatile boundary between the eye and eyewall. While the rain had mostly ceased by this point, winds were still very strong.
- **Backside (as center moved away): ~4.6 mb/n mi** (derived from a **4.6-mb rise** over 8.5 minutes, starting **5:59:30 pm EDT**).
    - This peak gradient was observed in the inner eyewall, barely 12 minutes after the eye had passed. Powerful winds and extremely heavy rain were pounding the location at this time.

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Figure 8 (below) is the Punta Gorda barogram again, this time showing when the peak gradients were sampled.

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Historical Comparison

The gradients shown for IAN are steep but commonplace for a severe hurricane.

Following is a list of selected intense cyclones in which the author collected core data, **ranked by calculated peak gradient.** Like LAURA in 2020, IAN ranks relatively low on the list, down with presumably lesser (Category-3) hurricanes like IRMA and ODILE:

CYCLONE	DATE	LOCATION	WIND	PEAK GRADIENT
DORIAN	Sep 2019	Marsh Harbour, Bahamas	160 kt	**12.4 mb/n mi**
PATRICIA	Oct 2015	Emiliano Zapata, JAL, MX	130 kt	**10.5 mb/n mi**
ROSLYN	Oct 2022	Santa Cruz, NAY, MX	105 kt	**8.9 mb/n mi**
MICHAEL	Oct 2018	Callaway, FL, USA	140 kt	**8.1 mb/n mi**
MARIA	Sep 2017	Palmas Del Mar, PR, USA	135 kt	**7.1 mb/n mi**
SALLY	Sep 2020	Gulf Shores, AL, USA	95 kt	**6.4 mb/n mi**
HARVEY	Aug 2017	Rockport, TX, USA	115 kt	**6.3 mb/n mi**
IRMA	Sep 2017	Naples, FL, USA	100 kt	**5.9 mb/n mi**
ODILE	Sep 2014	Cabo San Lucas, BCS, MX	110 kt	**4.6 mb/n mi**
IAN	Sep 2022	Punta Gorda, FL, USA	130 kt	**4.6 mb/n mi**
LAURA	Aug 2020	Sulphur, LA, USA	130 kt	**4.4 mb/n mi**

Limitations

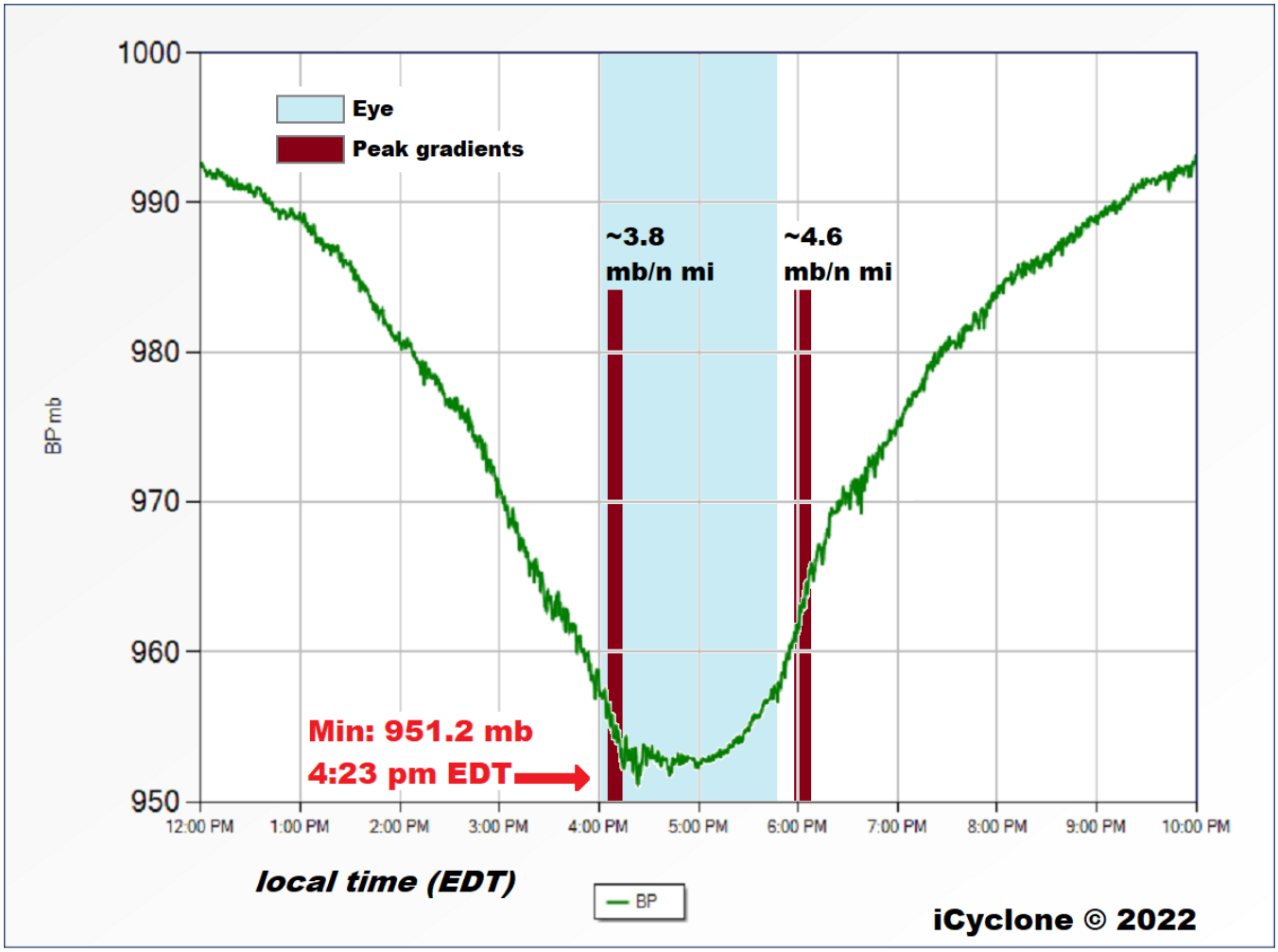
These calculations are coarse, with limitations to their accuracy. For example:

- Small, localized features within a hurricane's core—like mesovortices—can cause **short-term pressure fluctuations** that aren't necessarily representative of the system's overall pressure field.

- These calculations do not factor in **system weakening.** Since these pressure changes were measured near and after landfall, IAN was slowly filling, and the central pressure was rising. Given the short sample periods—8.5 minutes—this factor probably isn't significant. However, the peak gradient on the front side (during the center's approach) may be slightly underrepresented, and the gradient on the backside (during the center's departure) may be slightly exaggerated.

Figure 8: Barogram (Punta Gorda) with Peak Gradients

The pressure trace from Punta Gorda, showing when the peak gradients—in both the front and backsides of the cyclone—were sampled.



HURRICANE IAN: 28 Sep 2022

Punta Gorda, Florida, USA

26.9385N 82.0527W – ref el 6 ft

Figure 9: The Height of the Storm in Punta Gorda

Hurricane IAN's fiercest winds raked Punta Gorda, Florida, after the eye passed. This still image was shot at 6:25 pm EDT 28 Sep, when the author estimates the strongest winds were occurring.

Figure 10: Radar Image—4:24 pm EDT: Edge of Eye Over Punta Gorda

Radar image from 4:24 pm EDT 28 Sep, showing the NW edge of Hurricane IAN's eye passing over the author's location (blue marker) in Punta Gorda, Florida. At almost exactly this moment (4:23 pm) the minimum pressure of 951.2 mb was recorded, suggesting the cyclone's low-pressure center was near the edge of the eye and not perfectly aligned with the radar center. Although the rain had mostly ceased by this time, it was still very windy. (Image: RadarScope)

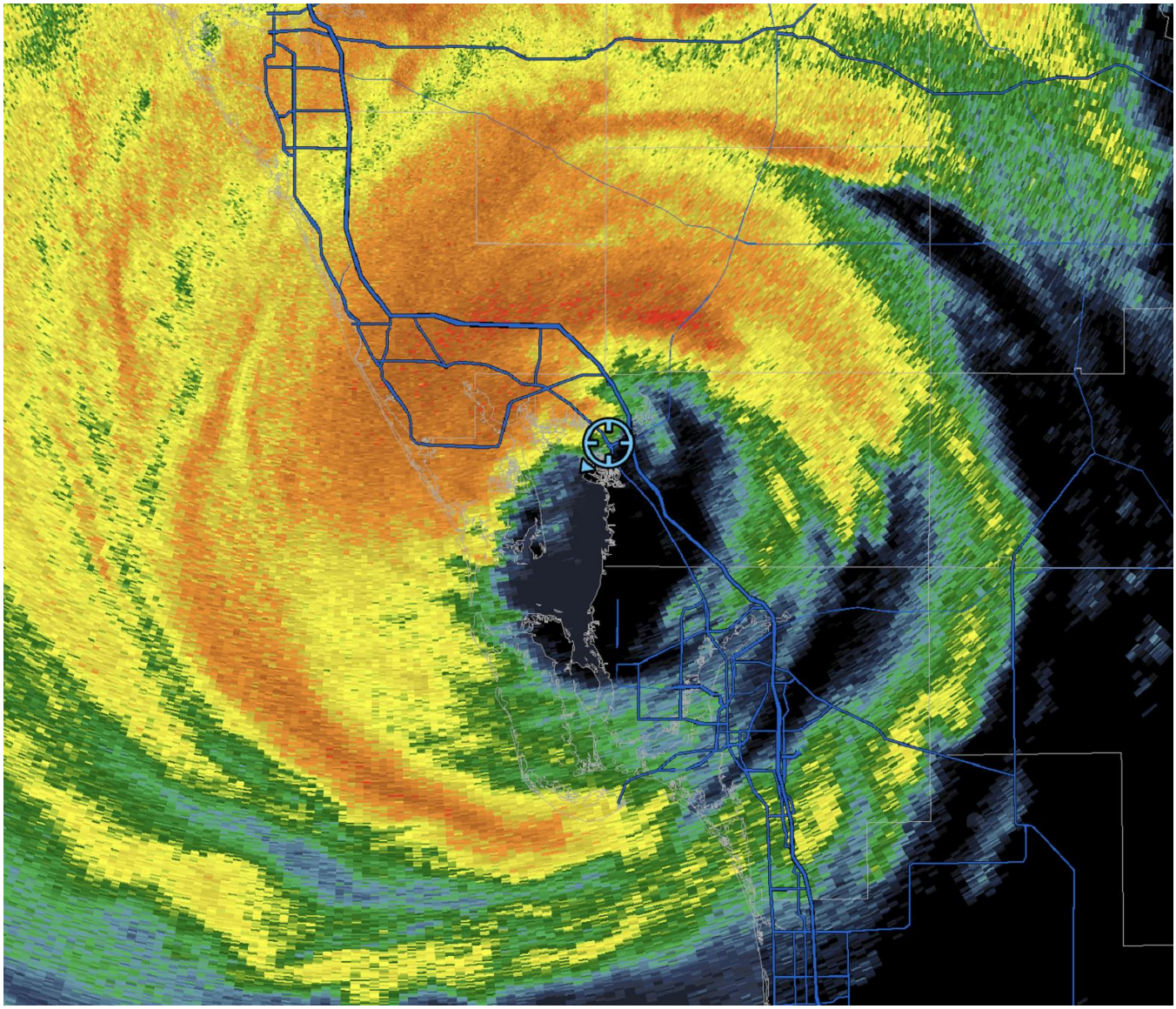


Figure 11: Radar Image—4:51 pm EDT: Eye Over Punta Gorda

Radar image from 4:51 pm EDT 28 Sep, showing the eye of Hurricane IAN squarely over the author's location (blue marker) in Punta Gorda, Florida. By this time, the winds had lessened considerably. But the eyewall's vigorous backside—clearly visible in this shot—was approaching and would reach Punta Gorda less than an hour later. (Image: RadarScope)

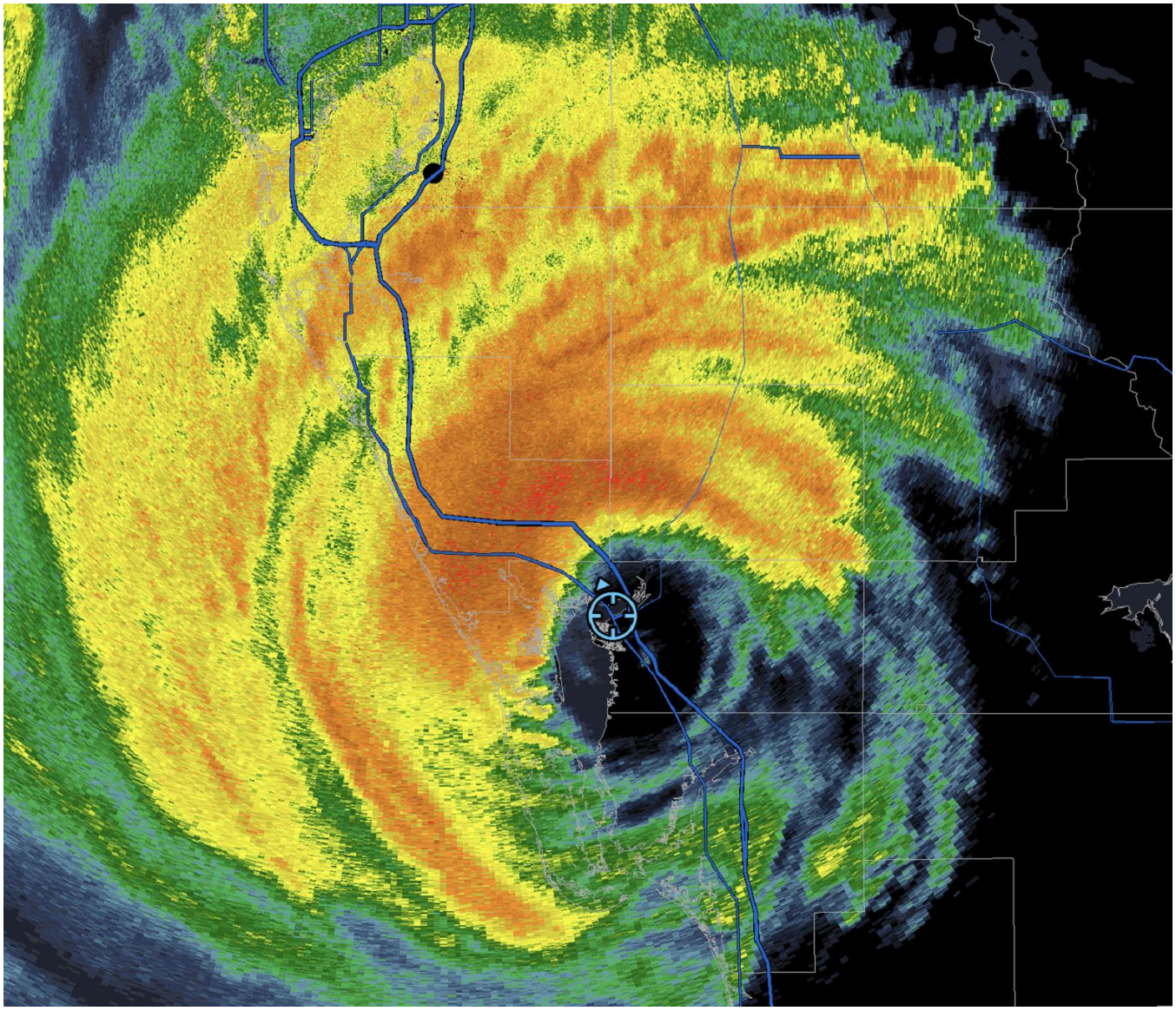
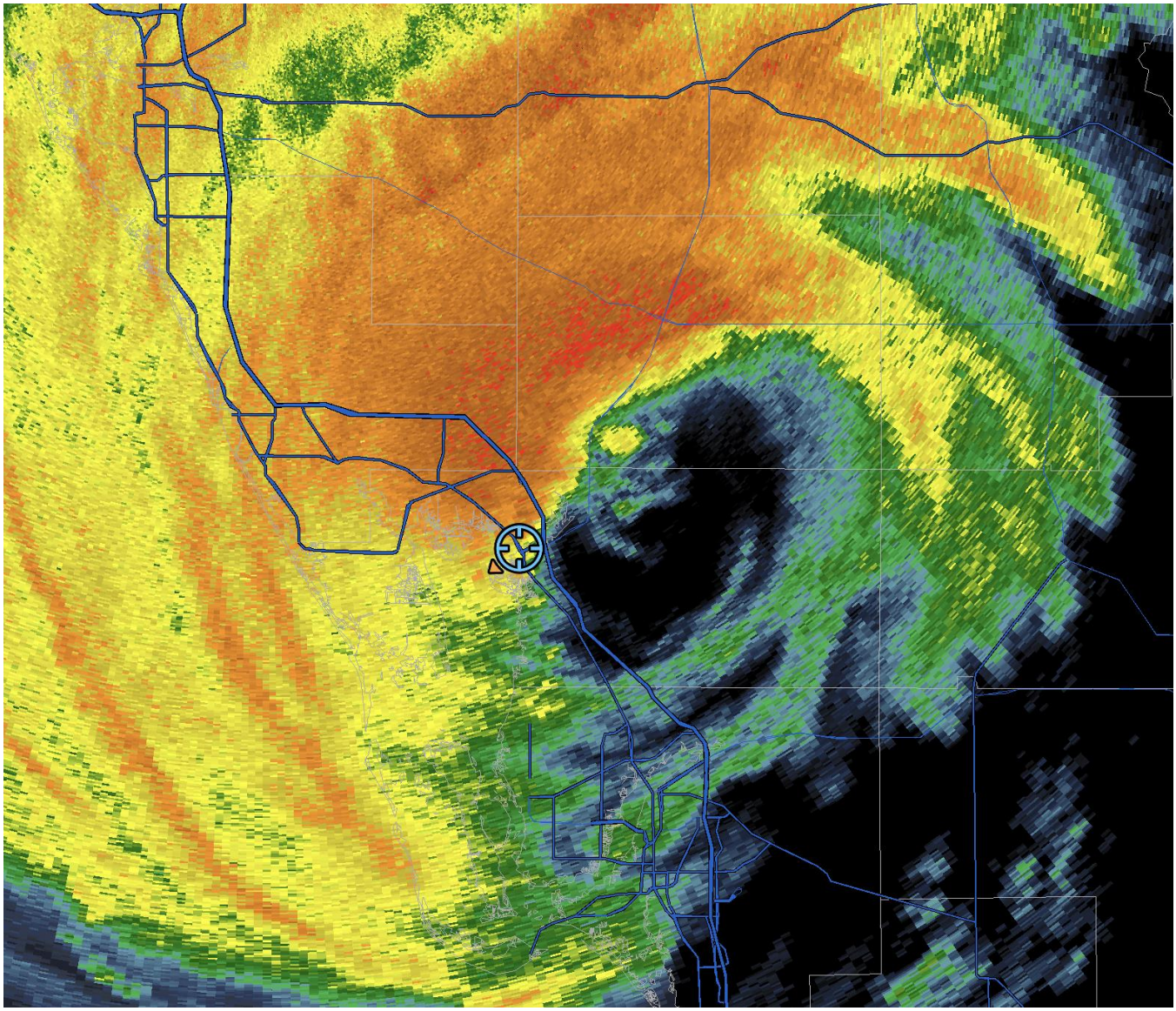


Figure 12: Radar Image—Backside of Eyewall Reaching Punta Gorda

Radar image from 5:58 pm EDT 28 Sep—about 10 minutes after the back eyewall of Hurricane IAN reached the author's location (blue marker) in Punta Gorda, Florida. Very severe conditions—including powerful winds and extremely heavy rainfall—were pounding the city at this time. The author believes winds were stronger on this side of the cyclone, after the eye had passed. (Image: RadarScope)



Data & Observations—South Carolina

Georgetown (Location A)

The author deployed a device at this location (**33.3661N 79.2827W**) as the hurricane approached the coast. This location ended up being the hurricane's landfall point.

Setup & Calibration

The author placed a Kestrel 4500 in a protected place behind the decorative potted plants in front of a gift shop. The reference elevation was **3 ft,** based on the author's visual estimate. This location is right across the street from the Sampit River, with very little elevation.

The sampling rate for the device was one reading every 30 seconds (2/min).

Minimum Pressure & Observations

The minimum pressure of **981.2 mb** was measured almost continuously for several minutes—with some small (0.1 or 0.2 mb) tremors upward—from **2:37 to 2:41 pm EDT (1837Z to 1841Z) 30 Sep.**

The timing of this minimum pressure suggests landfall may have occurred about 30 minutes later than the National Hurricane Center's operational estimate of 2:05 pm EDT.

When the author deployed the device—just before 10 am EDT—conditions in Georgetown were breezy, with moderate rain and no observable storm-surge flooding. When the author returned to Georgetown a little more than 4 hours later (~2:30 pm), the situation was very different. Much of the historic downtown district—including Front Street, the main commercial drag—was underwater, in some places to a depth of 2 ft to almost 3 ft.

Conditions at this time were relatively calm—a soft breeze and intermittent drizzle—perhaps because the hurricane's diffuse center was passing over this location.

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Figure 13 (below) visualizes the complete air-pressure data from this location.

Elsewhere in the Landfall Zone

The author did not stay in one place as Hurricane IAN impacted South Carolina, instead driving up and down the coast along the landfall zone, **from McClellanville up to Myrtle Beach**—so there are no complete observations from any one location.

The author observed storm surge inundation of some streets and residential neighborhoods in **Garden City,** as well as a couple of downed trees and branches on Highway 17 and some streets. That said, at no point did the author observe especially strong winds in the landfall zone, and wind impacts across the region appeared mild.

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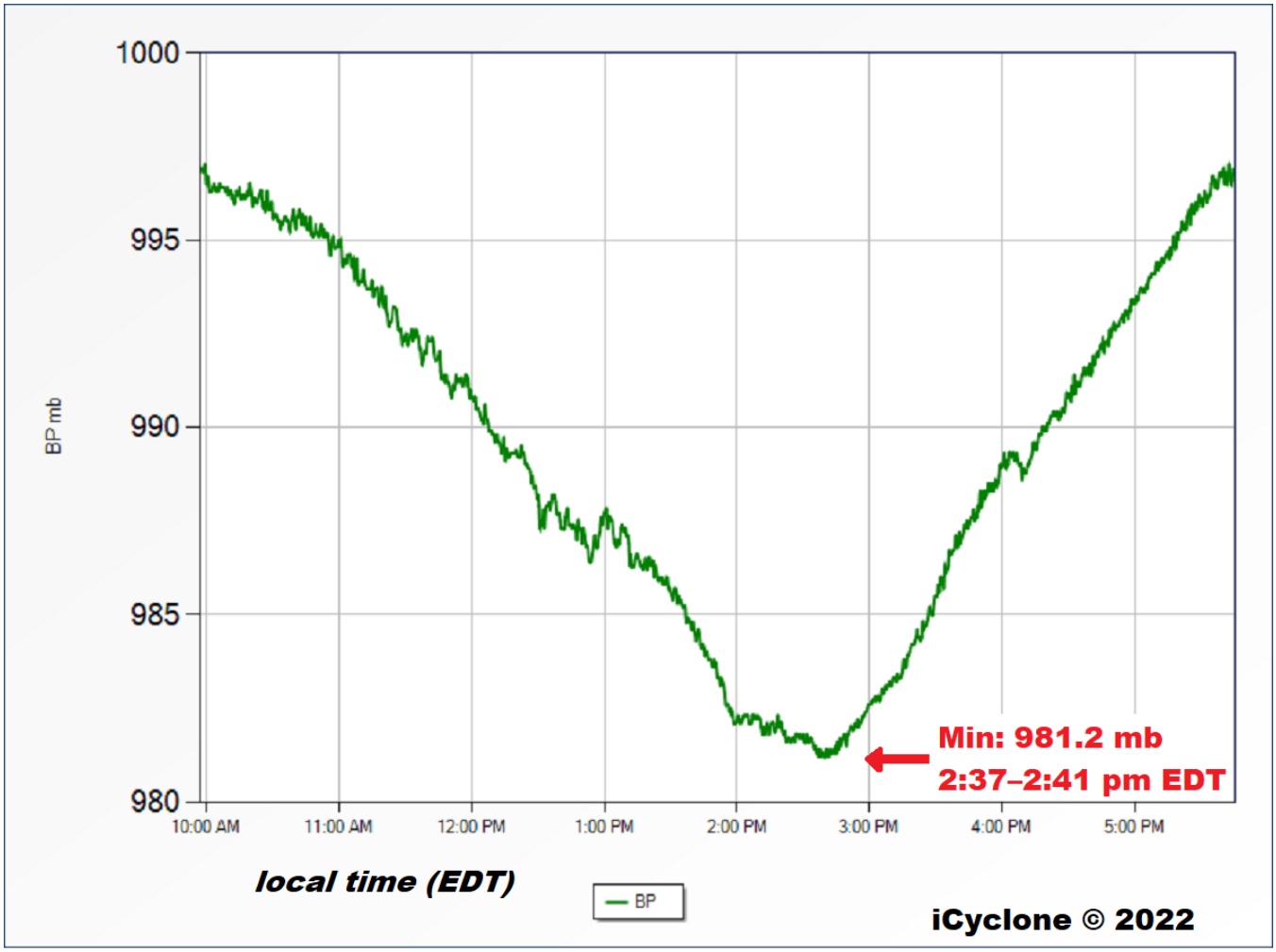
Figure 13: Barogram—Georgetown, South Carolina (Location A)

The minimum value of 981.2 mb occurred almost continuously for several minutes, from 2:37 to 2:41 pm EDT (1837Z to 1841Z) 30 Sep. The timing of this minimum suggests landfall occurred about 30 minutes later than the NHC's operational estimate of 2:05 pm. At this time the heart of Historic Georgetown was inundated by storm surge.



HURRICANE IAN: 30 Sep 2022

Georgetown, South Carolina, USA

33.3661N 79.2827W – ref el 3 ft

Charleston (Location B)

The author deployed a device at this location (**32.7810N 79.9652W**) early in the morning, as the hurricane approached the coast. Radar images and surface data suggest this location was lashed by the vigorous left side of the cyclone's core.

Setup & Calibration

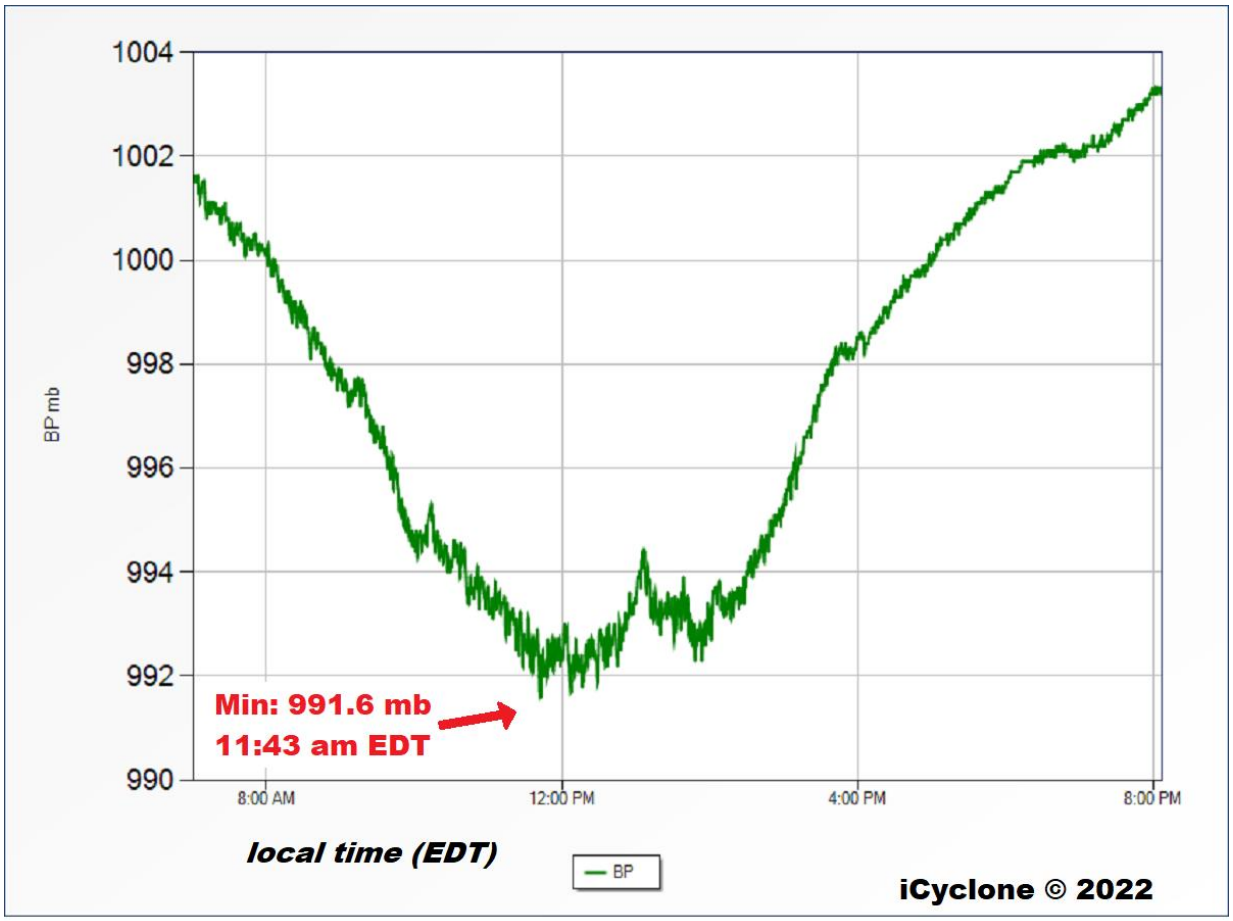
The author placed a Kestrel 4500 on the eighth floor of a high-rise hotel. The reference altitude was 69 ft, which is the ground elevation of **6 ft** (according to an elevation app and also the author's visual estimate), plus additional height to account for the device being on a bathroom countertop in an eighth-floor room.

The sampling rate for the device was one reading every 30 seconds (2/min).

Minimum Pressure

The minimum pressure of **991.6 mb** was measured at **11:43 am EDT (1543Z) 30 Sep.**

Figure 14: Barogram—Charleston, South Carolina (Location B)



HURRICANE IAN: 30 Sep 2022
Charleston, South Carolina, USA
32.7810N 79.9652W – ref el 6 ft

Figure 15: Storm Surge Inundation in Georgetown

Front Street in the heart of Historic Georgetown, South Carolina, between 2:35 and 2:50 pm EDT 30 Sep, showing extensive storm surge inundation around the time of Hurricane IAN's landfall.

Figure 16: Storm Surge Inundation in Georgetown

Another shot of Front Street in Historic Georgetown, South Carolina, showing extensive storm surge inundation between 2:35 and 2:50 pm EDT 30 Sep.

Figure 17: Storm Surge Inundation in Georgetown

Another shot of Front Street in Historic Georgetown, South Carolina, showing extensive storm surge inundation between 2:35 and 2:50 pm EDT 30 Sep.

Figure 18: Storm Surge Inundation in Georgetown

Another shot of Front Street in Historic Georgetown, South Carolina, showing extensive storm surge inundation between 2:35 and 2:50 pm EDT 30 Sep.

Figure 19: Storm Surge Inundation in Georgetown

Another shot of Front Street in Historic Georgetown, South Carolina, showing extensive storm surge inundation between 2:35 and 2:50 pm EDT 30 Sep.

Video

The passage of Hurricane IAN in Florida and South Carolina—as described in this report—is documented in a video on the author's YouTube channel: https://youtu.be/BB__9FaSHcc.

For easy analysis, all the footage is timestamped in local time (EDT).

Questions or Feedback?

Get in touch:

Josh Morgerman

josh.morgerman@symblaze.com
info@icyclone.com