# iCyclone Chase Report

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|---|---|---|---|
| **storm** | **Hurricane ZETA** | | |
| **location** | **Akumal, Quintana Roo, Mexico \| Bay St. Louis, Mississippi, USA** | | |
| **date** | **26-28 October 2020** | | |
| **chasers** | **Josh Morgerman** | **author** | **Josh Morgerman** |

# Overview

**Hurricane ZETA** struck Mexico's Yucatan Peninsula on the night of 26-27 October, and then the USA's Middle Gulf Coast during the afternoon and evening of 28 October 2020.

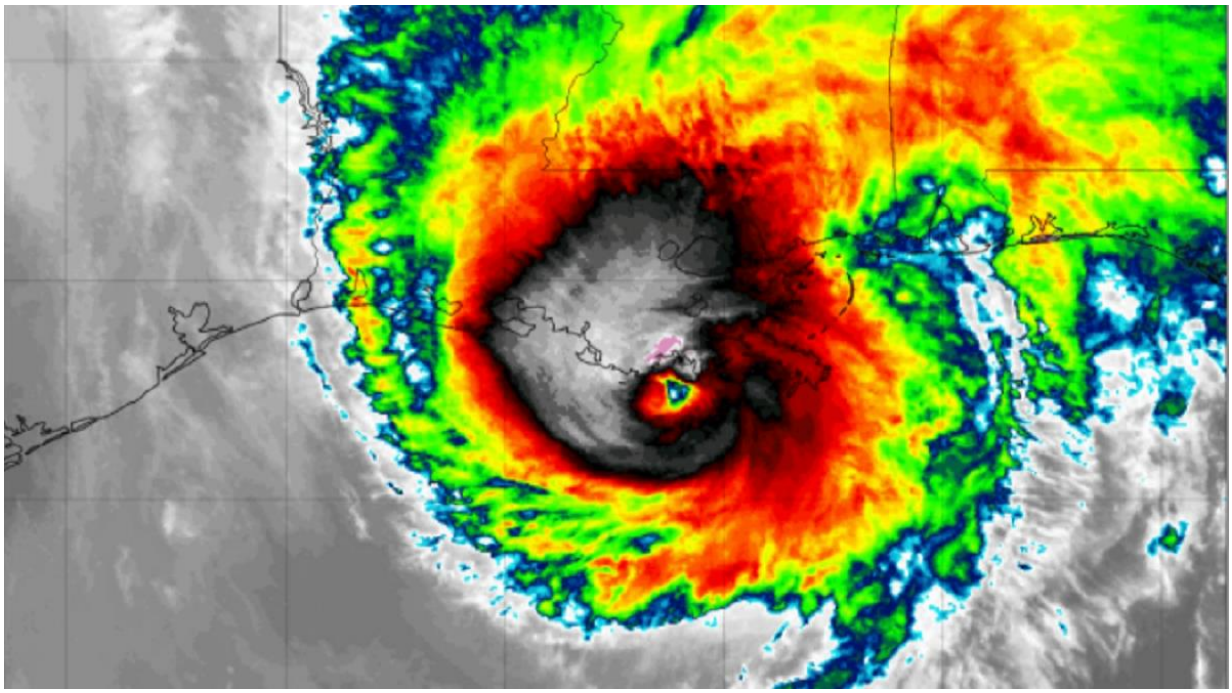
The author was in both impact zones to observe the cyclone's passage and collect data. **Highlights:**

### Mexico

- The author was in **Akumal, Quintana Roo (20.3980N 87.3205W),** close to the landfall point.
- The **calm eye** passed over this location from ~10:30 or 10:40 to 11:13 pm EST 26 October.
- Minimum sea-level pressure recorded here was **979.2 mb at 10:57 pm EST 26 October (0357Z 27 October).** This was during the passage of the calm eye.

### USA

- The author was in **Bay St. Louis, Mississippi (30.3151N 89.3446W),** ~22 n mi SE of the track of the hurricane's center.
- The hurricane's **destructive E (right) eyewall** raked this location from ~7:05 to 7:45 pm CDT.
- Minimum sea-level pressure recorded here was **979.6 mb at 7:34 pm CDT 28 October (0034Z 29 October).** This was during the period of destructive winds, as the center made its closest approach to the location.
- The cyclone's structure was **highly asymmetric** in Mississippi. The S half of the core had disintegrated, so stormy conditions in Bay St. Louis abruptly ceased by 8 pm CDT, as soon as the center pulled N of the town.



***ZETA at 3:37 pm CDT (2037Z) on 28 October—just before landfall in Louisiana, en route to Mississippi. (GOES-16 image.)***

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# Locations

The author documented both of Hurricane ZETA's landfalls—in Mexico and the USA.

## Mexico

### Chase Location—Akumal

The author observed the passage of the hurricane—and collected data—at **20.3980N 87.3205W**. This location is a gas station on Highway 307 in **Akumal, Quintana Roo.**

The National Hurricane Center's position updates indicate this location was very close to the track of the hurricane's center.

### Sensor Location—Playa del Carmen

Before positioning at the Chase Location (and before the hurricane struck), the author deployed a data sensor in his hotel, at **20.6202N 87.0900W**. This location is the City Express Suites in **Playa del Carmen,** and it's ~19 n mi NE of the Chase Location.

This location was ~21 n mi NE of the hurricane's track and apparently didn't go through the eye.

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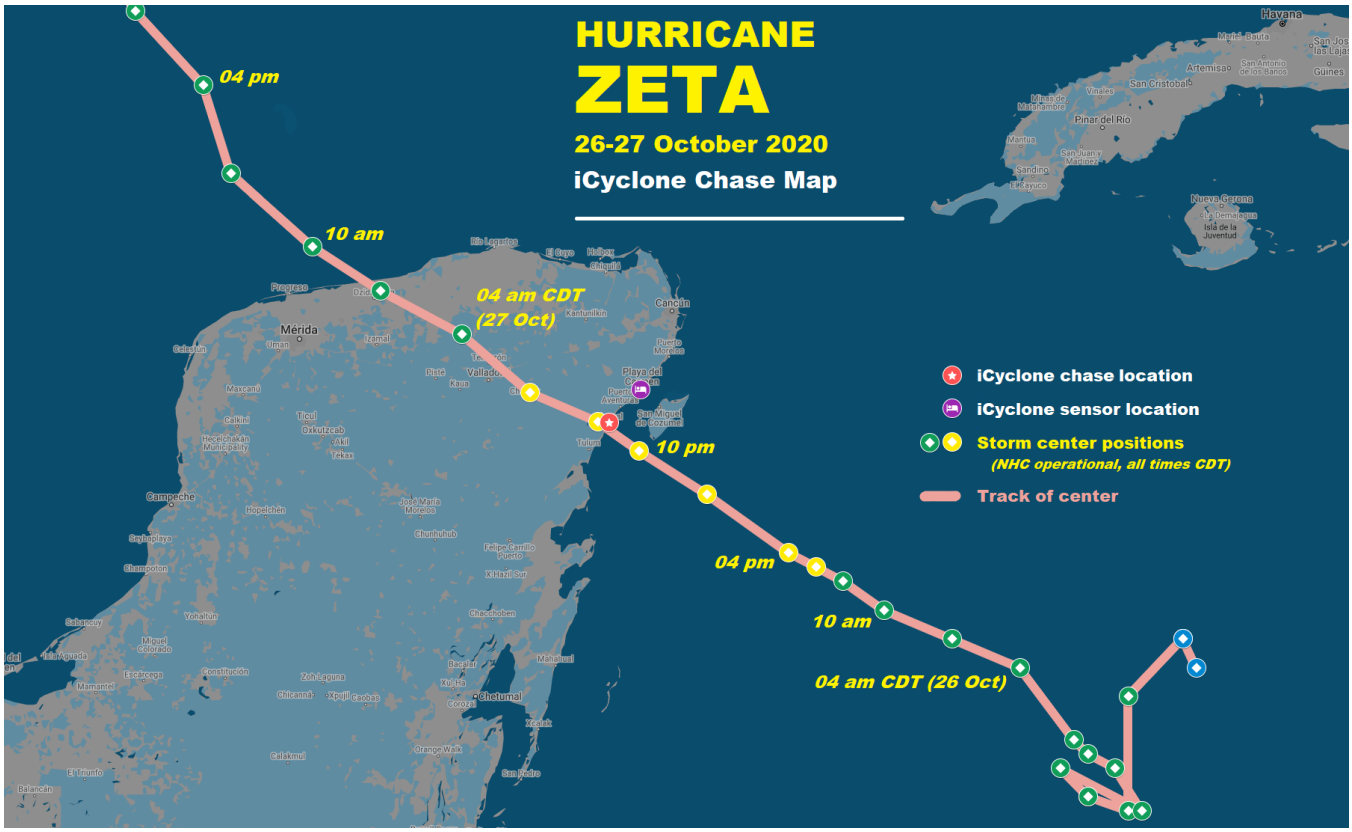
**Figure 1** shows the hurricane's track up to and after landfall in Mexico. **Figure 2** is a zoomed-in view. Both the **Chase Location** (**red star**) and **Sensor Location** (**purple hotel symbol**) are marked.

### Figure 1: Chase Map—Mexico Landfall

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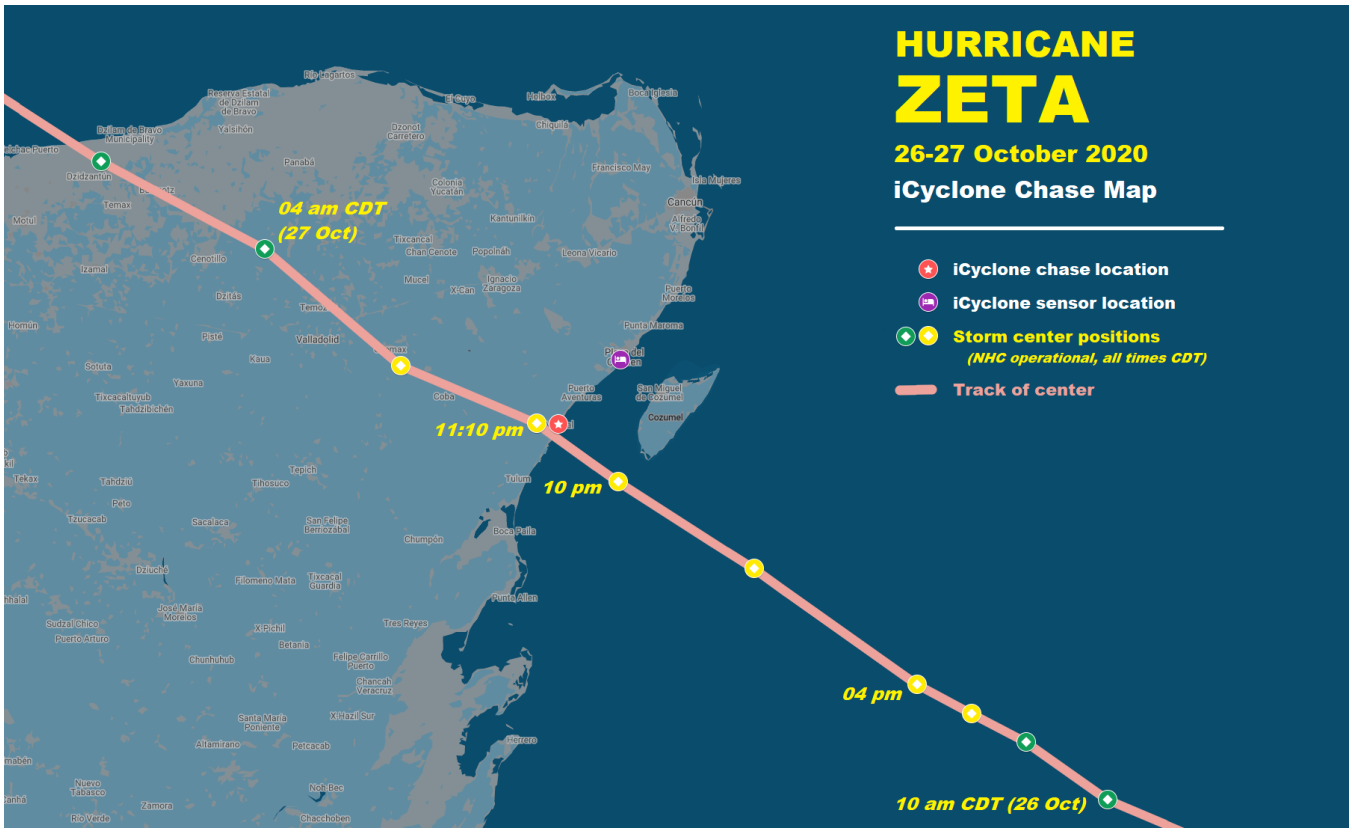
## Figure 2: Chase Map—Mexico Landfall (CLOSE)



# iCyclone Chase Report

## USA

The author rode out the hurricane—and collected data—at **30.3151N 89.3446W**. This location is his rental cottage in **Bay St. Louis, Mississippi.**

The National Hurricane Center's position updates indicate this location was ~22 n mi SE of the track of the hurricane's center. Radar imagery reveals the hurricane's intense right eyewall squarely impacted this location.

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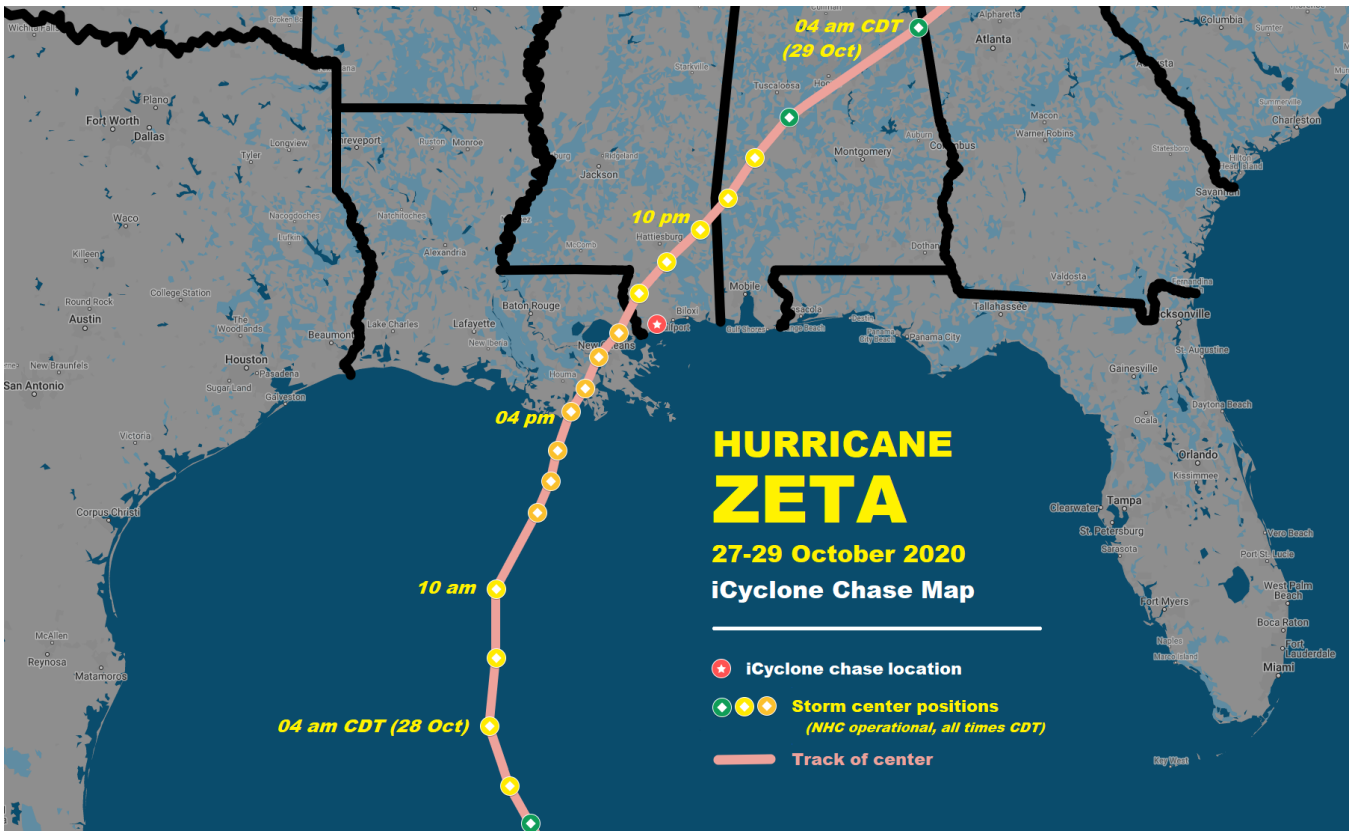
**Figure 3** shows the hurricane's track up to and after landfall on the USA's Middle Gulf Coast. **Figures 4** and **5** are zoomed-in views. The **Chase Location** is marked with a **red star**.

### Figure 3: Chase Map—USA Landfall

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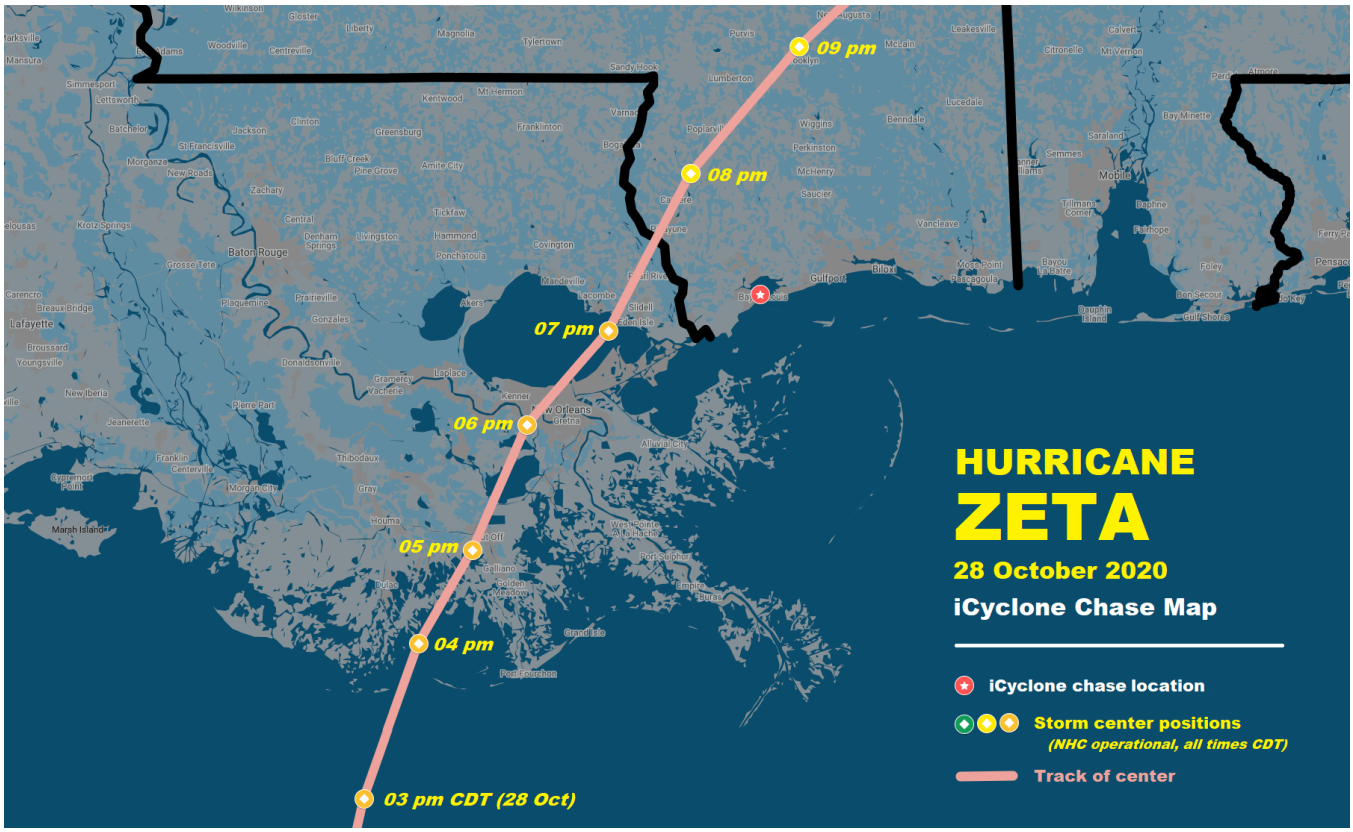
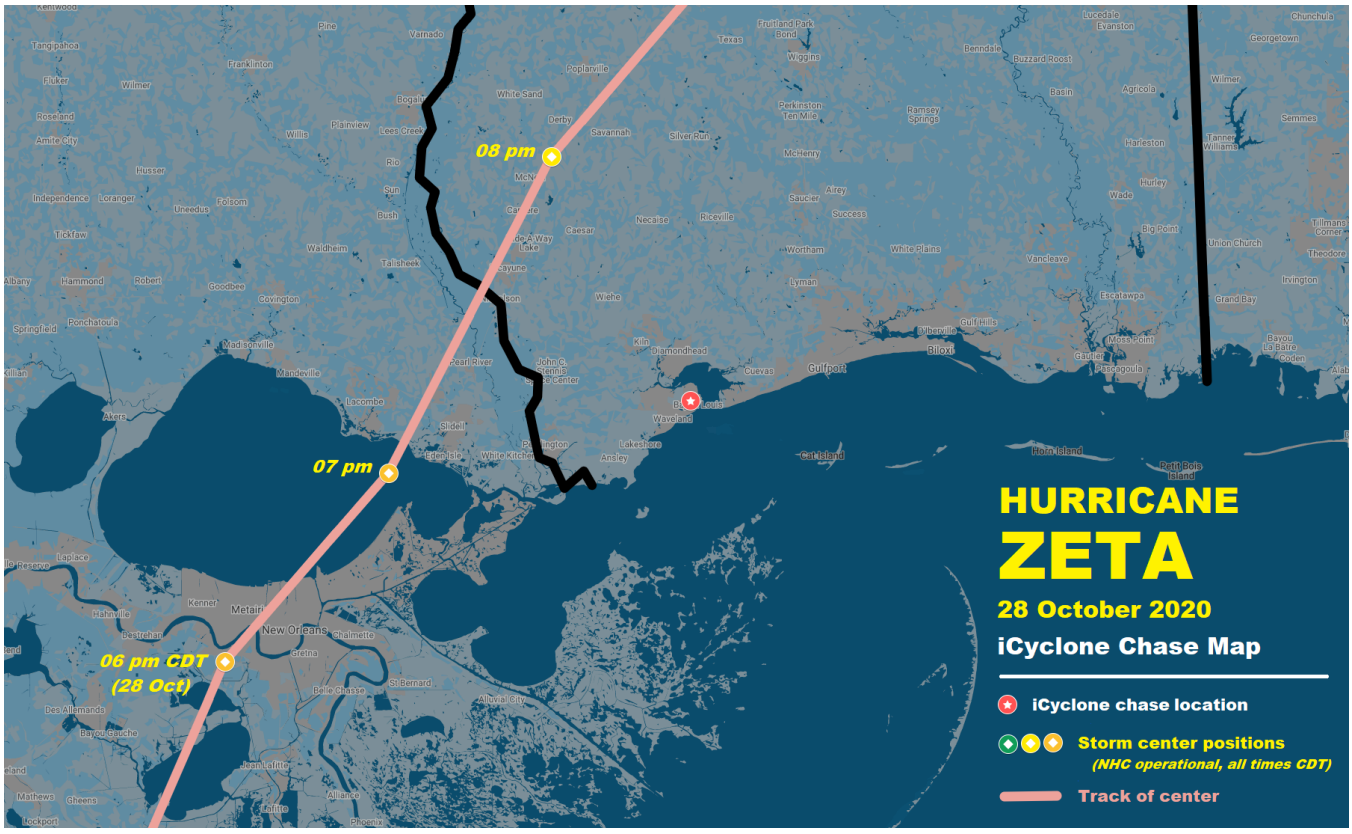
## Figure 4: Chase Map—USA Landfall (CLOSER)




## Figure 5: Chase Map—USA Landfall (CLOSEST)

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# Observations

As follows:

## Mexico

The author observed the hurricane's passage in **Akumal, Quintana Roo,** near the landfall point:

- **The calm eye passed over this location**—from ~10:30 or 10:40 to 11:13 pm EST 26 October. (At 11:13 pm, rain and wind started up again suddenly.)
- **Minimum sea-level pressure was 979.2 mb at 10:57 pm EST 26 October (0357Z 27 October)**—recorded in the eye.
- **The system's structure was fairly symmetric**—with distinct period of strong winds and heavy rain both preceding **and** following the passage of the eye.
- **The storm didn't last long:** by 1 am EST, it was over.
- **The impact was relatively mild,** with the main damage being downed tree limbs.

## USA

The author observed the hurricane's passage in **Bay St. Louis, Mississippi,** ~22 n mi SE of the track of the center:

- **The storm didn't last long:** almost all the strong wind and heavy rain occurred **between ~5 and 8 pm CDT.**
- **The E (right) eyewall passed over this location from ~7:05 to 7:45 pm CDT**—accompanied by loud, howling winds that inflicted widespread, moderate damage across the region.
    - **Figures 6** and **7** show the hurricane's center passing over SE Louisiana, en route to coastal Mississippi.
    - **Figures 8, 9,** and **10** show the hurricane's core passing over Bay St. Louis.
- **Minimum sea-level pressure was 979.6 mb at 7:34 pm CDT 28 October (0034Z 29 October)—**recorded during the destructive winds, as the center made its closest approach to this location.
- **The cyclone's structure was highly asymmetric.** The S half of the core had disintegrated by the time it reached coastal Mississippi, leaving a classic N Gulf Coast "halfacane." Due to this, stormy conditions in Bay St. Louis abruptly ceased before 8 pm CDT, as soon as the center pulled N of the town. Winds went from hurricane force to a stiff breeze in a matter of minutes.
    - **Figure 11** illustrates this lopsided structure: Bay St. Louis is "in the clear" only minutes after getting raked by the destructive right eyewall.

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The conditions described here are captured in the author's video of both the Mexico and USA impacts: https://youtu.be/mNGAxHjRWA8.

See **Air Pressure Data** (below) Re: instrument calibration and data collection.

See **Figures 16** and **17** (below) for a visualization of ZETA's impact in Bay St. Louis, Mississippi, depicting the period of estimated peak winds overlaid on the air-pressure data.

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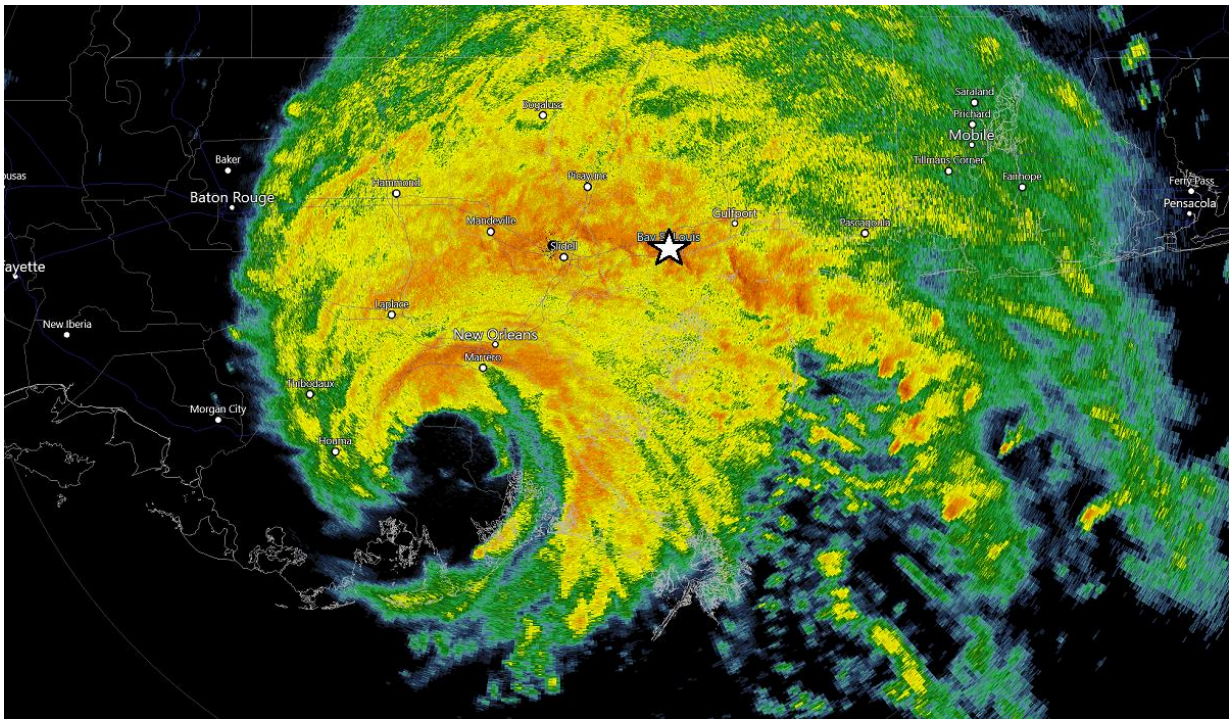
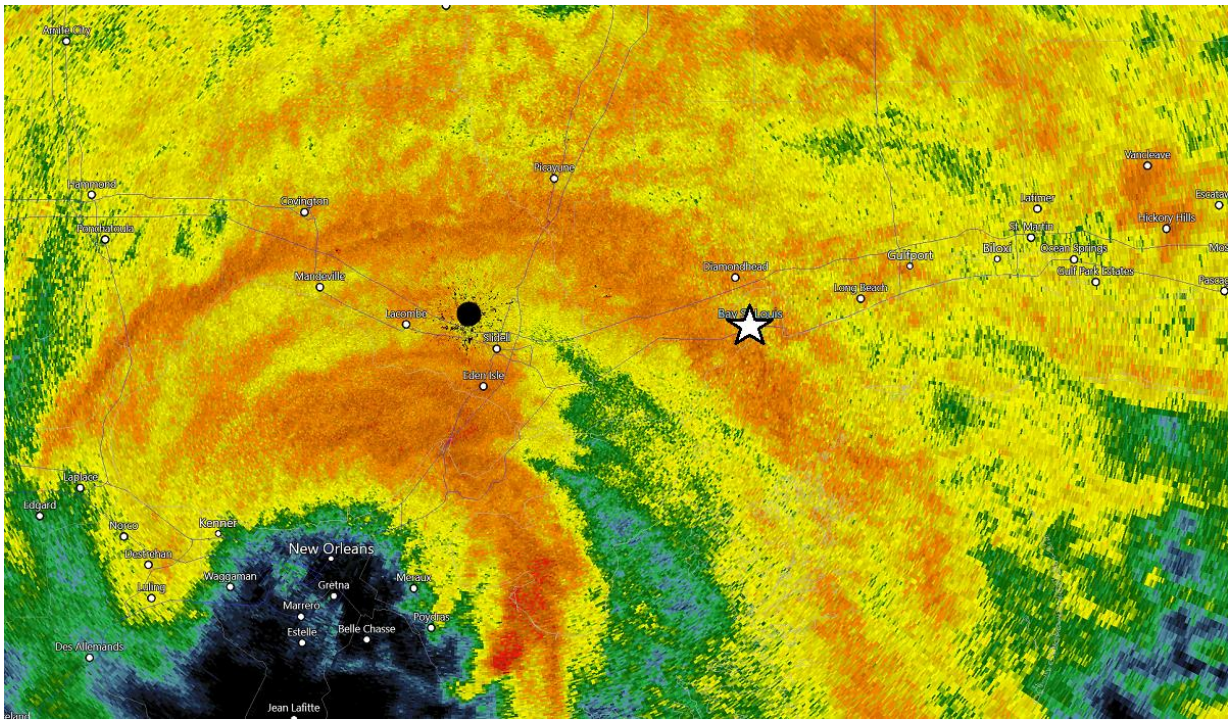
## Figure 6: Radar Image—Bay St. Louis in Outer Rainbands

***Radar image from New Orleans at 5:19 pm CDT. The hurricane's center had made landfall in SE Louisiana and was approaching Metro New Orleans. Meanwhile, outer rainbands were sweeping coastal Mississippi, bringing stormy conditions to Bay St. Louis (marked with a star). (Image: RadarScope)***



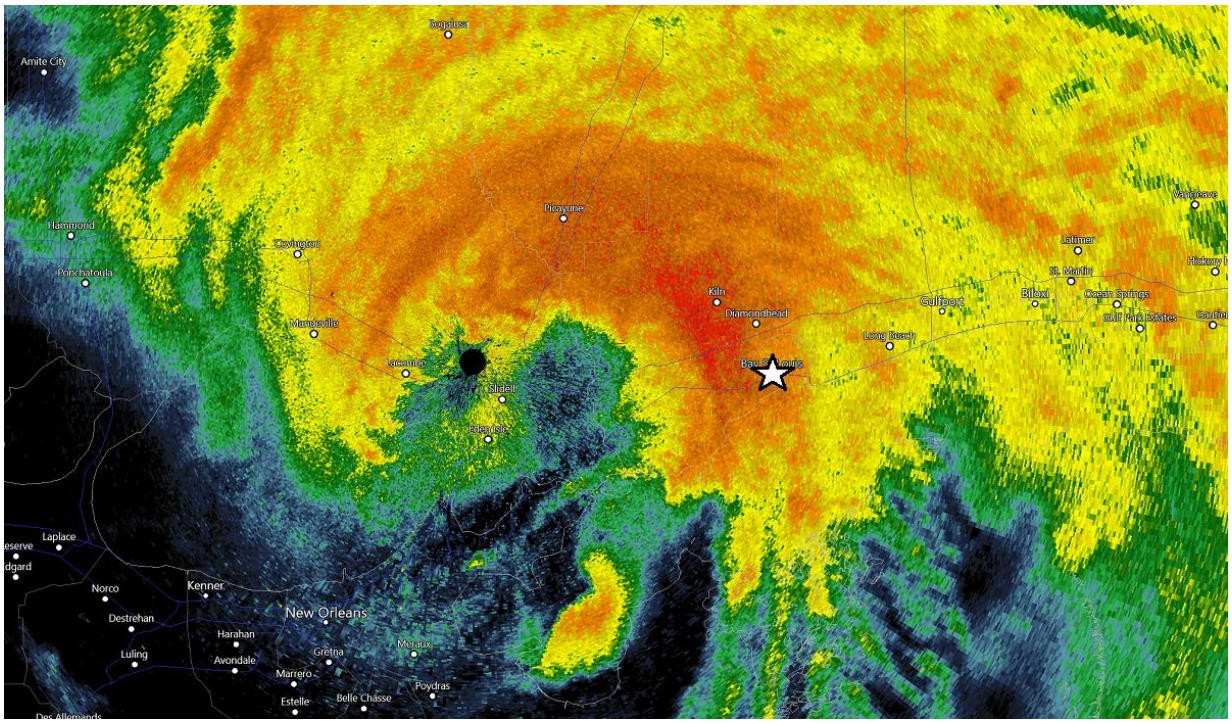

## Figure 7: Radar Image— Bay St. Louis in Inner Rainbands

***Radar image from New Orleans at 6:10 pm CDT. The eye was over New Orleans and heading rapidly NNE as strong inner rainbands blasted Bay St. Louis, Mississippi. (Image: RadarScope)***



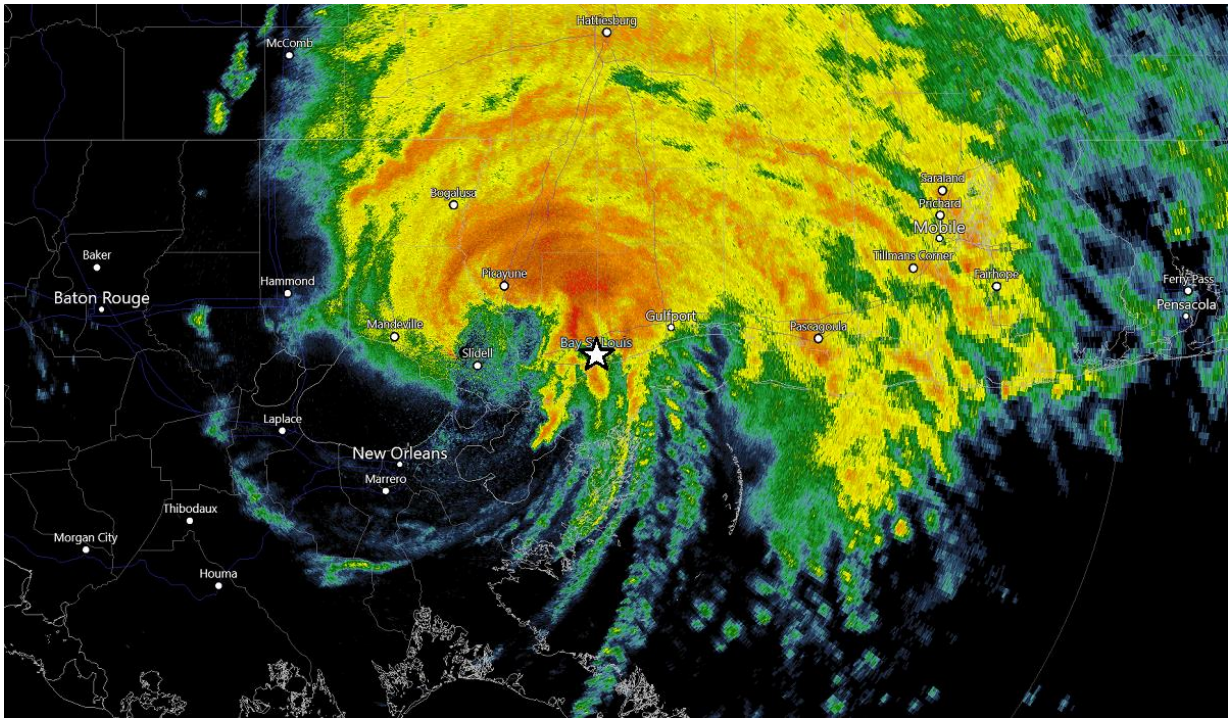
## Figure 8: Radar Image—Eyewall Reaching Bay St. Louis

***Radar image from New Orleans at 7:04 pm CDT. The intense E (right) eyewall was just reaching Bay St. Louis, Mississippi, accompanied by howling, destructive winds. (Image: RadarScope)***



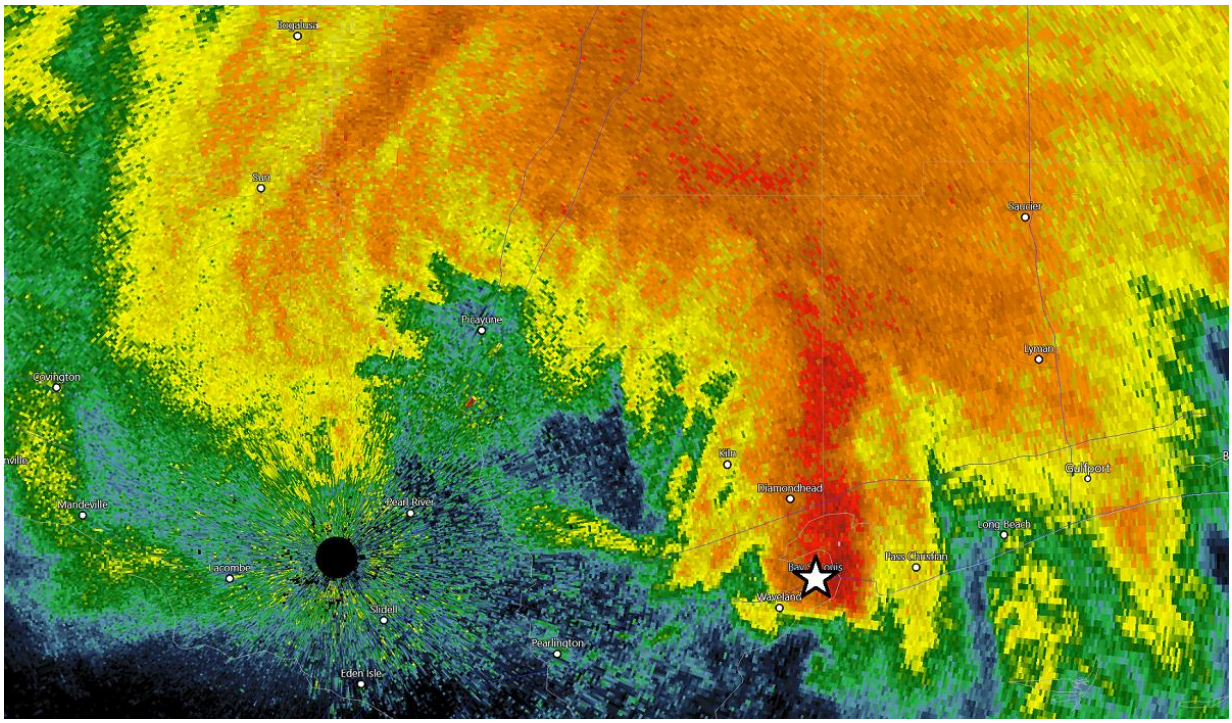

## Figure 9: Radar Image—Eyewall Over Bay St. Louis

***Radar image from New Orleans at 7:20 pm CDT, as the eyewall pounded Bay St. Louis, Mississippi. Two minutes earlier (7:18 pm), the Bay-Waveland Yacht Club just N of Downtown Bay St. Louis recorded winds of 70 knots (1-min) gusting to 90 kt. (Image: RadarScope)***



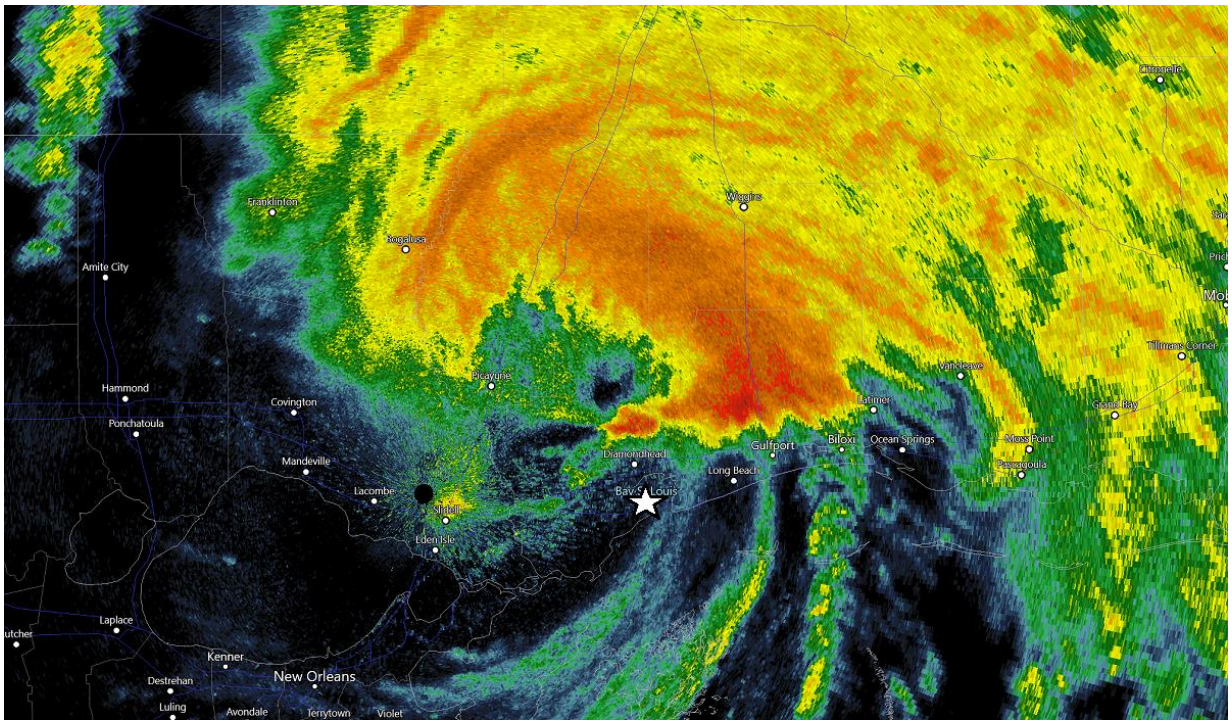
## Figure 10: Radar Image—Eyewall Over Bay St. Louis (Close)

***Radar image from New Orleans at 7:32 pm CDT. Close shot of the intense E (right) eyewall passing directly over Bay St. Louis, Mississippi (star). At this time, destructive winds were blasting the town. (Image: RadarScope)***




## Figure 11: Radar Image—Bay St. Louis Suddenly "In the Clear"

***Radar image from New Orleans at 7:50 pm CDT. The S half of the hurricane's core had disintegrated, so conditions in Bay St. Louis rapidly improved as soon as the center pulled N of the town. Winds went from a hurricane to a stiff breeze in just minutes. (Image: RadarScope)***



# Air Pressure Data

The author collected quality-controlled air-pressure data in Hurricane's ZETA's core in both Mexico and the USA. All data were collected using Kestrel 4500s.

## Mexico

Data were collected in two locations:

### Akumal (Chase Location)

- **Coordinates:** 20.3980N 87.3205W
- **Reference elevation:** 12 ft
- **Sampling rate:** 1 reading per 30 seconds (2/min)

The minimum recorded sea-level pressure was **979.2 mb** **at 10:57 pm EST 26 October (0357Z 27 October).** This was measured inside the calm eye, very near the hurricane's exact center.

The pressure data show an odd secondary dip, to **980.3 mb**, at 11:41 pm. This occurred in stormy conditions, in the hurricane's backside, after the eye had passed. The author does not have an explanation for this.

The complete data for this location are graphed in **Figure 12**, below.

### Playa de Carmen (Sensor Location)

- **Coordinates:** 20.6202N 87.0900W
- **Reference elevation:** 35 ft
  - ***Note:*** *40 ft was used for calibration—to account for device's height above the floor.*
- **Sampling rate:** 1 reading per 30 seconds (2/min)

The minimum recorded sea-level pressure was **996.0 mb** **at 10:50 pm EST 26 October (0350Z 27 October).** This was measured ~21 n mi NE of the hurricane's center, and apparently outside the eye.

The complete data for this location are graphed in **Figure 13**, below.

### Comparison of Akumal & Playa del Carmen Data

Following are the sea-level pressures **at each location at 10:57:30 pm EST:**

- Akumal (near center): **979.2 mb**
- Playa del Carmen (NE of center): **996.4 mb**

That's a difference of 17.2 mb across 19 n mi, which is a gradient of **~0.9 mb/n mi.**

This gradient probably wasn't uniform across the whole distance; it was likely gentler near Playa del Carmen and increased as you headed SW toward Akumal. Either way, this is an unremarkable gradient and not surprising given ZETA was a minimal hurricane at landfall on the Yucatan Peninsula.

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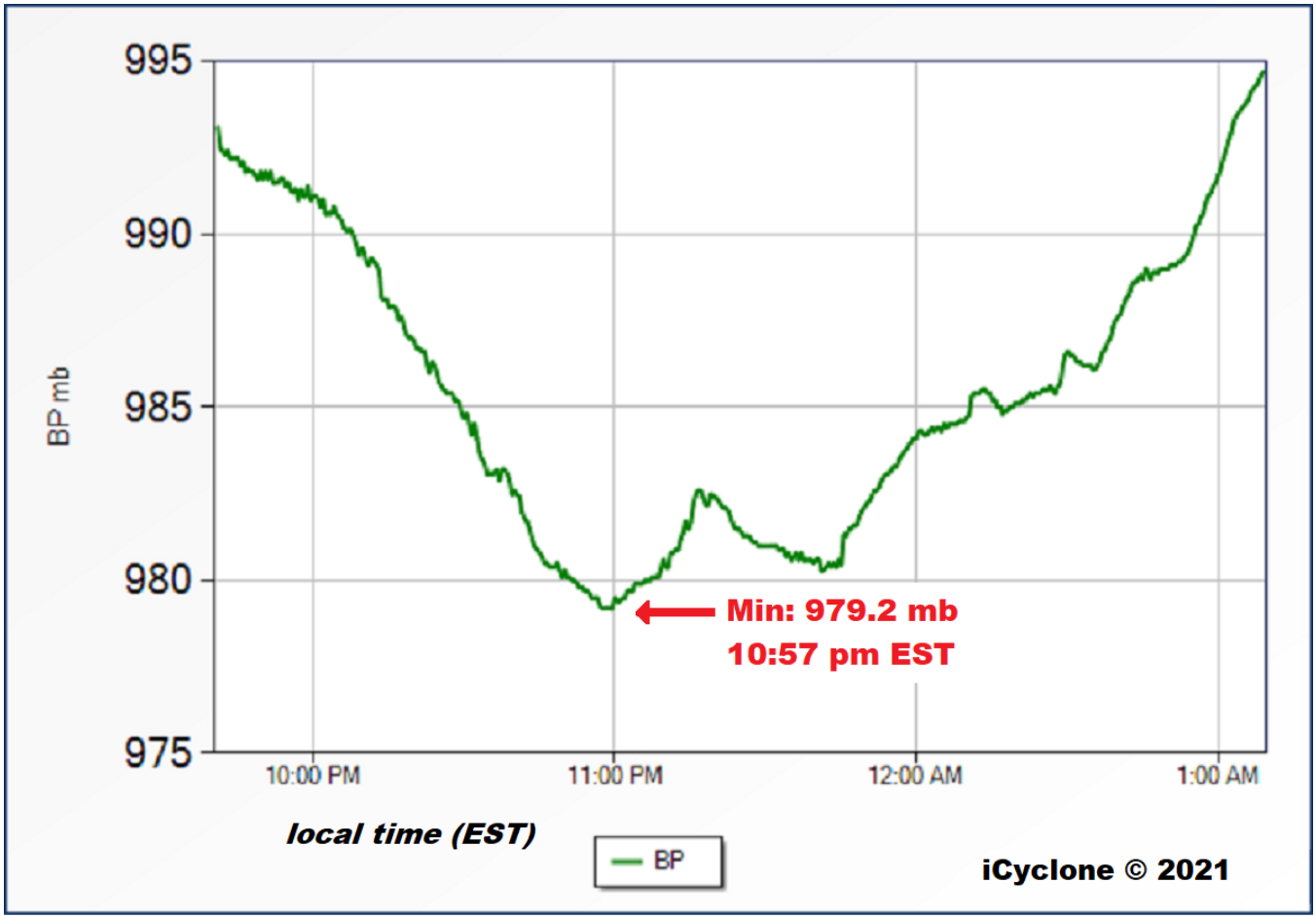
## Figure 12: Barogram—Akumal, Quintana Roo, Mexico

***Air-pressure data reveal the minimum value of 979.2 mb occurred at 10:57 pm EST, as the eye passed over Akumal. There was an odd secondary minimum of 980.3 mb, which occurred at 11:41 pm in the hurricane's backside, after the eye had passed.***

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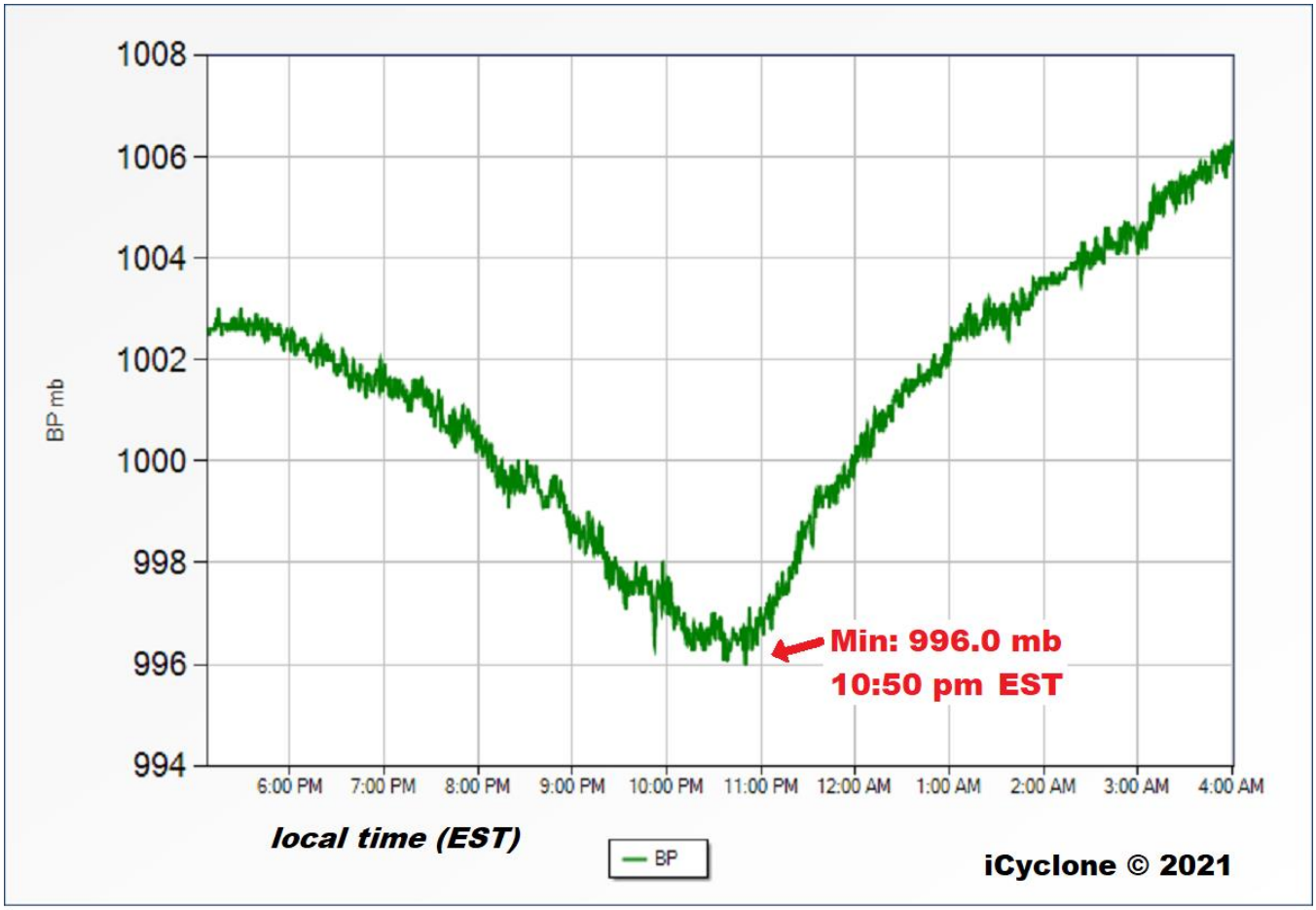
## Figure 13: Barogram—Playa del Carmen, Quintana Roo, Mexico

***Air-pressure data reveal the minimum value of 996.0 mb occurred at 10:50 pm EST, as the hurricane's center was passing well SW of this location.***




**HURRICANE ZETA: 26-27 October 2020**

**Playa del Carmen, Quintana Roo, Mexico**

**20.6202N 87.0900W – ref el 35 ft**

# iCyclone Chase Report

## USA

All data were collected at the single location in **Bay St. Louis, Mississippi.** Two devices were used:

- **Coordinates:** 30.3151N 89.3446W
- **Reference elevation:** 21 ft
  - ***Note:*** *25 ft was used for calibration—to account for the devices' height above the floor.*
- **Sampling rate:** 1 reading per 30 seconds (2/min)

Minimum recorded sea-level pressures for each device were:

- **Device A: 979.6 mb at 7:34 pm CDT 28 October (0034Z 29 October).**
- **Device B: 980.7 mb at 7:34 pm CDT 28 October (0034Z 29 October).**

These minimums were measured **in the hurricane's E (right) eyewall,** as the center was making its closest approach to the location, and around the time of the apparent maximum winds.

The data for **Devices A** and **B** are graphed in **Figures 16** and **18**, below. **Figure 17** is a zoomed-in view of the **Device A** data, focusing on when the hurricane's core was impacting the location.

### Discussion

The air-pressure traces are "jagged" during the time the eyewall (and peak winds) are estimated to have occurred (**pink phase** in **Figures 16** and **17**). This is especially so when the eyewall first reaches Bay St. Louis: notice the sharp dip just after 7 pm CDT. The author has noticed this jagged pressure pattern in other hurricane eyewalls, and it often seems to correlate with intense, destructive winds.

The author determined the timing of the eyewall's passage (~7:05 to 7:45 pm CDT) based on the apparent violence of the wind, including the loudness of its howl. While this is a subjective assessment, it's corroborated by data from the nearby **Bay-Waveland Yacht Club** (**Figure 14**). This official station, located ~1 n mi NE of the author's cottage (and just N of Downtown Bay St. Louis), recorded its peak wind of 70 kt (1-min) gusting to 90 kt at 7:18 pm—which falls squarely within the eyewall phase as estimated by the author. Also, the Yacht Club's air-pressure data correspond well with the author's: both the minimum value and timing of it. **Figure 15** maps the data from these two locations.

### Figure 14: Bay-Waveland Yacht Club

***This official station, located 1 n mi NE of the author's cottage and just N of Downtown Bay St. Louis, measured 70 kt (1-min) gusting to 90 kt as Hurricane ZETA's eyewall pounded the town.***

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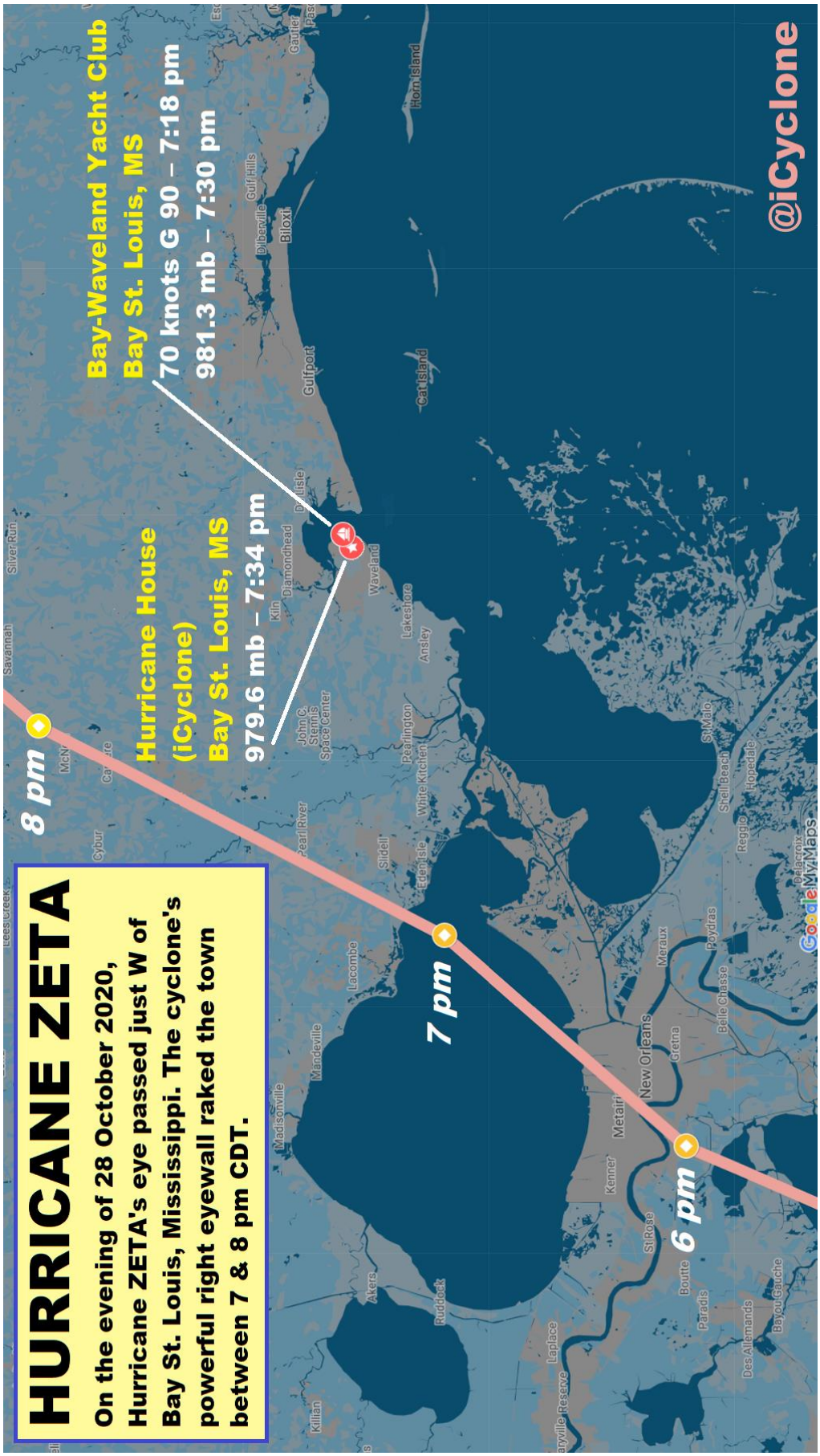
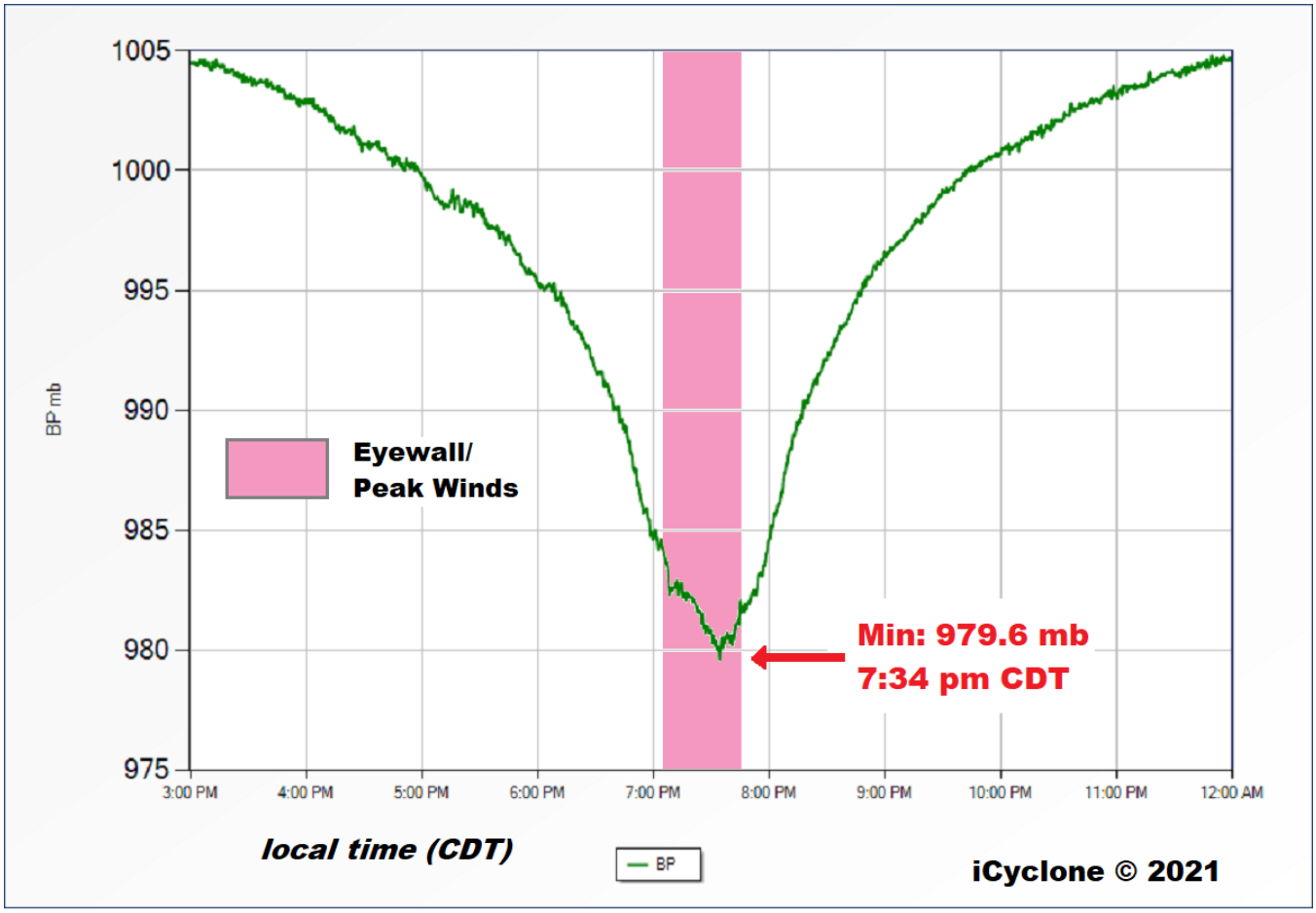
## Figure 15: Data from Multiple Locations



## Figure 16: Barogram—Bay St. Louis, Mississippi, USA—Device A

***Air-pressure data reveal the minimum value of 979.6 mb occurred at 7:34 pm CDT, as the hurricane's center was making its closest approach to this location and the E eyewall was raking Bay St. Louis, Mississippi.***




**HURRICANE ZETA: 28 October 2020**
**Bay St. Louis, Mississippi, USA**
**30.3151N 89.3446W – ref el 21 ft** ***DEVICE A***

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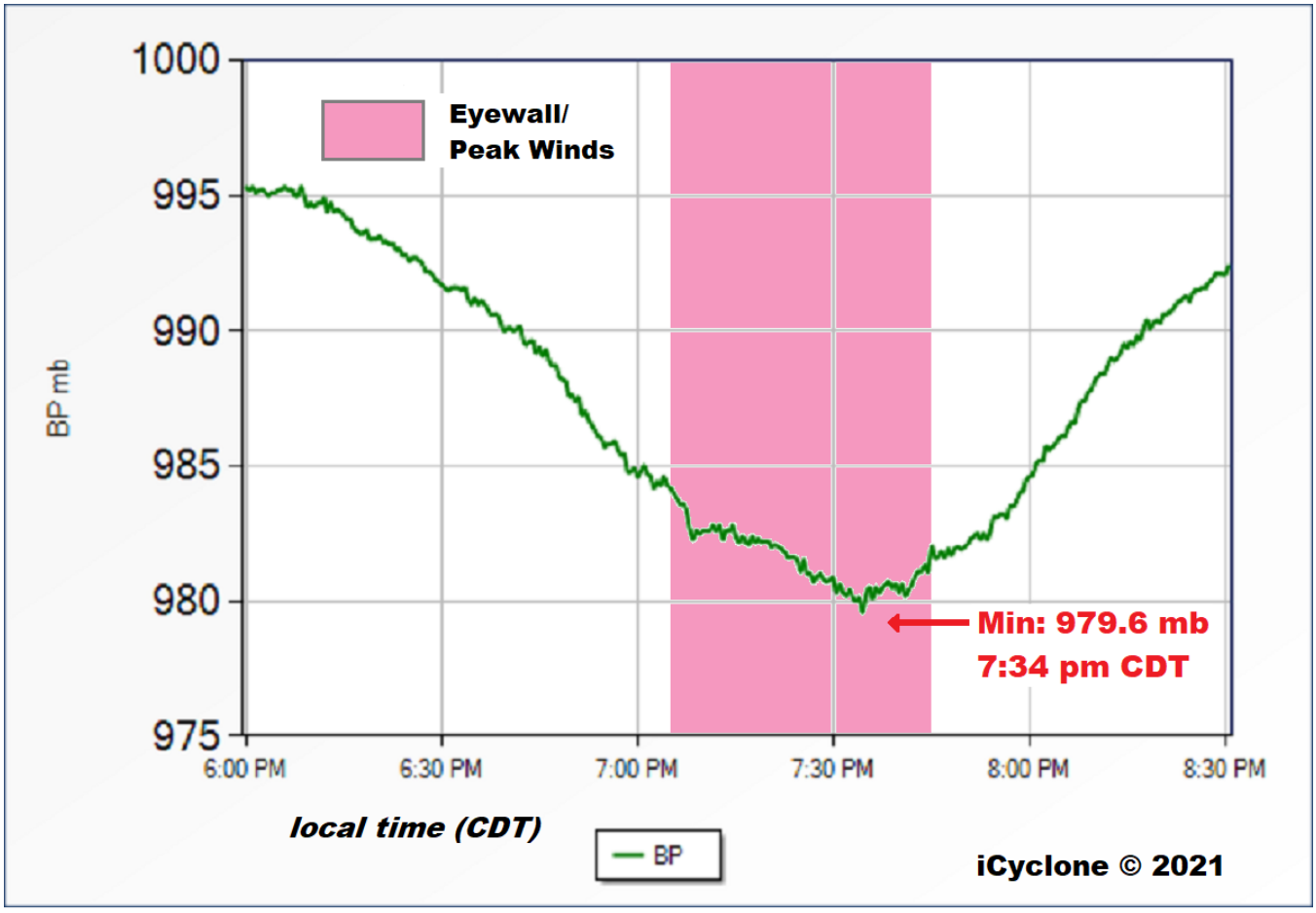
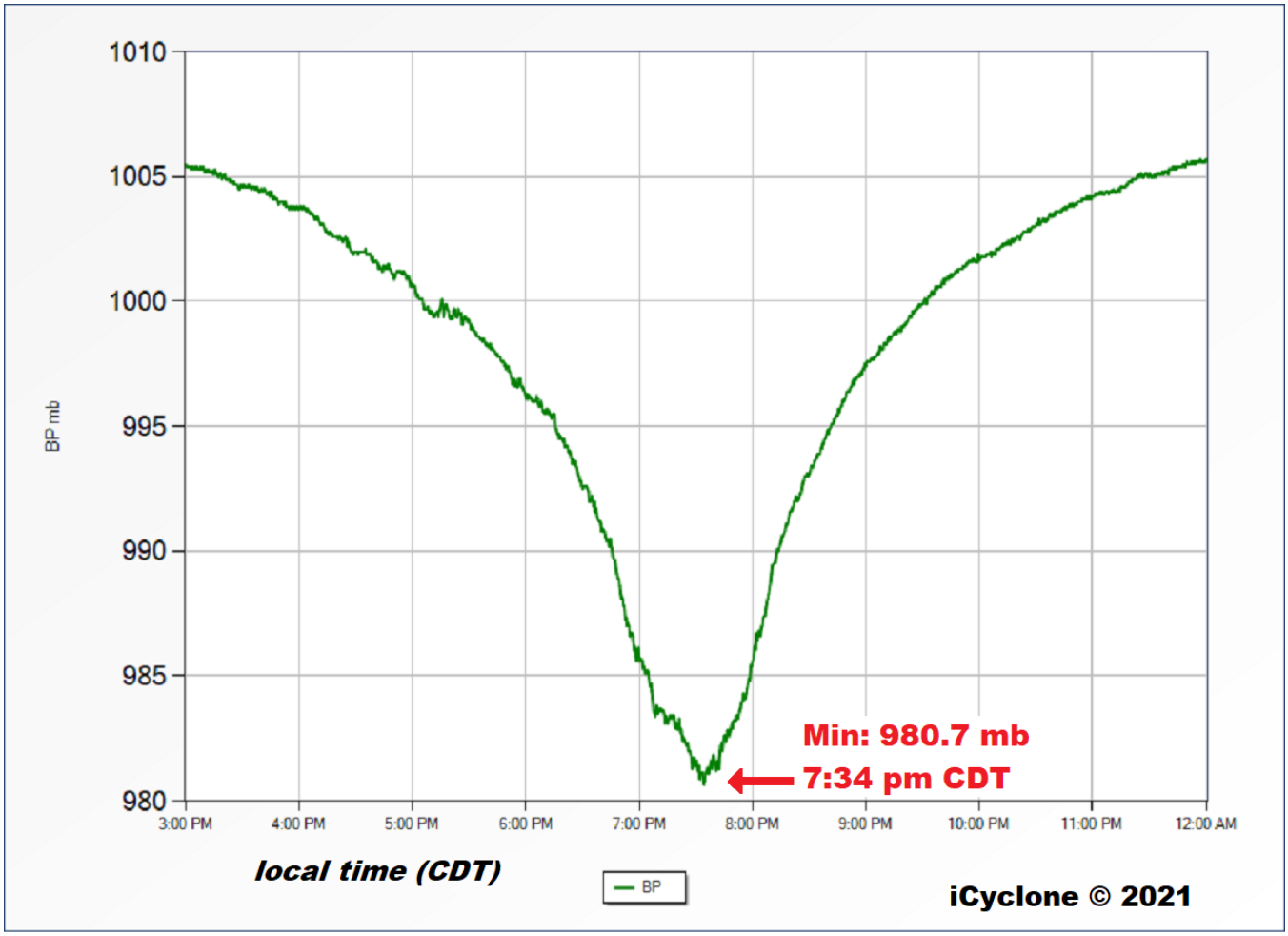
## Figure 17: Barogram—Bay St. Louis, Mississippi, USA—Device A (CLOSE VIEW)

***A close view of Device A's air-pressure trace shows a jagged pattern during the period of estimated peak winds—with an especially sharp dip just as the eyewall is estimated to have arrived at this location.***



## Figure 18: Barogram—Bay St. Louis, Mississippi, USA—Device B

***Device B's air-pressure trace is very similar to Device A's—and Device B's minimum value of 980.7 mb occurred at the same time as Device A's (7:34 pm CDT). Device B's minimum is higher than Device's A—however the difference is within the devices' accuracy range of +/- 1.5 mb.***




**HURRICANE ZETA: 28 October 2020**
**Bay St. Louis, Mississippi, USA**
**30.3151N 89.3446W – ref el 21 ft**

***DEVICE B***

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# Aftermath

Hurricane ZETA's core raked Bay St. Louis, Mississippi, and neighboring Waveland, inflicting widespread, moderate wind damage across these communities—typical of what you'd expect to see in a Category-2 hurricane.

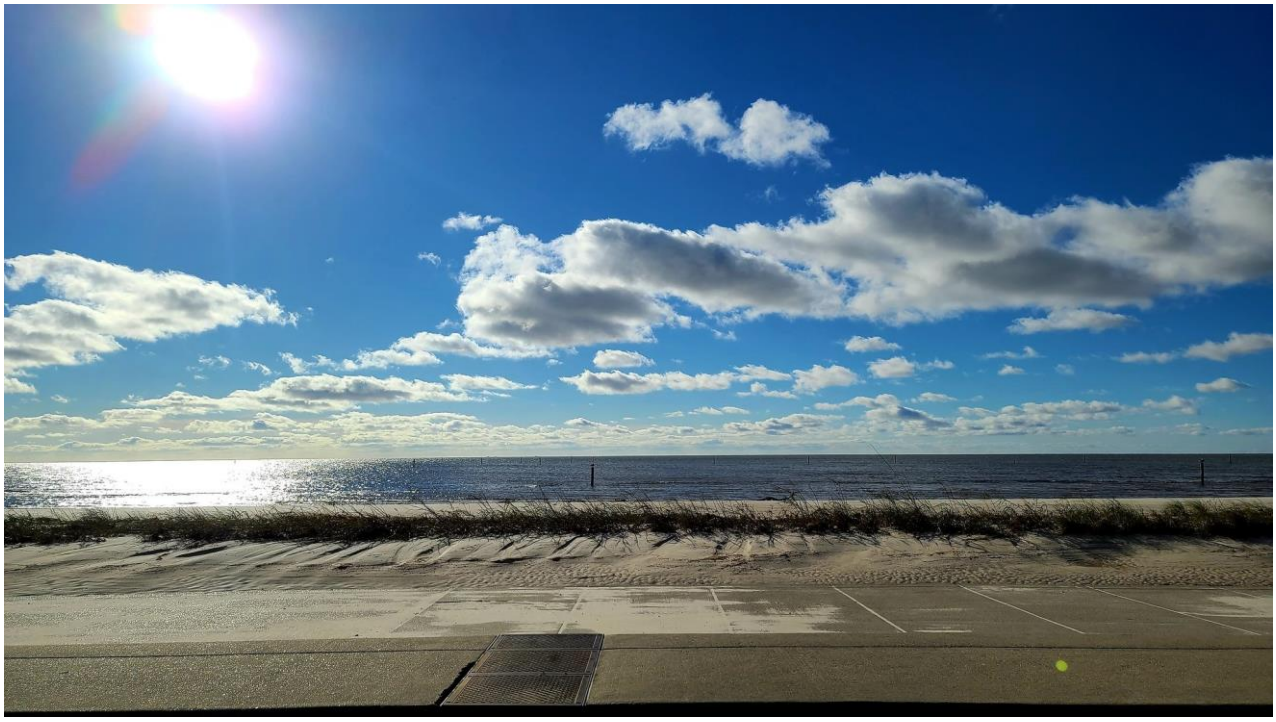
Along Highway 90, numerous power poles were felled, and many signs were blown out. Gas stations were mangled. Some commercial buildings had extensive structural damage, including collapsed façades.

In Downtown Bay St. Louis, a row of decorative palm trees was mowed down. The town's welcome sign was blown out, and the flying pieces smashed the windows of a nearby restaurant.

In residential neighborhoods, many trees fell, blocking streets and in some cases inflicting serious damage to homes. (The house across the street from the author's cottage was flattened by a large falling pine and declared a total loss.) Numerous homes—perhaps as many as a third or a half—had at least minor roof damage. Weeks after the hurricane, protective blue tarps were a common sight around town.

Sand deposits and debris lines along the waterfront in Bay St. Louis and Waveland suggest the storm surge came over Beach Boulevard and up onto lawns, in some places penetrating several blocks inland.

The hurricane knocked out power across almost all of Bay St. Louis, but it was fortunately restored to most homes and businesses within four or five days.



***A view of the Gulf of Mexico from Bay St. Louis, Mississippi, the day after Hurricane ZETA. Picture perfect.***

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***A home across the street from the author's cottage in Bay St. Louis. This large tree aimed with cruel precision as it fell, crushing much of the house at the height of the storm. The occupants were inside at the time, but fortunately there were no injuries.***

***Some buildings—like this business on Highway 90 in Bay St. Louis—suffered heavy wind damage to their façades.***

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***A mangled gas station on Highway 90 in Waveland, Mississippi.***

***Damaged façade in a medical complex along Highway 90 in Bay St. Louis.***

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***Tossed kiosk in the foreground; damaged roofing surface in the background. Hurricane ZETA's winds inflicted widespread, moderate damage across Bay St. Louis and neighboring Waveland.***

***Several days after the hurricane: damaged industrial building in Bay St. Louis.***

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***Several days after the hurricane: damaged roof covered by a tarp in Bay St. Louis.***

***Hurricane ZETA's winds tore much of the roof off the historic 100 Men Hall in Bay St. Louis, Mississippi. Built in 1922, the hall has been a center of black social life and entertainment for almost a century.***

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***Hurricane ZETA's winds mowed down these decorative palm trees along Beach Boulevard in Downtown Bay St. Louis, Mississippi.***

***Downtown Bay St. Louis. The hurricane's winds tore apart the town's welcome sign. The popular restaurant next to it (The Blind Tiger) had many broken windows—more than other buildings Downtown—probably due to flying debris from the destroyed sign.***

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***Close view of The Blind Tiger. The restaurant had many broken windows—more than other buildings in Downtown Bay St. Louis—probably due to flying debris from the town's destroyed welcome sign.***

***In the wake of Hurricane ZETA, minor-to-moderate roof damage was a common sight in Bay St. Louis and neighboring Waveland.***

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***This church on Highway 90 in Bay St. Louis took a beating during Hurricane ZETA. It lost the top of its steeple and some siding, and a tree fell on it.***

***Debris lines and sand deposits along the coast in Bay St. Louis and Waveland suggested Hurricane ZETA's storm surge washed over Beach Boulevard and up onto lawns.***

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***Near Waveland City Hall, facing the Gulf of Mexico. Sand deposits and debris lines suggest the storm surge came over Beach Boulevard and penetrated several blocks inland in some places.***

***A few days after Hurricane ZETA, storm surge wreckage was piled along Beach Boulevard for eventual pickup.***

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***Downed palm tree and bent power pole on Beach Boulevard in the Bay St. Louis/Waveland area.***

***Hurricane ZETA's winds tore the siding off many homes—like this one on Beach Boulevard in the Bay St. Louis/Waveland area.***

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***A church on Beach Boulevard in the Bay St. Louis/Waveland area. Another example of damaged siding.***

***Few houses completely lost their roofs during Hurricane ZETA. That said, winds peeled the surface materials off many, like this one on Beach Boulevard in the Bay St. Louis/Waveland area.***

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***Storm surge debris near Beach Boulevard in the Bay St. Louis/Waveland area.***

***Tree damage along Beach Boulevard in the Bay St. Louis/Waveland area.***

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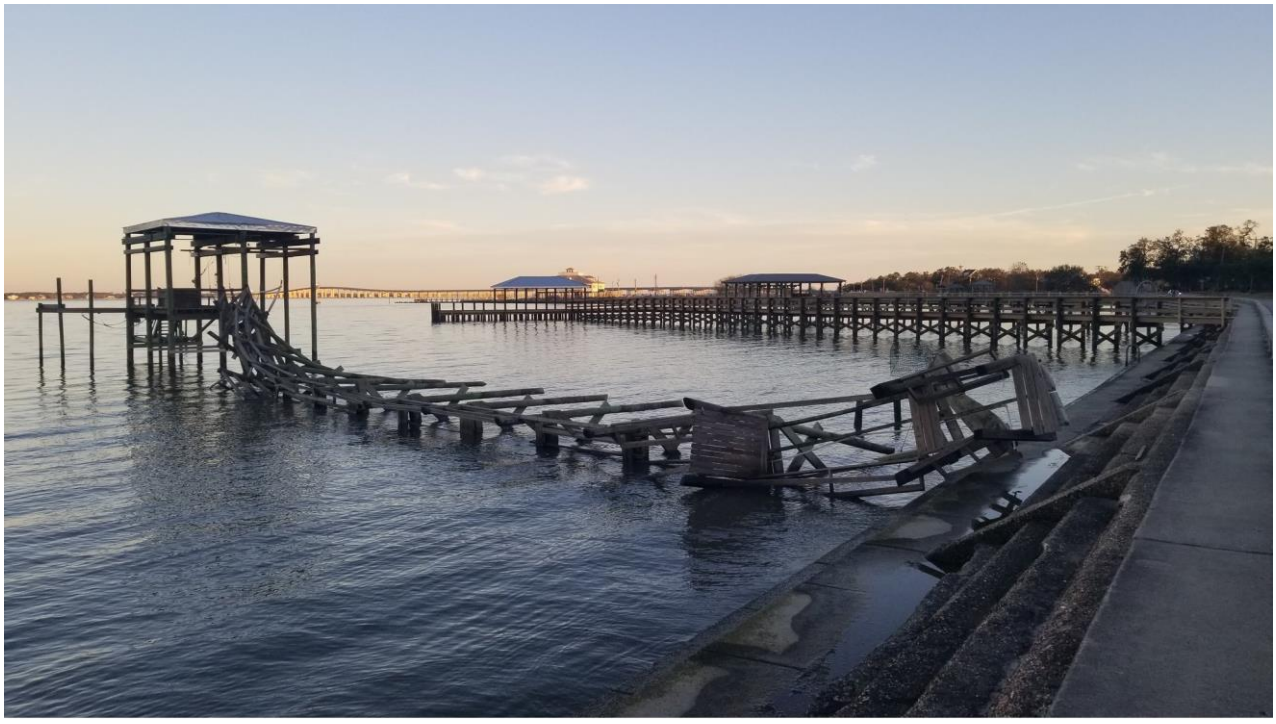
***Three weeks after Hurricane ZETA's assault, scars remained all along the Mississippi coast. This is on Highway 90 in Long Beach.***



***More than three weeks after Hurricane ZETA in Bay St. Louis. Some piers survived the storm—some, like this one near the Bay-Waveland Yacht Club, didn't.***

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***Two days after Hurricane ZETA, the cottage in Bay St. Louis where the author rode out the storm. This century-old home—which has survived CAMILLE and KATRINA—withstood ZETA's winds with only minor damage. But the property was covered in fallen branches, which the author piled along street for pickup.***

# Questions or Feedback?

Get in touch:

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