iCyclone Chase Report

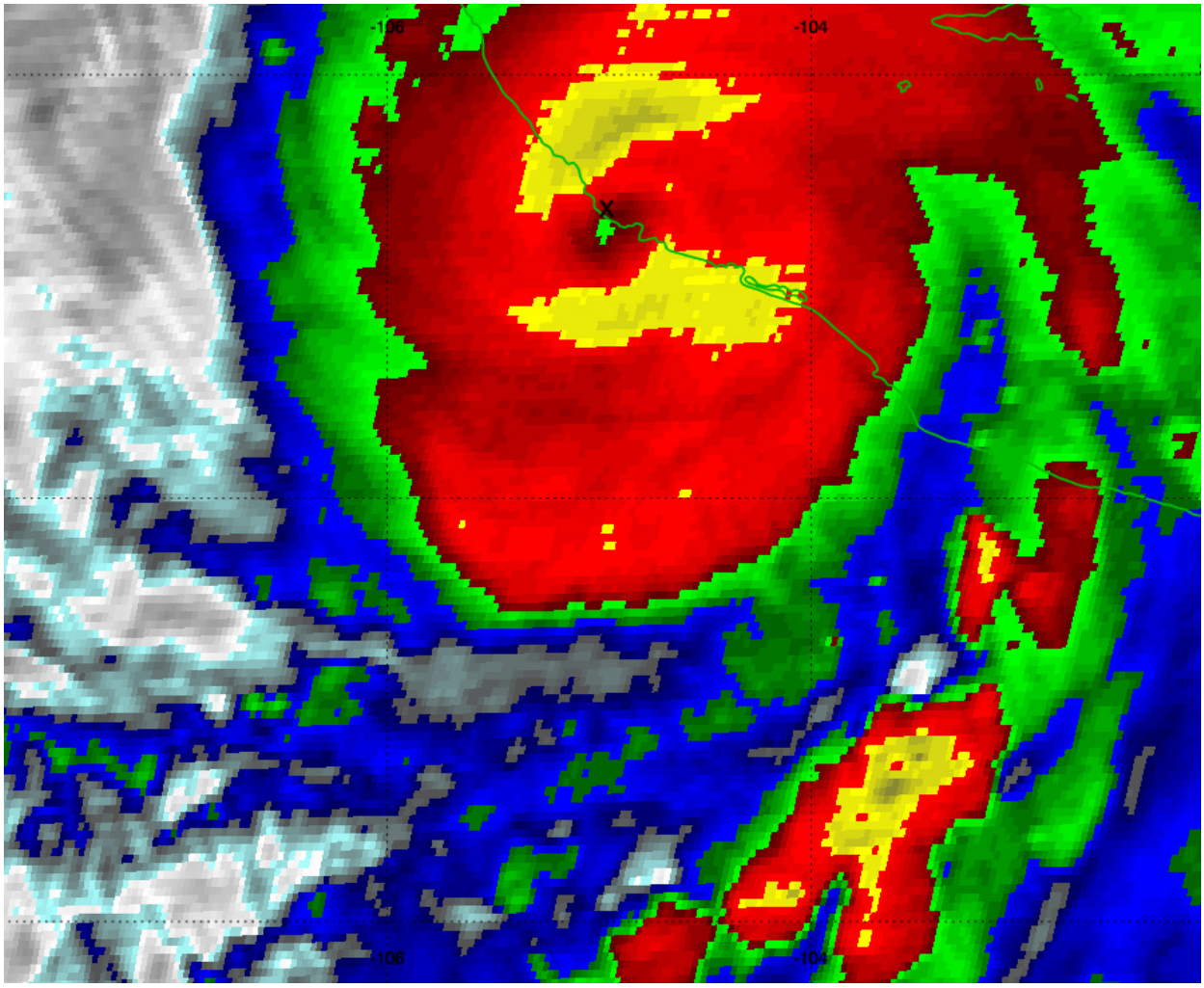
storm	**Hurricane PATRICIA**		
location	**Emiliano Zapata, Jalisco, Mexico**		
date	**23 October 2015**		
chasers	**Josh Morgerman, Erik Sereno**	**author**	**Josh Morgerman**

Overview

Hurricane PATRICIA was a small, extremely powerful hurricane that made a bull's-eye, direct hit on Emiliano Zapata, devastating that town and nearby villages along the Jalisco coast of Mexico.

At the time of this writing, questions remain about the exact landfall intensity of PATRICIA, as well as the intensity of the Great Mexico Hurricane of 1959 (currently being reanalyzed). Despite these unknowns, PATRICIA is likely the most-intense hurricane landfall in the history of the Eastern Pacific and the W coast of Mexico.

We were in Emiliano Zapata (19.38973N 104.96391W)—very close to the landfall point—to document this extreme, historic event.



Hurricane PATRICIA at 5:30 pm CDT (2230Z) on 23 October, just before landfall near Emiliano Zapata, Jalisco, Mexico. (The iCyclone chase location is marked with an X.)

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iCyclone Chase Report

Highlights

Following are the **five important conclusions** of this report. All times in this document are local (**CDT**) time—which is UTC minus 5 hours:

1. **The hurricane still had an intense, compact core at landfall.** Despite weakening prior to landfall, PATRICIA came ashore with a tight, concentrated, extremely violent inner core. Damaging winds only persisted for ~ 2 hours at our location (~5:25 – 7:30 pm), and the peak winds only lasted ~17 minutes (6:33 – 6:50 pm). This is consistent with recon data and radar imagery of the cyclone from a couple of hours before landfall, depicting a core ~22 n mi in diameter and an RMW of ~6-7 n mi.

2. **The eye passed over Emiliano Zapata.** The coincidence of several factors within a short time (~6:12 – 6:30 pm) makes it clear Emiliano Zapata was, indeed, in the eye: 1) minimum pressure, 2) brightening of the sky, 3) significant lessening of the winds, and 4) sharp shift in wind direction. However, the brevity of the lull and the lack of true calm suggest we caught only a **portion** of the eye, **not the dead center of it.**

    - The relative lull lasted <10 minutes—from about 6:06 to 6:15 pm. During this time, the sky brightened—the sun was trying to poke through—and there were tiny patches of blue sky. But it remained very breezy, with winds always tugging at maybe 20 or 30 kt.

    - Judging from the shifts in wind direction, it seems the hurricane's center was wobbling NNW as it moved over us—as winds were generally NE before the lull and SW after.

    - I measured a minimum pressure of **937.8 mb** **at 6:12 pm**, during the lull. ***This is the lowest sea-level pressure ever recorded on land during an Eastern Pacific hurricane.***

3. **The pressure gradient in the hurricane's inner core was incredible—over 11 mb/n mi in one place.** So despite pre-landfall filling, the cyclone's pressure profile was still jaw-dropping. I measured the peak gradients in the back (SE) eyewall, as the center was moving away. Not surprisingly, the short period of extremely violent winds coincided with these peak gradients (see next point).

4. **The backside (SE eyewall) was much more vigorous than the front.** The SE eyewall (which hit after the eye passed) packed an incredible, ferocious punch: very heavy rain, whiteout conditions, and **extremely** destructive winds. But it didn't last long—sweeping in and out with tornadic efficiency, in just a little over 15 minutes. The front side (NW eyewall) wasn't as vigorous: wind speeds weren't as high and precipitation wasn't as heavy. In fact, there was very little rain during some of the strongest winds preceding the eye. But the front side was still very destructive. In fact, much of the heavy tree damage (defoliation, stripping of branches, uprootings, and snapped trunks) had already happened by the time the eye arrived—and well before the peak winds.

5. **Damage was consistent with the passage of an extremely severe hurricane.** Heavy wind damage occurred in Emiliano Zapata and nearby villages that experienced the hurricane's violent core. Most trees were 100% defoliated and/or stripped of branches. Palms were badly thrashed, with some defronded or snapped off at the trunk. The nearby hills—which had been green and jungly before the storm—were brown and dead. In just two hours, the tropical landscape was transformed into something barren and wintry. Many houses and buildings lost their roofs or had other structural damage. Concrete power poles were snapped; communications towers were crumpled. Piles of debris was strewn everywhere.

The rest of this report provides more detail Re: the above points.

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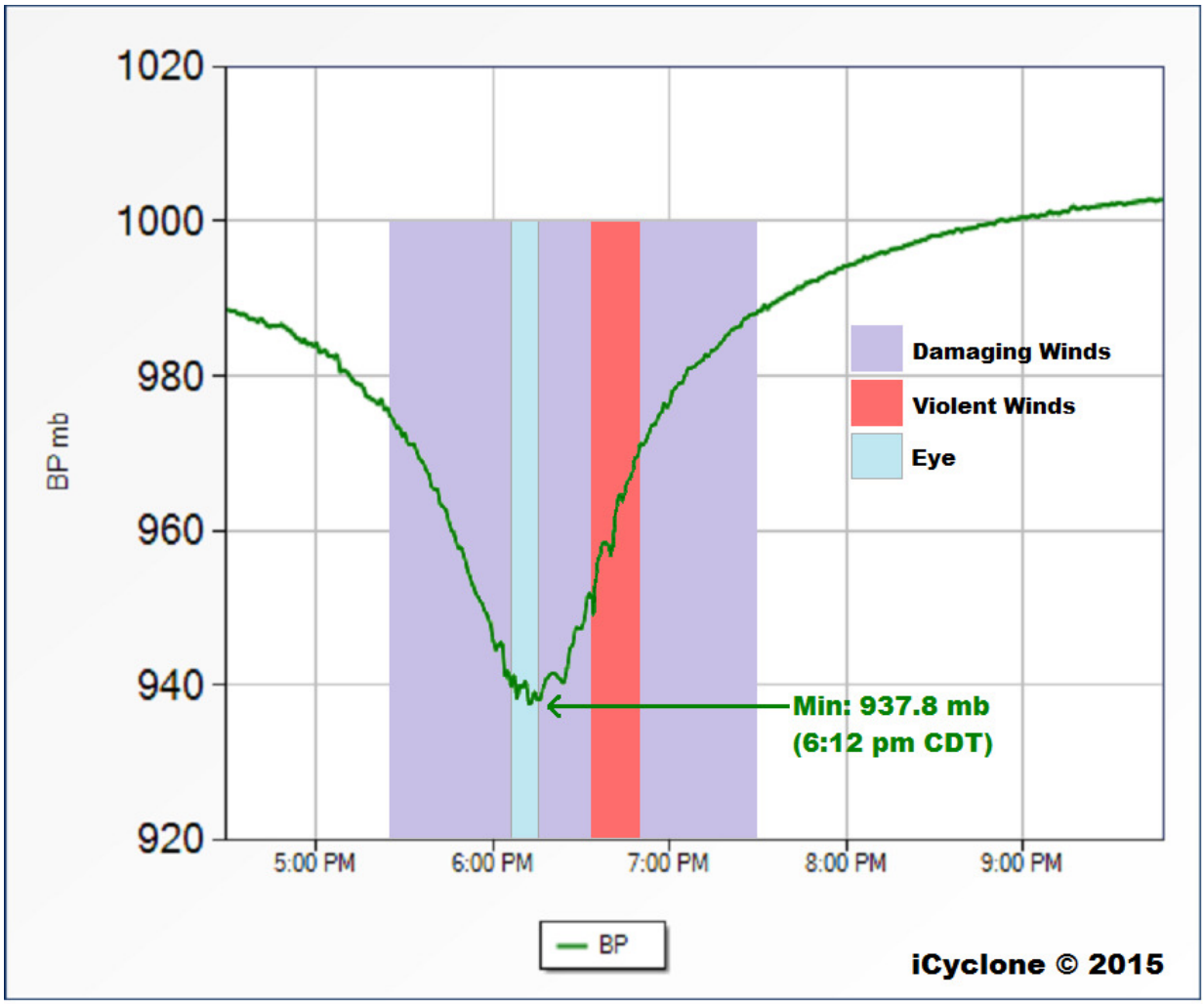
Storm Summary Infographic

The following infographic combines my surface observations and air-pressure data into a single, consolidated summary of Hurricane PATRICIA's passage over our chase location in Emiliano Zapata.

These observations and data are described in more detail later in this report:



HURRICANE PATRICIA: 23 Oct 2015

Emiliano Zapata, Jalisco, Mexico

19.38973N 104.96391W – ref el 60 ft **DEVICE 1**

Chase Location

We observed the passage of **Hurricane PATRICIA** in **Emiliano Zapata, Jalisco, Mexico**, at **19.38973N 104.96391W**. We rode out the storm in the Hotel El Refugio, which is on W side of Highway 200, in the N outskirts of the town.

The National Hurricane Center has not yet completed its postanalysis of this storm. However, the NHC's operational track puts the **landfall point at 19.4N 105.0W, which is only ~2 n mi W of our location.**

The **Chase Map** shows our location (**black star**) in relation to **PATRICIA's center positions** (**pink diamonds**), as per the NHC's operational track. **Chase Map (Detailed)** is a closer view, and **Chase Map (Satellite)** is a zoomed-in look at the environment.

Figure 1: Chase Map

Figure 2: Chase Map (Detailed)

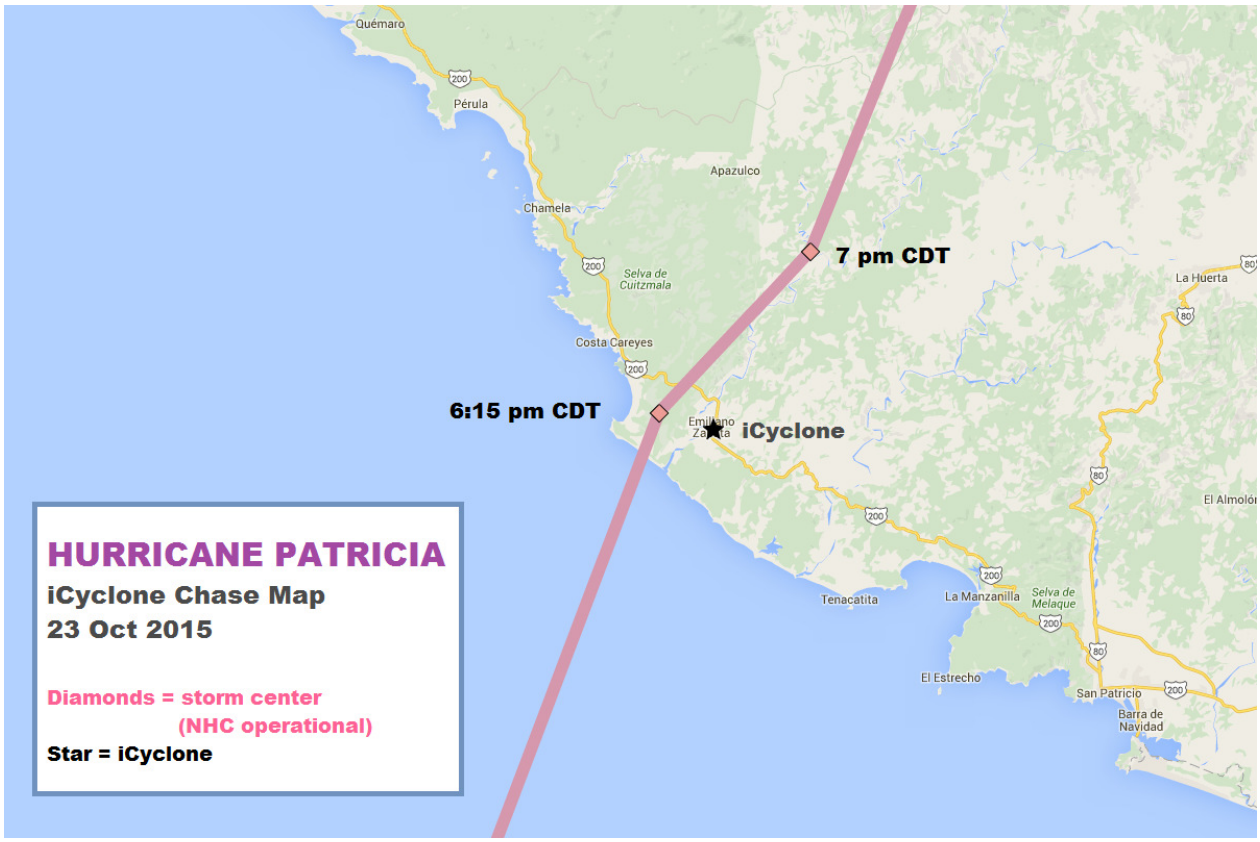
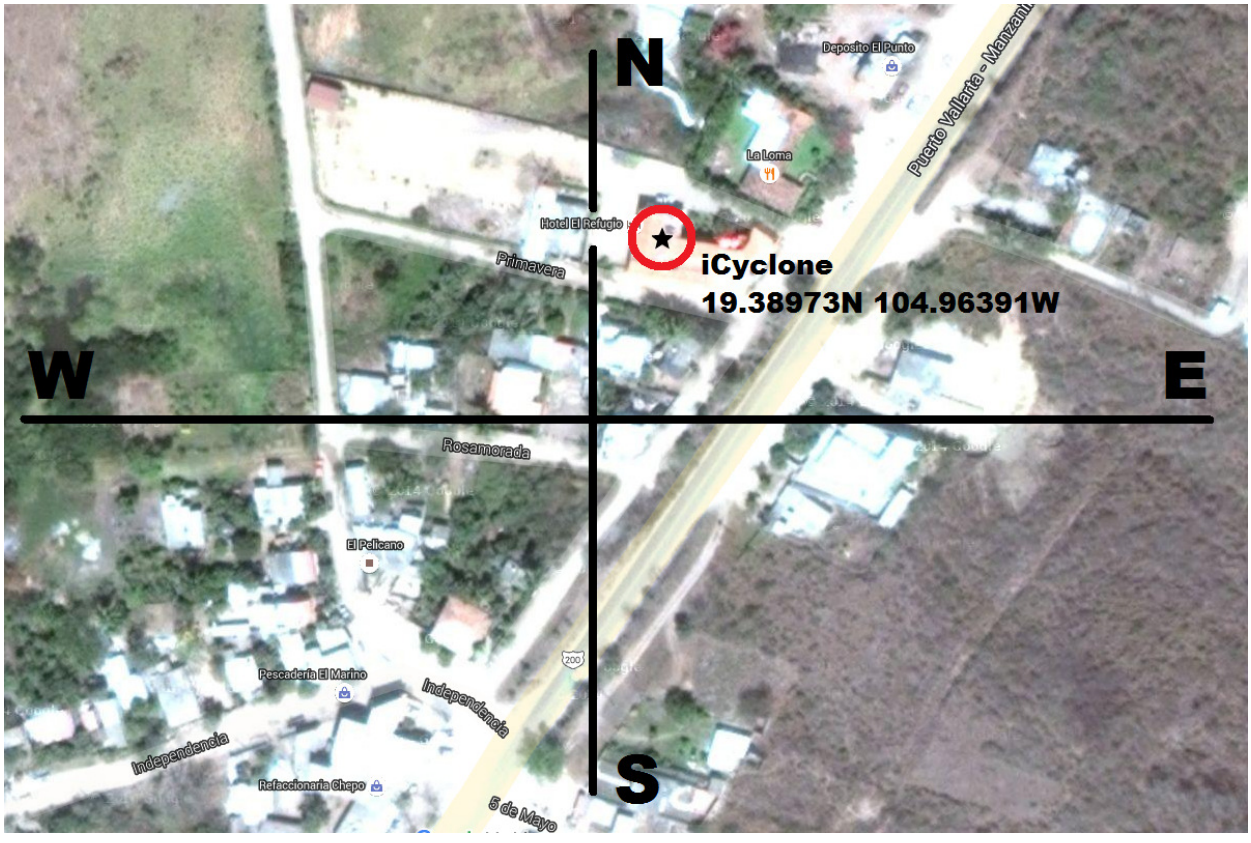
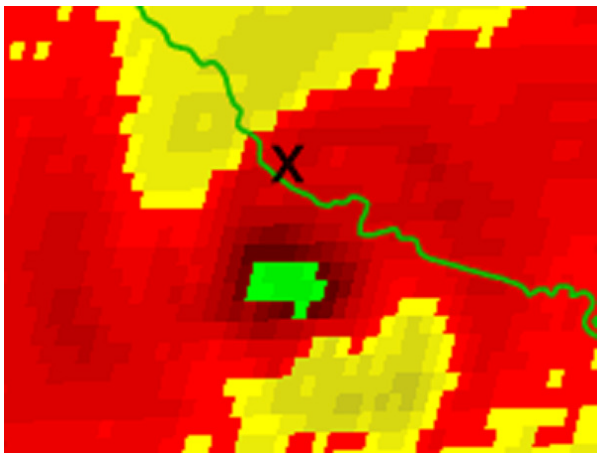


Figure 3: Chase Map (Satellite)

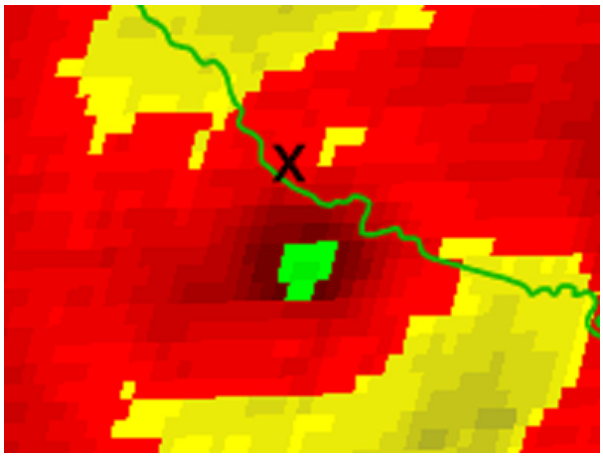


Landfall Location

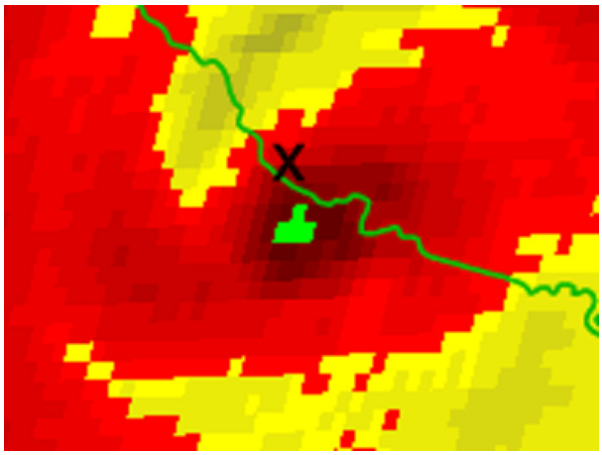
Unfortunately there are no radar images from the time of landfall. However, infrared imagery from that time suggests the center crossed the coast **very** near our chase location (marked with an **X**). *(**Note:** Because these are GOES-West images, it's assumed the actual surface center is a bit WSW of the apparent center in these images, due to parallax displacement.)*



4:45 pm CDT (2145Z)



5:00 pm CDT (2200Z)



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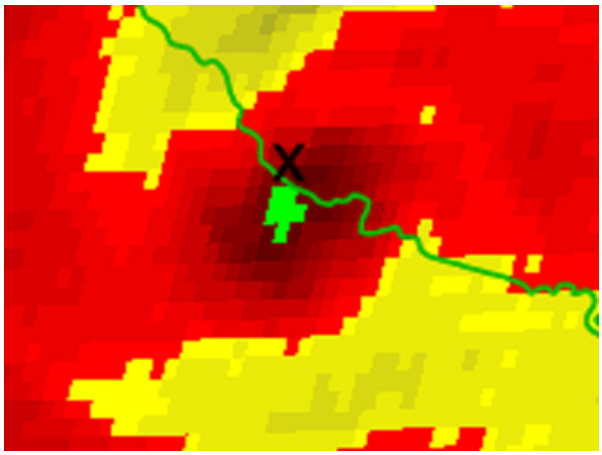

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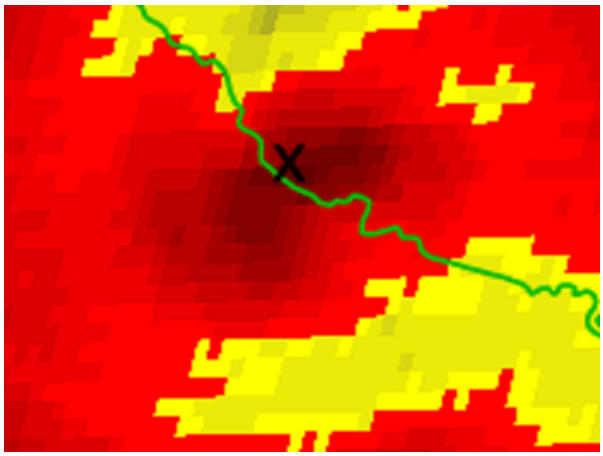
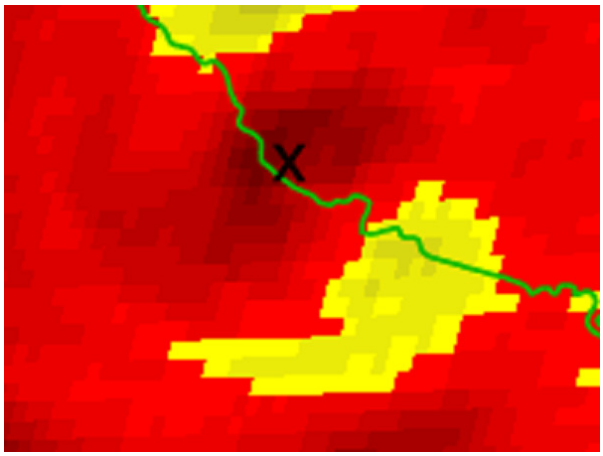
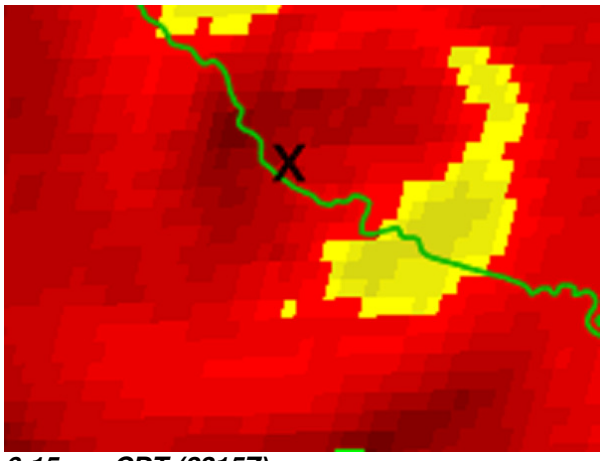


5:45 pm CDT (2245Z)



6:00 pm CDT (2300Z)



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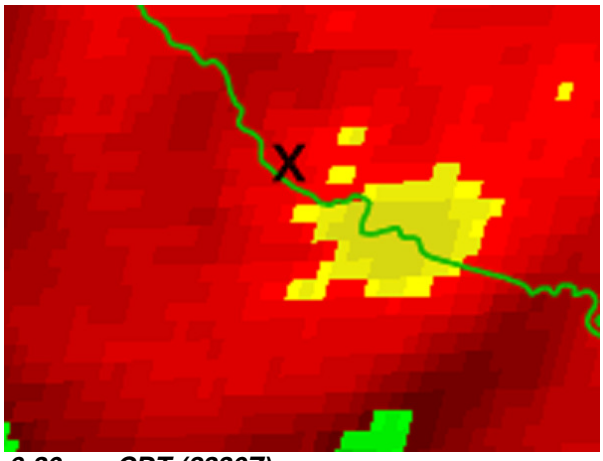
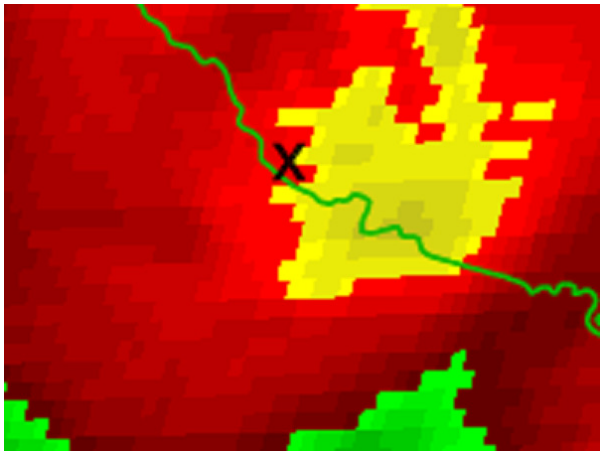
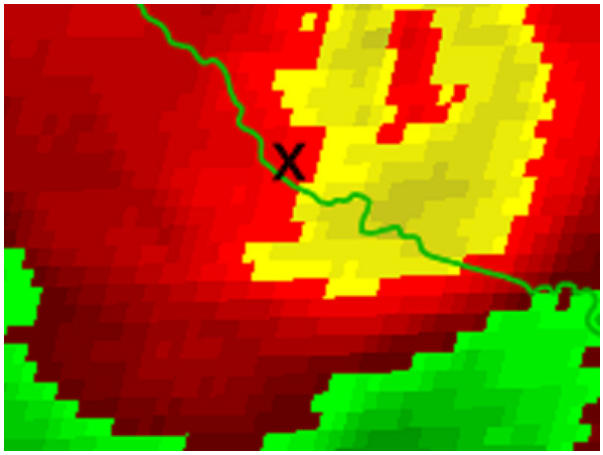


6:30 pm CDT (2330Z)

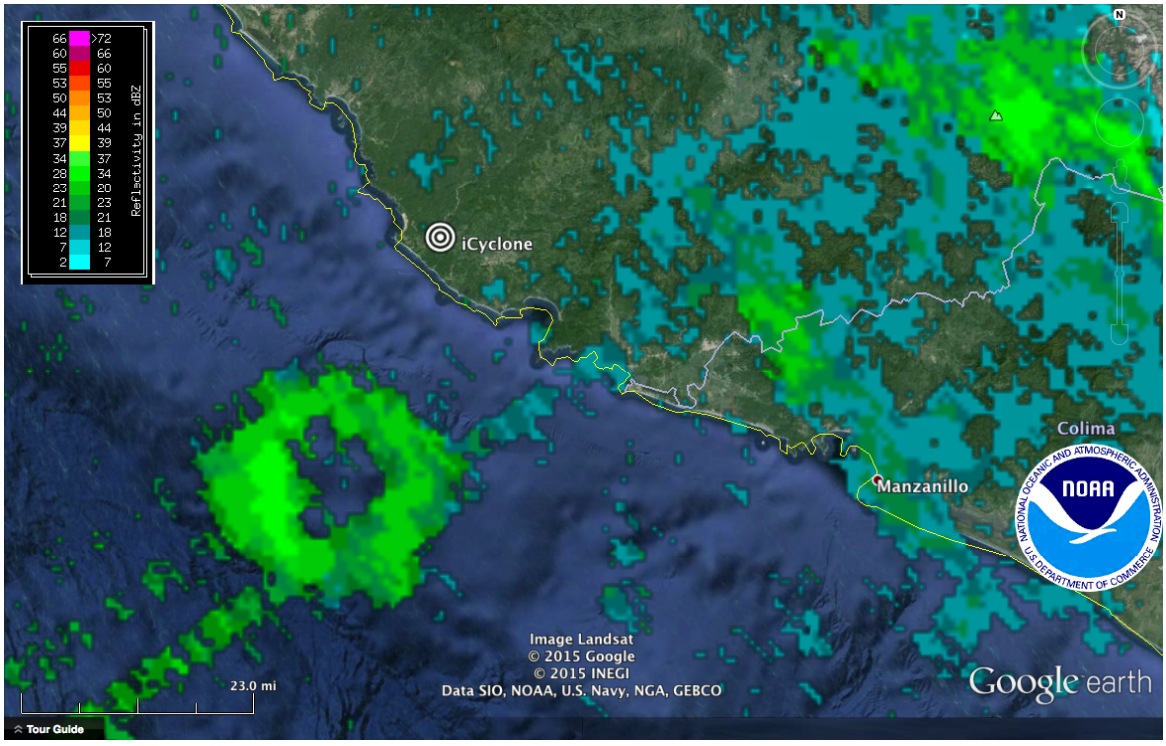


6:45 pm CDT (2345Z)



7:00 pm CDT (000Z 24Oct)

The last reconnaissance radar image (from 4:51 pm CDT (2151Z)) suggests the hurricane's core remained very small as it wobbled toward the coast. PATRICIA was a tiny and difficult-to-chase target:



Detailed Chronology

Following is a detailed chronology of observed conditions in Emiliano Zapata during the passage of Hurricane PATRICIA, reconstructed from **time-stamped video footage** and **air-pressure data**.

Observations are listed every 15 minutes **and also** when significant events or changes occurred. In most (but not all) cases, times are rounded to the nearest 5 minutes.

Color key:

- **Purple = damaging winds**—defined here as winds that can tear large branches from trees.
- **Red = violent winds**—defined here as winds that inflict significant structural damage.
- **Blue = relative calm of the eye.**

Please note that the start and end times of these periods were subjectively determined (without wind data) and should be considered **approximate**. Please also note that wind direction in some cases was difficult to precisely determine (due to localized effects from nearby buildings and hills) and should also be considered approximate.

/1 – Front Side

TIME (CDT)	MB	WIND DIR	CONDITIONS
4:30 pm	988.6	NE	gusty winds start suddenly from near calm; breezy; light rain
4:45 pm	986.6	ENE	gusty winds; light rain
5:00 pm	984.2	NE	gusty winds; some broken branches; moderate rain
5:15 pm	978.9	NE	winds increasing, with strong gusts; moderate/heavy rain
5:25 pm	974.9	NE	squall with damaging gusts; trees uprooting or snapping at trunk, or large branches breaking; heavy rain
5:30 pm	972.6	NE	damaging gusts coming in waves; light rain
5:45 pm	960.9	NNE	winds continuously strong & damaging; some brightness in sky; light/no rain
5:50 pm	956.8	NE	very gusty, damaging winds; flying tin, landscape in constant motion; sky dark again; light rain
6:00 pm	945.8	NE	gusty & very turbulent winds; flying debris; sky brightening to SW; light/moderate rain

/2 – Eye

TIME (CDT)	MB	WIND DIR	CONDITIONS
6:06 pm	939.9	ENE	calming; rain tapering
6:10 pm	939.8	ENE	relative lull (but still breezy); sun almost coming out; touches of blue sky; light/no rain
6:12 pm	937.8	E	breezy; some blue sky; no rain (lowest pressure reading)

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/3 – Backside

TIME (CDT)	MB	WIND DIR	CONDITIONS
6:15 pm	938.2	ESE	gusty, turbulent winds; flying debris; sky darker; light rain
6:30 pm	947.4	SW	pronounced direction change; strong winds & heavy rain suddenly sweep in, then ease up momentarily
6:33 pm	951.7	W or WSW*	extreme, violent winds; very heavy rain; whiteout conditions; loud crashing as hotel is damaged
6:35 pm	955.0	W or WSW*	extreme, violent winds; very heavy rain; whiteout conditions; eight of us seek shelter in room, then retreat to bathroom & pull mattress over us for protection
6:45 pm	965.8	--	extreme, violent winds; we stay put in bathroom
6:50 pm	971.3	--	roar of wind lessening, but still too dangerous to leave shelter
7:00 pm	976.7	--	roar of wind continues to lessen, but we're still unable to leave shelter
7:05 pm	979.9	W	strong, steady winds—but less dangerous than earlier; heavy rain
7:15 pm	983.4	WSW	strong, steady winds; widespread destruction now visible; heavy rain
7:30 pm	988.4	--	windy; light/moderate rain
7:45 pm	991.5	--	windy; light/moderate rain
8:00 pm	994.2	--	--
8:15 pm	996.4	--	--
8:30 pm	998.2	--	--
8:45 pm	999.5	--	--
9:00 pm	1000.5	--	--

** This wind direction at 6:33 and 6:35 pm was not directly observed, but was inferred afterward from the location of the hotel's roof across the street.*

Given the above, the destructive core of the cyclone was apparently quite small, as it only took ~**2 hours** to pass our location:

- **Front eyewall: ~5:25 – 6:06 pm**
- **Eye: ~6:06 – 6:15 pm**
- **Back eyewall: ~6:15 – 7:30 pm**

And the ferocious peak winds in the SE eyewall lasted very briefly, inflicting all their damage in only about 17 minutes (6:33 – 6:50 pm).

Video footage showing these conditions is available on the iCyclone YouTube channel. See the video entitled: **Hurricane PATRICIA Smashes Jalisco, Mexico (2015)**: https://youtu.be/V2H1M0n2Q14

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Air Pressure Discussion

Devices

I had three devices—all Kestrel 4500s. The sampling rate was one reading per minute. Quality-controlled data were recorded on **Devices 1 and 2**. I kept **Device 3** on a lanyard around my neck and used it only to "spot check" air pressure during the storm.

The pressure traces for **Devices 1 and 2** are below: **Barogram—Device 1** and **Barogram—Device 2**. **Barogram—Device 1 (CLOSE)** is a zoomed-in look at the **Device 1** data collected during the passage of the cyclone's core.

The complete data are available from iCyclone upon request.

Calibration

Data from the Shuttle Radar Topography Mission (SRTM), accessed via Google Earth, indicate the ground elevation at our location was ~60 ft. Unfortunately, given our distance from the ocean (2.5 n mi), it was impossible to "eyeball" it, so I couldn't visually confirm our elevation. Given the available information, I used 60 ft.

Devices 1 and 2 were deployed in a safe place in my second-floor hotel room—on the bathroom-sink counter. To calibrate these devices, I used a **reference altitude of 75 ft**—which is the ground elevation (60 ft) plus additional altitude for being on a countertop on the second floor.

Devices 1 and 2 weren't moved or touched during the storm and are considered accurate sources.

While **Device 3** was hanging from my neck and not in a controlled environment, the spot readings I took on this this device matched pretty well with data collected on the control instruments.

Lowest Pressure

Devices 1 and 2 matched fairly well, showing minimum readings of ~938 mb a little after 6 pm, during the passage of the eye:

- **Device 1: 937.8 mb at 6:12 & 6:13 pm.**
- **Device 2: 938.2 mb at 6:09 pm.**

As both devices are considered equally accurate and reliable, iCyclone's official minimum pressure during Hurricane PATRICIA is **937.8 mb**. As far as I'm aware, this is the lowest sea-level pressure ever recorded on land during an Eastern Pacific hurricane. It beats the previous record, also set by me: 943.1 mb in Cabo San Lucas during Hurricane ODILE of 2014.

The timing of the lowest pressure at my location 2.5 n mi inland suggests landfall probably happened a little earlier than the NHC's operational estimate—closer to 6:00 pm CDT (2300Z) instead of the estimated 6:15 pm.

Core Gradient

My data show **incredible** air-pressure gradients in PATRICIA's inner core—stunning pressure changes over tiny distances that far exceed anything I've previously measured or observed.

Methodology

First I used the cyclone's forward speed to calculate how much time it took for each nautical mile of the cyclone to pass my fixed location. I then calculated gradients by noting the change in pressure across these 1-n-mi samples of the cyclone.

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As per NHC advisories, PATRICIA was accelerating from 12 to 13 kt during its passage through Emiliano Zapata, Therefore, I calculated gradients using forward speeds of 12 and 13 kt:

- For a forward speed of 12 kt, I assumed my fixed location sampled **1 n mi** of the cyclone every **5 minutes**.
- For a forward speed of 13 kt, I assumed my fixed location sampled **1.08 n mi** of the cyclone ever **5 minutes**.

Peak Gradients

Applying this methodology and a forward speed of 12 kt, **Device 2** showed a whopping peak gradient of **11.4 mb/n mi** in PATRICIA's violent SE eyewall, as the center moved away from us. Using the faster forward speed of 13 kt reduces this value to a still-extreme **10.6 mb/n mi**. **Device 1's** peak gradient in the back eyewall was lower but still extreme: **8.9 mb/n mi** for 12 kt and **8.2 mb/n mi** for 13 kt.

Not surprisingly, these explosive gradients occurred deep in the cyclone's inner core, just outside the eye. Also not surprisingly, ***these peak gradients coincided with the short (17-minute) period of explosive peak winds following the eye.***

Peak gradients on the cyclone's front side—measured as the center **approached** our location—were lower but still extreme. **Device 1** had **6.8 mb/n mi** for 12 kt and **6.3 mb/n mi** for 13 kt; **Device 2** had **7.1 mb/n mi** for 12 kt and **6.6 mb/n mi** for 13 kt.

Even much larger samples of the cyclone's inner core—one sample over **5 n mi** (26 minutes)—still yielded average gradients of almost **6 mb/n mi** for 12 kt and **5.5 mb/n mi** for 13 kt.

Limitations

Of course these calculations are approximate, and there are limitations to their accuracy. They do not factor in:

- **Center's motion in relation to the observation point.** These calculations assume the cyclone's center moved directly to and away from us, so that the isobars moved perpendicular to our location. As it's unlikely the motion was this perfectly ideal for sampling the storm's gradient, the peak gradients may have been even steeper than these figures indicate.
- **System weakening.** PATRICIA was filling during this time and the central pressure was rising. Given the very short sample periods—usually 5 minutes— this factor probably isn't significant. However, peak gradients on the front side (during the cyclone's approach) may be slightly underrepresented, and gradients on the backside (during the cyclone's departure) may be slightly exaggerated.

For More Info

All of the detailed pressure-gradient calculations can be found in the **Appendix** at the end of this report.

Central Pressure at Landfall

The NHC's operational landfall point and the infrared imagery bring PATRICIA's center within **about 2 n mi of our chase location** at its close approach (~6:15 pm)—and we clearly got in the eye. Still, central pressure at landfall was most certainly much lower because:

- Our location apparently skirted the **edge** of the eye, as we never had a dead calm; winds were almost always blowing at least 20 or 30 kt.
- The core gradient was unusually steep—so every small fraction of a mile counted.
- Our location was a couple of miles inland and therefore didn't sample the eye pressure right at landfall.

Given these factors, it seems likely the hurricane's central pressure at landfall was 3-7 mb lower than my observed pressure—or between **931 and 935 mb**.

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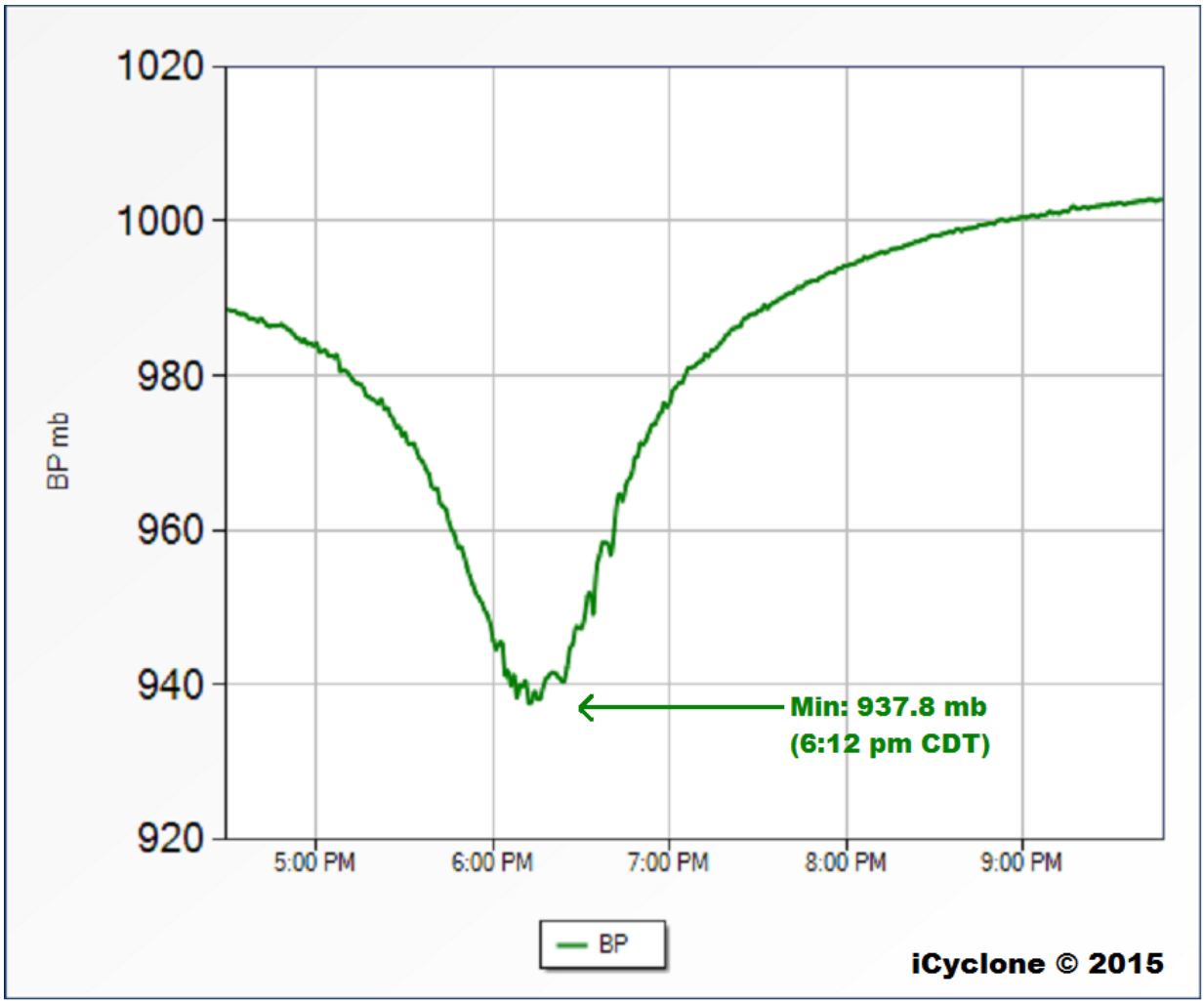
Barogram—Device 1

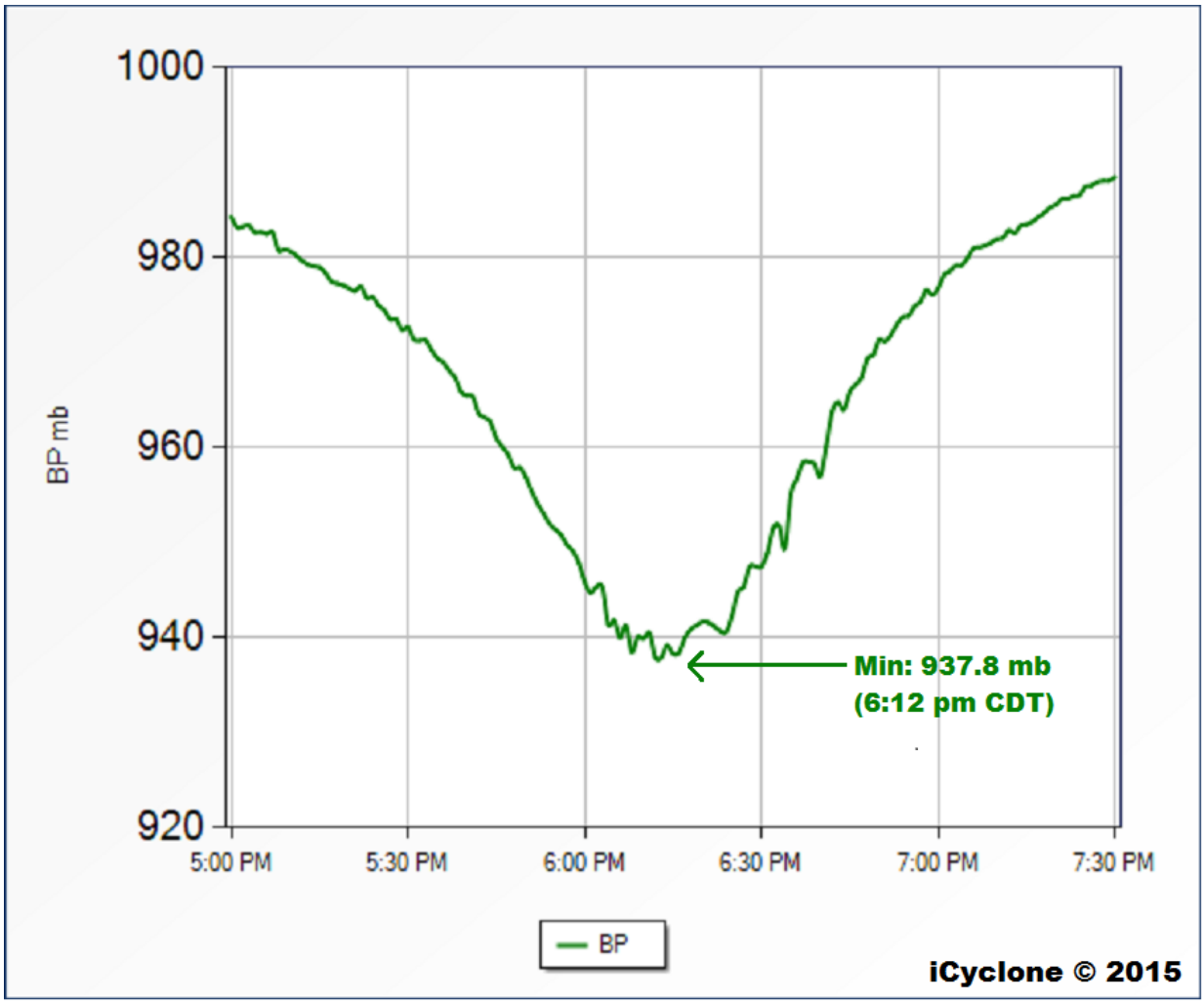


HURRICANE PATRICIA: 23 Oct 2015

Emiliano Zapata, Jalisco, Mexico

19.38973N 104.96391W – ref el 60 ft **DEVICE 1**

Barogram—Device 1 (CLOSE)



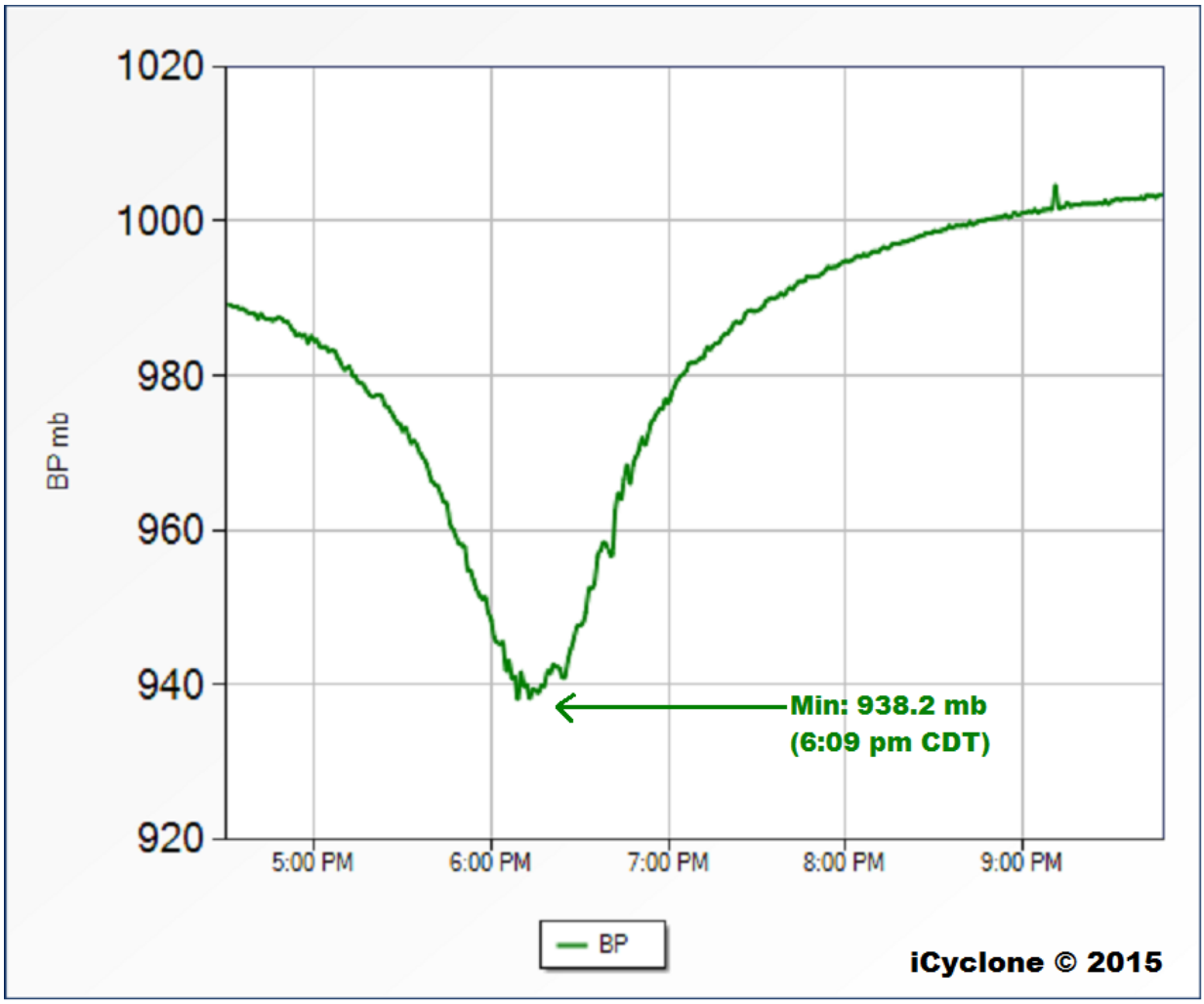
HURRICANE PATRICIA: 23 Oct 2015

Emiliano Zapata, Jalisco, Mexico

19.38973N 104.96391W – ref el 60 ft

DEVICE 1 – CLOSE VIEW

Barogram—Device 2



HURRICANE PATRICIA: 23 Oct 2015

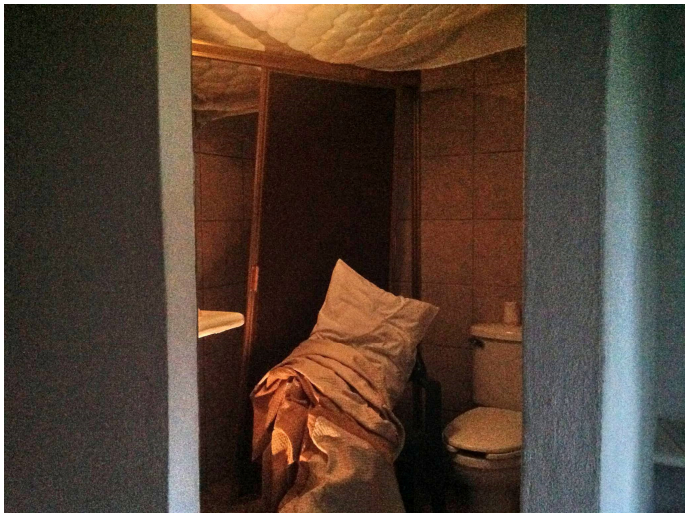
Emiliano Zapata, Jalisco, Mexico

19.38973N 104.96391W – ref el 60 ft **DEVICE 2**

Wind Damage

As mentioned (in **Highlights**), wind damage from PATRICIA was consistent with the passage of a very severe hurricane. Following are images showing the damage to our hotel and the town of Emiliano Zapata, and along Highway 200 between Emiliano Zapata and Agua Caliente (5 n mi to the ESE).

A large part of Hotel El Refugio lost its roof during the especially violent winds in the back (SE) eyewall. Rooms facing the S and W were especially exposed to the maximum winds and had the most damage. Several rooms were torn open, presenting great danger to the occupants. A family in one such room fled to ours and sought refuge with us at the height of the storm. Eight of us—six adults and two children—squeezed into this tiny bathroom (below) to ride out the most violent winds. Worried the roof would blow off our room, too, we wedged a mattress in the ceiling for added protection. Fortunately there were no major injuries in the hotel.



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Damaged roof of Hotel El Refugio.

Roof damage from inside Hotel El Refugio. The family in this room saw the entire roof lift into the air. They joined the author and his chase partner across the hall, where we all took cover.

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Roof damage from inside Hotel El Refugio.

Roof damage from inside Hotel El Refugio.

The roof partially stayed on here—but notice the lifting stress cracked the wall.

Roof damage. Notice how the roof tore away parts of the wall as it lifted off.

The roof partially stayed on in this room—but again, notice the cracked wall.

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Hotel El Refugio from across the highway.

We found a large portion of Hotel El Refugio's roof across the highway. The resting point suggests winds during the violent SE eyewall were W or WSW.

Defoliated, stripped trees around the hotel.

Stripped palm trees next to the hotel.

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Heavy damage to a home in Emiliano Zapata.

Heavy damage to a home and completely stripped, defoliated trees in Emiliano Zapata.

Heavy damage to a home and completely stripped, defoliated trees in Emiliano Zapata.

Collapsed brick wall in Emiliano Zapata.

Defoliated, stripped trees in Emiliano Zapata.

Smashed concrete power pole in Emiliano Zapata.

Snapped palm trees (both foreground and background) in Emiliano Zapata.

Snapped palm trees (both foreground and background) in Emiliano Zapata.

***Snapped palm trees** in Emiliano Zapata.*

Completely stripped, defoliated trees; gutted house; and dead hillsides near Emiliano Zapata.

Completely defoliated, stripped trees and dead hillsides near Emiliano Zapata.

Snapped and thrashed palm trees near Emiliano Zapata.

Crumpled communications tower atop stripped, dead hillsides near Emiliano Zapata. Notice the near 100% blowdown of the trees.

Close shot of the crumpled communications tower near Emiliano Zapata.

Smashed power pole near Emiliano Zapata.

Stripped, defoliated tree—with debris stuck in its branches—outside of Emiliano Zapata.

Ghostly, completely defoliated trees along Highway 200 between Emiliano Zapata and Agua Caliente.

Stripped, mowed-down hillsides along Highway 200 between Emiliano Zapata and Agua Caliente.

Completely defoliated trees along Highway 200 between Emiliano Zapata and Agua Caliente.

Bent signpost along Highway 200 between Emiliano Zapata and Agua Caliente.

Special Thanks

Without a doubt, Hurricane PATRICIA is one of iCyclone's most meaningful chases, given the historic stature of the storm and the lack of other data and observations from the inner core.

Several people helped make this chase a huge success:

- **Erik Sereno** – chase partner.
- **Scott Brownfield** – right-hand man, satellite analysis & navigation assistance.
- **James Hyde** – satellite analysis & navigation assistance.
- **Jorge Abelardo Gonzalez** – satellite analysis & navigation assistance.
- **Eric Blake** – forecast insights.
- **Brian McNoldy** – archivist, generation of infrared satellite images.
- **Brenden Moses** – generation of radar image.
- **Adam Moyer** – consultation Re: gradient calculations.
- **Gene Bank** – photo lightening.

Thanks to all!

—Josh Morgerman

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Questions or Feedback?

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Josh Morgerman—the day after the hurricane, along Highway 200, just outside Emiliano Zapata.

Appendix: Core Gradient Calculations

Following are all the pressure samples and gradient calculations used for this report:

Assuming Storm's Forward Speed is 12 Knots

Each 5 minutes = 1 n mi.

Device 1

Storm's Front Side (Approach)

5:43 pm: 963.1
5:48 pm: 957.8
= 5.3 mb/n mi

5:49 pm: 957.8
5:54 pm: 951.9
= 5.9 mb/n mi

5:56 pm: 950.7
6:01 pm: 944.6
= 6.1 mb/n mi

6:03 pm: 945.2
6:08 pm: 938.4
= 6.8 mb/n mi

Storm's Backside (Departure)

6:24 pm: 940.5
6:50 pm: 971.3
= 30.8 change over **5.2 n mi**
= 5.9 mb/n mi

6:34 pm: 949.3
6:50 pm: 971.3
= 22 change over **3.2 n mi**
= 6.9 mb/n mi

6:34 pm: 949.3
6:43 pm: 964.7
= 15.4 change over **1.8 n mi**
= 8.6 mb/n mi

6:24 pm: 940.5
6:29 pm: 947.4
= 6.9 mb/n mi

6:40 pm: 956.9
6:45 pm: 965.8
= 8.9 mb/n mi

6:34 pm: 949.3
6:39 pm: 958.2
= 8.9 mb/n mi

Device 2

Storm's Front Side (Approach)

5:42 pm: 965.7
5:47 pm: 960.2
= 5.5 mb/n mi

5:44 pm: 963.7
5:49 pm: 958.3
= 5.4 mb/n mi

5:51 pm: 957.8
5:56 pm: 951.6
= 6.2 mb/n mi

5:58 pm: 951.3
6:03 pm: 945.3
= 6.0 mb/n mi

6:04 pm: 945.3
6:09 pm: 938.2
= 7.1 mb/n mi

Storm's Backside (Departure)

6:25 pm: 941.1
6:51 pm: 971.9
= 30.8 change over **5.2 n mi**
= 5.9 mb/n mi

6:27 pm: 944.7
6:43 pm: 964.7
= 20 change over **3.2 n mi**
= 6.3 mb/n mi

6:34 pm: 952.5
6:43 pm: 964.7
= 12.2 change over **1.8 n mi**
= 6.8 mb/n mi

6:41 pm: 957.0
6:50 pm: 970.4
= 13.4 change over **1.8 n mi**
= 7.4 mb/n mi

6:25 pm: 941.1
6:30 pm: 947.7
= 6.6 mb/n mi

6:31 pm: 948.0
6:36 pm: 956.6
= 8.6 mb/n mi

6:41 pm: 957.0
6:46 pm: 968.4
= 11.4 mb/n mi

iCyclone Chase Report

Assuming Storm's Forward Speed is 13 Knots

Each 5 minutes = 1.08 n mi.

Device 1

Storm's Front Side (Approach)

5:43 pm: 963.1
5:48 pm: 957.8
= 5.3 mb change
= 4.9 mb/n mi

5:49 pm: 957.8
5:54 pm: 951.9
= 5.9 mb change
= 5.5 mb/n mi

5:56 pm: 950.7
6:01 pm: 944.6
= 6.1 mb change
= 5.6 mb/n mi

6:03 pm: 945.2
6:08 pm: 938.4
= 6.8 mb change
= 6.3 mb/n mi

Storm's Backside (Departure)

6:24 pm: 940.5
6:50 pm: 971.3
= 30.8 change over 5.63 n mi
= 5.5 mb/n mi

6:34 pm: 949.3
6:50 pm: 971.3
= 22 change over 3.47 n mi
= 6.3 mb/n mi

6:34 pm: 949.3
6:43 pm: 964.7
= 15.4 change over 1.95 n mi
= 7.9 mb/n mi

6:24 pm: 940.5
6:29 pm: 947.4
= 6.9 mb change
= 6.4 mb/n mi

6:40 pm: 956.9
6:45 pm: 965.8
= 8.9 mb change
= 8.2 mb/n mi

6:34 pm: 949.3
6:39 pm: 958.2
= 8.9 mb change
= 8.2 mb/n mi

Device 2

Storm's Front Side (Approach)

5:42 pm: 965.7
5:47 pm: 960.2
= 5.5 mb change
= 5.1 mb/n mi

5:44 pm: 963.7
5:49 pm: 958.3
= 5.4 mb change
= 5.0 mb/n mi

5:51 pm: 957.8
5:56 pm: 951.6
= 6.2 mb change
= 5.7 mb/n mi

5:58 pm: 951.3
6:03 pm: 945.3
= 6.0 mb change
= 5.6 mb/n mi

6:04 pm: 945.3
6:09 pm: 938.2
= 7.1 mb change
= 6.6 mb/n mi

Storm's Backside (Departure)

6:25 pm: 941.1
6:51 pm: 971.9
= 30.8 change over 5.63 n mi
= 5.5 mb/n mi

6:27 pm: 944.7
6:43 pm: 964.7
= 20 change over 3.47 n mi
= 5.8 mb/n mi

6:34 pm: 952.5
6:43 pm: 964.7
= 12.2 change over 1.95 n mi
= 6.3 mb/n mi

6:41 pm: 957.0
6:50 pm: 970.4
= 13.4 change over 1.95 n mi
= 6.9 mb/n mi

6:25 pm: 941.1
6:30 pm: 947.7
= 6.6 mb change
= 6.1 mb/n mi

6:31 pm: 948.0
6:36 pm: 956.6
= 8.6 mb change
= 8.0 mb/n mi

6:41 pm: 957.0
6:46 pm: 968.4
= 11.4 mb change
= 10.6 mb/n mi