iCYCLONE CHASE REPORT – FINAL

storm	**Super Typhoon HAIYAN (YOLANDA)**		
location & date	Tacloban City, Leyte, Philippines – 08 November 2013		
report date	15 January 2014		
chasers	Josh Morgerman, James Reynolds, Mark Thomas	**author**	**Josh Morgerman**

Location

On 08 November 2013, we observed the passage of **Super Typhoon HAIYAN (YOLANDA)** in **Tacloban City, Leyte, Philippines**, at **11.2414N 125.0036E**. We rode out the storm in Hotel Alejandro, in the heart of the Downtown district.

As per radar (see **Radar** shots, below), the center of the cyclone crossed the Leyte coast between Tolosa and Dulag, very near the village of San Jose, at ~7 am PHT.

This landfall point is ~15 n mi S of downtown Tacloban City. The city was in the N eyewall and just a couple of miles from the edge of the eye.

The **Chase Map** shows **our location** (**green marker**) in relation to **Haiyan's center** at landfall (**red marker**), as per radar. (**Chase Map Detail** is a closer view.)

Figure 1: Chase Map

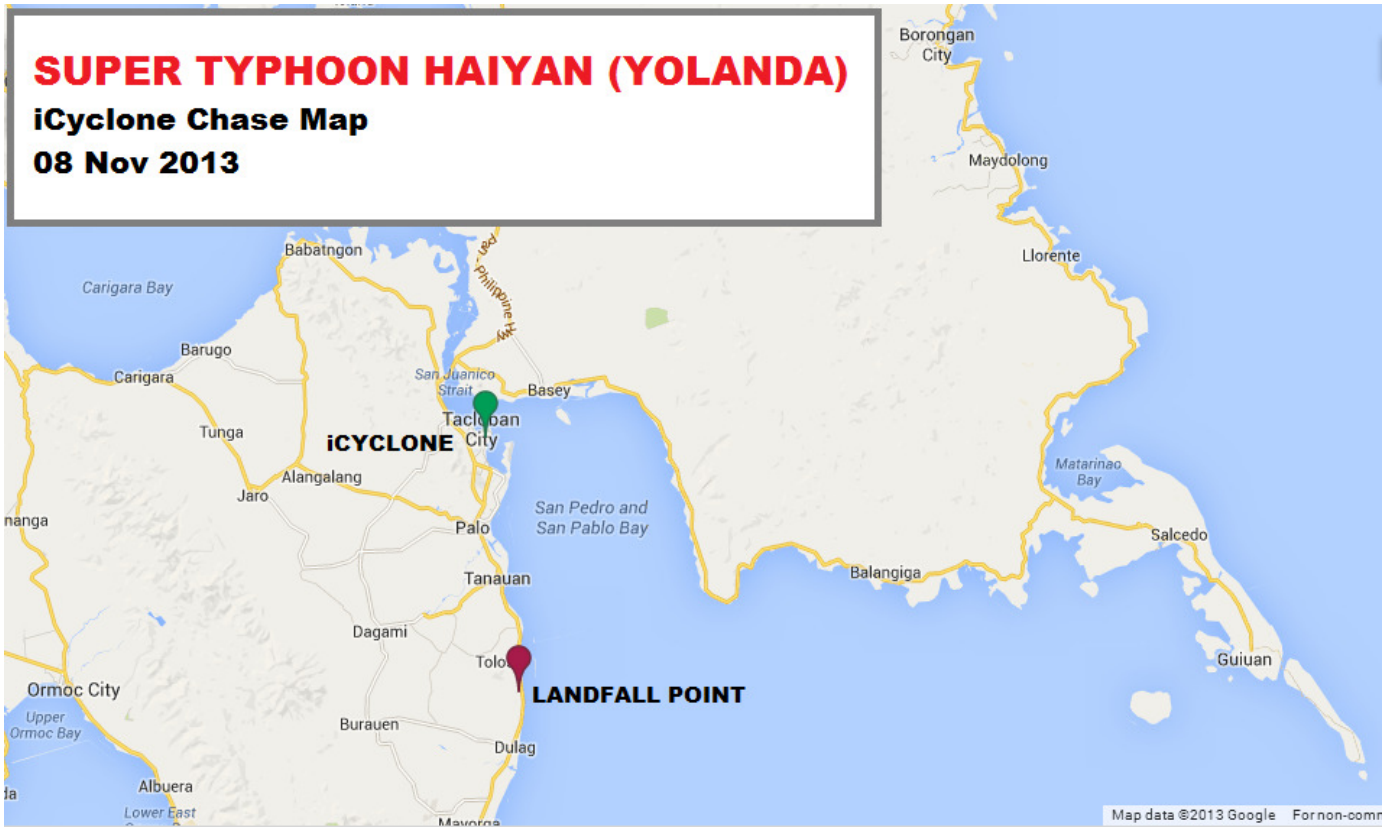

Figure 2: Chase Map Detail

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Overview

Haiyan was a **small, fast-moving, extremely violent cyclone** that made a direct hit on Tacloban City.

Following are key observations, which have been derived from 1) our collected/analyzed data and 2) time-stamped video footage (all times in this document **PHT**):

- **Very destructive winds** didn't start until about 6:45 am—**only ~30 minutes** before the **center's closest approach** (~7:15 am).

- **Highest winds** (and heaviest rain) occurred **near or after** the center's closest approach, with the most **violent conditions** occurring from ~7:10 to ~7:30 am. Some particularly extreme gusts occurred around 7:25 am.

- The **storm surge rose very suddenly and rapidly at our location between 7:30 and 7:45 am,** and we estimate it probably **peaked** between 8:00 and 8:15 am—**well after** the center's closest approach. By 8:45 am, it was already noticeably **receding**—so its impact at our location was significant but short-lived. During the peak surge, the hotel flooded to a depth of ~4 ft. If the elevation at this location is truly 26 ft—as indicated by USGS—that suggests a storm surge of **up to ~30 ft**. It's possible the elevation may have been as low as 15 ft, in which case, the surge was ~20 ft. *(See more about our elevation below, under **Calibration**.)*

- **Very destructive winds and storm-surge inundation** lasted **only a couple of hours**—basically from ~6:45 am to ~8:45 am—**a short-duration event** compared with a typical tropical-cyclone impact.

- We observed **lightning and thunder** in or near the NE eyewall, as the center was moving away from the city. This phenomenon was captured in Earth Uncut TV's video footage, which unfortunately wasn't time-stamped. However, based on the wind strength, direction, and storm-surge height in the shot, we estimate this lightning occurred between 7:30 and 7:45 am, which was near the end of—**or just after**—the peak conditions.

We deployed two devices for measuring air pressure. Lowest pressures and times are as follows:

- **Device 1: 960.8 mb at 7:12 am**

- **Device 2: 960.3 mb at 7:20 am**

See more below Re: the air-pressure readings.

Air Pressure Discussion

Devices

We deployed two devices in our hotel—both Kestrel 4500s. The sampling rate was one reading per 30 seconds.

Calibration

USGS data indicate the ground elevation at the hotel is ~26 ft. Before the storm, we attempted to verify this with a three-block walk to the waterfront—to "eyeball it"—but it was difficult to assess with confidence. Given this, we used 26 ft as our value. *(**Note:** Afterward, geography specialist James Hyde researched the elevation at our chase location and derived 8 m or ~26 ft—thus verifying the value we'd used.)*

Device 1 was deployed in a small drawer in the hotel lobby, on the ground floor. Since it was several feet off the ground, the device was calibrated (for sea-level readings) using an altitude of 30 ft.

Device 2 was deployed in our fourth-floor room. To calibrate this device, we used the air-pressure value from Device 1 as a reference, setting the altitude in Device 2 to make the air-pressure value match that shown by Device 1 (60 ft).

Disruption of Device 1

Sometime after 7:30 am (and probably after 7:45 am), storm surge flooded the hotel lobby, knocking over the piece of furniture holding Device 1. The drawer holding Device 1 was submerged for a time—until the storm died down and we were able to retrieve it. It's unclear what effect this may have had on the air-pressure data—and there are no obvious irregularities in the trace that can help identify when the disruption occurred. However, this disruption happened **after** the lowest pressure was reached and the center was moving away from the city.

Lowest Pressure & Intensity

Both instruments had low pressures around 960 mb in the cyclone's N eyewall, just a couple of miles outside of the eye. At the time, the typhoon was estimated to have a central pressure possibly under 900 mb.

The center was only ~15 n mi away at the time, suggesting an incredible gradient of ~4 mb/n mi.

If this seems implausible, then either the central-pressure estimates were too low or our equipment wasn't accurate. The healthy corroboration between our two instruments, spaced four stories apart, gives some confidence to those readings—but not 100%.

The cyclone was extremely severe, with very high winds that completely defoliated—and in some instances debarked—trees across the city and region, suggesting the intensity was not overestimated.

But perhaps the central pressure didn't need to be so exceptionally low to cause these winds. The cyclone's relatively small RMW, as well as very strong high pressure to the N, are two factors which may have contributed to augmenting the cyclone's winds.

Eyewall Irregularity

Data from both devices show a slight—yet distinct—irregularity from ~6:53 to ~6:56 am. This was just minutes after we'd entered the typhoon's eyewall, as the center was approaching and the pressure was still dropping.

This irregularity might be evidence of a mesovortex or other localized disturbance passing near the building.

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Barograms—Clean

Following are clean barograms for both devices—plotted for the same time period (for easy comparison), and excluding some non-representative pressure spikes:

Figure 3: Barogram—Device 1 (CLEAN)

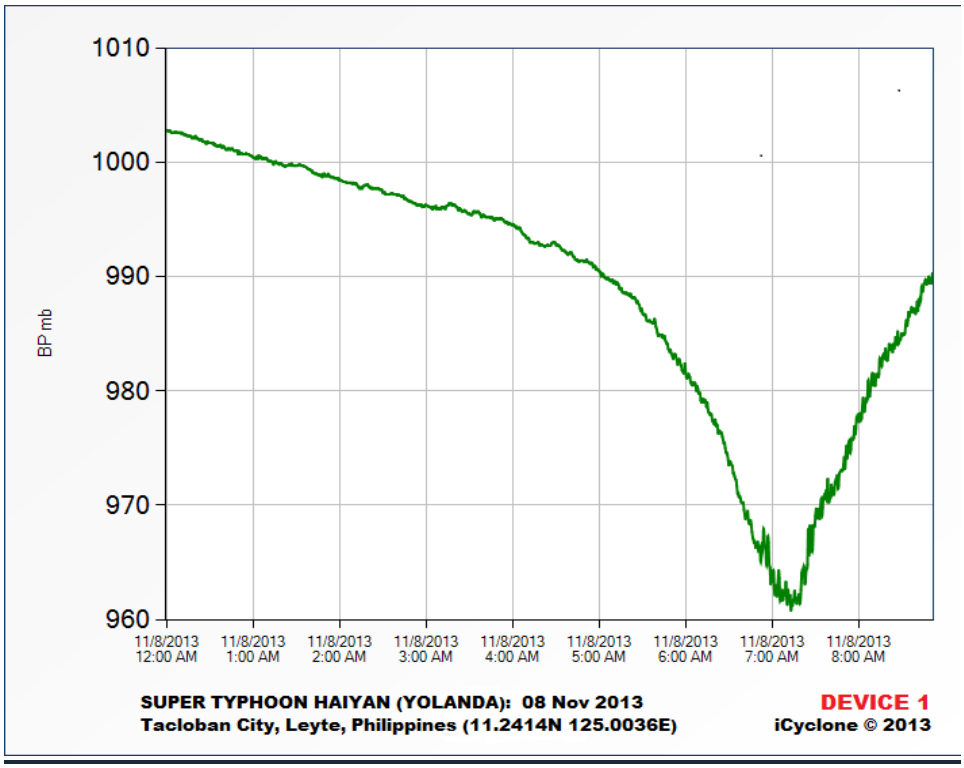
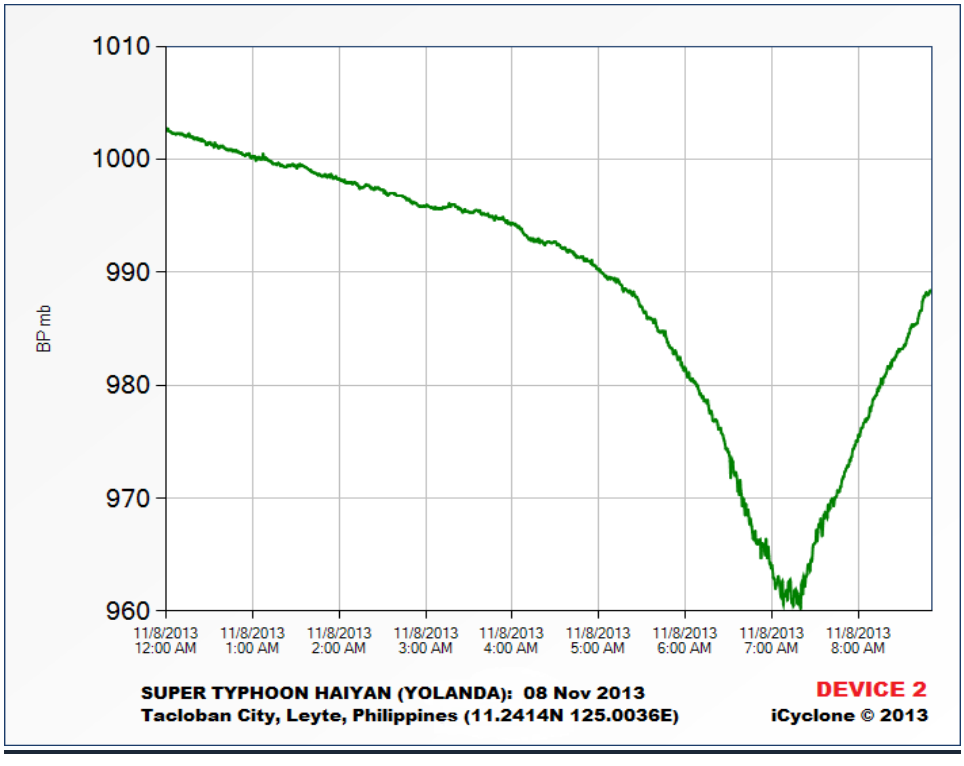


Figure 4: Barogram—Device 2 (CLEAN)



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Barograms—Raw

Following are barograms of the raw data. Notice that the two devices ran for different periods—and also Device 2 had some odd pressure spikes which are not considered representative:

Figure 5: Barogram—Device 1 (RAW)

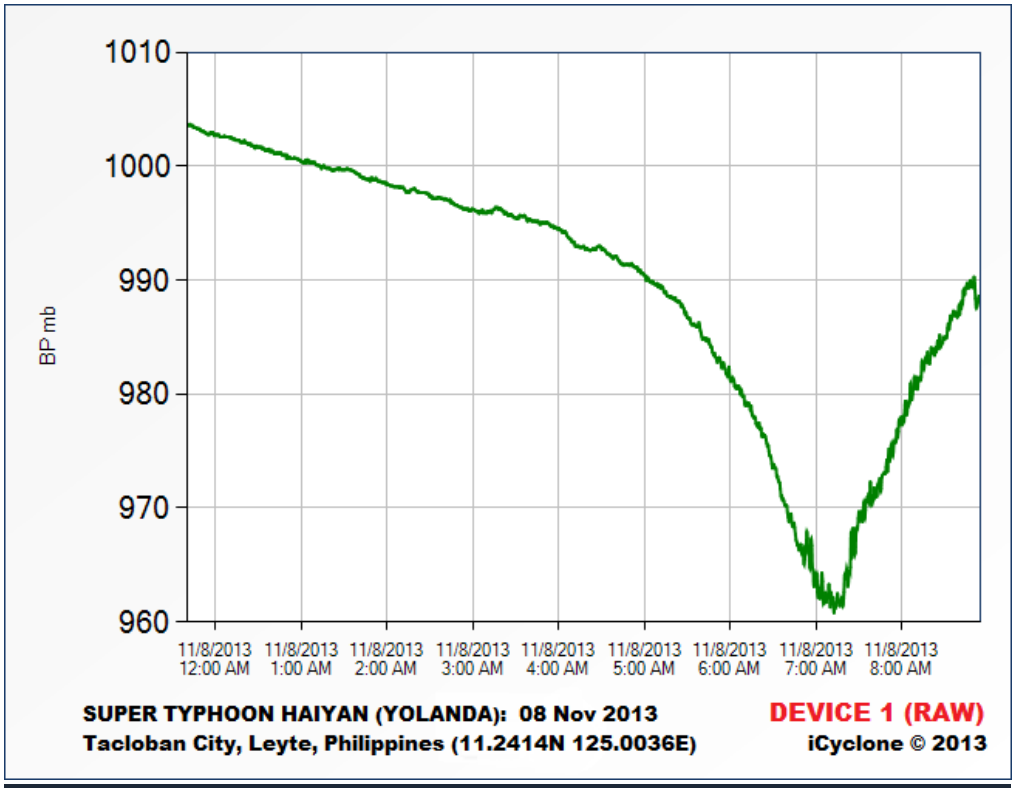
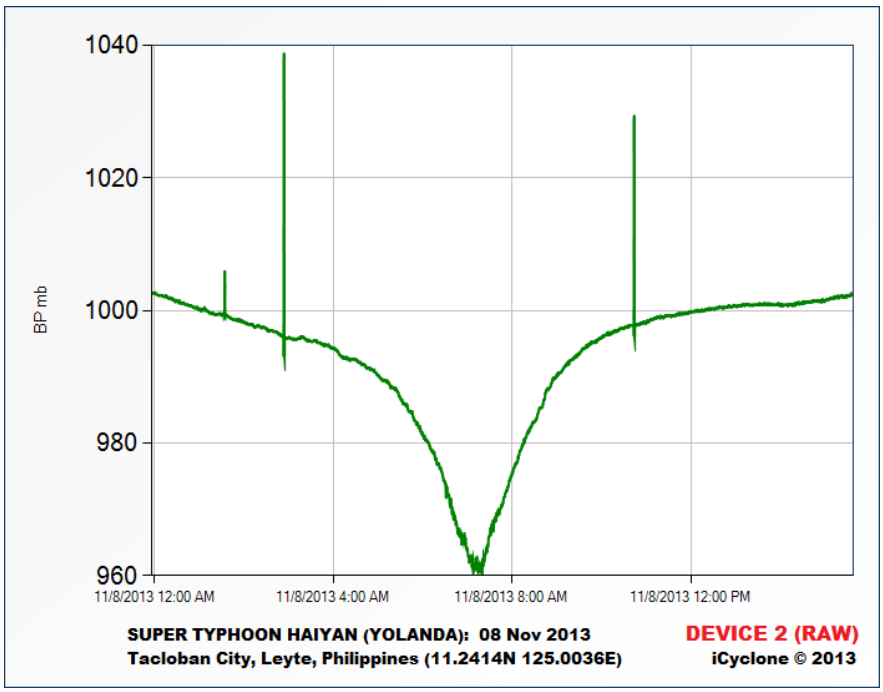


Figure 6: Barogram—Device 2 (RAW)



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More Imagery

Figure 7: Radar—Far

Cebu radar at 07:00:59 am PHT, showing Haiyan's center making landfall on the Leyte coast. At this time, Tacloban City (black square) was in the N eyewall. The lowest pressure in the city occurred ~15 minutes later.

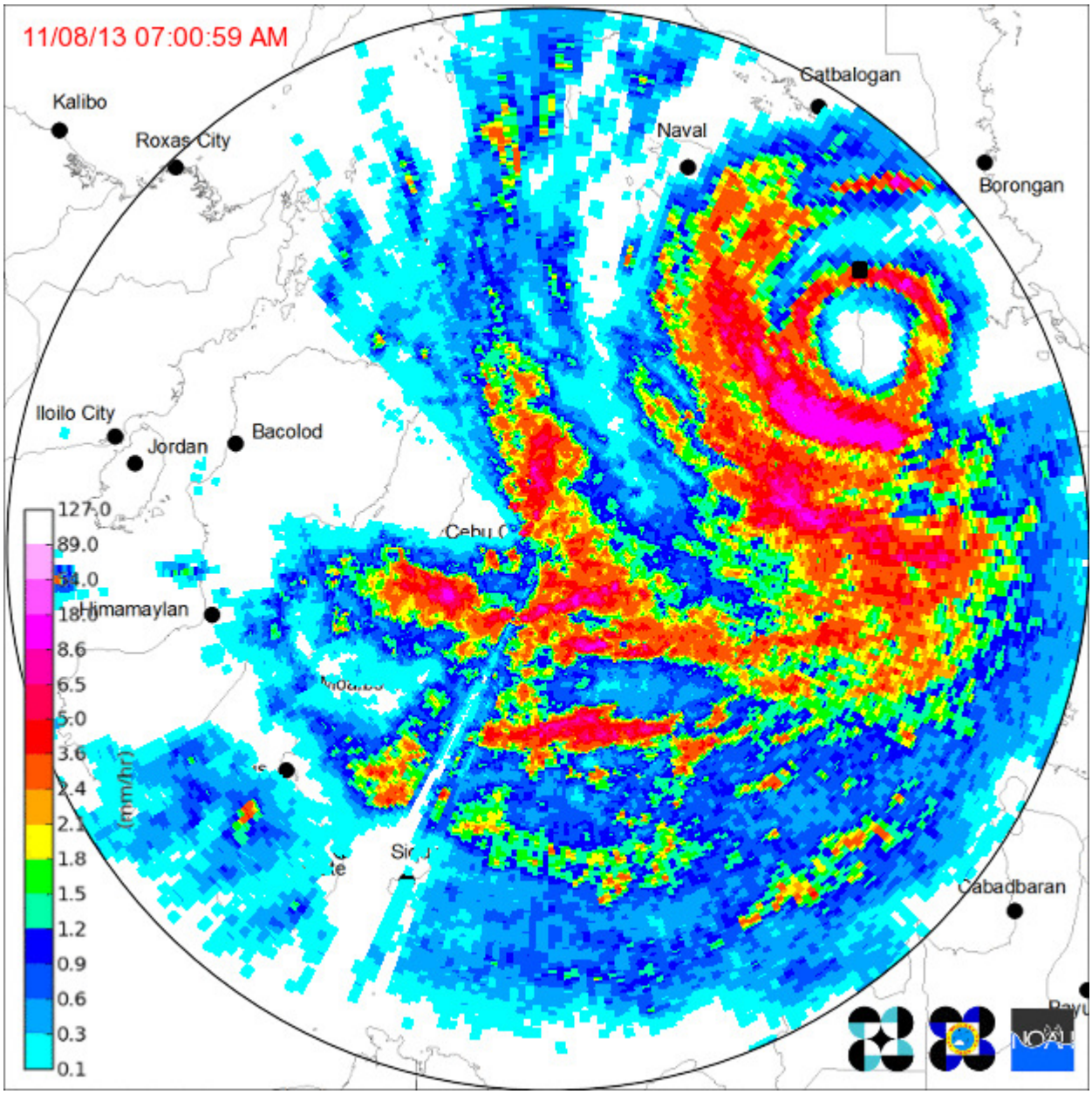
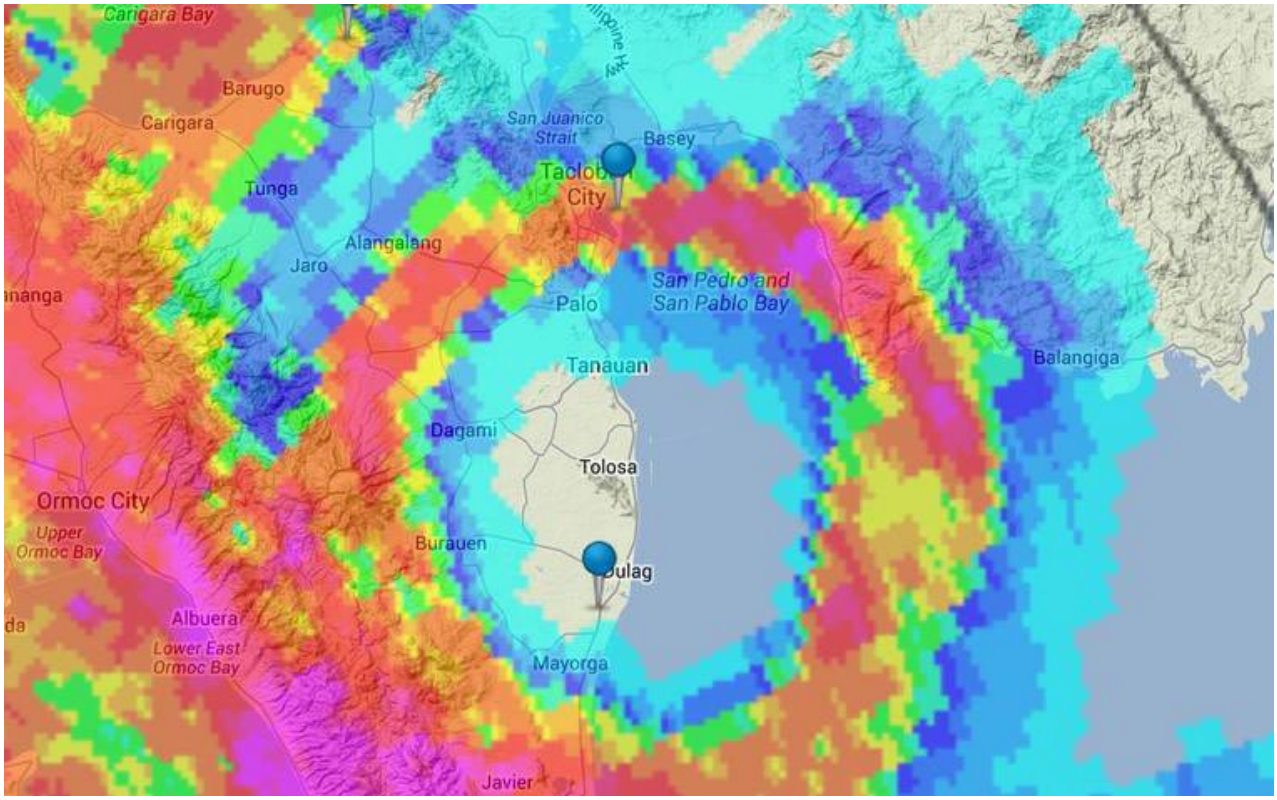


Figure 8: Radar—Close

Close-up of Cebu radar, showing Haiyan's center making landfall and Tacloban City in the N eyewall.



Video Footage

Everything described above can be seen in iCyclone's two videos documenting the typhoon:

- **Entire event (12:34):** http://youtu.be/4wrgrJwYdy8
- **Eyewall only (6:19):** http://youtu.be/133F6-5qi2w

All footage is time-stamped in local time (PHT).

Questions or Feedback?

Get in touch:

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