A Review of Dropwindsondes from the 2020 Season

Sim Aberson (with help from Isabel Suhr and Holger Vömel of EOL)

Thanks to AOC and 53rd for making data available and
NHC specialists for asking lots of good questions about the data

Identifier:	ODW	LOD2/LZD2	RD93	RD94	NRD94	NRD41
Year:	1970's	1980's-1990's	1996-2009	2009-2018	2010-2017	2017 -
Weight:	1320g	445g	400g	350g	166g	133g
Winds:	Omega	LORAN/Omega	Codeless GPS	OEM GPS	OEM GPS	OEM GPS

AVAPS Users Meeting
13 April, 2021

Post-splash data

Note: 53rd did not provide FRD or BUFR data for many flights during season, so could not check all AF data for the season

Sondes frequently continue to transmit data after they splash. ASPEN does not automatically flag the data, but sends a message telling the operator to look at data near the surface.

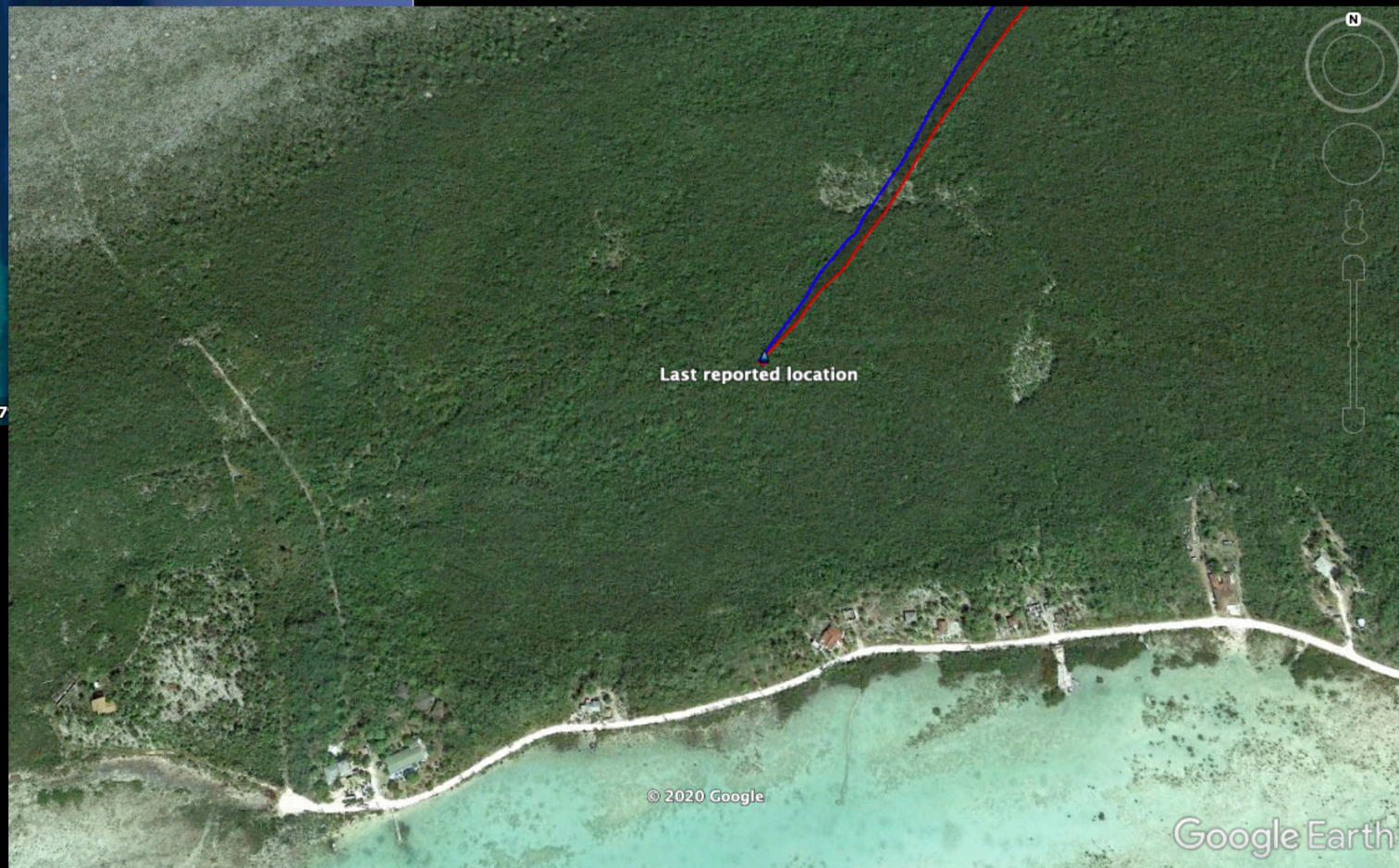
ASPEN often suggests that there are post-splash data when there are none, and does not flag cases when there are post-splash data. IT IS IMPORTANT THAT THE ASPEN USER LOOK AT RAW DATA NEAR SURFACE FOR ALL SONDES.

AF transmitted 16 sondes with post-splash data not removed. NOAA transmitted one sonde with post-splash data not removed.

NOAA transmitted one sonde (Laura) with data near the surface erroneously removed due to ASPEN warning message.

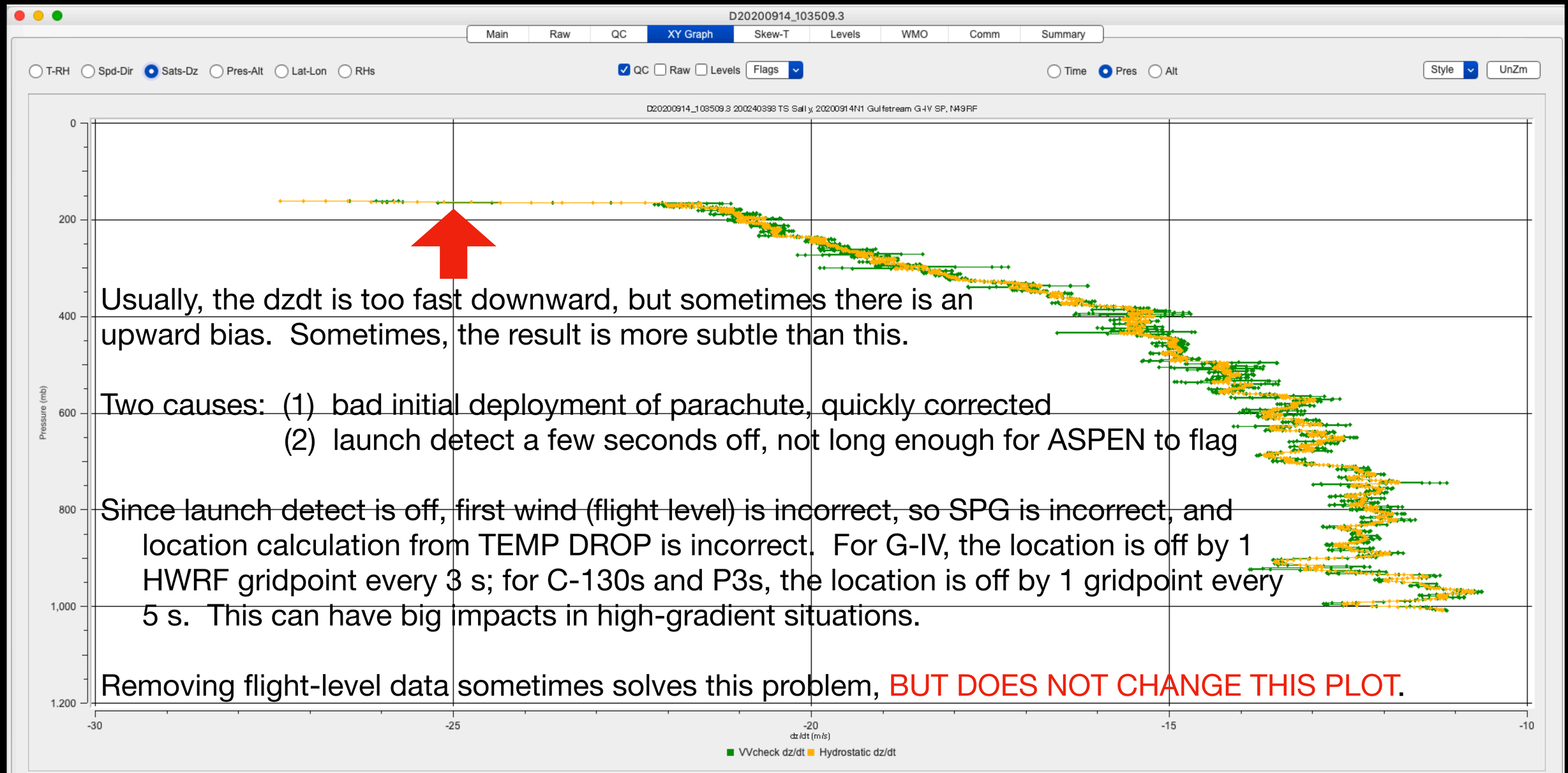
NOAA transmitted one sonde without data removed after pressure stopped increasing.


N
Balloon
Balloon ceiling
Launch
Launch
Last reported location
© 2020 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
2007
Imagery Date: 2/25/2017
24°31'06.66" N
77


N
Last reported location
© 2020 Google
Google Earth

Vertical velocity check

About 1/3 (!) the sondes have erroneous dzdt near the top of the sounding



Usually, the dzdt is too fast downward, but sometimes there is an upward bias. Sometimes, the result is more subtle than this.

Two causes: (1) bad initial deployment of parachute, quickly corrected
(2) launch detect a few seconds off, not long enough for ASPEN to flag

Since launch detect is off, first wind (flight level) is incorrect, so SPG is incorrect, and location calculation from TEMP DROP is incorrect. For G-IV, the location is off by 1 HWRF gridpoint every 3 s; for C-130s and P3s, the location is off by 1 gridpoint every 5 s. This can have big impacts in high-gradient situations.

Removing flight-level data sometimes solves this problem, BUT DOES NOT CHANGE THIS PLOT.

Why do we have flight-level data in TEMP DROP (and bufr, and frd…)

They are not sonde data.

There is no way to know from TEMP DROP and frd files whether the first point is from flight level or from the sonde.

The habit of including flight-level data began when we did not sent HDOBS.

The inclusion of the flight-level data allowed interpolation to estimate an additional mandatory level, which were the only data sent.

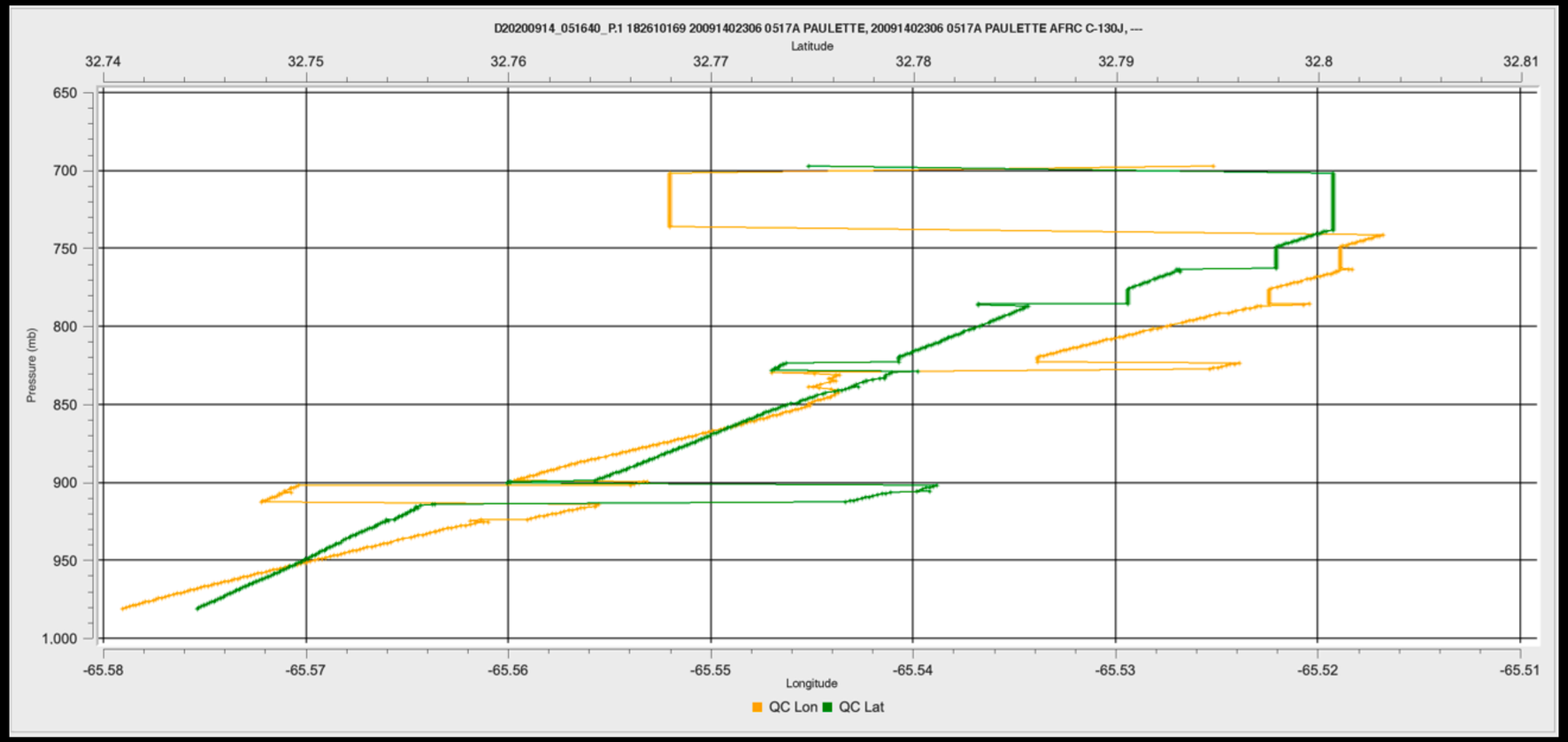
The gap between the first sonde data point and flight level was initially large [O(1 min)]. Inclusion of flight-level data allowed plotting of skew-t diagram.

None of these remain issues. Do we still need to add flight-level data to the dropwindsonde data?

Answer: No. NOAA and the Air Force will not put launch data into dropwindsonde messages starting during the 2021 season.

Location

Location is part of the product suite, but we do not pay much attention to it in ASPEN.



In this case, fluctuations were 1-2 HWRF grid points back and forth, related to changes in the number of satellites. ASPEN removes points near shirts with buddy check, but fluctuations remain. There are cases with fluctuations up to 30 km (~ 20 gridpoints).

It is not easy in ASPEN to fix this in ASPEN.

Dfiles (raw data)

There are two versions of Dfiles. For example, D20200915_180910.4 and D20200915_180910_P.4.

The first file contains all data from when the sonde is initialized to when it is closed. The second (_P) file contains data from 30 s before launch to the last transmission.

If you process the _P file, you may miss early launch detects.

EOL suggests that only the full Dfile should be processed to eliminate this problem.

Wind error check

The default ASPEN setup has a wind error check limit of 0.6 m/s.

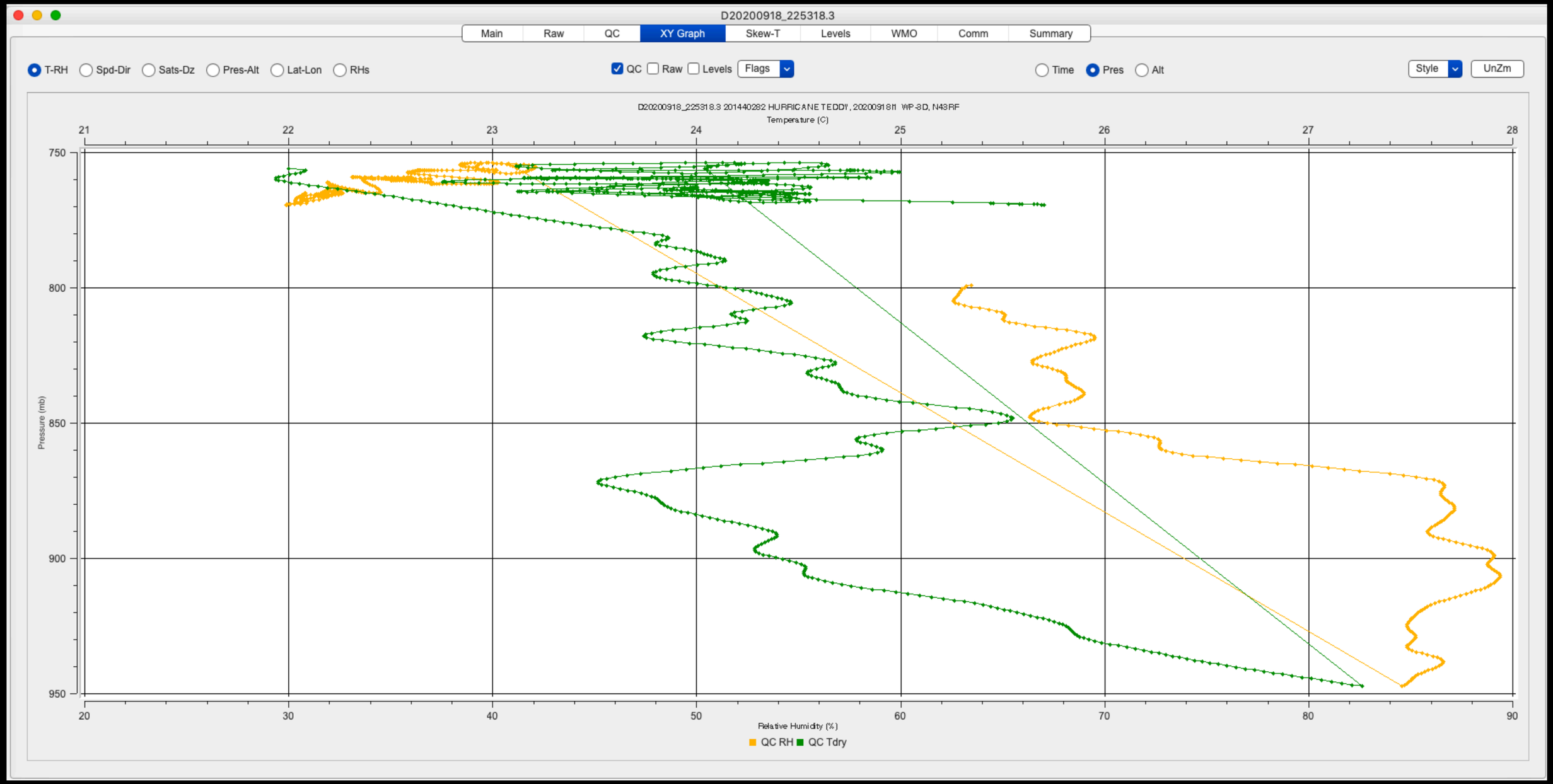
ASPEN gets wind-speed accuracy information transmitted by the GPS. EOL defined a threshold of six standard deviations around the mean values for a sample of sondes, which is 0.6. This was calculated mainly for environmental sondes.

The surface in a hurricane is very different from the environment, so the check throws out a large amount of data near the surface, especially in strong storms.

Newer sondes do not have issues (multipath) near the surface that older ones did. So, we recommend raising this automatic threshold.

EOL will do a recalculation and get back with a suggested value.

20200918I1 - all these data were sent in bfr, frd, and TEMP DROP files.



Other issues

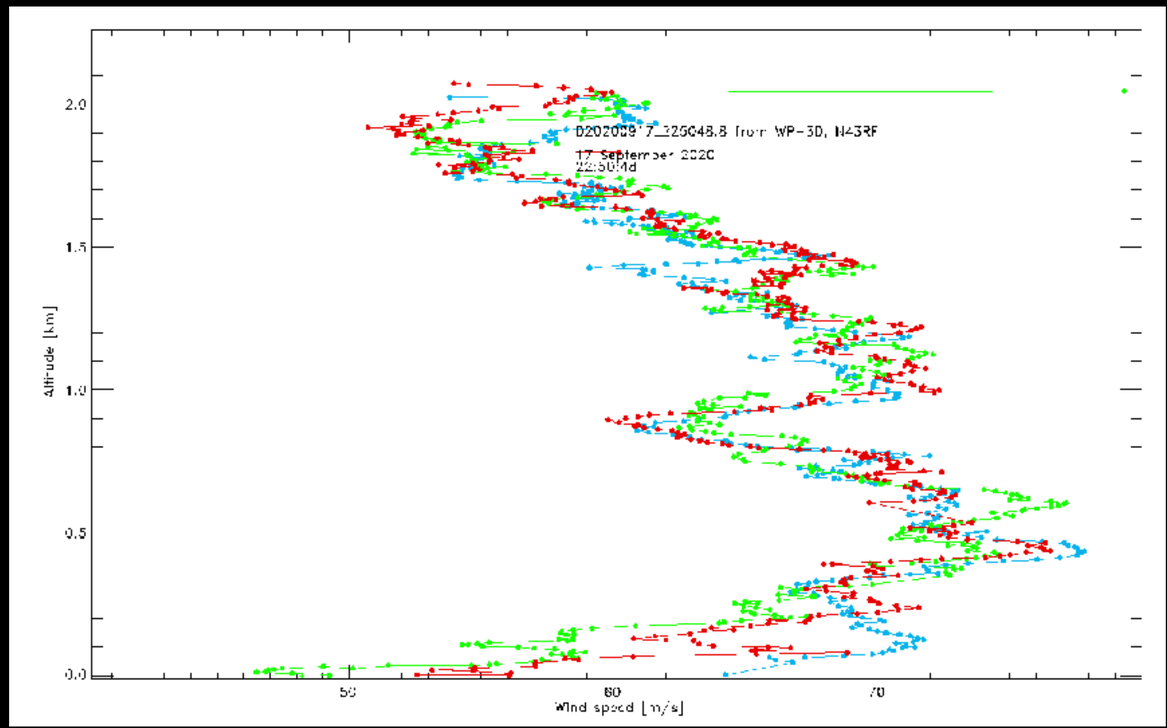
AF: D20200903_024249 bad data after splash not removed, fast fall sonde transmitted
AF: D20200921_232424 partial fast fall, data not removed (post-splash data correctly removed)

NOAA: D20200914_004226 partial fast fall data not removed
NOAA: D20200918_191336 partial fast fall data not removed
NOAA: D20201006_163502 partial fast fall data not removed
NOAA: D20201007_195446 bad data after splash not removed
NOAA: D20201008_131646 partial fast fall data not removed

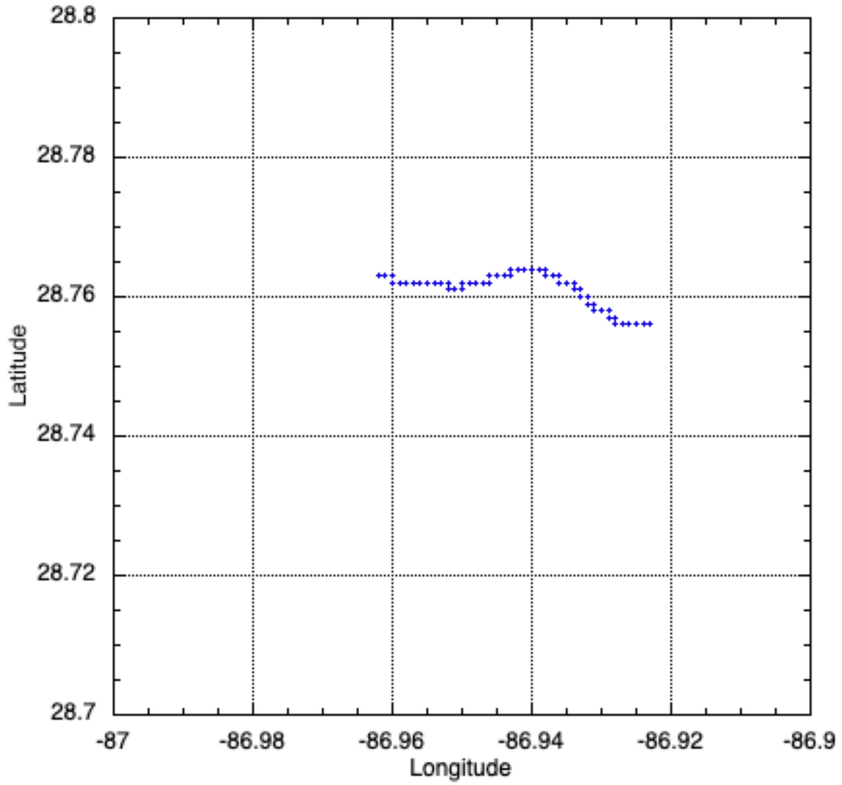
On a P3 flight into Teddy, the following sonde data were available.

```
D20200917_225048.1
D20200917_225048.2
D20200917_225048.8
D20200917_225048_P.1
D20200917_225048_P.2
D20200917_225048_P.8
```

Three sondes with launch detect within 1 s of each other! It would be good for AOC to tell us how they did this. Is this naming convention adequate to distinguish sondes from different aircraft released at the same time?



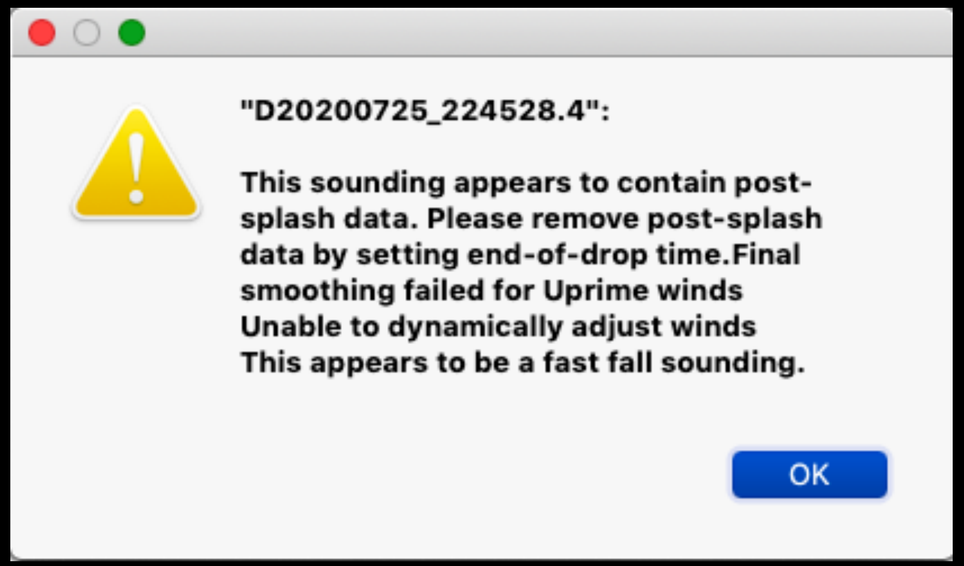
In hurricane Sally, a drop measured surface pressure of 988 mb with 57 kt of wind at the lowest level. The high wind suggested that the central pressure was quite a bit lower than that measured by the center drop. An alternative scenario was that the sonde fell into a miso-cyclone explaining the lower pressure.

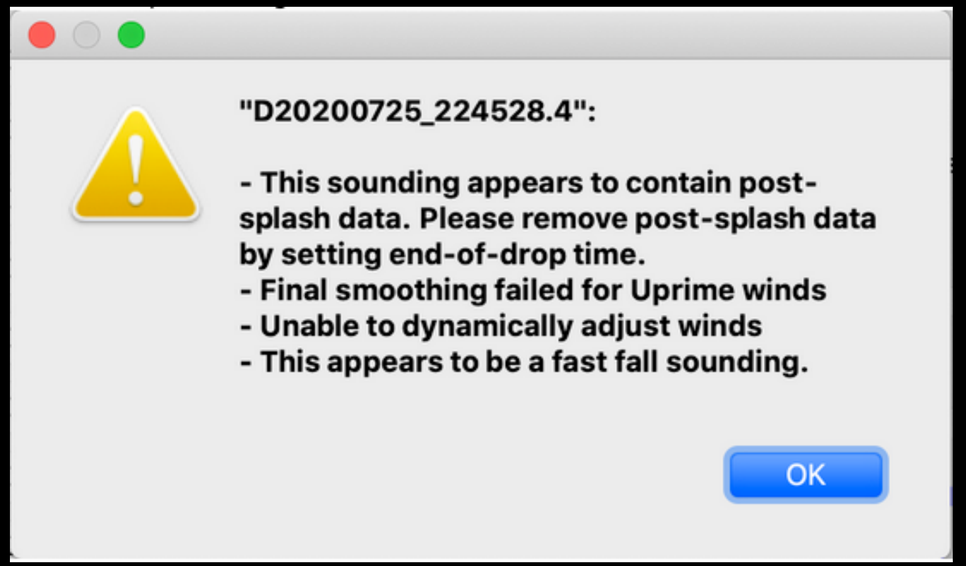


The trajectory of the sonde within the eyewall suggests that it encountered a meso-cyclonic feature. So, the central pressure from the other sonde was likely accurate.

It would be useful to be able to see trajectories in real time to identify these cases.

Individual warning messages not separated, so they sometimes get lost





Fixed in next update

Other question

All dropwindsonde data are reported in realtime except vertical velocity. Are vertical velocity data useful for assimilation into models? If so, we can add that to the bufr messages.

Answer: Yes, these data would be useful for assimilation into models. This requires conferring with the WMO on changes to bufr format.