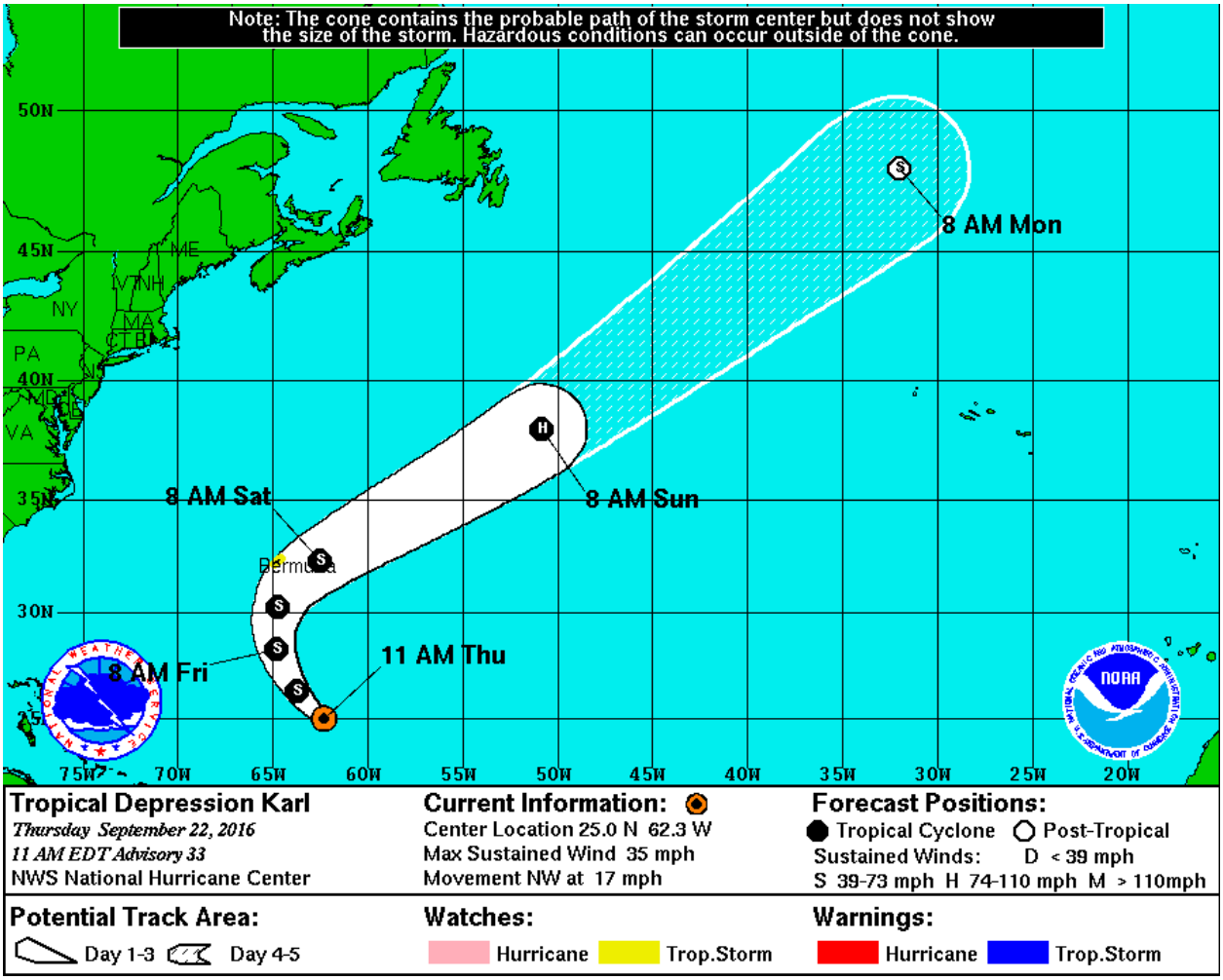
SHOUT Research Flight 5 – 20160922 - Karl

Shift 1 Mission Scientists: Derrick Herndon, Sarah Griffin, Tim Olander
Shift 2 Mission Scientists: Eric Hendricks, Dave Nolan, Jon Moskaitis
Shift 3 Mission Scientists: Gary Wick, Jason Dunion, Chris Velden

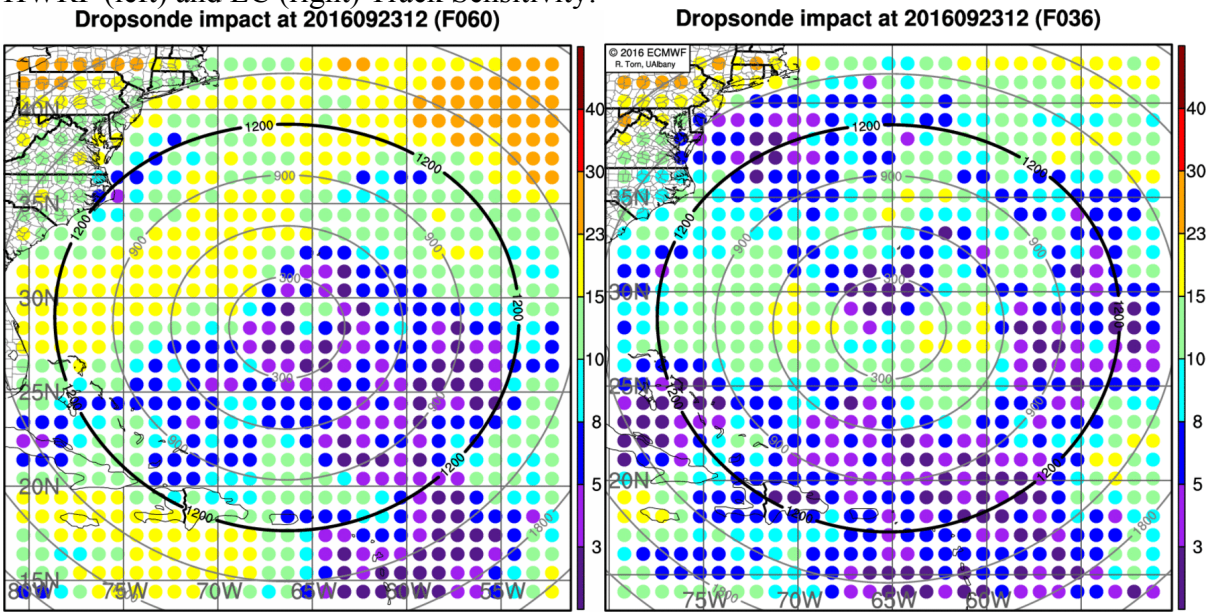
Log initiated by G. Wick

Mission to sample Tropical Depression Karl and highlighted sensitive areas to the north and northwest. While still a tropical depression during flight preparations, forecasts generally call for intensification to tropical storm strength in the near term and then perhaps to at least a minimal hurricane in the slightly longer term after recurvature. The models have all generally been in agreement on the track up to the point of recurvature, though the location has shifted somewhat to the east over the recent cycles. There has been greater forecast spread in how rapidly the storm moves to the northeast after recurvature. Throughout the earlier forecast cycles there has been disagreement between models on intensity.

Shown below are the NHC forecast track during preflight preparations and the sensitivity graphics provided by Ryan Torn this morning.



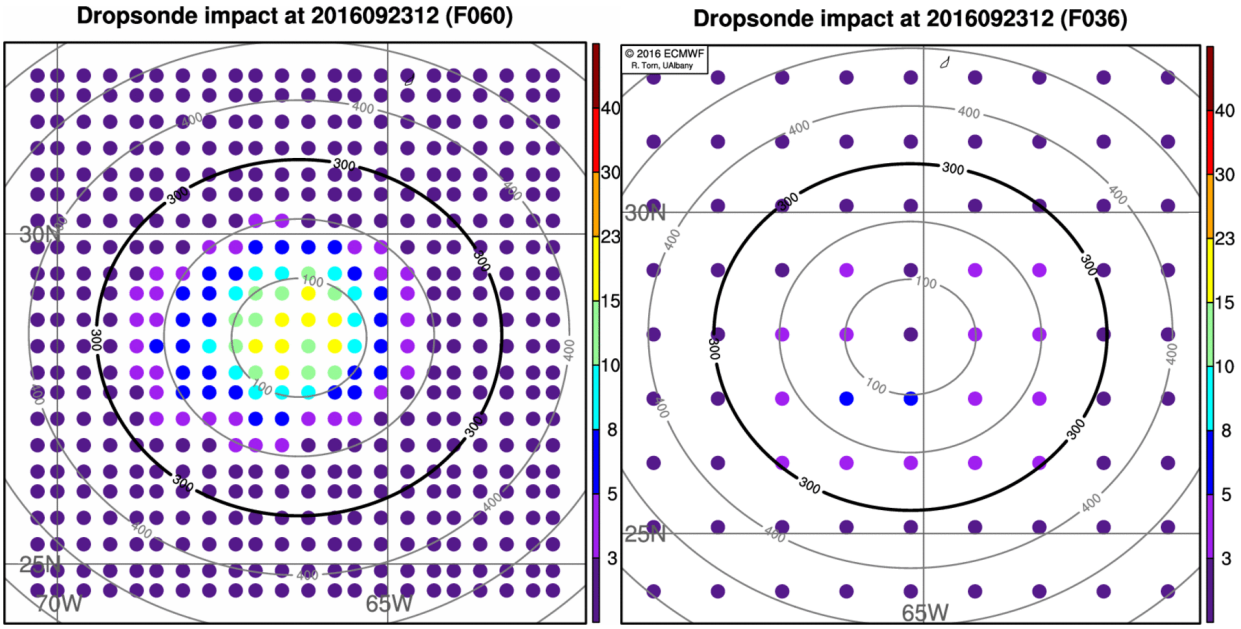
HWRF (left) and EC (right) Track Sensitivity:



From Ryan: The focus of this target discussion is on TD Karl at 1200 UTC 23 September. For track, the HWRF targets (left) are mainly concentrated on the northwest side of the TC associated with sensitivity to how close the midlatitude westerlies get to the TC. The ECMWF-based targets are qualitatively similar though perhaps a bit more to teh west, suggesting that taking observations to the NW of the storm, either coming into or leaving the TC would be beneficial. While COAMPS shows sensitivity to the northwest as well, it is further upstream with the trough.

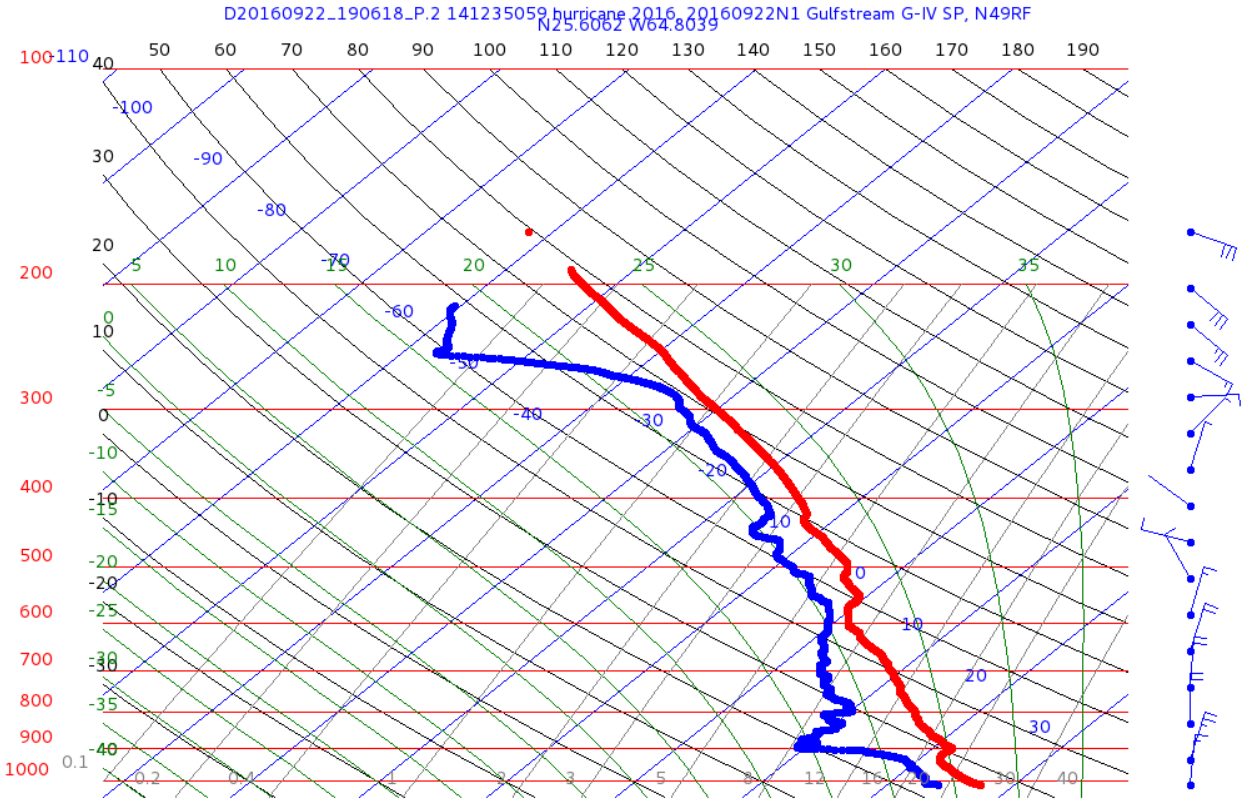
For intensity, the HWRF targets (left) and ECMWF (right) targets are within 300 km of the center of the TC, though the HWRF is a bit more biased to the west, while the ECMWF is more biased toward the south. The COAMPS intensity targets are more remote associated with the upstream trough, suggesting the potential importance of baroclinic processes.

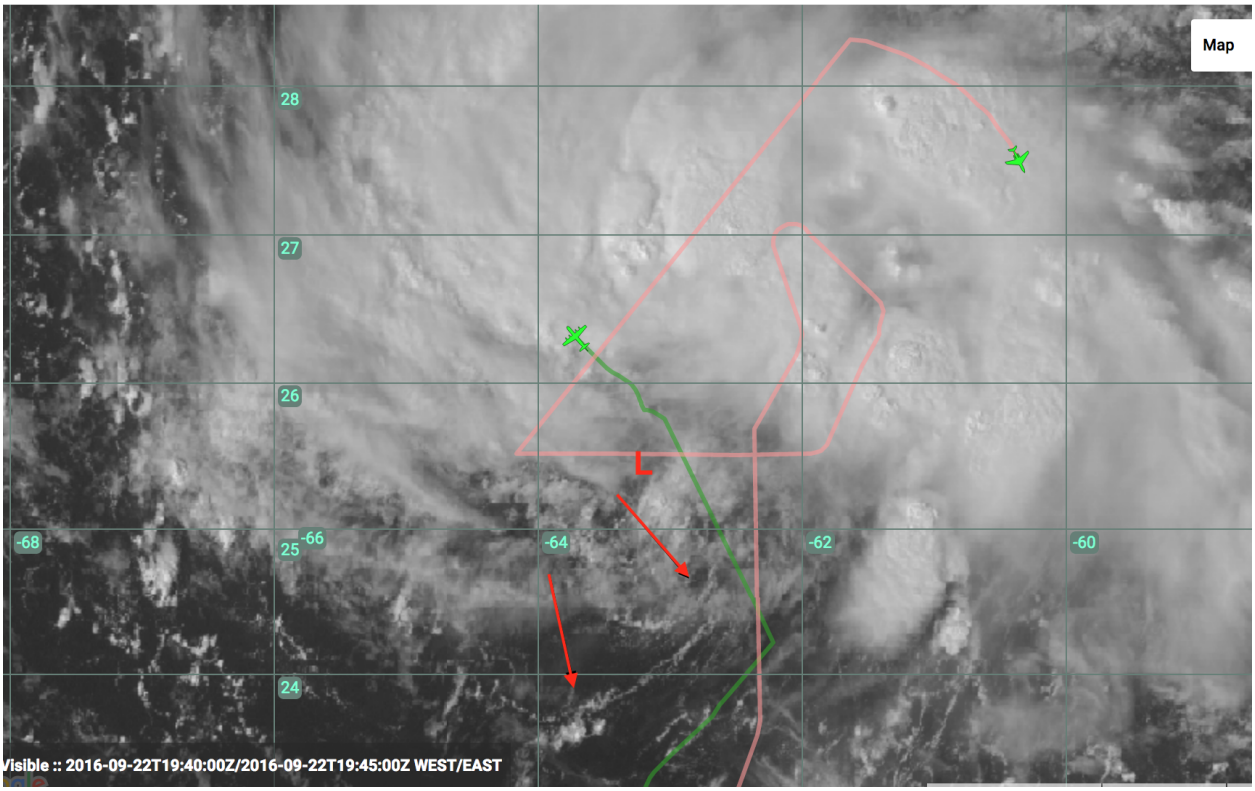
Corresponding images for intensity sensitivity:



Scheduled takeoff time is 1800 EDT or 2200 UTC on 22 Sep. Payloads are AVAPS, HAMSR, and HIWRAP. 90 dropsondes are loaded and 90 drops are planned. Initial plans were for takeoff as early as Wednesday the 21st, but local weather at WFF has been bad with low overcast and rain since early in the week. Takeoff this evening would still likely preserve a two flight sequence with a follow on departure on Saturday.

The NOAA GIV (N49), P3 (N43) and Air Force C-130 are currently sampling Karl. The GIV dropsondes continue to show the presence of dry air on the south side of the circulation with cool outflow boundaries propagating to the SE away from the center (skew-T below). The center is currently located on the south side of the main convection with the mid level center located about 30 nm north of the sfc center (see 1945Z vis image below).


D20160922_190618_P.2 141235059 hurricane 2016_20160922N1 Gulfstream G-IV SP, N49RF
N25.6062 W64.8039
Aspen V3.3, 22 Sep 2016 19:32 UTC


Map
28
27
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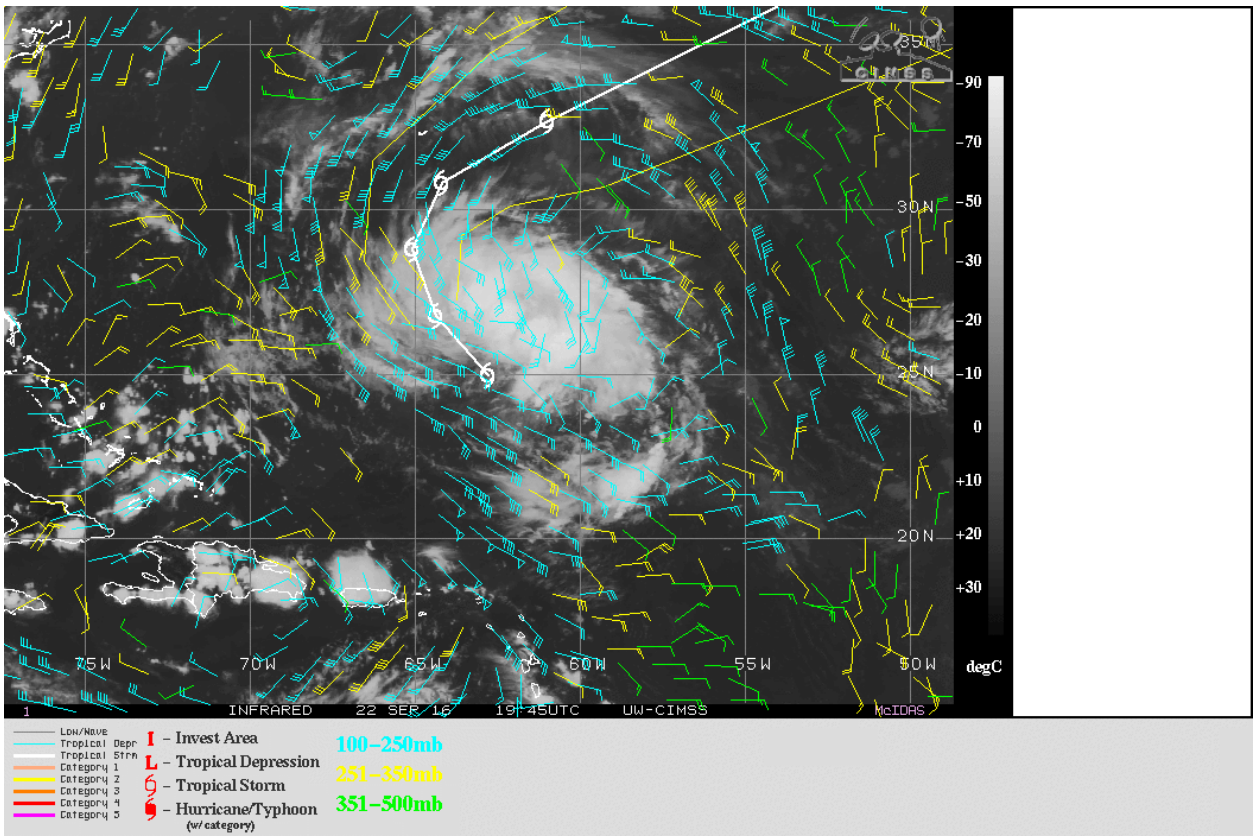
Visible :: 2016-09-22T19:40:00Z/2016-09-22T19:45:00Z WEST/EAST

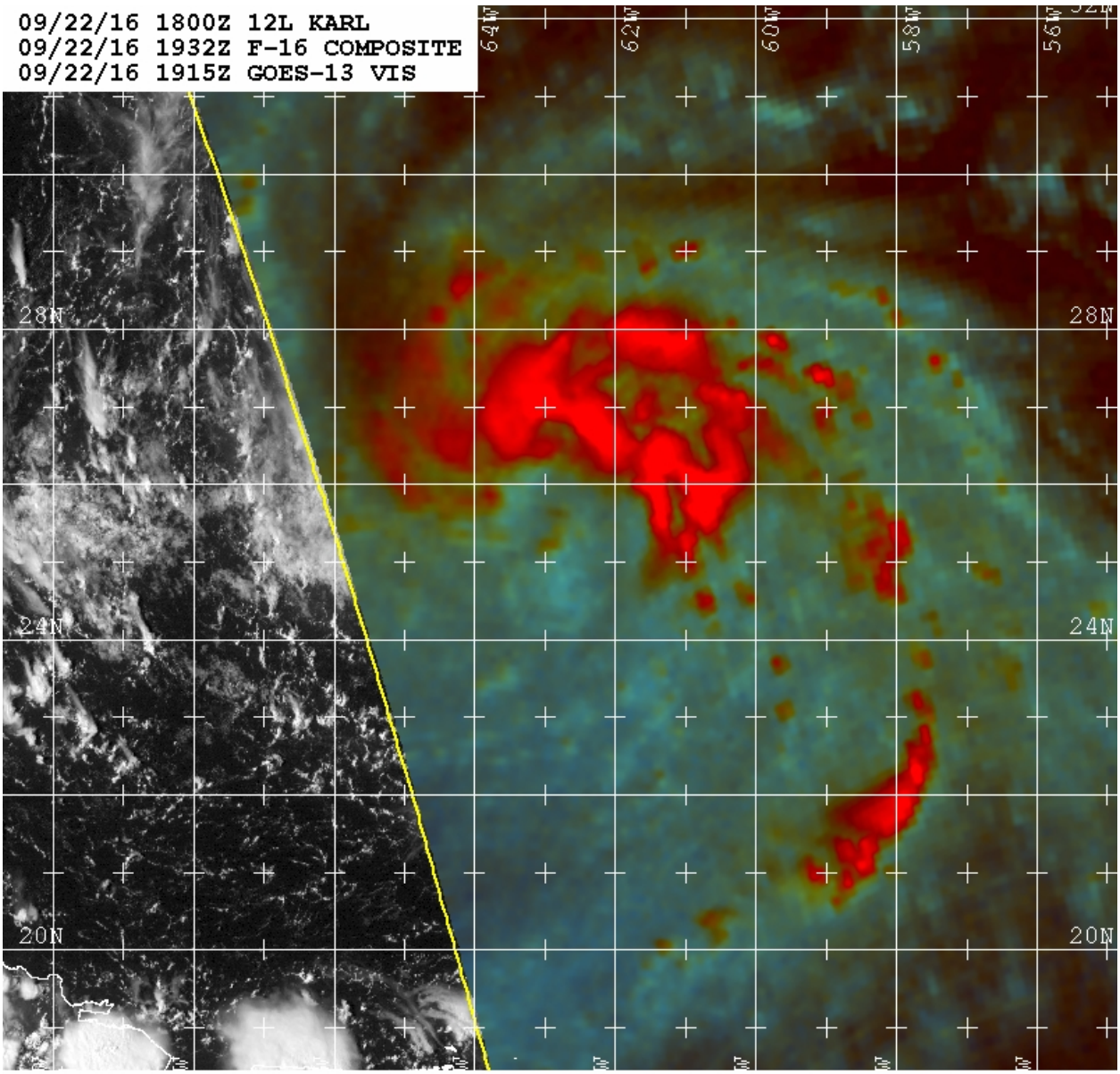


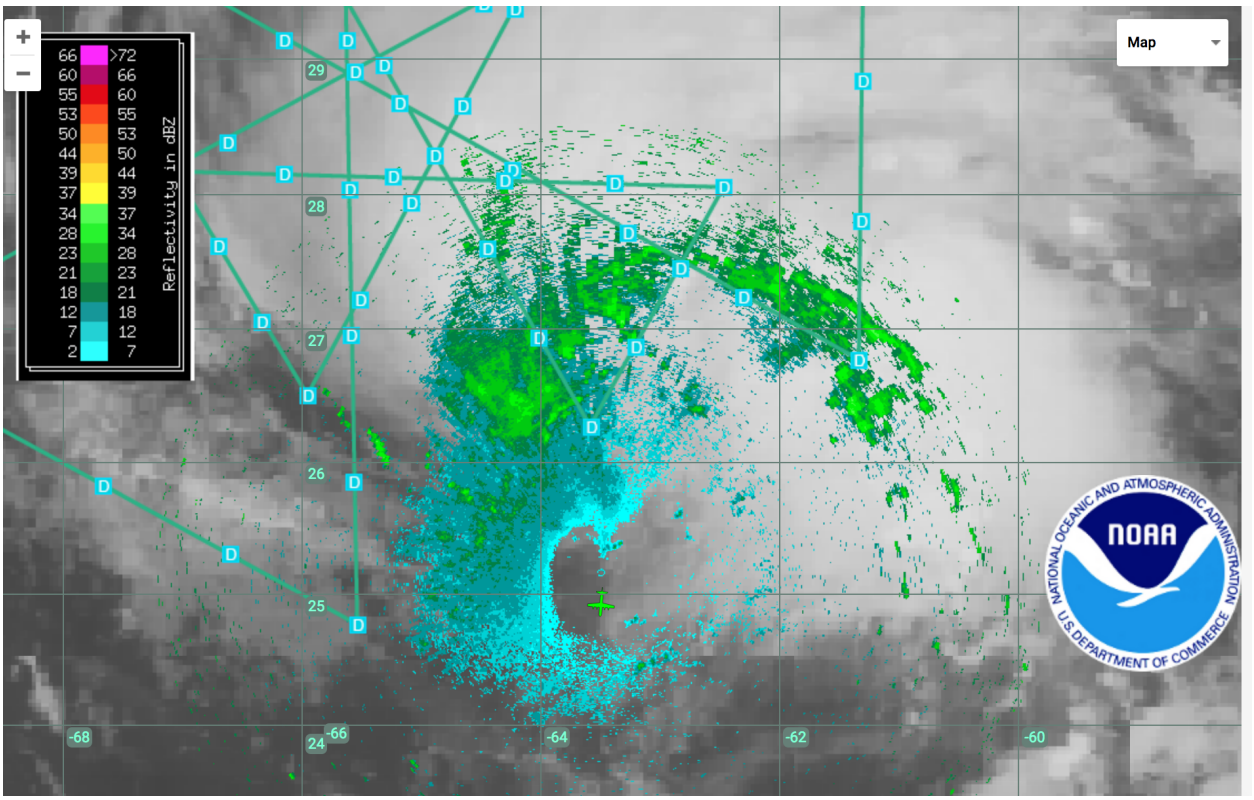
Upper level winds over Karl show a well defined anti-cyclone and outflow jet/region to the north of the storm.

Karl has been upgraded to a Tropical Storm by NHC with the 21Z update.

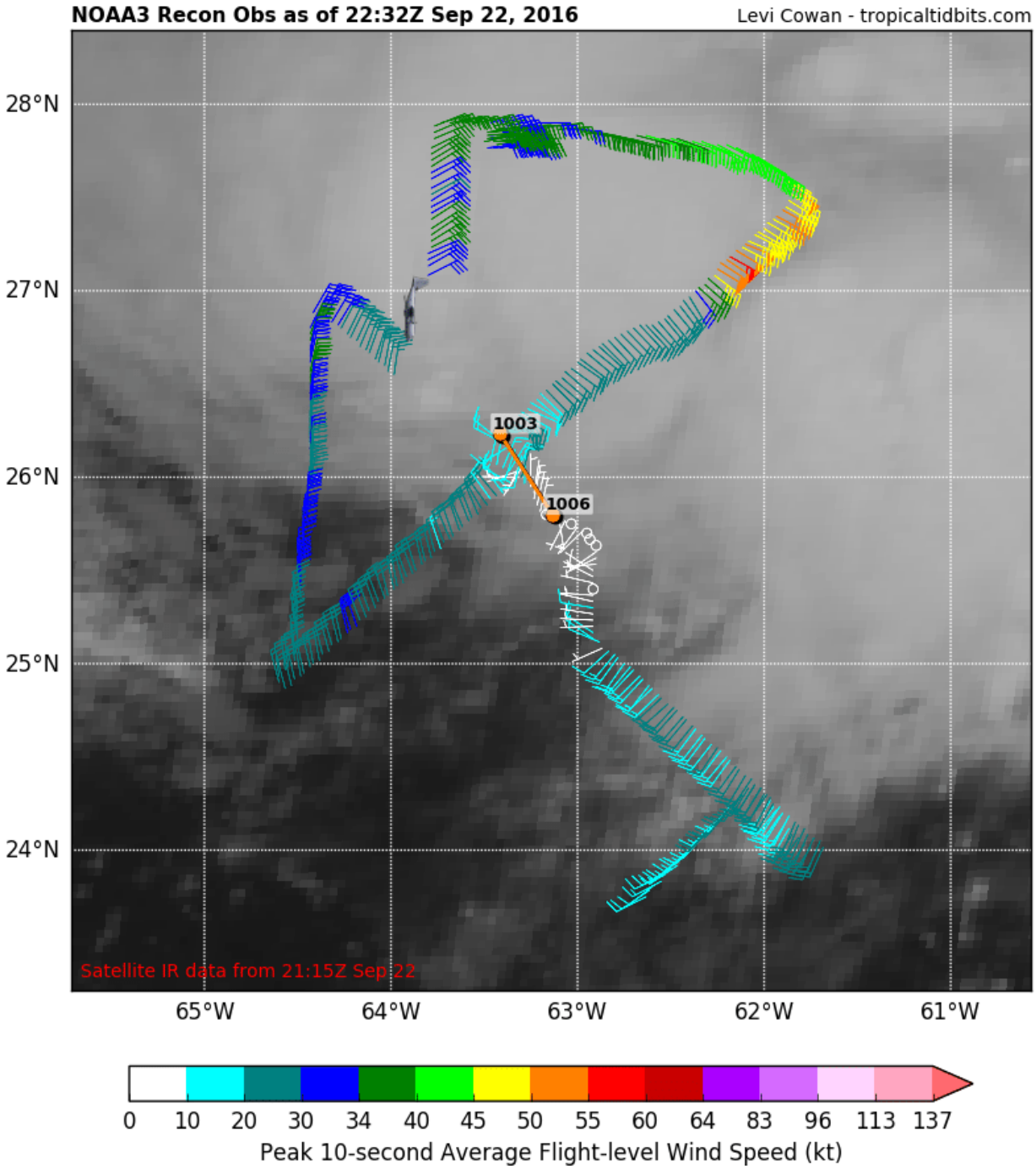
Airborne at 2213 UTC

Earlier 1932Z SSMIS pass suggested mid-level nascent eye feature however recent P3 radar shows this region remains poorly organized. Most recent pass at 22:33Z through the center indicates west winds of 30 knots suggesting an improvement in the strength of the circulation in agreement with pressure falls.

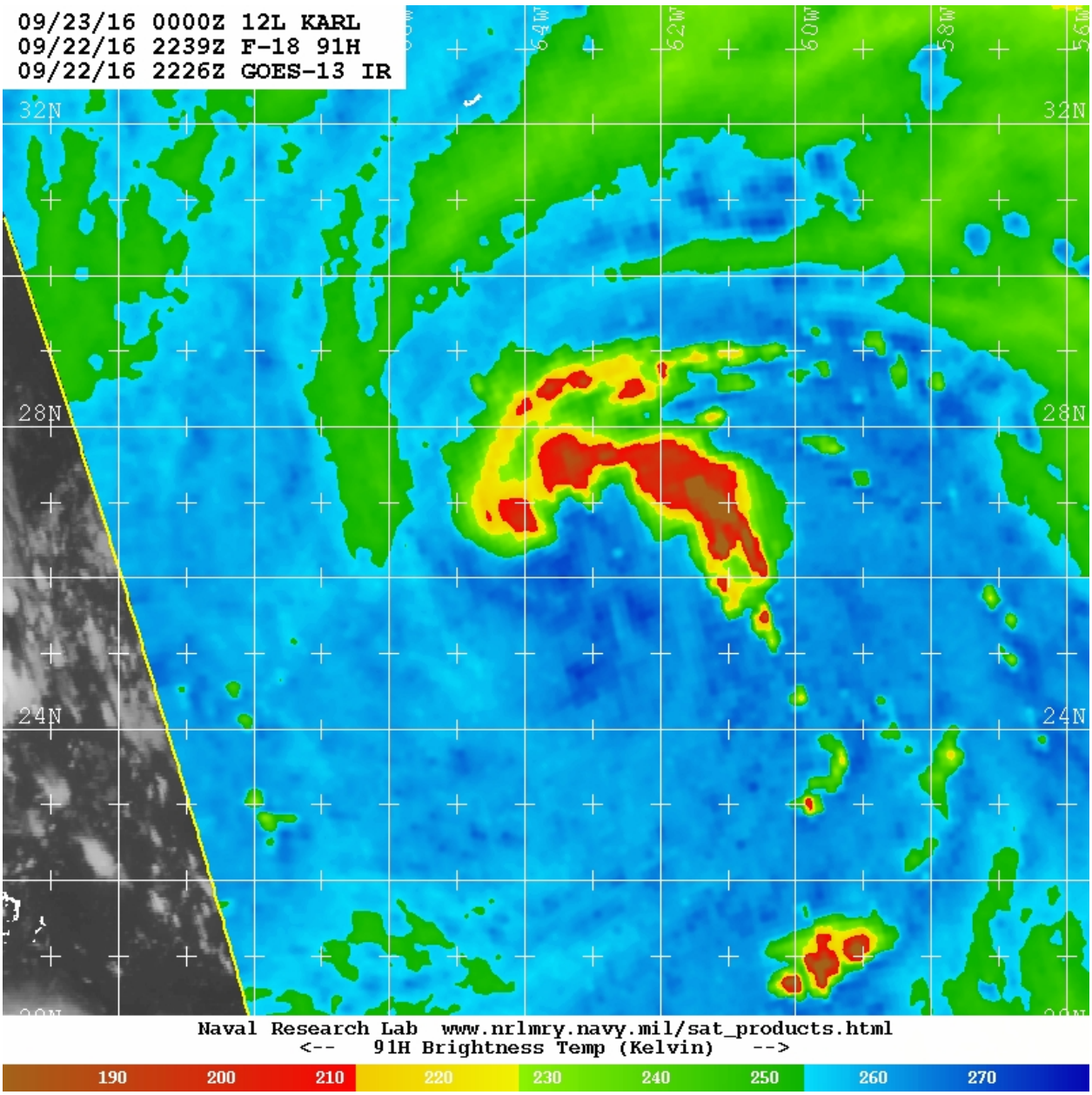

09/22/16 1800Z 12L KARL
09/22/16 1932Z F-16 COMPOSITE
09/22/16 1915Z GOES-13 VIS
64W
62W
60W
58W
56W
28N
24N
20N
Naval Research Lab www.nrlmry.navy.mil/sat_products.html
Red=91PCT Green=91H Blue=91V



P3 Radar composite Sep 22, 2016 22:55Z



2232 UTC: Recon from the P3 indicates a 3 mb drop in Karl's central pressure.



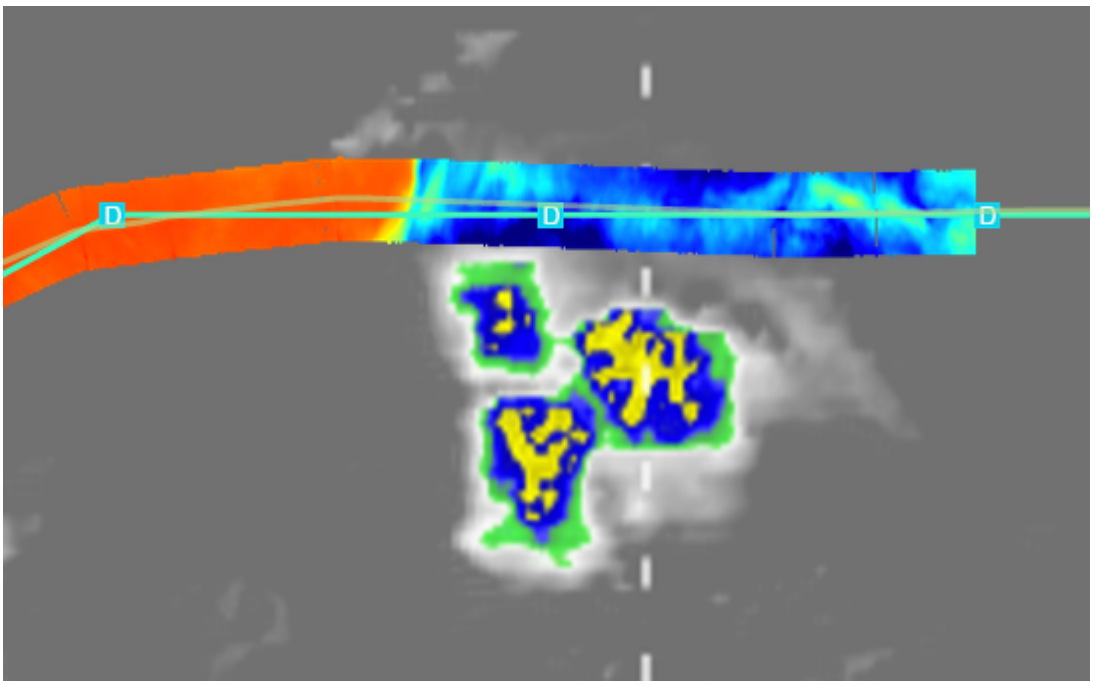
2317 UTC P3 center fix indicates continued pressure fall with dropsonde pressure of 1003 mb with 24 knots of wind putting MSLP near 1001 mb.

2355 UTC: Drop 1 is good.

0014 UTC: Drop 2 is good. Update -> cut out around 850 mb.

0015 UTC: At 0000 UTC intermediate advisory, NHC increases Karl's intensity to 40 kt, based on low-level recon

0032 UTC: Drop 3 is good.



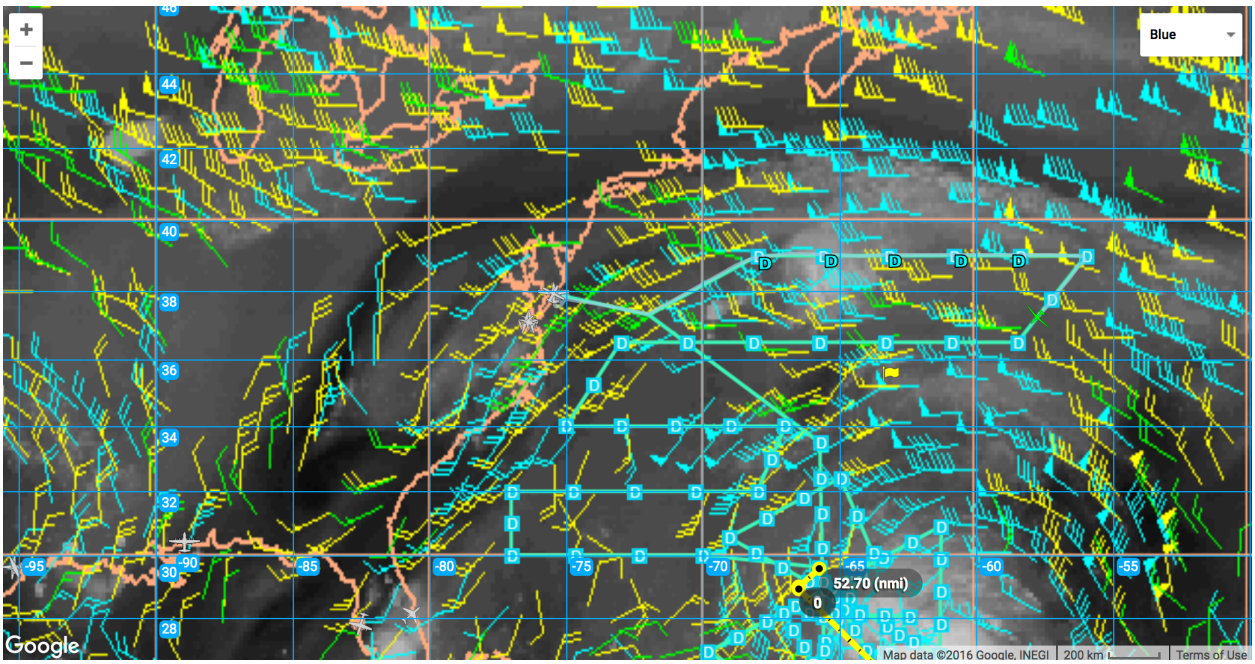
0045 UTC: Outflow from convective mass we passed to the north shows up nicely in HAMSR 166 GHz TB. Probably see some upper-level southwesterlies in drop 2.

0050 UTC: Drop 4 is good

0108 UTC: Drop 5 is good

Skip drop 6 on corner due to air traffic control, will be released at MTS drop point 7I. Actual drops behind MTS drops by 1.

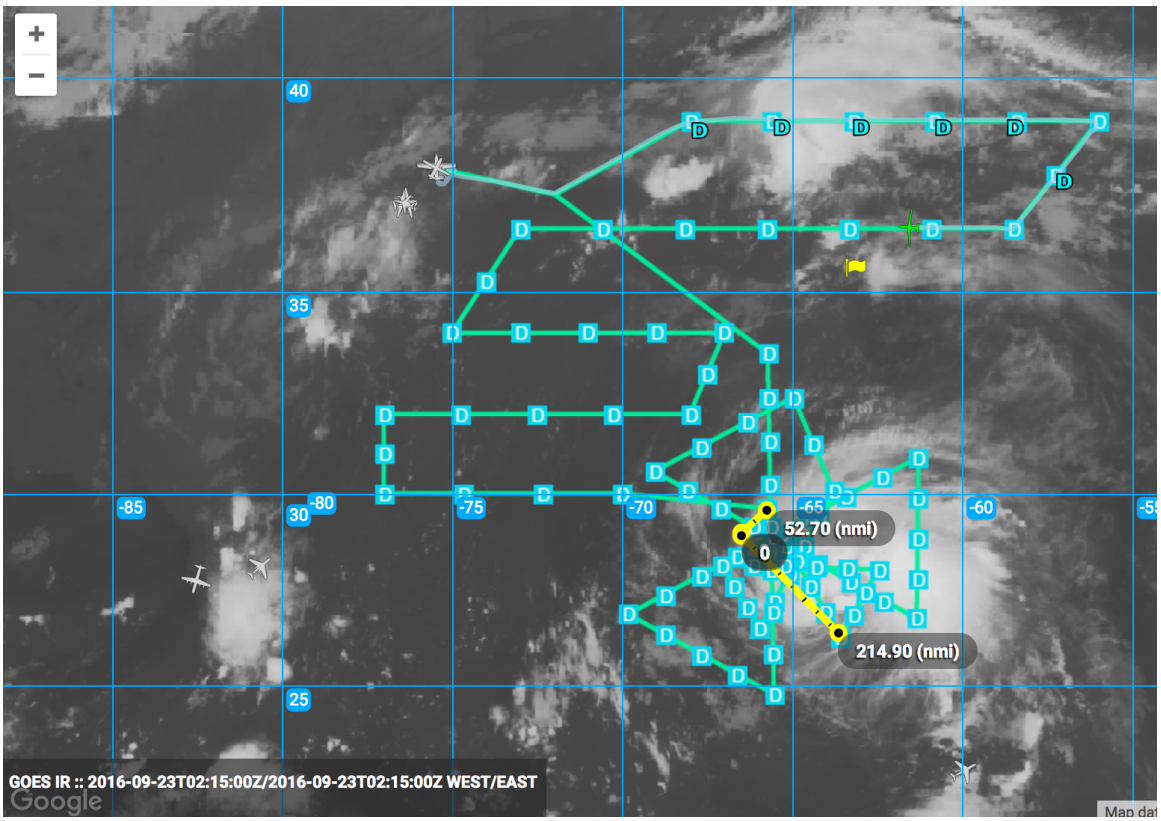
0145 UTC: Drop 6 is good. Launched at location 7.



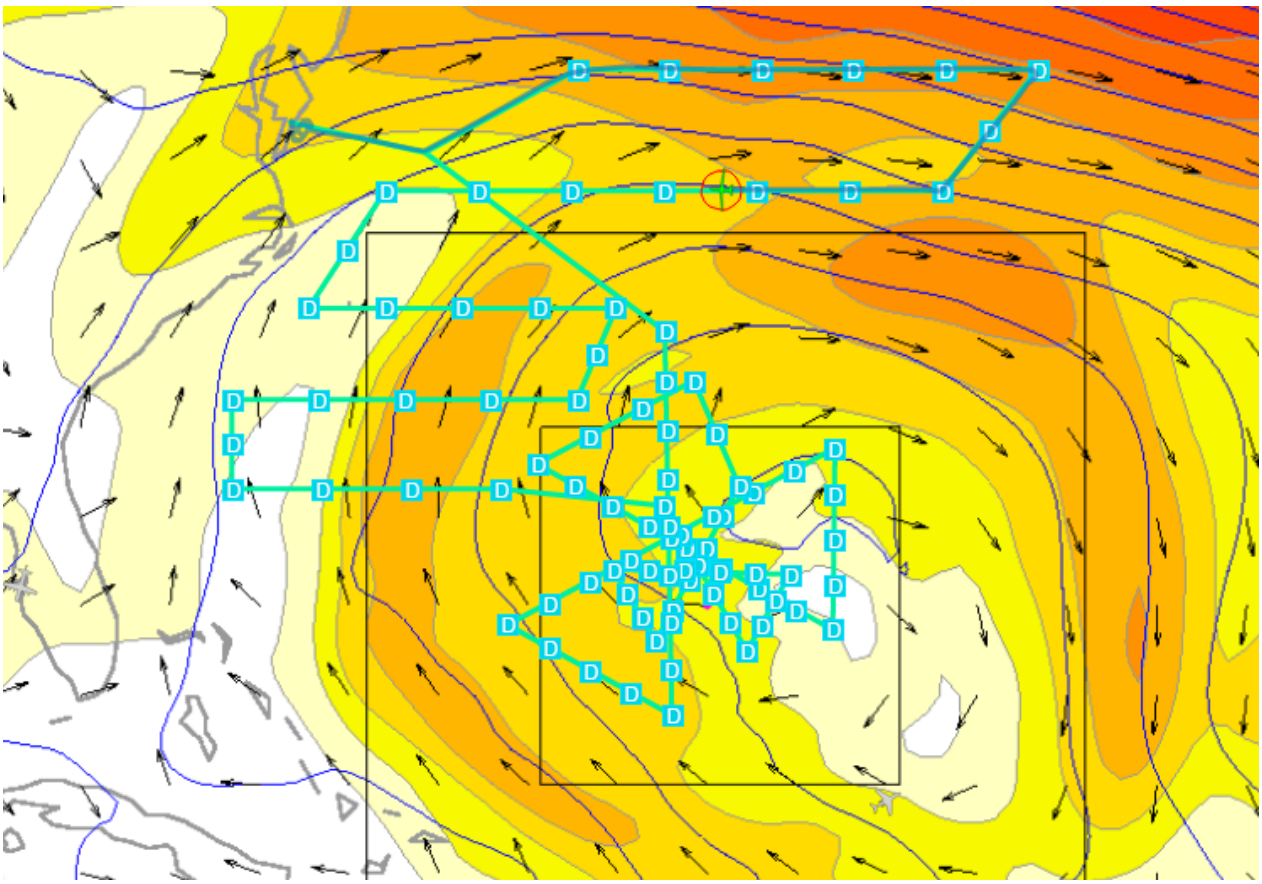
0000 UTC Sept 23 AMVs with flight track. Currently sampling sensitive region to the north of the TC and outflow.

0203 UTC: Drop 7 is good. Launched at location 8.

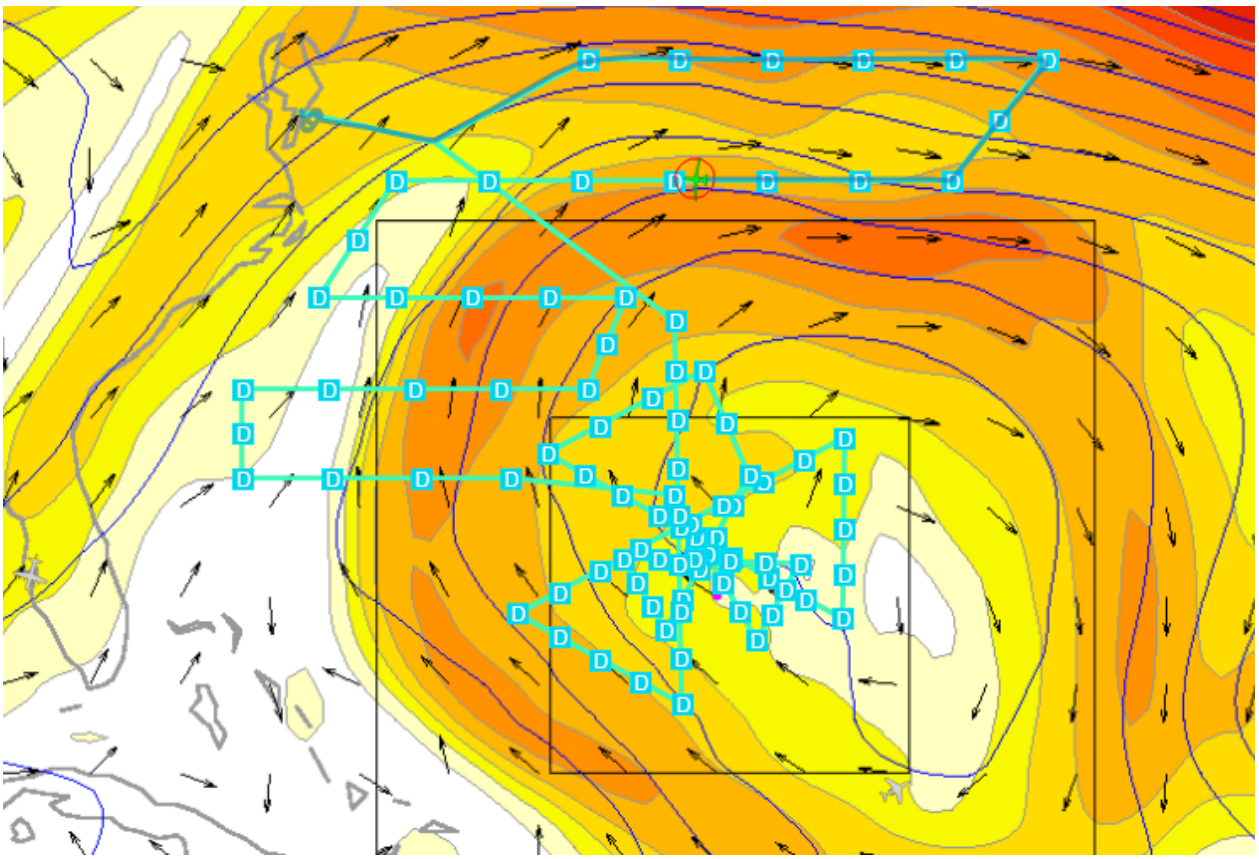
0223 UTC: Drop 8 is good. Launched at location 9.



0245 UTC: Drop 9 is good. Launched location 10.



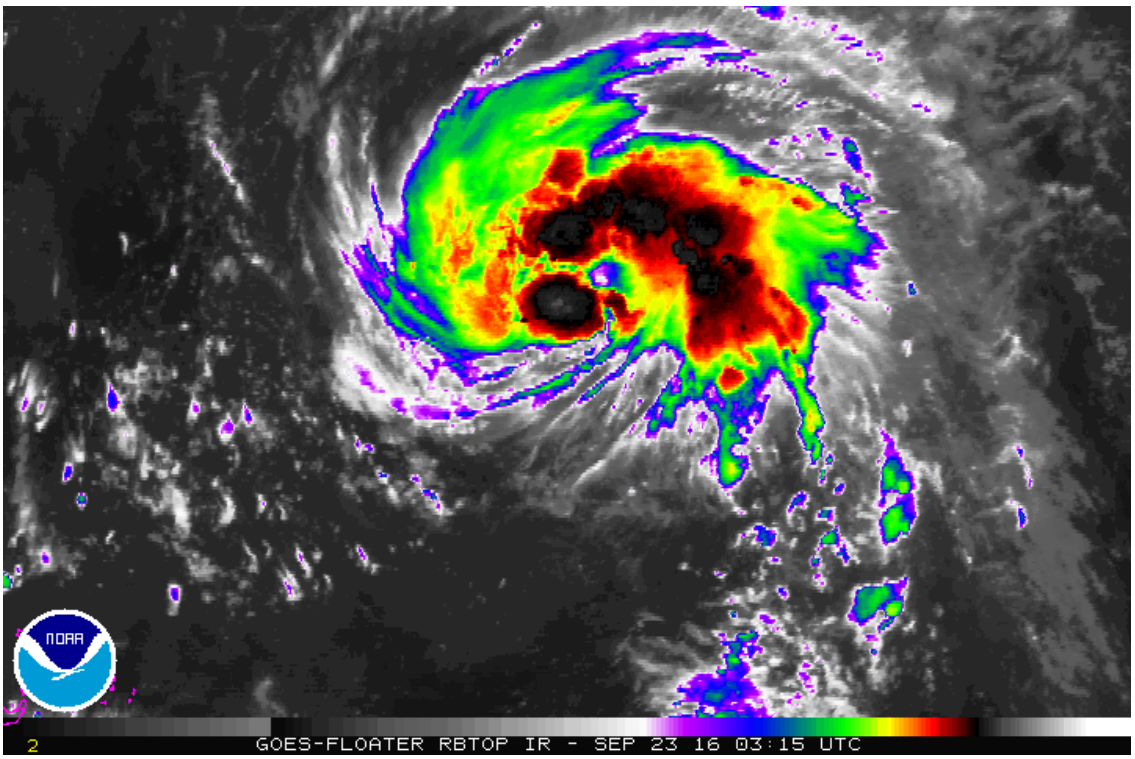
0257 UTC: 22/18z COAMPS-TC forecast of 150 mb winds and heights valid at 23/06z. Color-contours every 5 m/s. Upper level anticyclone predicted to be centered somewhat SE of Karl, with donut of strong winds around the TC. Current leg of lawnmower on northern side of anticyclone where it meets up with midlatitude flow. Subsequent lawnmower legs cut across northwestern side of donut. Anticyclone is partially or mostly built by Karl's outflow.



0257 UTC: As previous plot, but for 200 mb winds and heights.

11 pm EDT NHC (23 / 0300 UTC) update increases intensity of Karl to 40 kt. Center location 27.0N, 64.0W. Motion is 315/14.

0307 UTC: Drop 10 is good. Launched at location 11.



Karl at 0315 UTC. Burst of deep convection near the center.

Location 12 was skipped due to air traffic. Possible other air traffic issues expected for drops near the coast.

0349 UTC: Drop 11 is good. Launched at location 13.

0413 UTC: Drop 12 is good. Launched at location 14 after turn.

0426 UTC: Drop 13 is good. Launched at location 15.

0443 UTC: Completing wide turn at location 16. Drop will occur after turn.

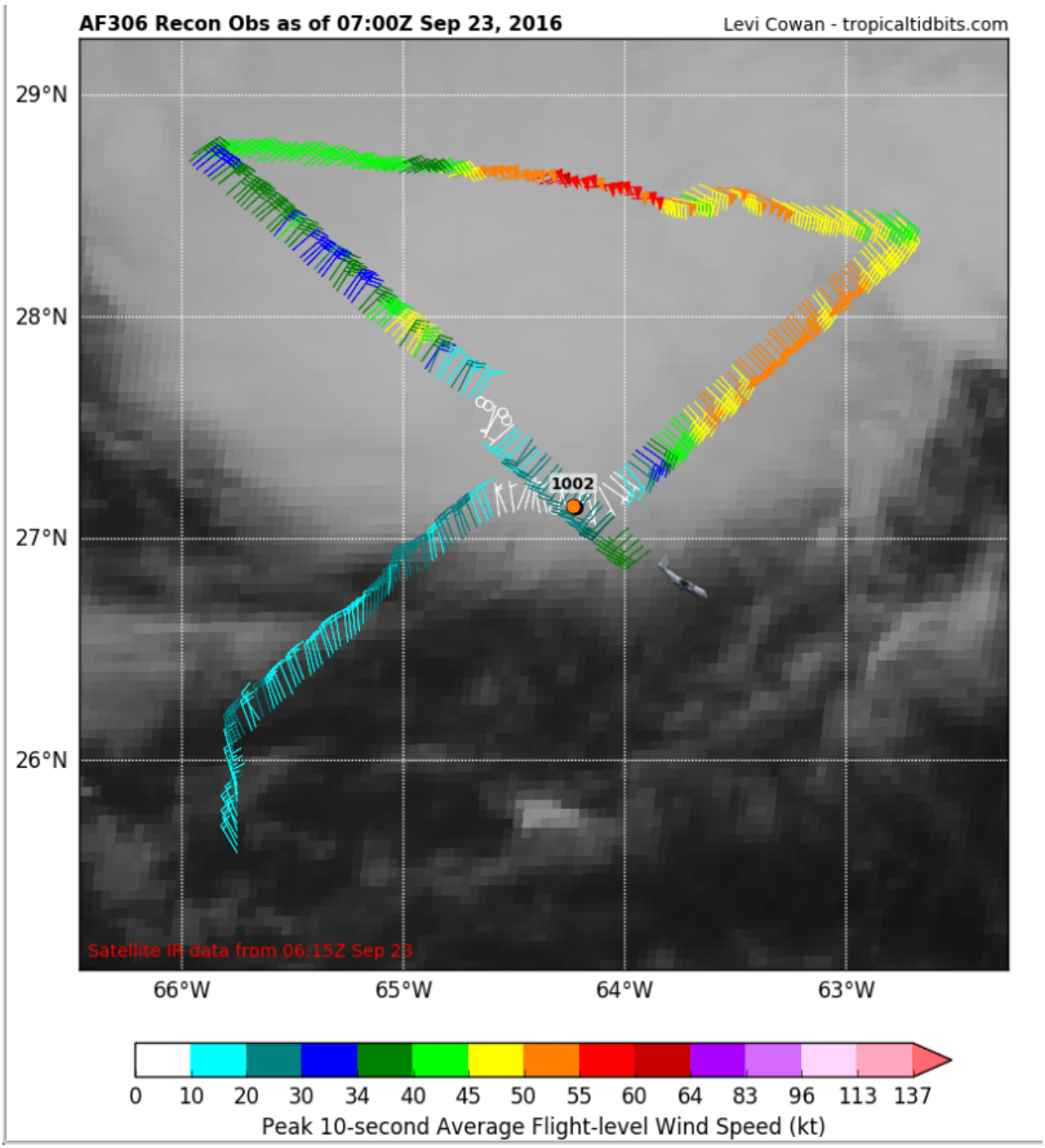
0445 UTC: Drop 14 is good. Launched 30 nmi east of location 16.

0457 UTC: Drop 15 is good. Launched at location 17.

Skipping location 18 due to traffic.

Skipping location 19 due to traffic. Will try to launch sonde in between 19 and 20.

0543 UTC: Drop 16 is good. Launched halfway between locations 19 and 20.



0528 UTC: First center pass of Air Force recon mission finds 50 kt flight level winds much closer to center than during earlier P3 flight. Only about 30 kt on the SFMR though.

0600 UTC update from National Hurricane Center based on Air Force Recon flight:

SUMMARY OF 200 AM AST...0600 UTC...INFORMATION

LOCATION...27.3N 64.3W
ABOUT 350 MI...560 KM S OF BERMUDA
MAXIMUM SUSTAINED WINDS...45 MPH...75 KM/H
PRESENT MOVEMENT...NW OR 315 DEGREES AT 16 MPH...26 KM/H
MINIMUM CENTRAL PRESSURE...1002 MB...29.59 INCHES

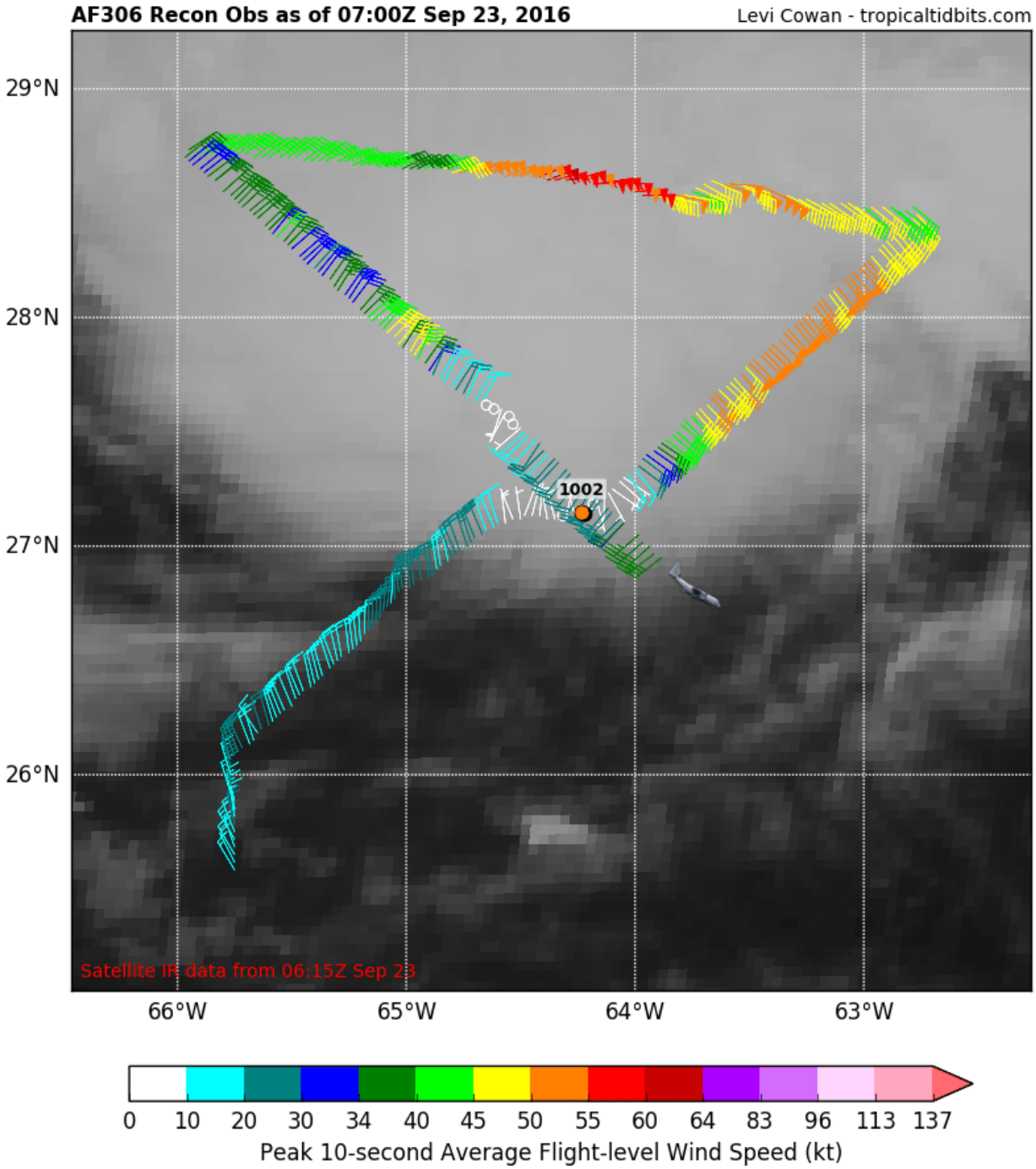
0554 UTC: Drop 17 is good. Launched 30 km SSW of location 20.

0602 UTC: Drop 18 is good. Launched at location 21.

0616 UTC: Drop 19 is good. Launched at location 22.

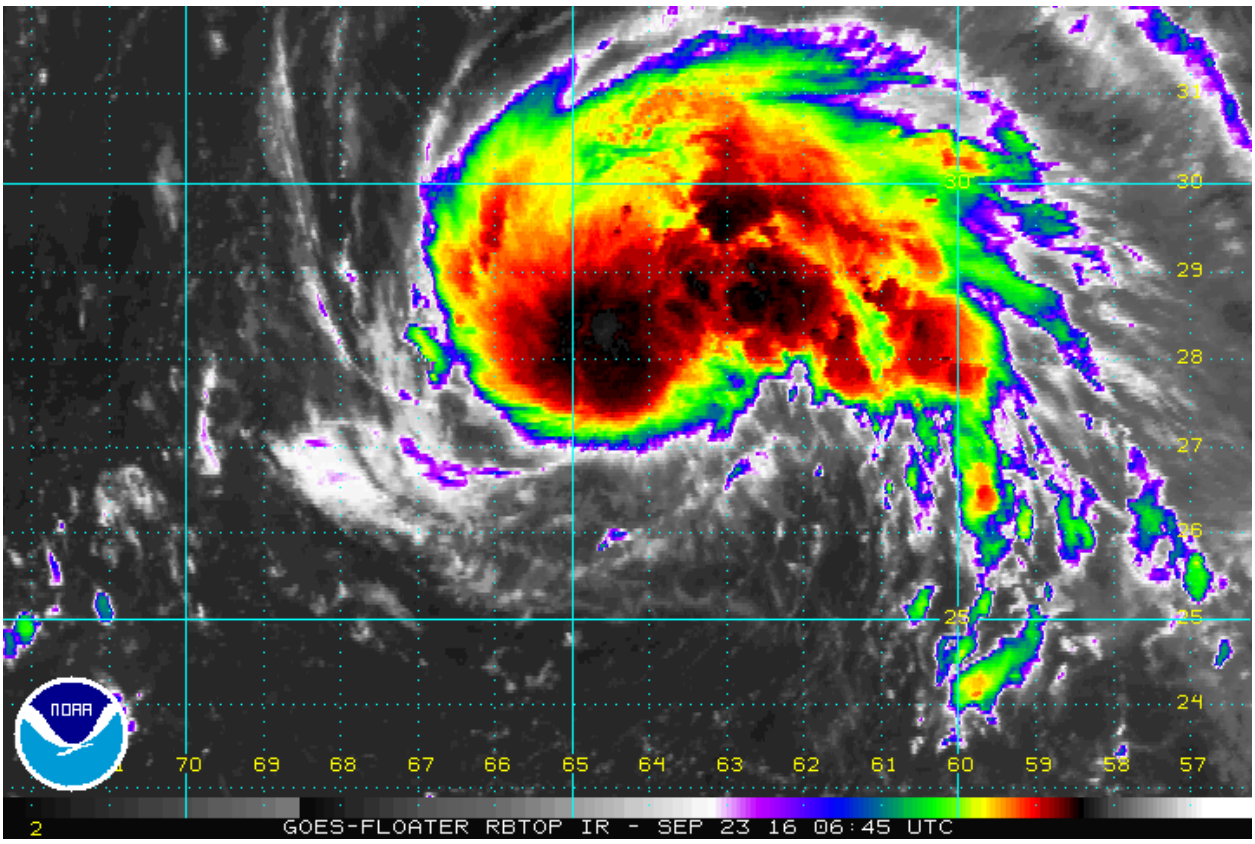
0638 UTC: Drop 20 is good. Launched at location 23.

0654 UTC: Drop 21 is good. Launched at location 24.



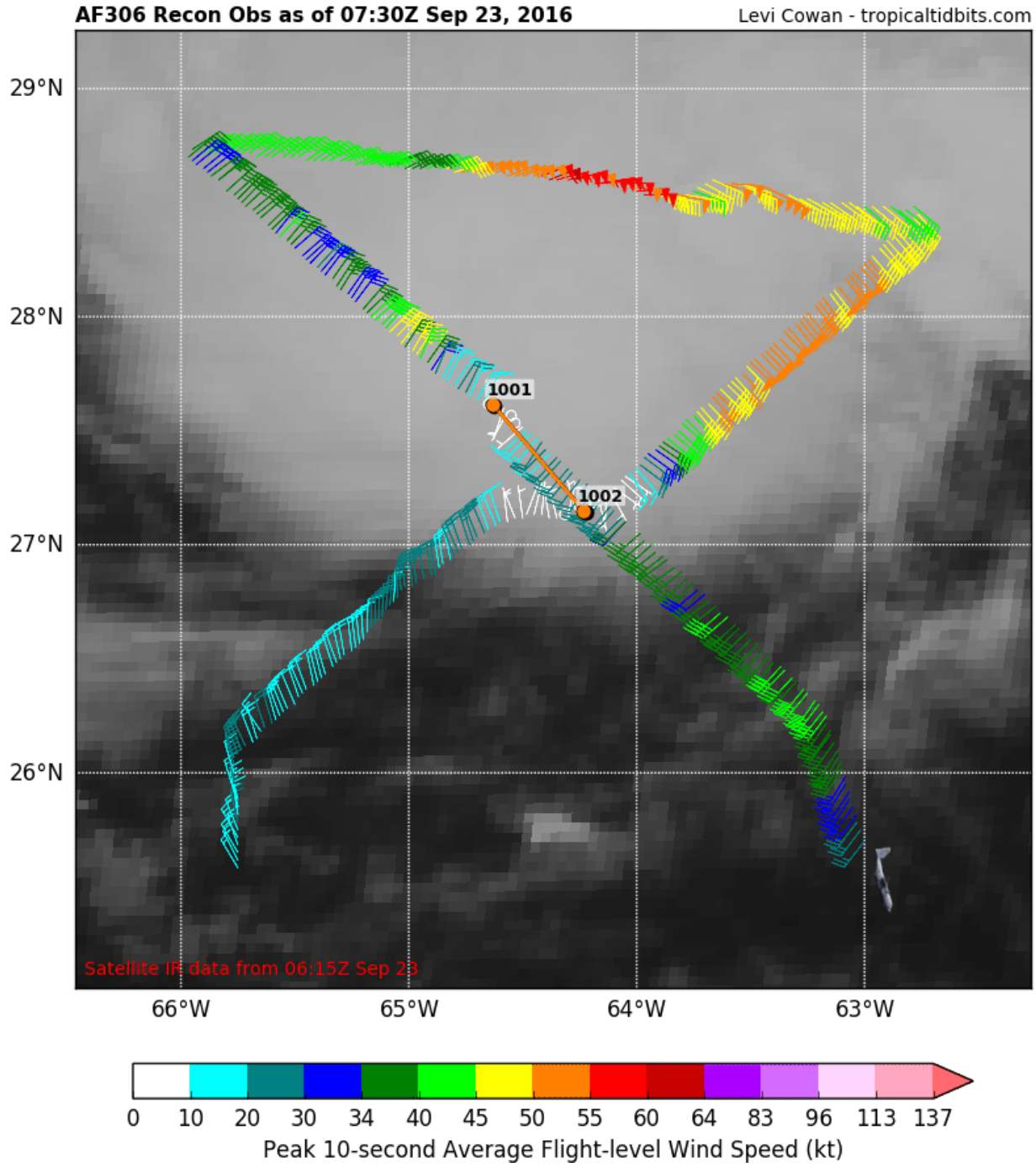
0704 UTC: 2nd Air Force pass through center finds a somewhat better-defined low-level center perhaps. SFMR winds nearly 45 kt about 30 nm NW of center, where those yellow 45-50 kt flight level wind vectors are located.

Jon, I moved the NRL image up since it was taken at 2239Z.



IR satellite presentation of Karl looking more symmetric with central dense overcast building. Image at 0645 UTC.

0714 UTC: Drop 22 is good. Launched at location 25.



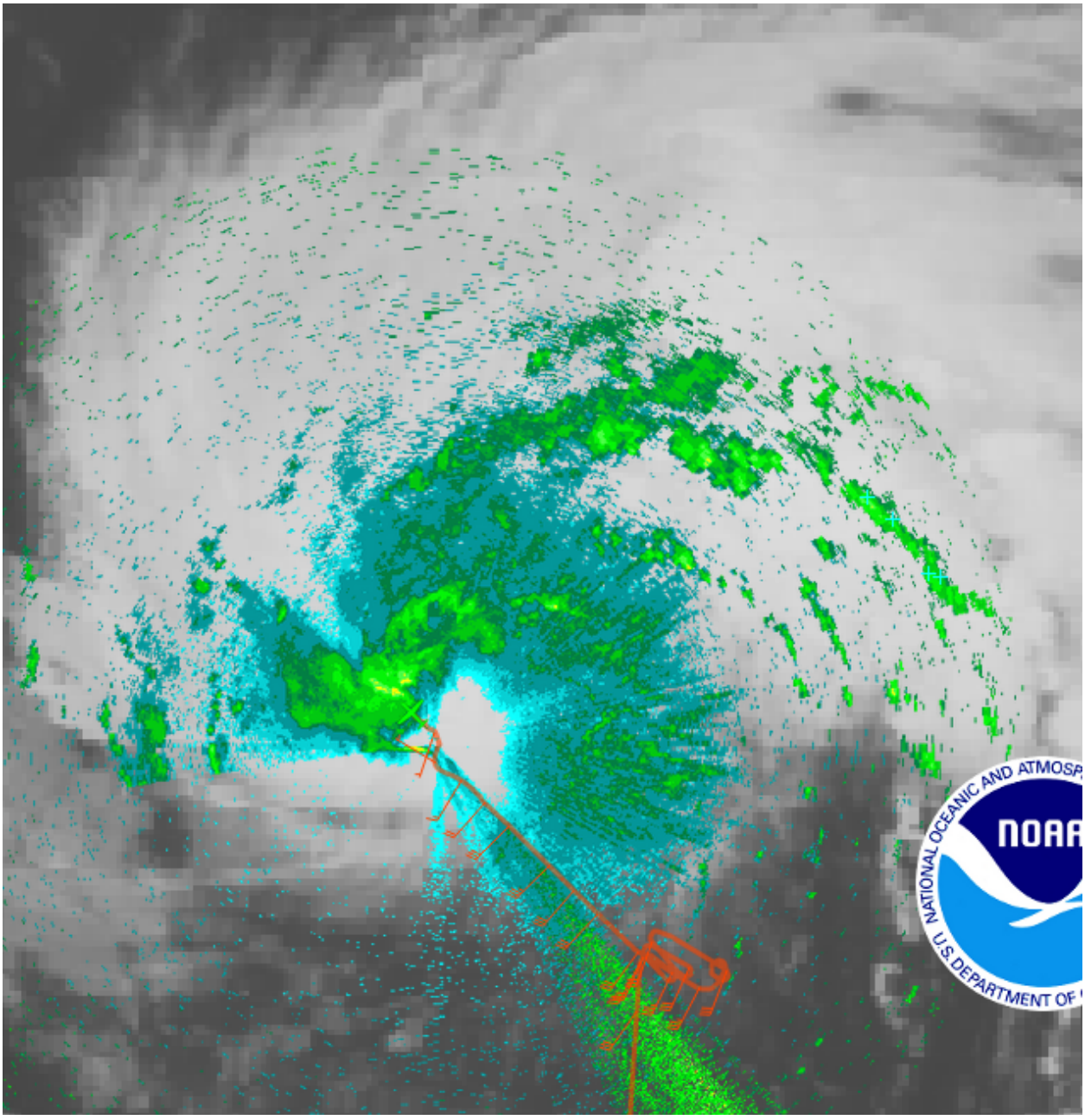
AF flight completes second pass through center. Minimum pressure on second pass is 1001 mb.

0739 UTC: Drop 23 released 40 km south of location 26. Good drop.

0745 UTC: Drop 24 is good. Launched at location 27. Good drop.

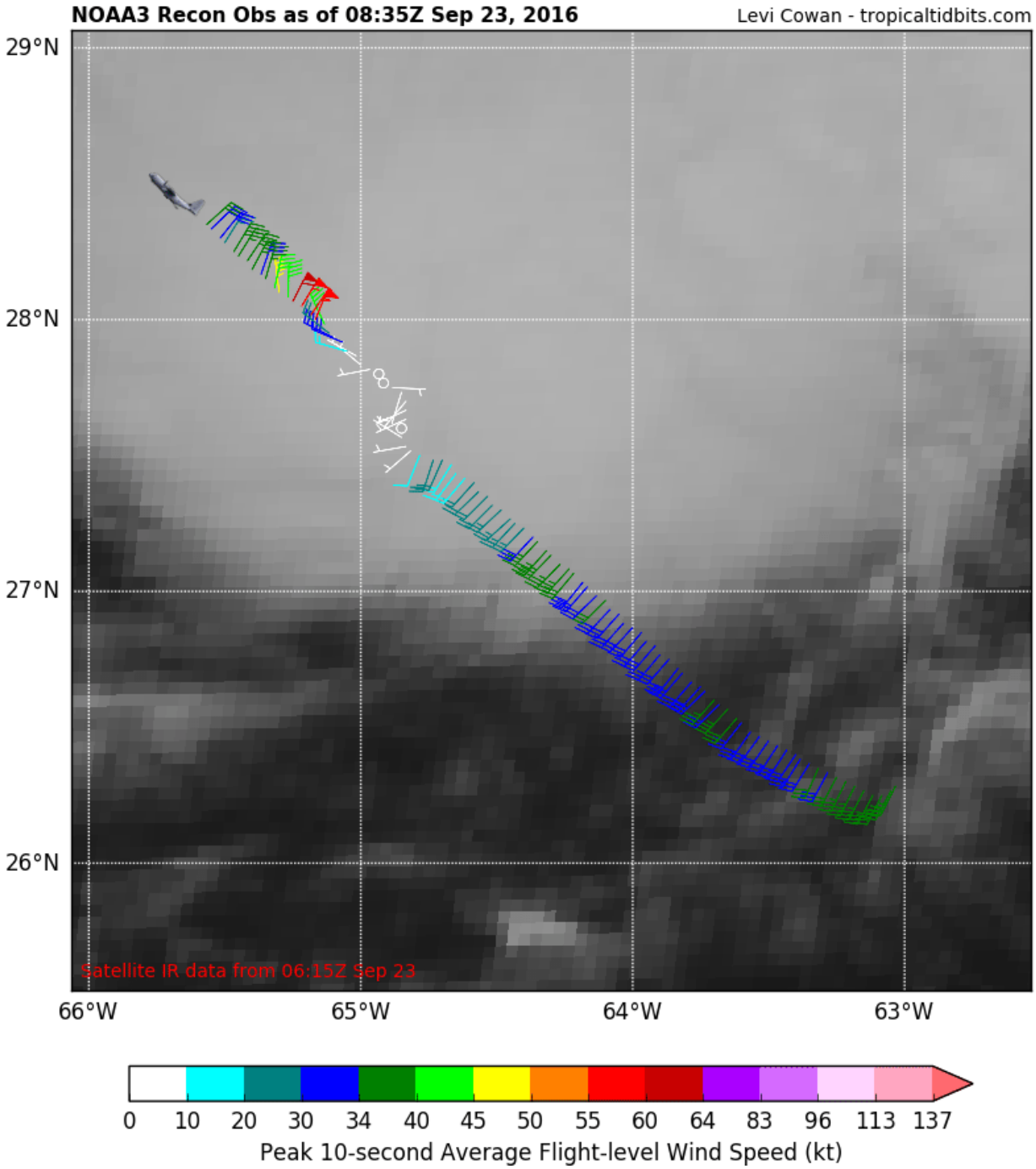
0756 UTC: Drop 25 is good. Launched at location 28. Good drop.

0816 UTC: Drop 26 is good. Launched at location 29. Good drop.



0822 UTC: P3 near center, P3 radar and IR image.

0838 UTC: Drop 27 is good. Launched at location 30.

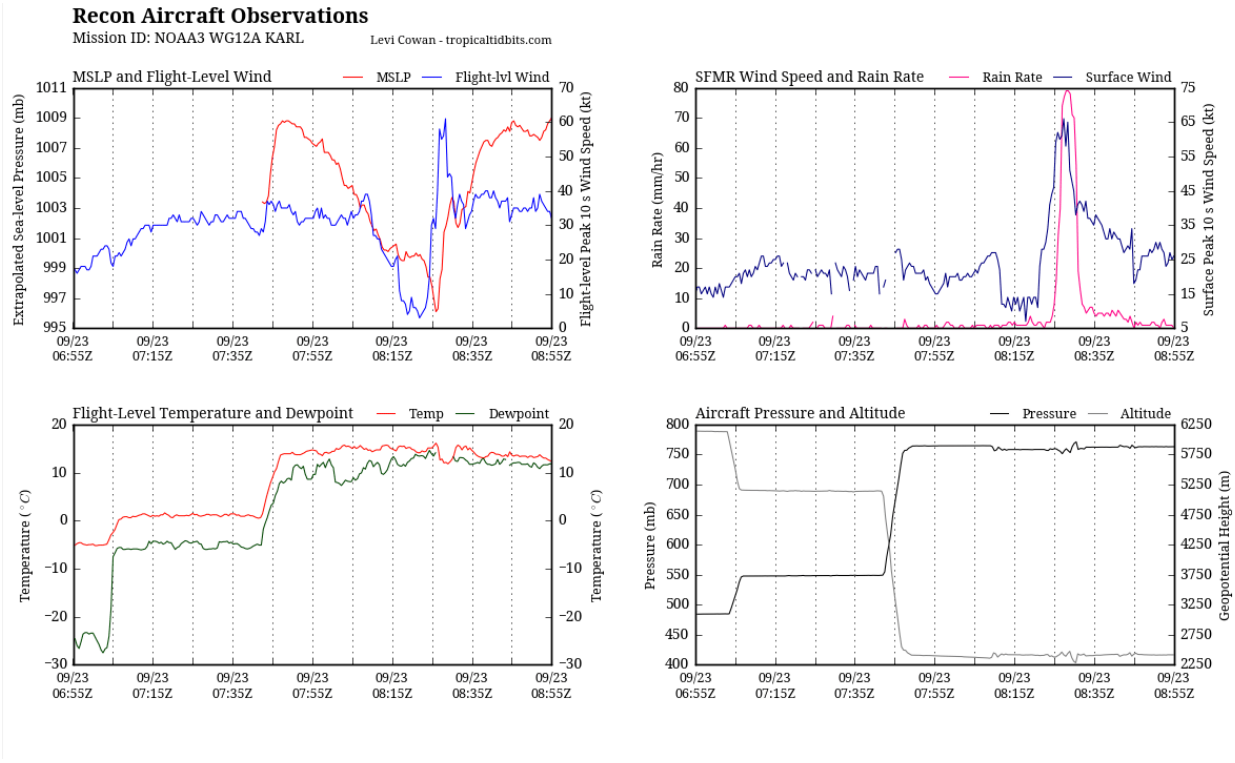


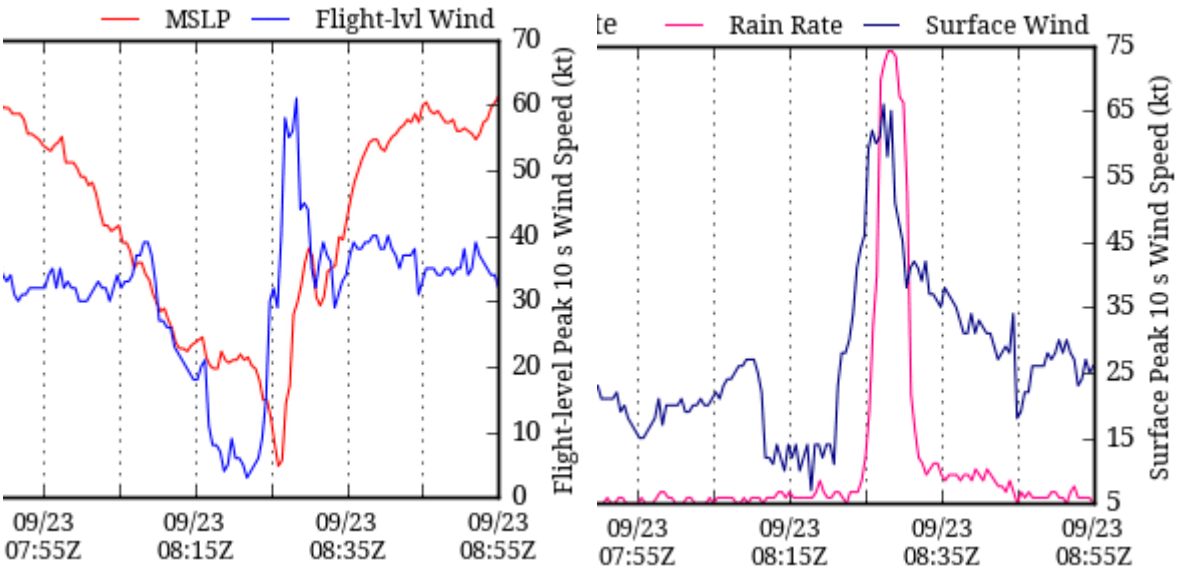
0838 UTC: First P3 center crossing, with flight level winds up to 60 kt NW of center, right in the strongest convection according to the P3 radar. SFMR got up to 65 kt, but in heavy rain, so that looks fishy.

0840 UTC: Gary and Jason stepping in

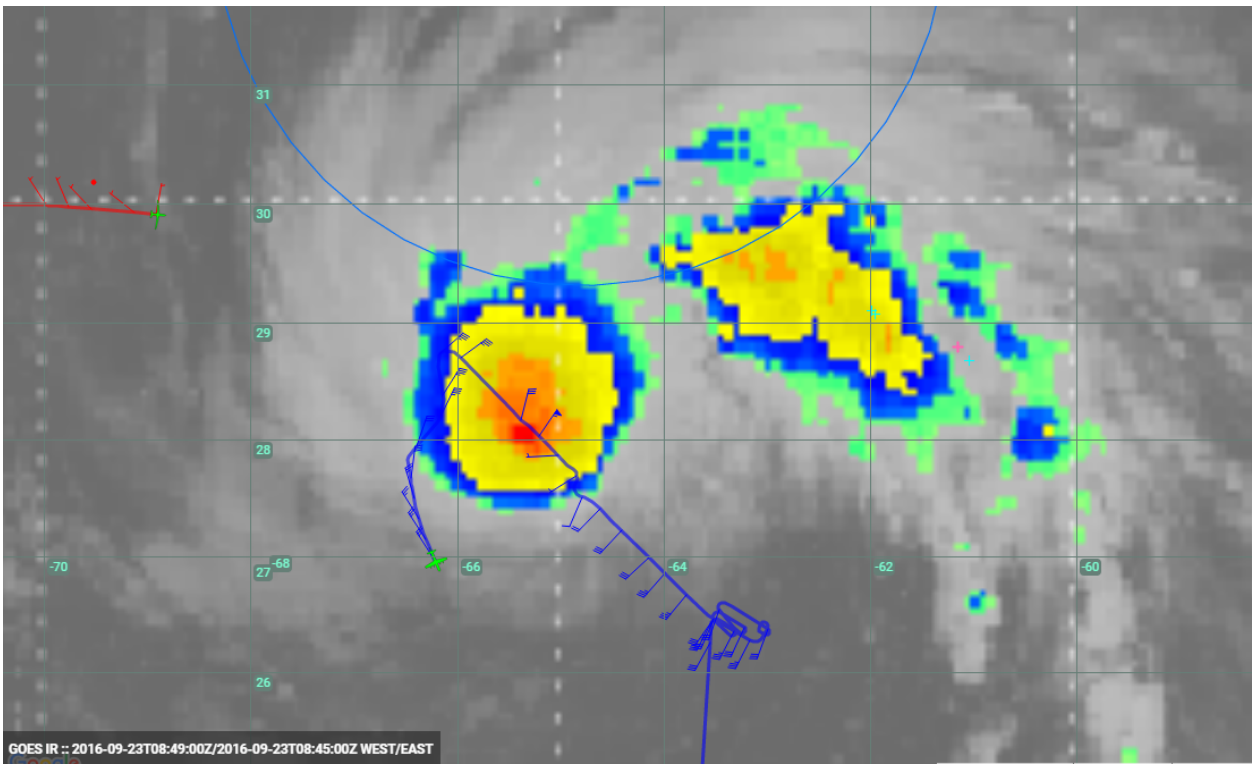
0858: Nice cirrus clouds on low light camera. But what is the black shadow creeping across the image?

0900 UTC: Drop 28 at location 31; Good drop

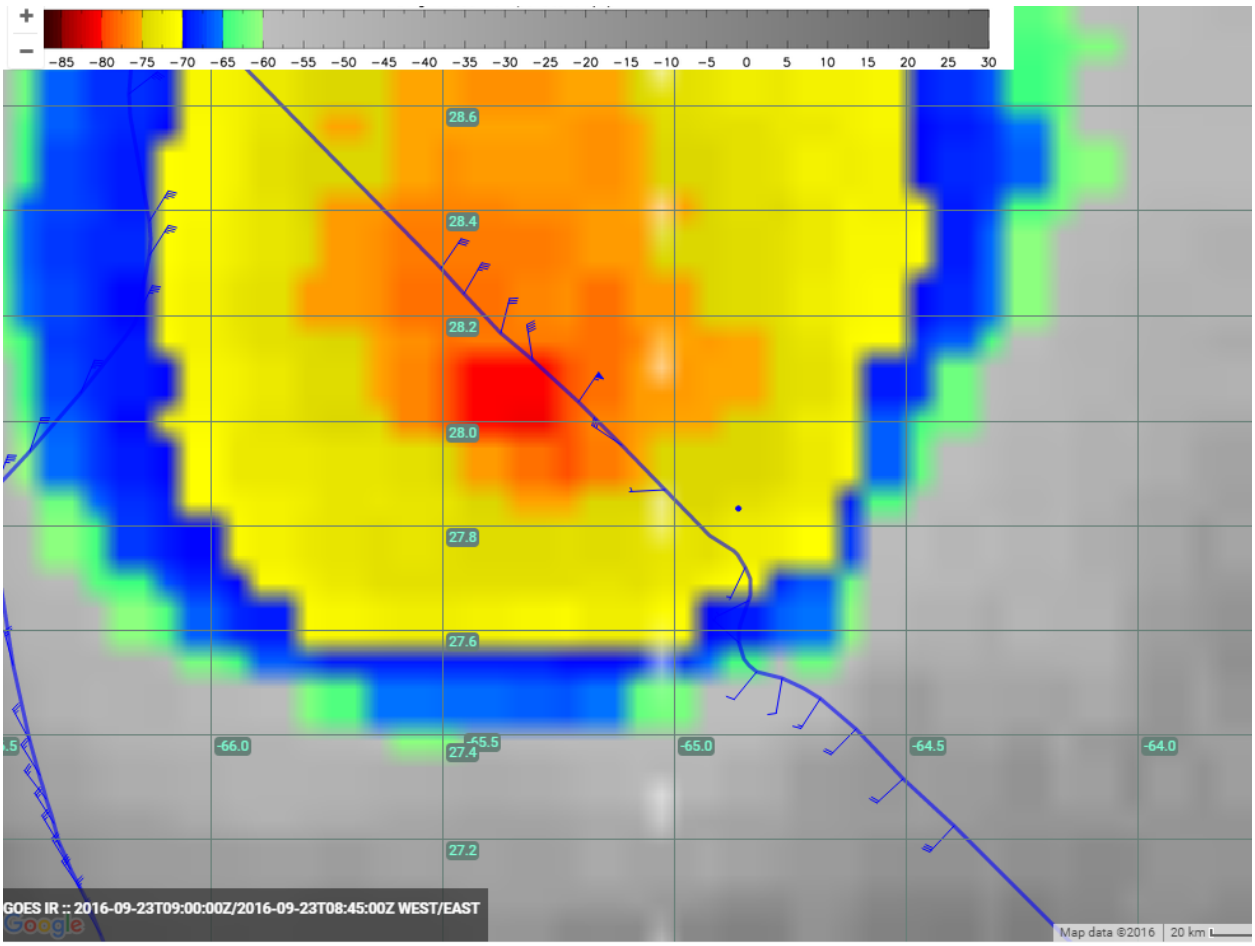




P3 passing thru mesovortex at edge of intense overshooting convection



Overshooting tops in IR at time of P-3 mesovortex. Zoom below:


−85 −80 −75 −70 −65 −60 −55 −50 −45 −40 −35 −30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30
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28.4
28.2
28.0
27.8
27.6
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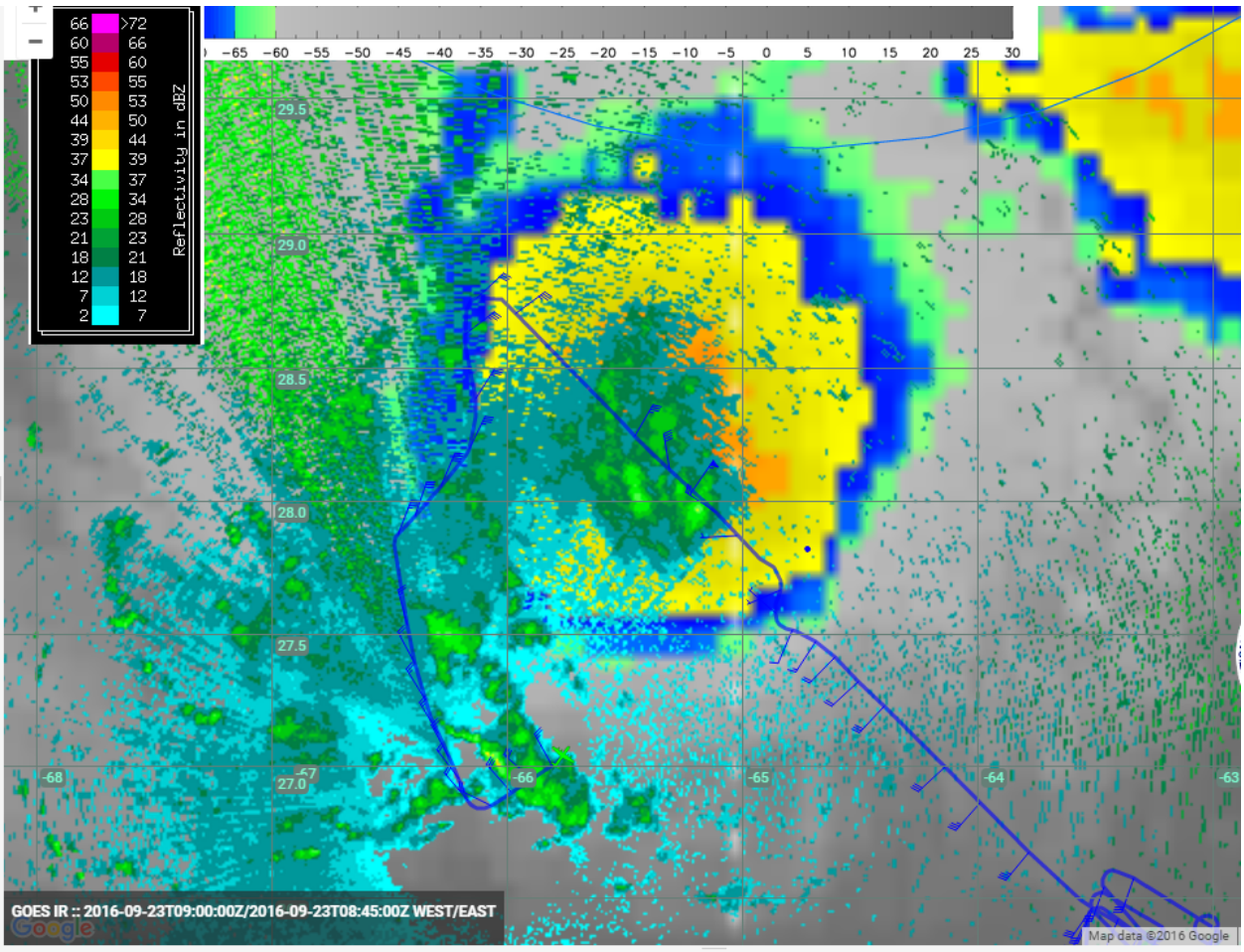
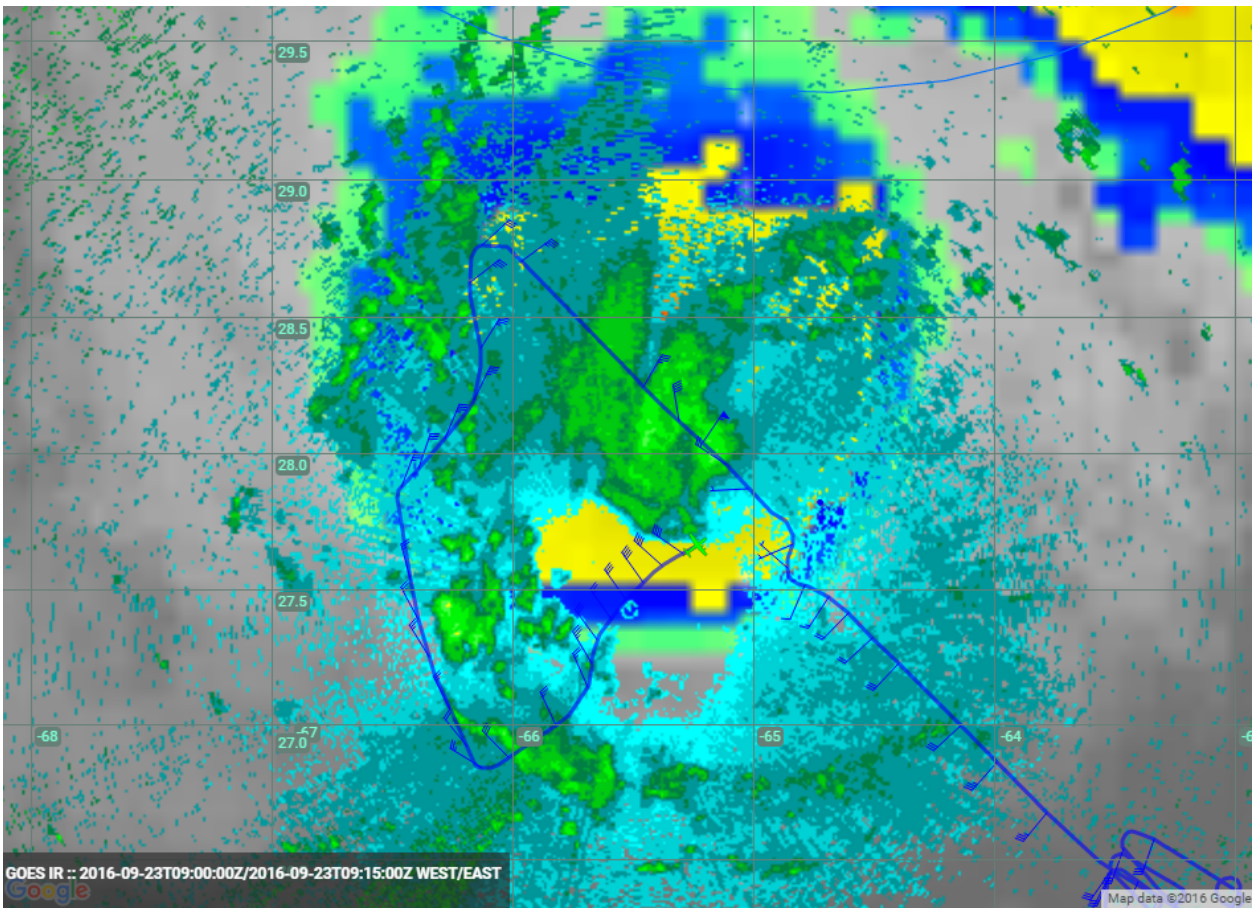
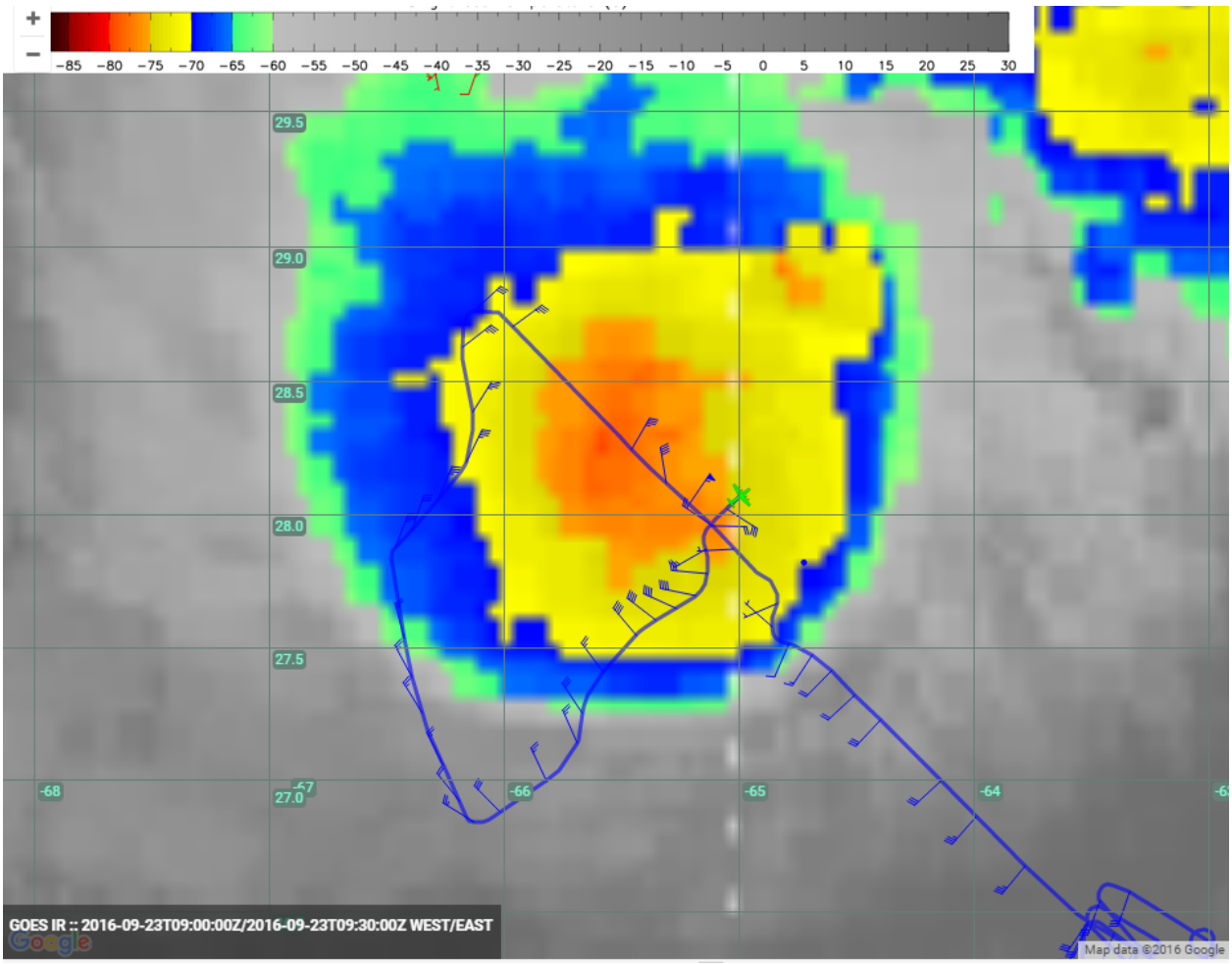
-65.0
-64.5
-64.0
GOES IR :: 2016-09-23T09:00:00Z/2016-09-23T08:45:00Z WEST/EAST
Google
Map data ©2016
20 km


66 >72
60 66
55 60
53 55
50 53
44 50
39 44
37 39
34 37
28 34
23 28
21 23
18 21
12 18
7 12
2 7
Reflectivity in dBZ
−65 −60 −55 −50 −45 −40 −35 −30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30
29.5
29.0
28.5
28.0
27.5
27.0
-68
-67
-66
-65
-64
-63
GOES IR :: 2016-09-23T09:00:00Z/2016-09-23T08:45:00Z WEST/EAST
Map data ©2016 Google

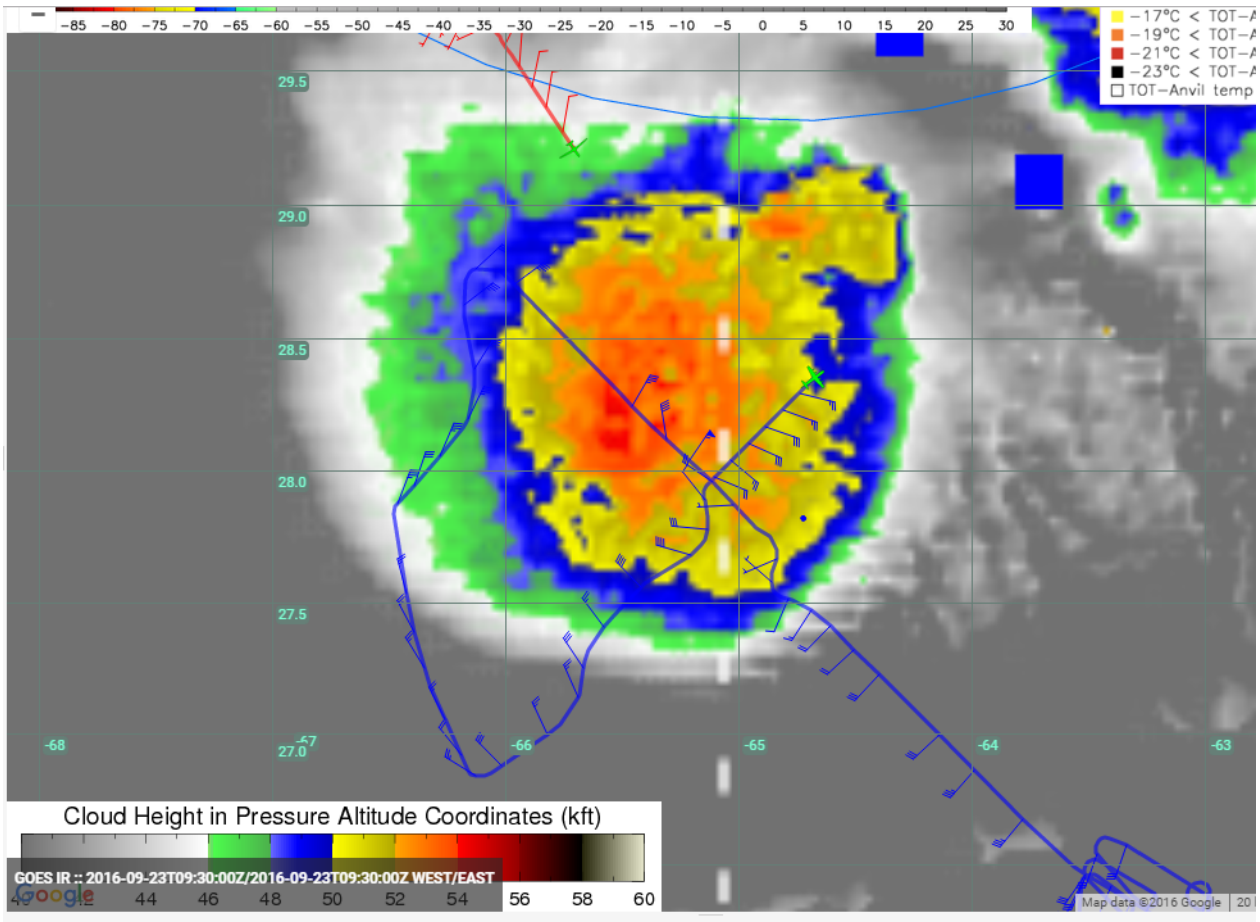
0930Z:



IR overshooting tops with P3 radar 0930Z 2nd pass



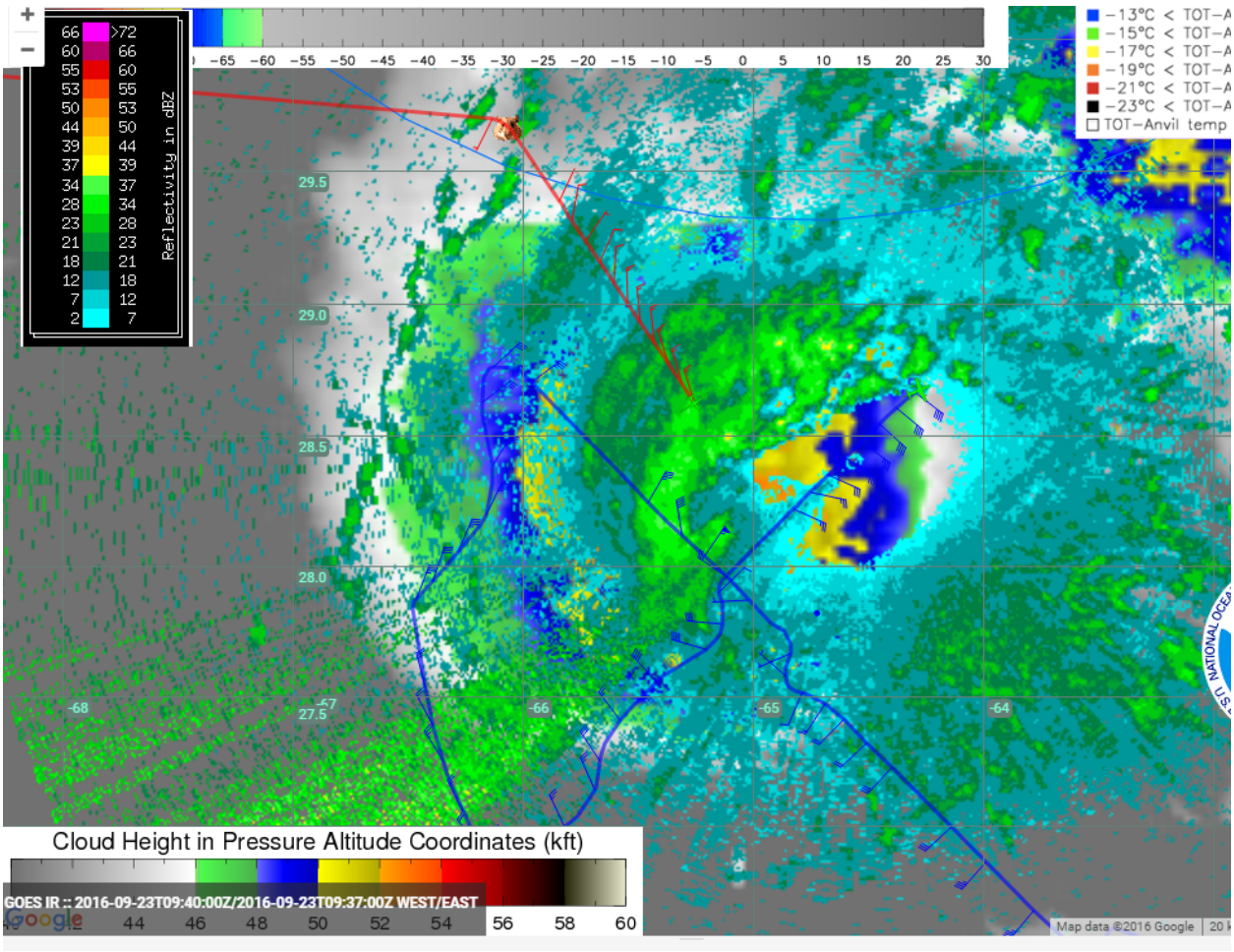
0938Z: Drop 29 at location 32, Good drop



Cloud tops

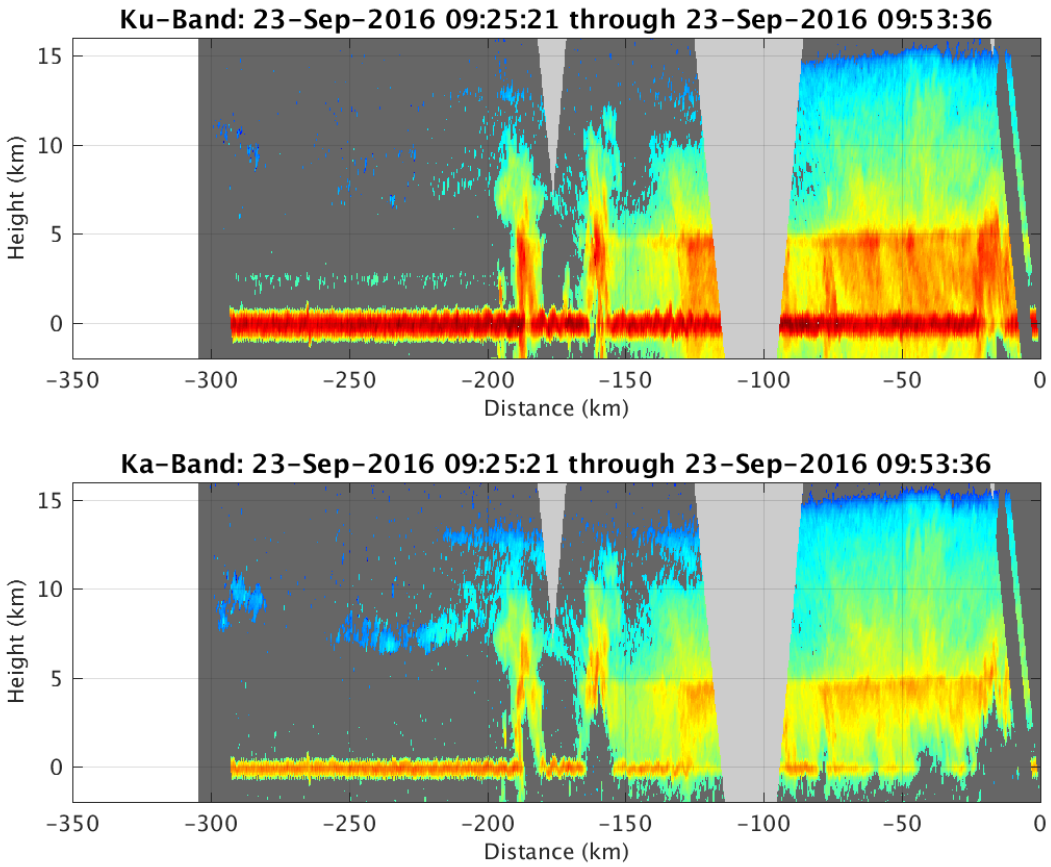
0946Z: Drop 30 at location 33; Good drop

Radar eye forming 0952:

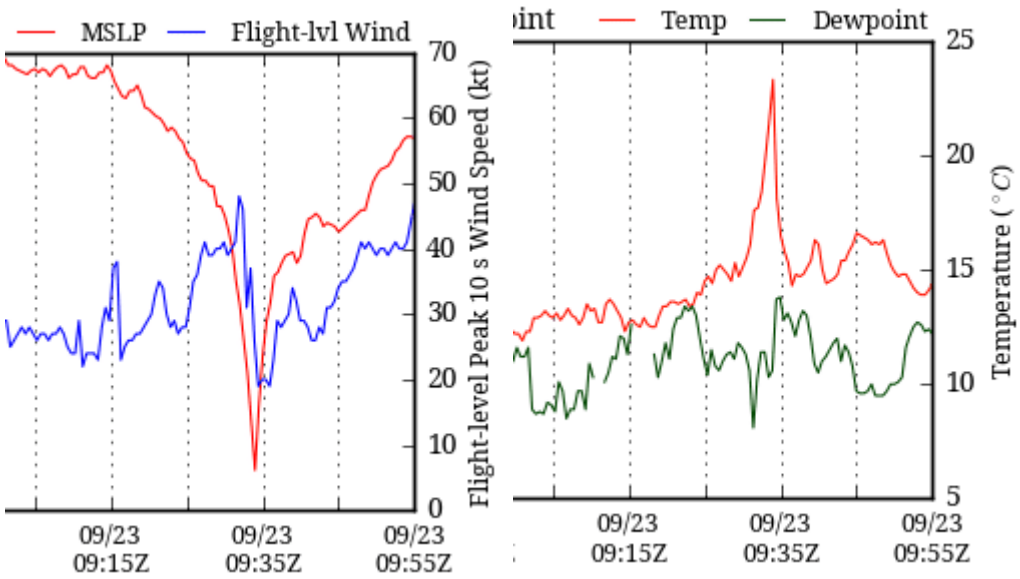


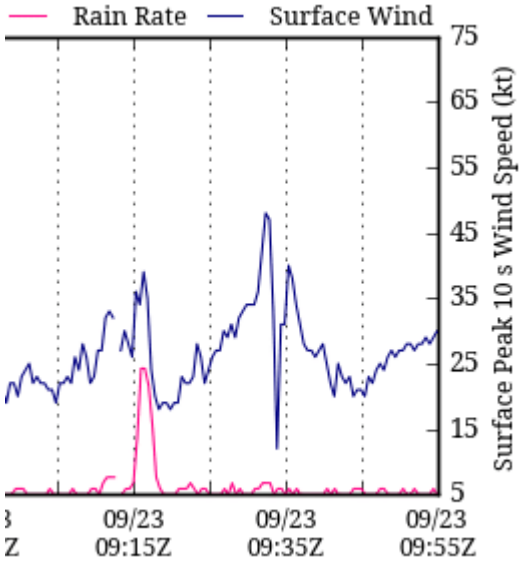
0955Z: Drop31 at location 34; Good drop

0958 - HIWRAP cross section as crossing convection

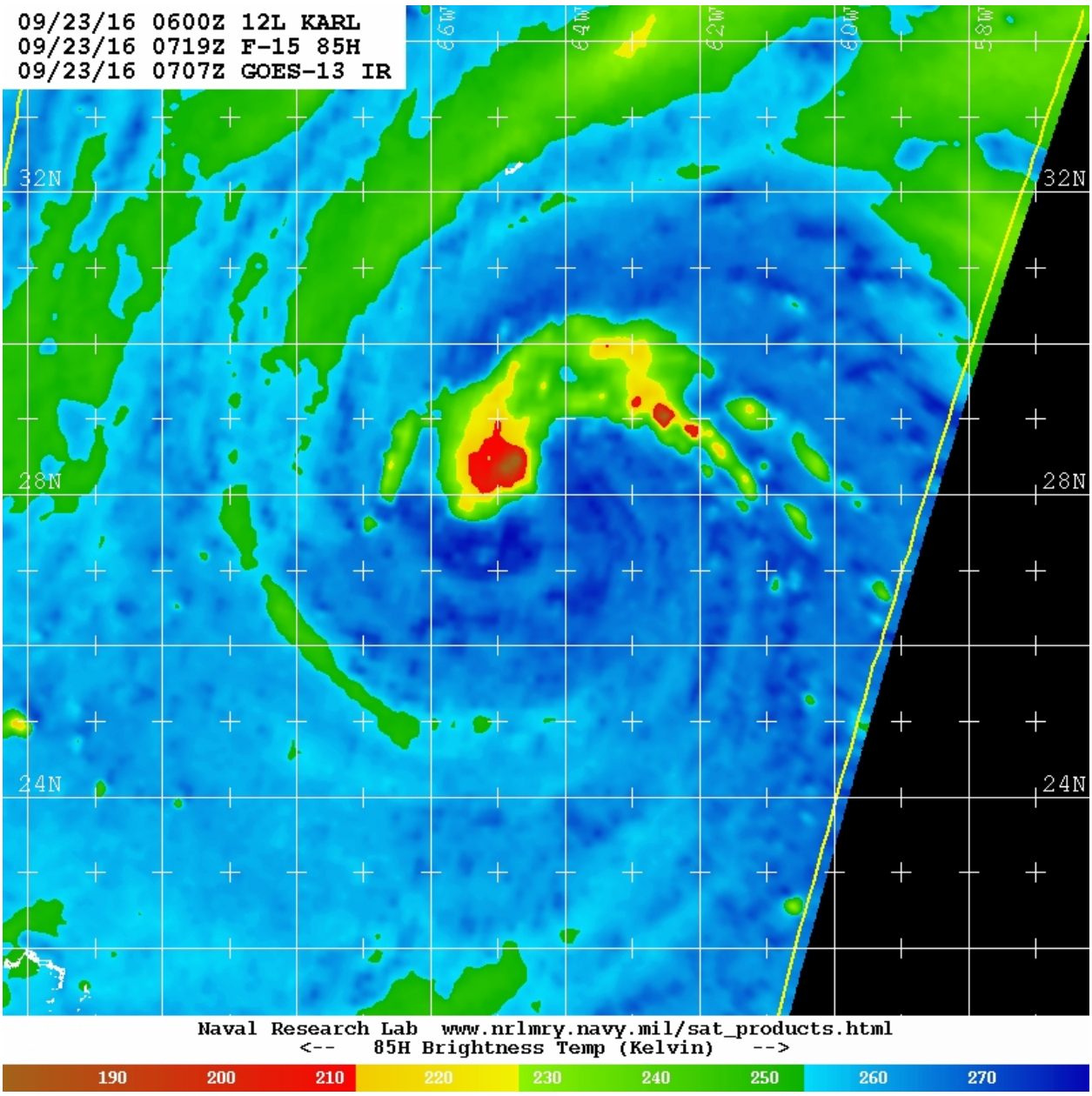


987mb pressure spike together with +9 C temp spike near meso location, SFMR wind minimum near 10 kt at same location braceted by 47- and 38- kt SFMR wind peaks- all the makings of mesovortex structure





1003Z: Drop 32 at location 35; Good data


09/23/16 0600Z 12L KARL
09/23/16 0719Z F-15 85H
09/23/16 0707Z GOES-13 IR
32N
28N
24N
Naval Research Lab www.nrlmry.navy.mil/sat_products.html
<-- 85H Brightness Temp (Kelvin) -->
190
200
210
220
230
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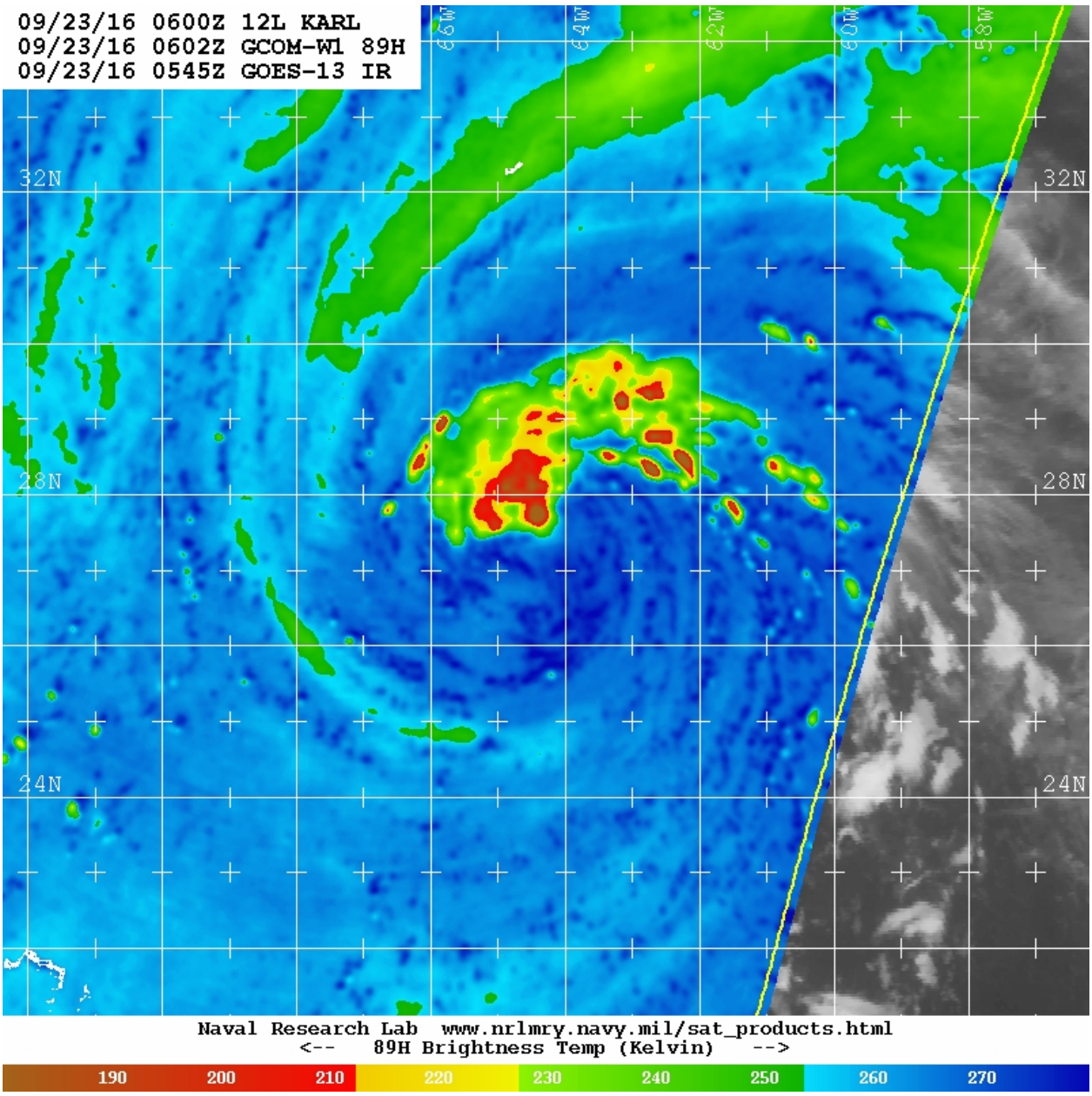
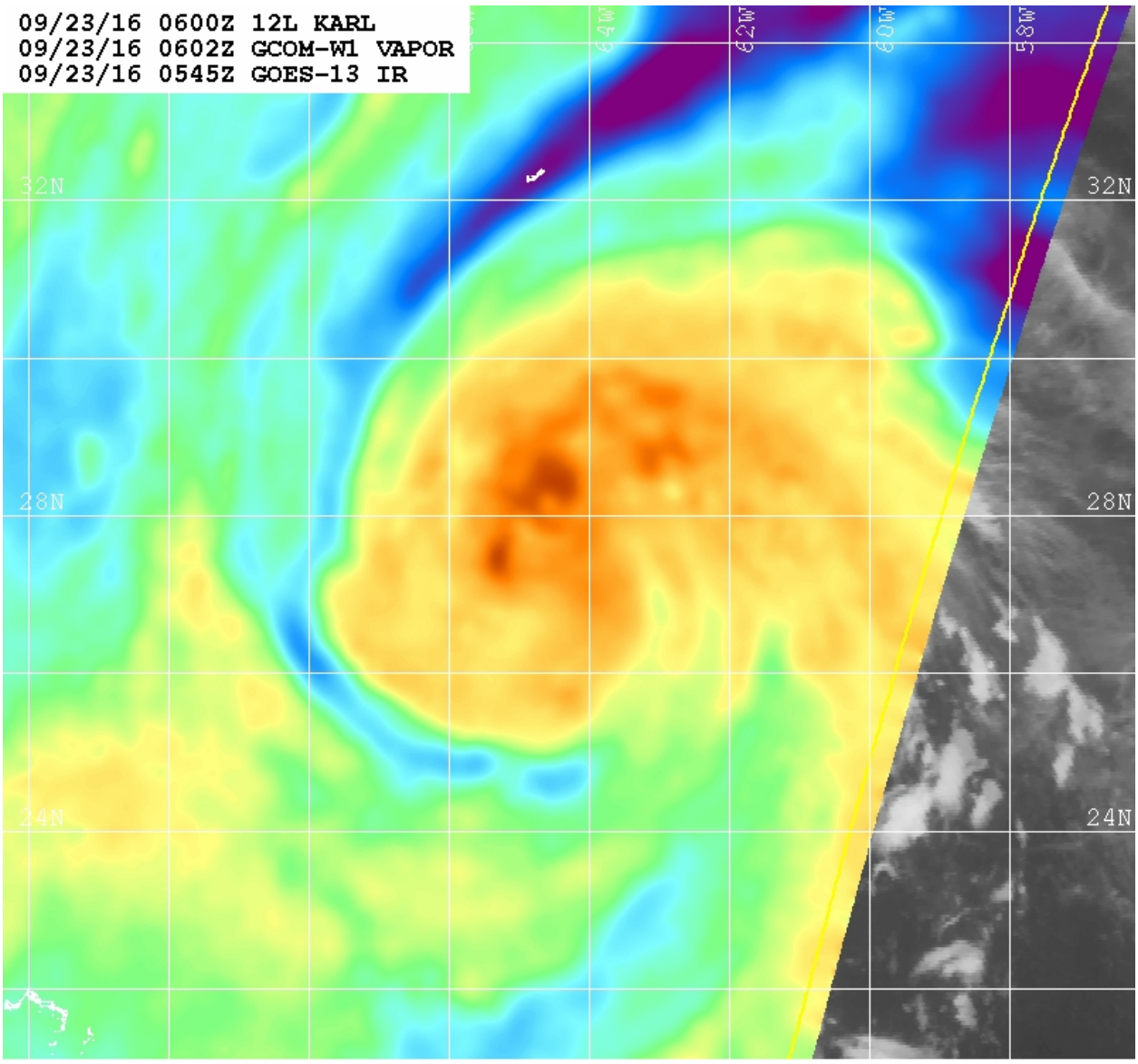
250
260
270



1012Z: Drop 33 at location 36; Good data


09/23/16 0600Z 12L KARL
09/23/16 0602Z GCOM-W1 VAPOR
09/23/16 0545Z GOES-13 IR
32N
28N
24N
Naval Research Lab www.nrlmry.navy.mil/sat_products.html
<-- Precipitable Water (mm) -->
35
40
45
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55
60
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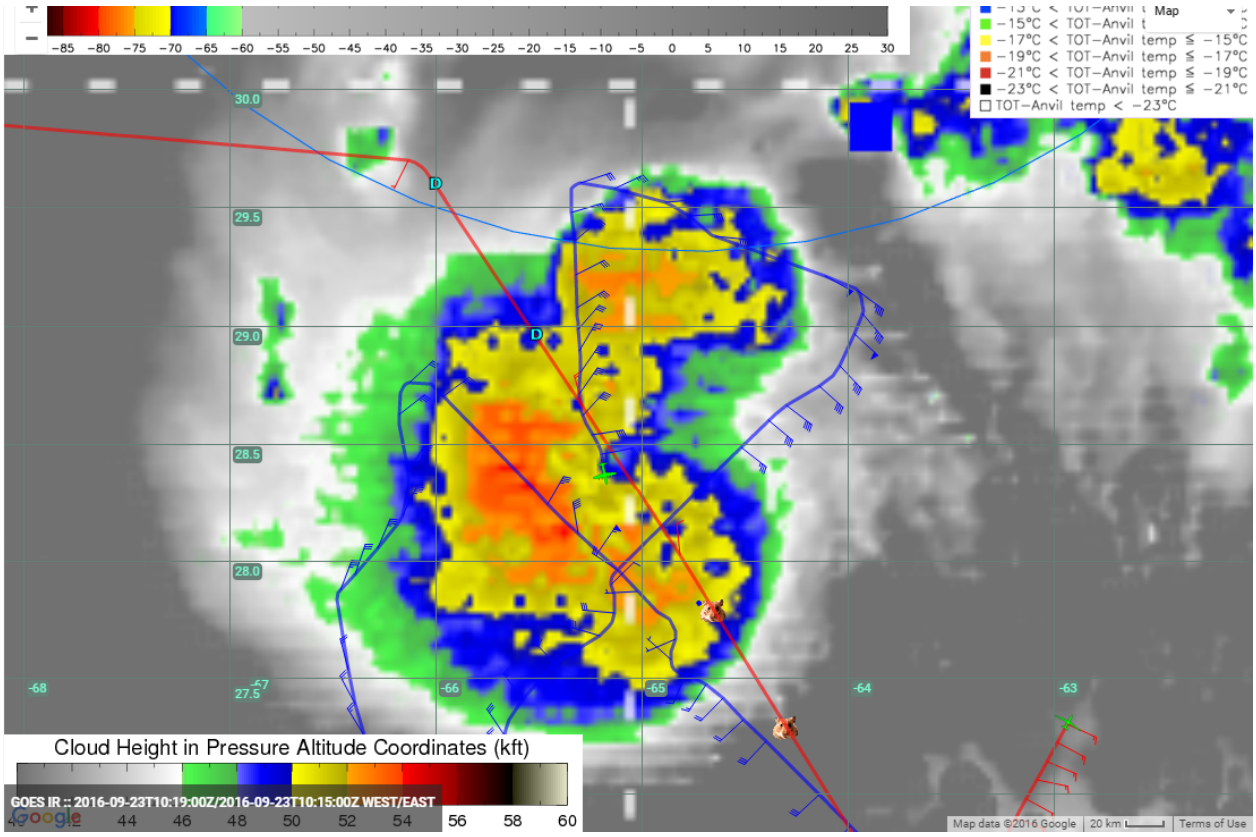
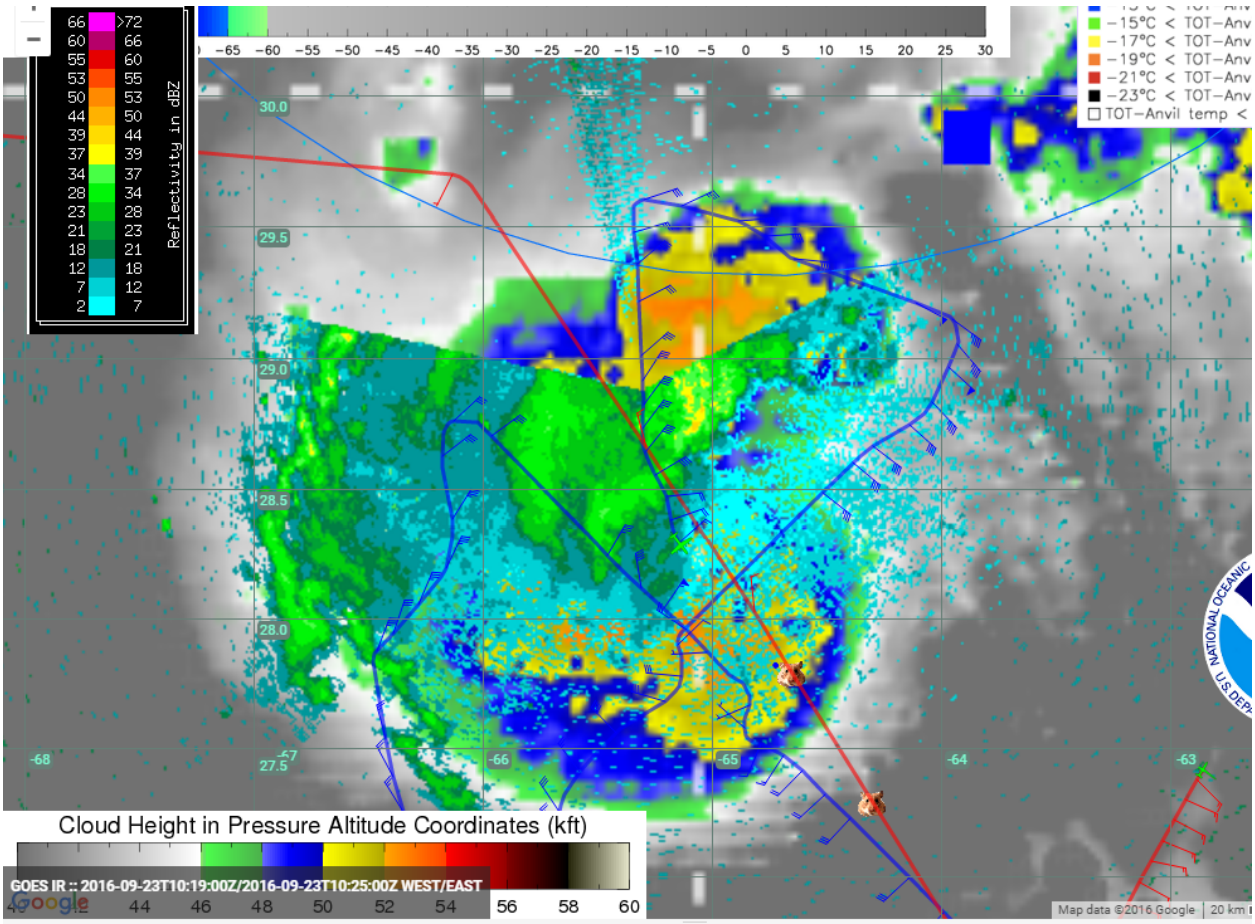
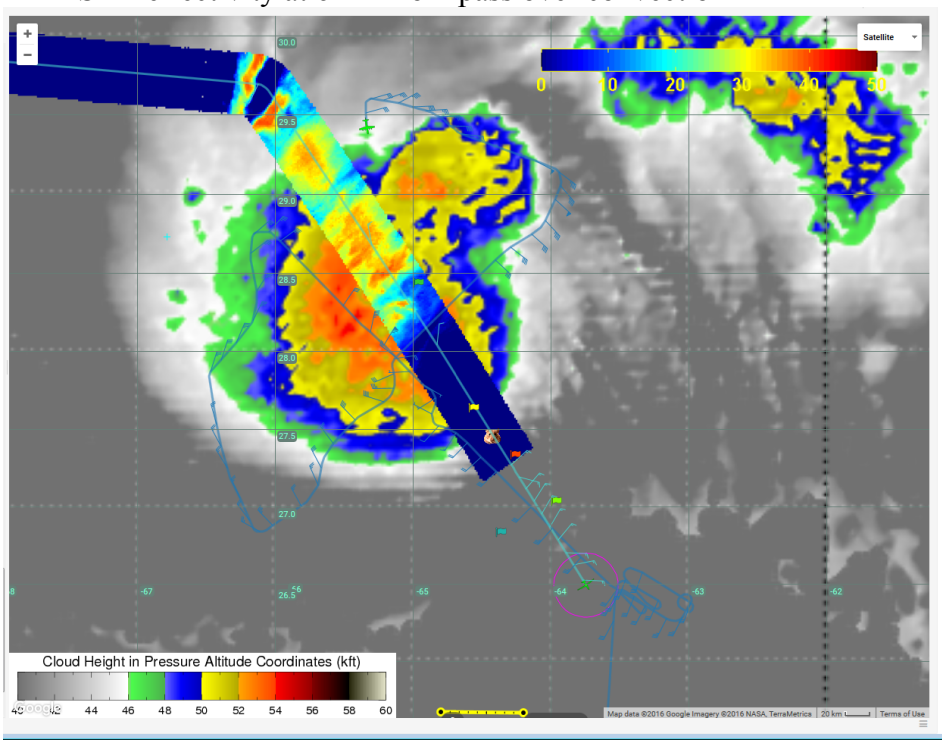

Map
−15°C < TOT−Anvil
−17°C < TOT−Anvil temp ≤ −15°C
−19°C < TOT−Anvil temp ≤ −17°C
−21°C < TOT−Anvil temp ≤ −19°C
−23°C < TOT−Anvil temp ≤ −21°C
TOT−Anvil temp < −23°C
−85 −80 −75 −70 −65 −60 −55 −50 −45 −40 −35 −30 −25 −20 −15 −10 −5 0 5 10 15 20 25 30
30.0
29.5
29.0
28.5
28.0
27.5
-68
-67
-66
-65
-64
-63
Cloud Height in Pressure Altitude Coordinates (kft)
GOES IR :: 2016-09-23T10:19:00Z/2016-09-23T10:15:00Z WEST/EAST
40 42 44 46 48 50 52 54 56 58 60
Google
Map data ©2016 Google
20 km
Terms of Use



HAMSR Reflectivity at 6 km from pass over convection



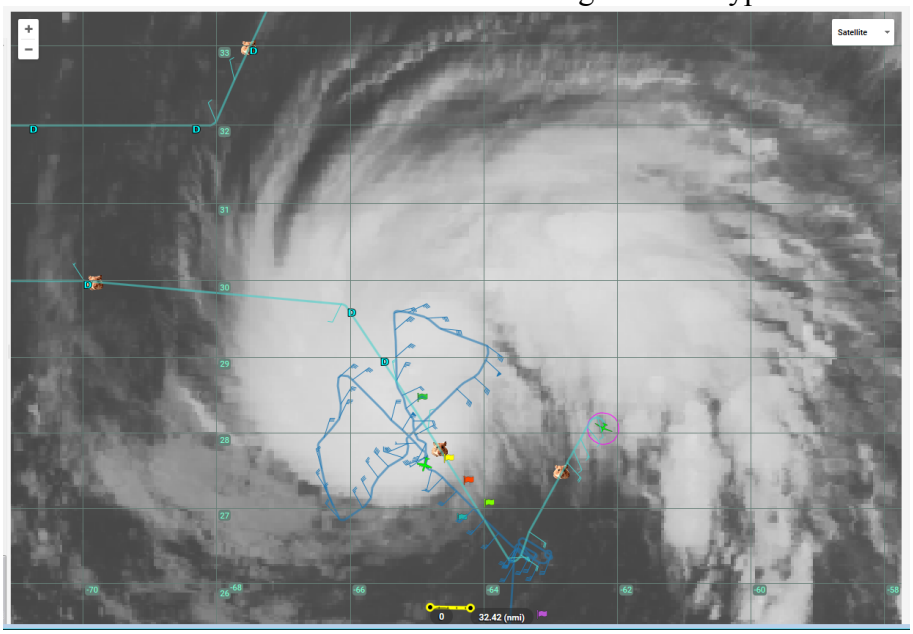
1022Z: Drop 34 at location 37; Good data

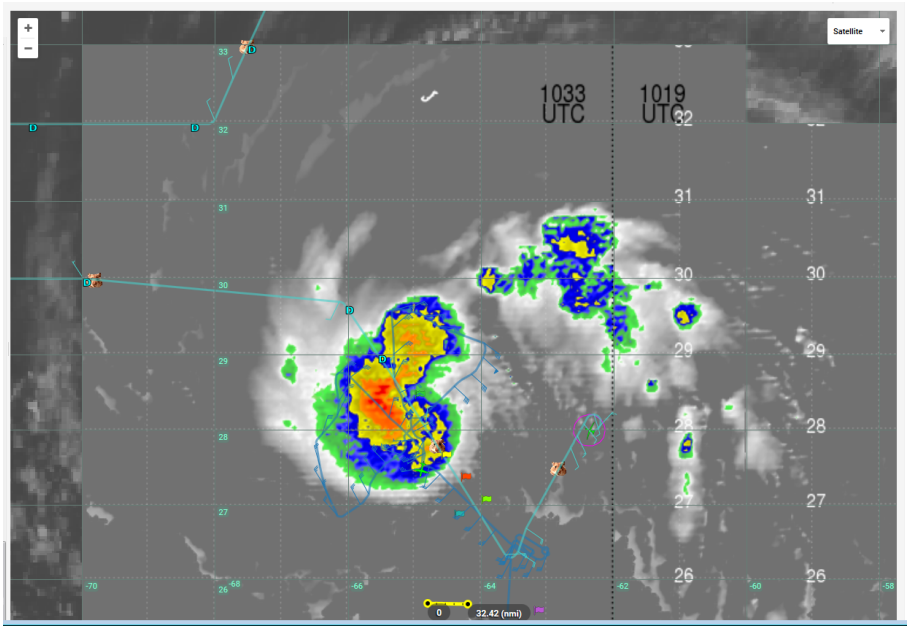
1028Z: Drop 35 at location 38; Good data

planning a ~15 min loop once we reach this E waypt (drop 40) to let noaa 43 catch up to us a bit for coordination

1036Z: Drop 36 at location 39; Good data

1048Z: Broad scale satellite IR while holding at east waypoint

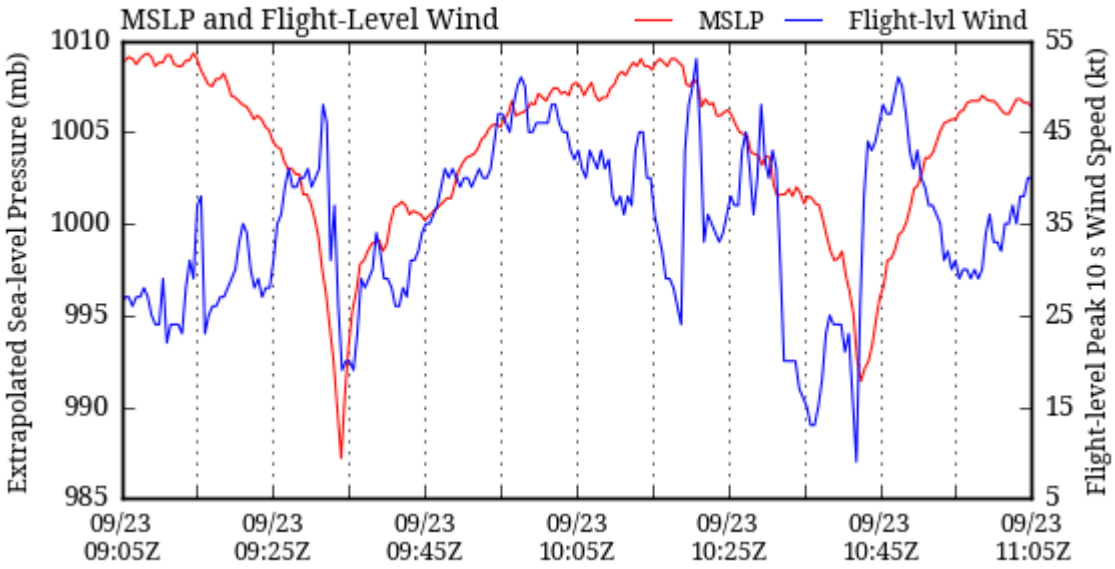


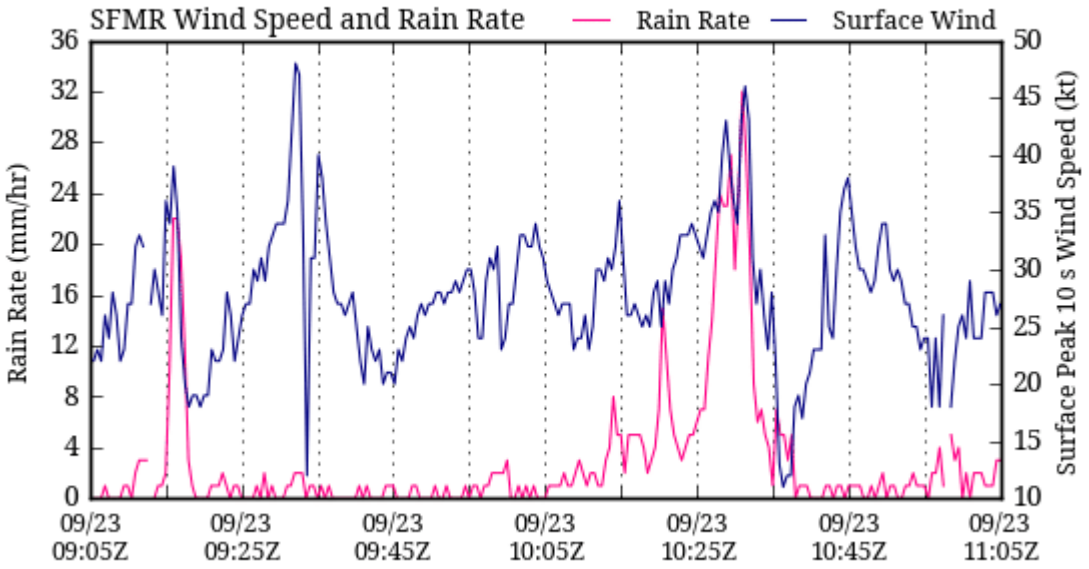


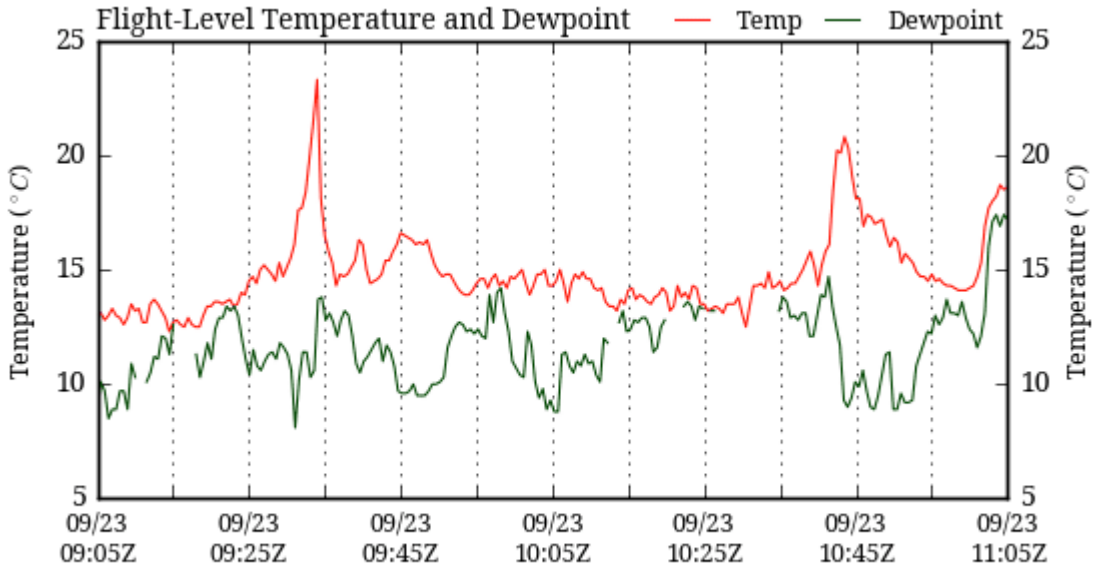
Recon Aircraft Observations

Mission ID: NOAA3 WG12A KARL

Levi Cowan - tropicaltidbits.com

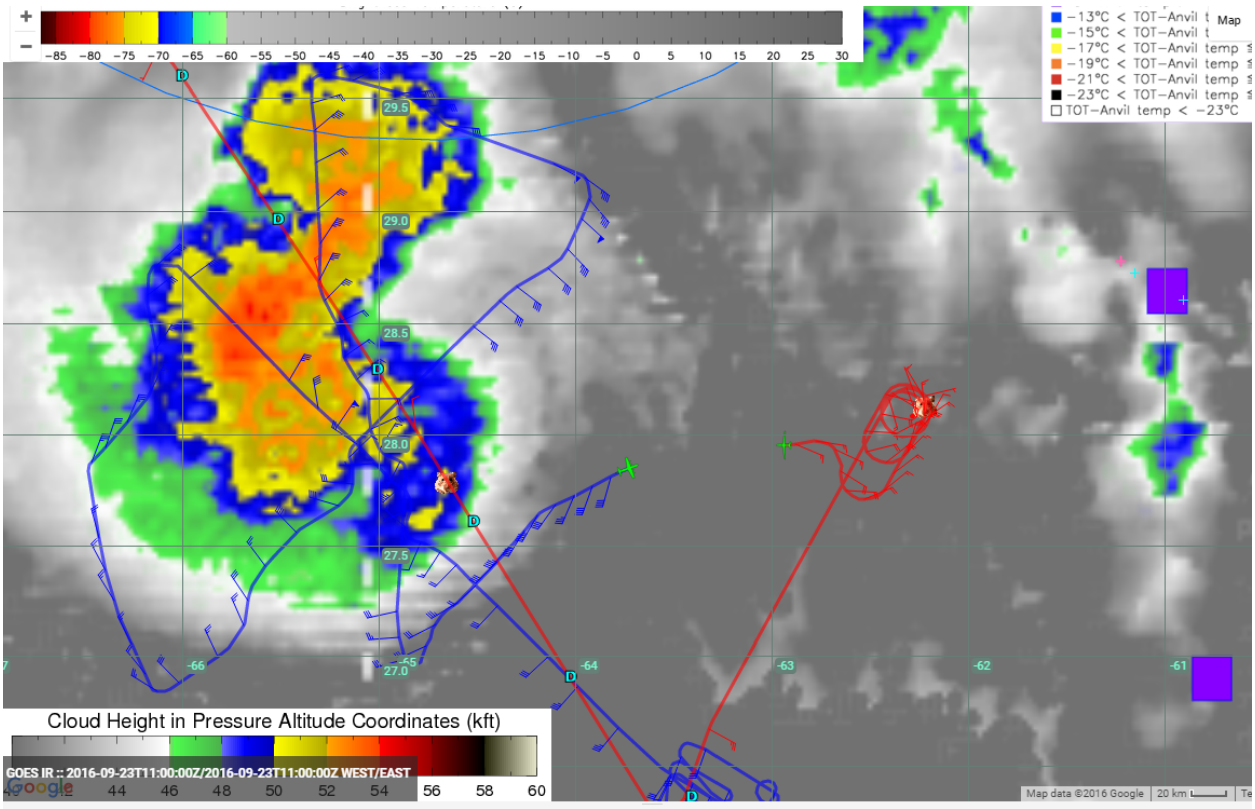


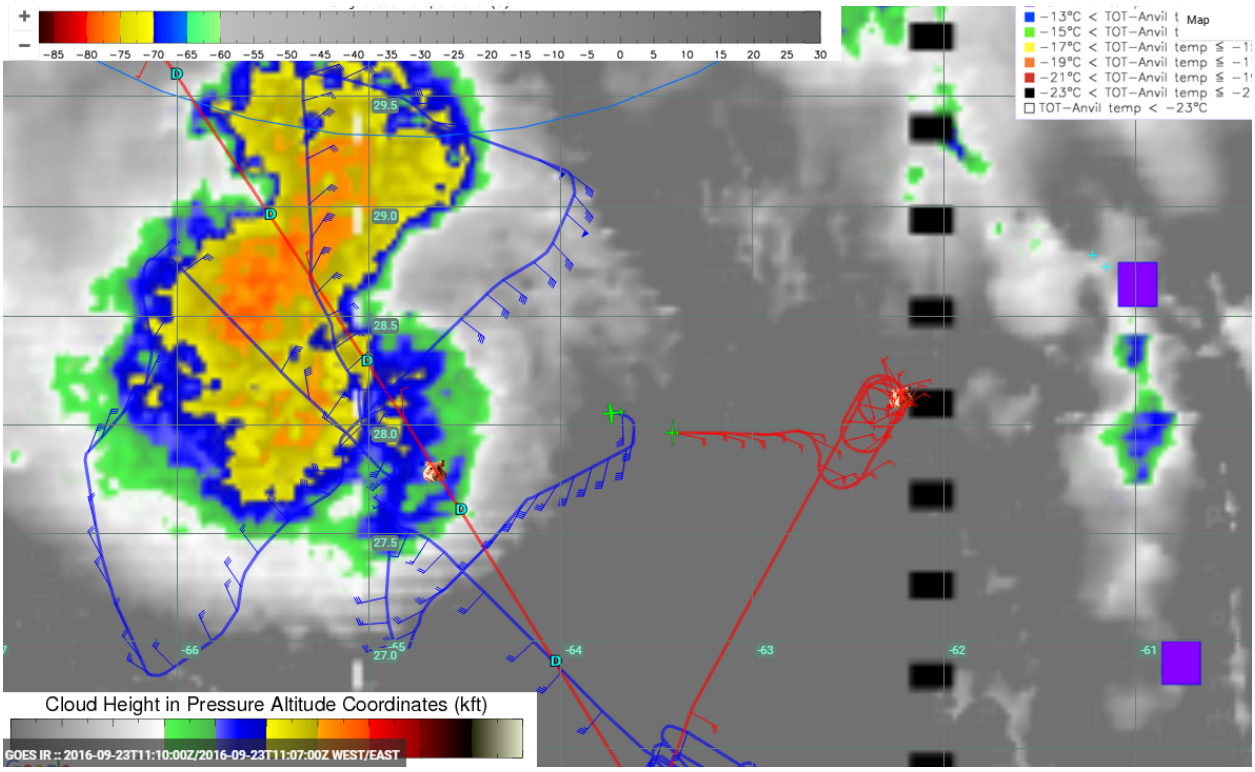




1111 UTC: Had added an extra ~10 minutes in hold to align with N43 during E-W line and shifted line slightly south. Starting to head into line now

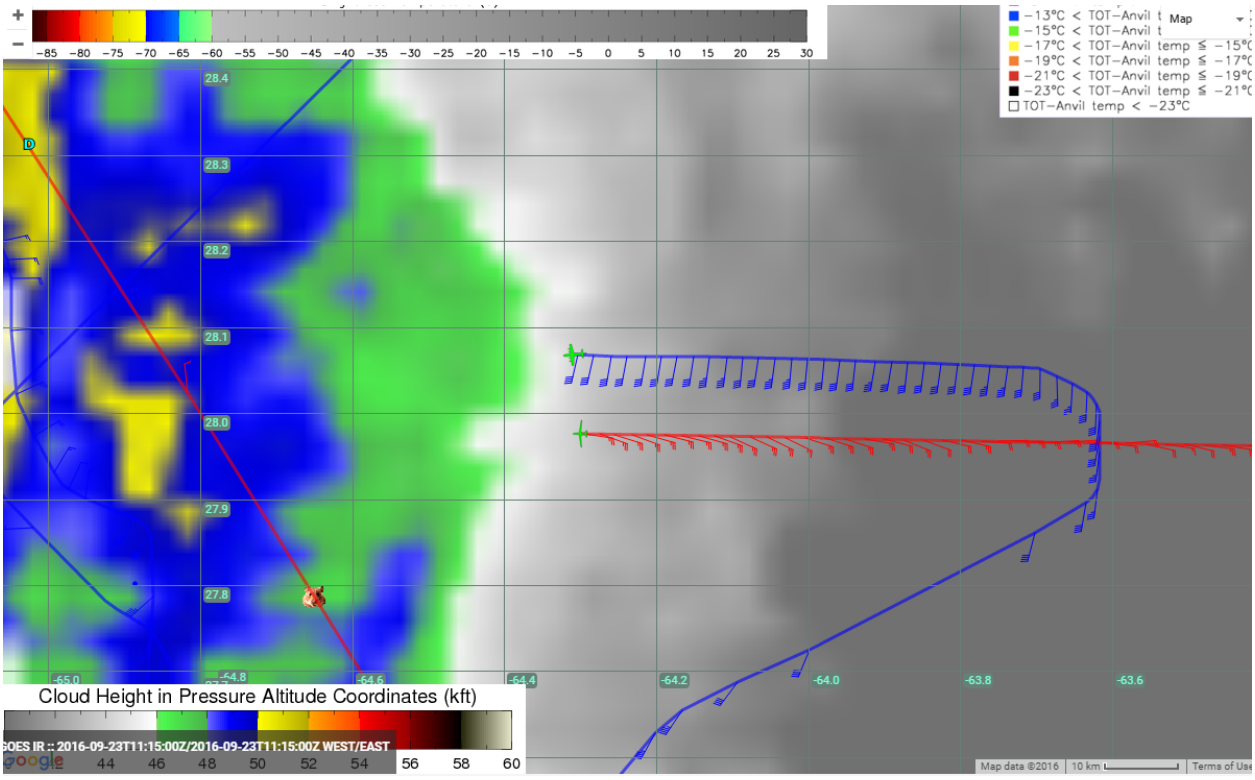
1114Z: Drop 37 at location 40; Good drop





1118Z: Drop 38 at location 41; Good drop

1125Z: Drop 39 at location 42; Good release



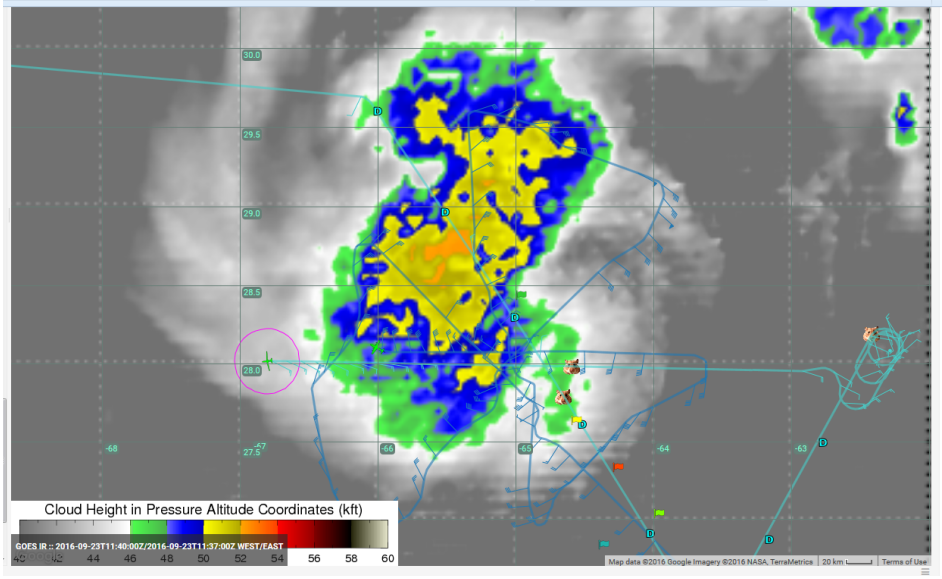
1131Z: Drop 40 at location 43; Good release

1138Z: Drop 41 at location 44; good drop

From CVelden: CDO diurnal convection waning fast

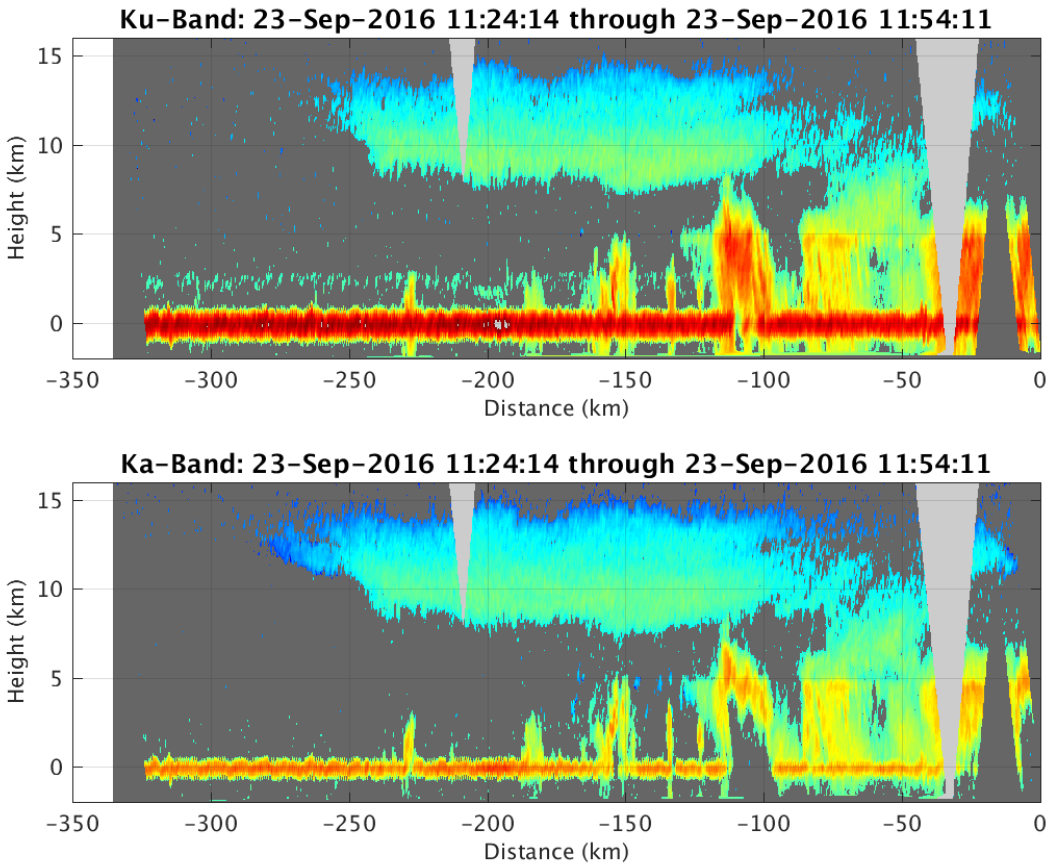
1145Z: Drop 42 at location 45; Good drop

1150 Z: Cloud top height with tracks from coordinated crossing



1153Z: Drop 43 at location 46; Good drop

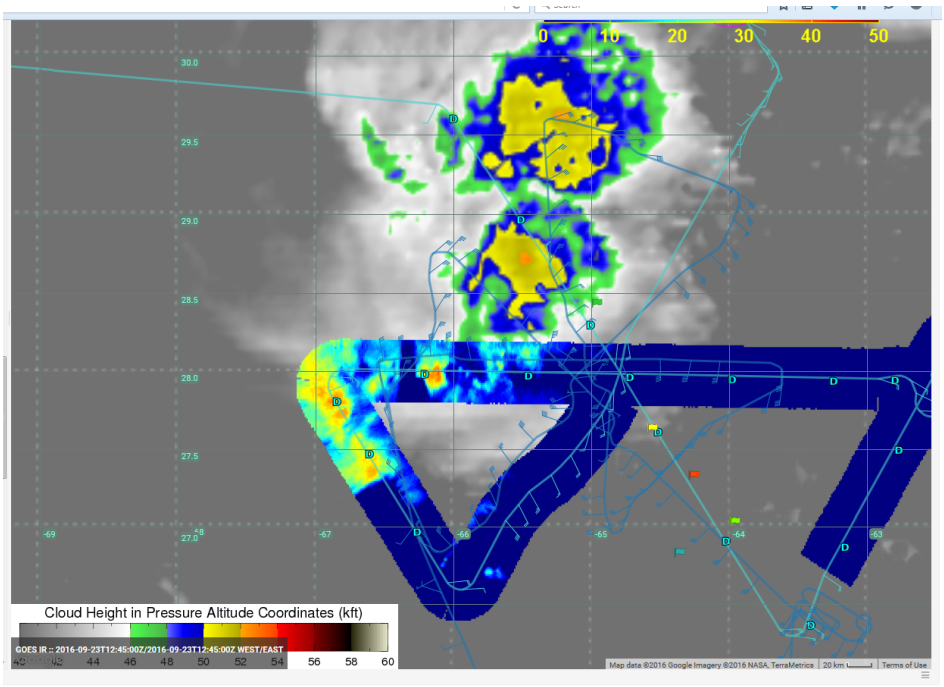
HIWRAP Cross section from center crossing:



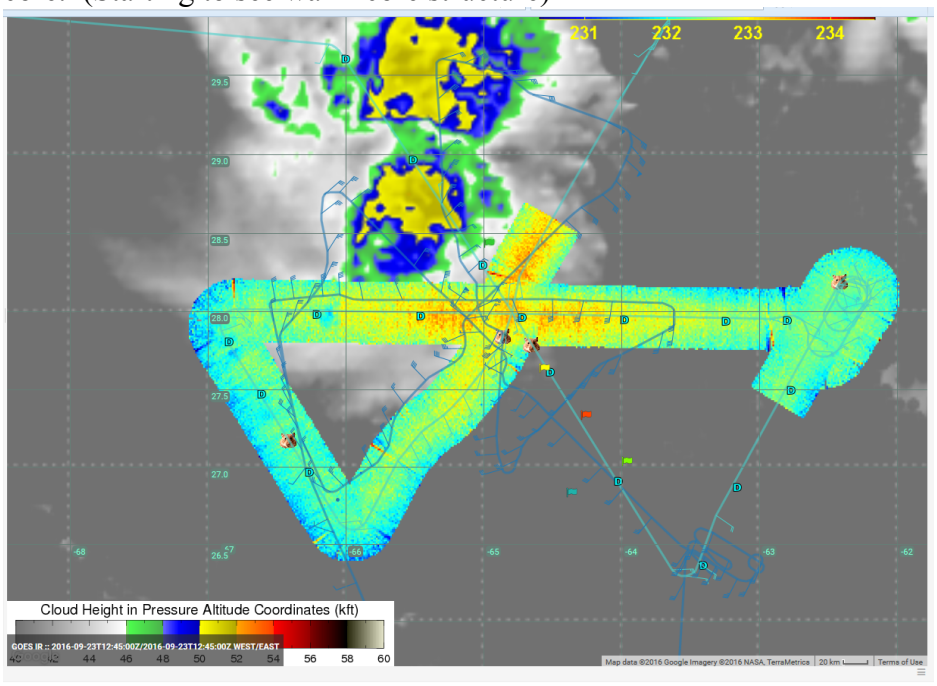
1157Z: Drop 44 at location 47; Good drop

1204Z: Drop 45 at location 48; good drop

HAMSR Reflectivity from previous center crossing



Corresponding relative 54.94 GH TB [250 mb]. Boon reports about 1 K deepening of warm core. (Starting to see warm core structure)



1211Z: drop 46 at location 49; good drop

1214Z: drop 47 at location 50; Good drop

1223Z: drop 48 at location 51: Good drop

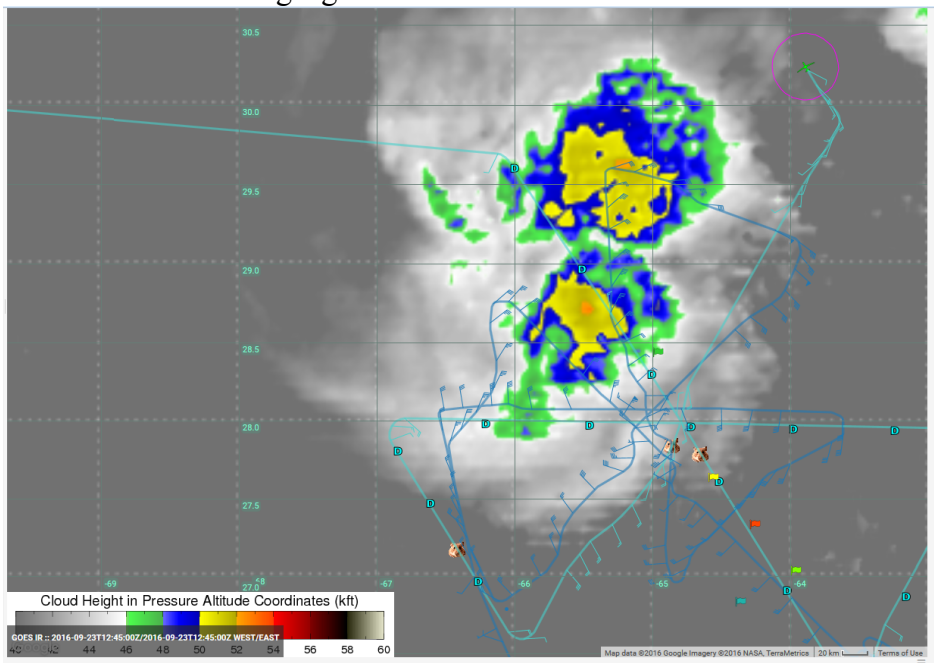
1230Z: Drop 49 at location 52: Good drop

1237Z: Drop 50 at location 53; Good drop

1244Z: Drop 51 at location 54; Good drop

1252Z: Drop 52 at location 55; Good release

1255Z: CTH showing significant decrease in convection from earlier



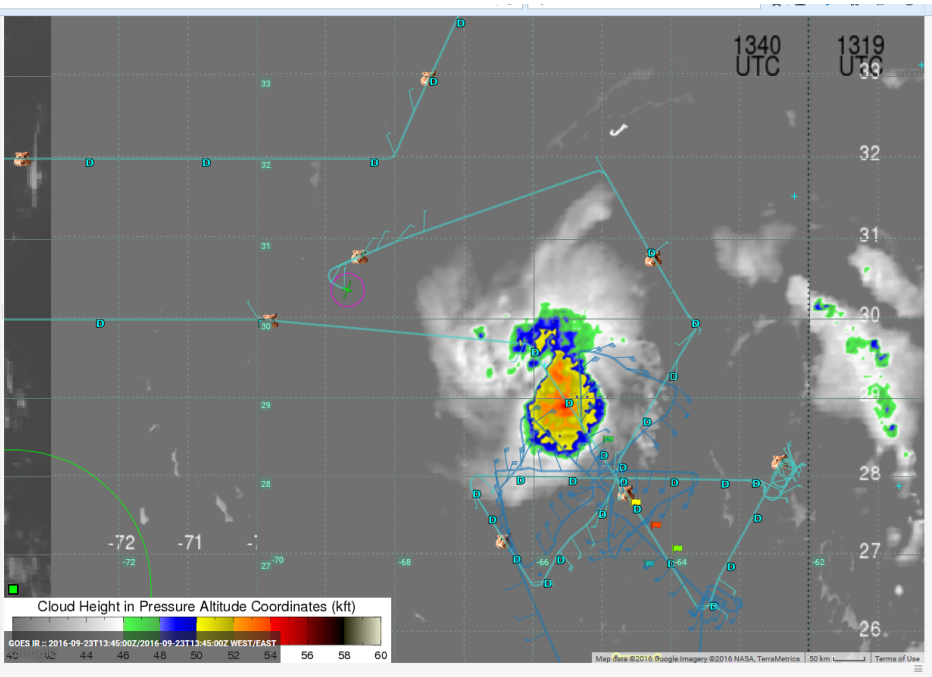
1303Z: Drop 53 at location 56; Good drop

1316Z: Drop 54 at location 57; Good drop

1328Z: Drop 55 at location 58; Good drop

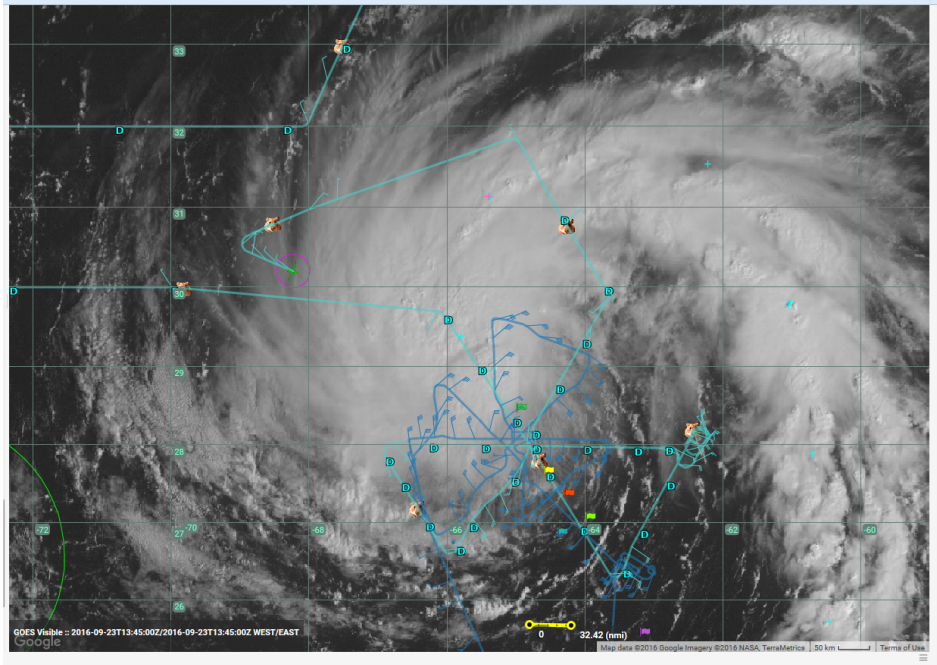
1341Z: Drop 56 at location 59; Good drop

Approaching large butterfly line: Some new cloud tops higher than before, but convective extent smaller. Perhaps seeing start of new active period



1355Z: Drop 57 at location 60; good drop

1402Z: Large scale visible satellite image

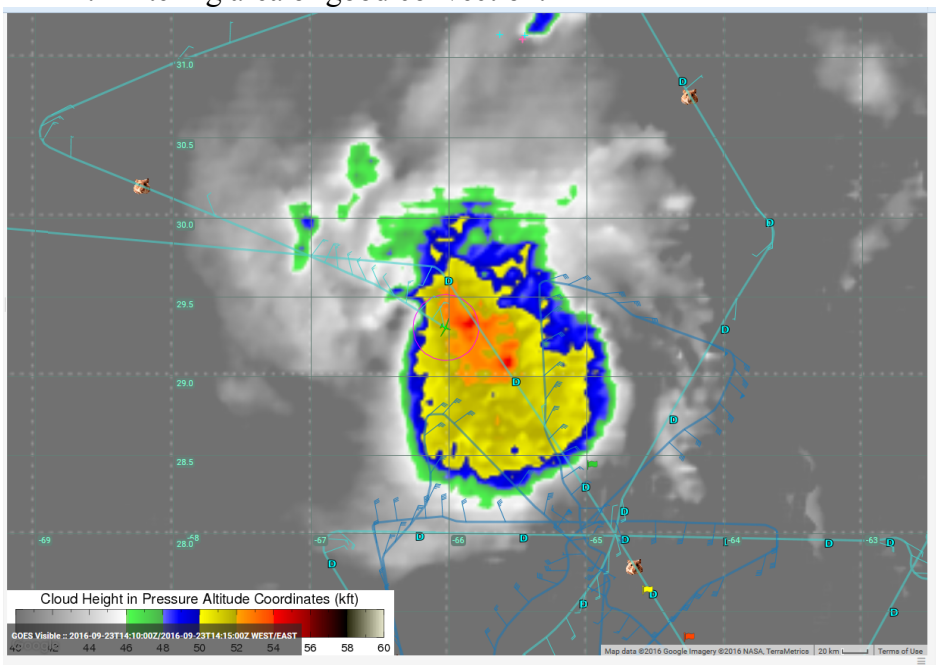


1403Z: Drop 58 at location 61; good drop

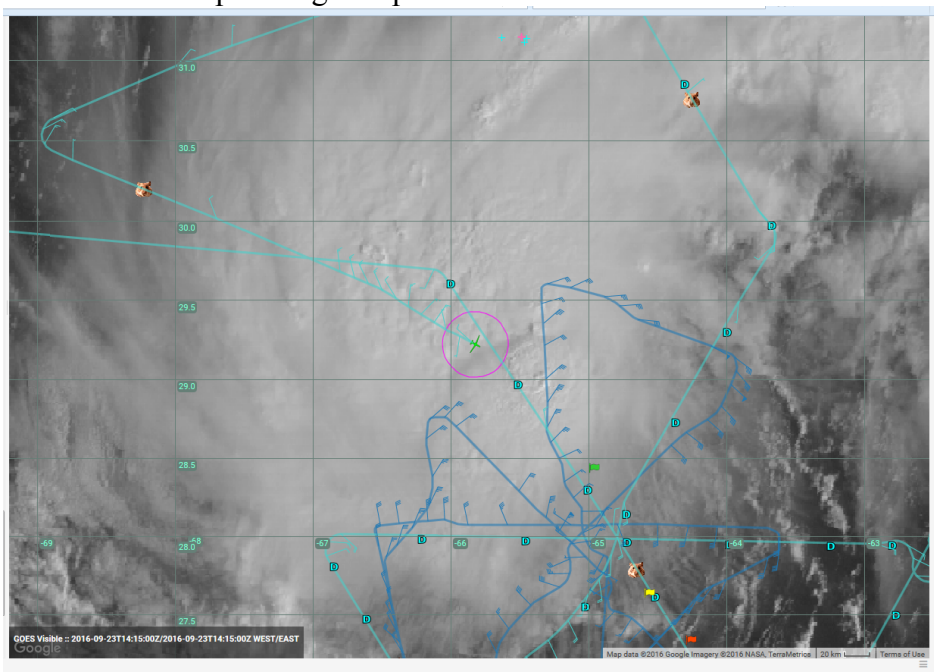
1413Z: Drop 59 at location 62; Good drop

1423Z: Drop 60 at location 63; good drop

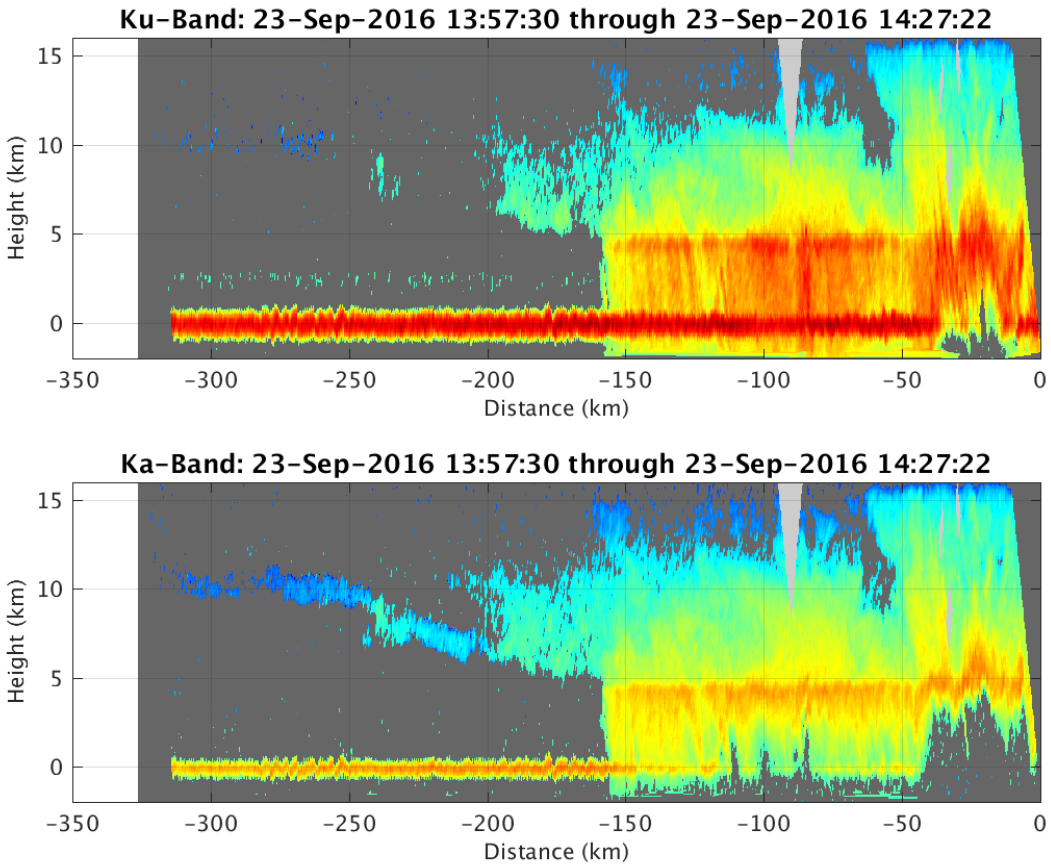
1424Z: Entering area of good convection:



Visible look at upcoming overpass

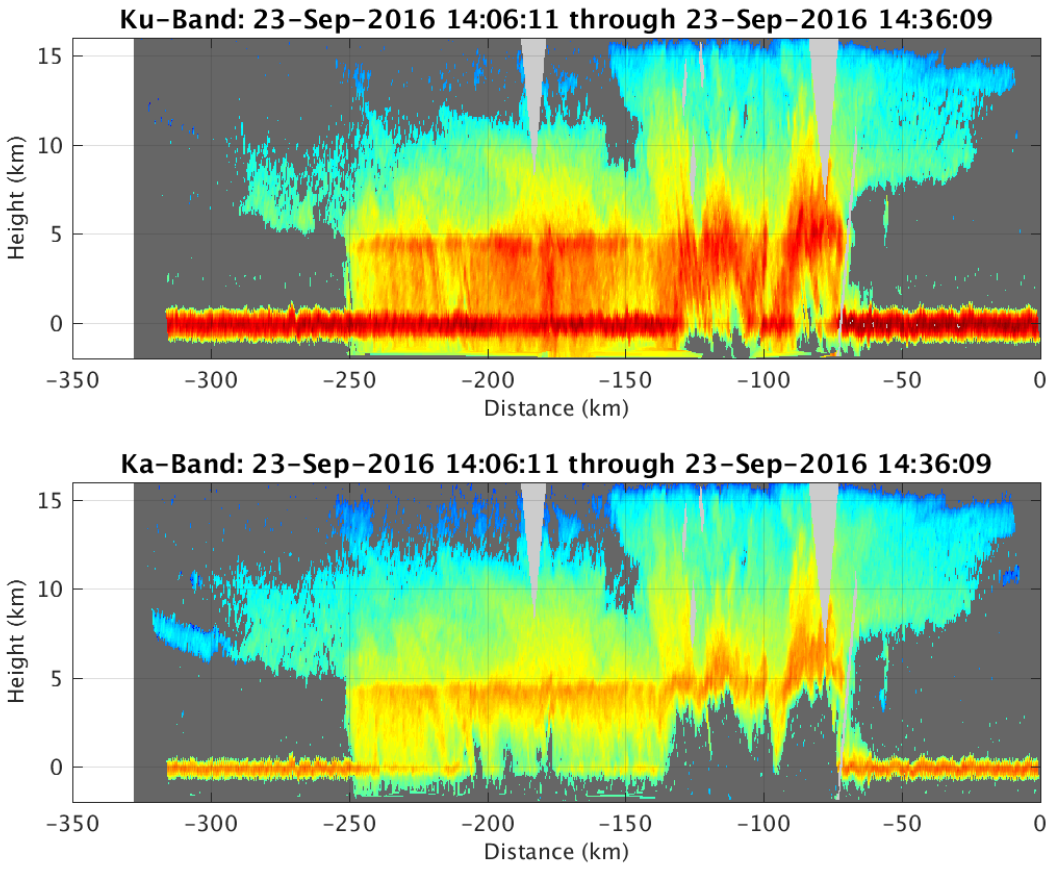


1428Z HIWRAP image of early part of pass:

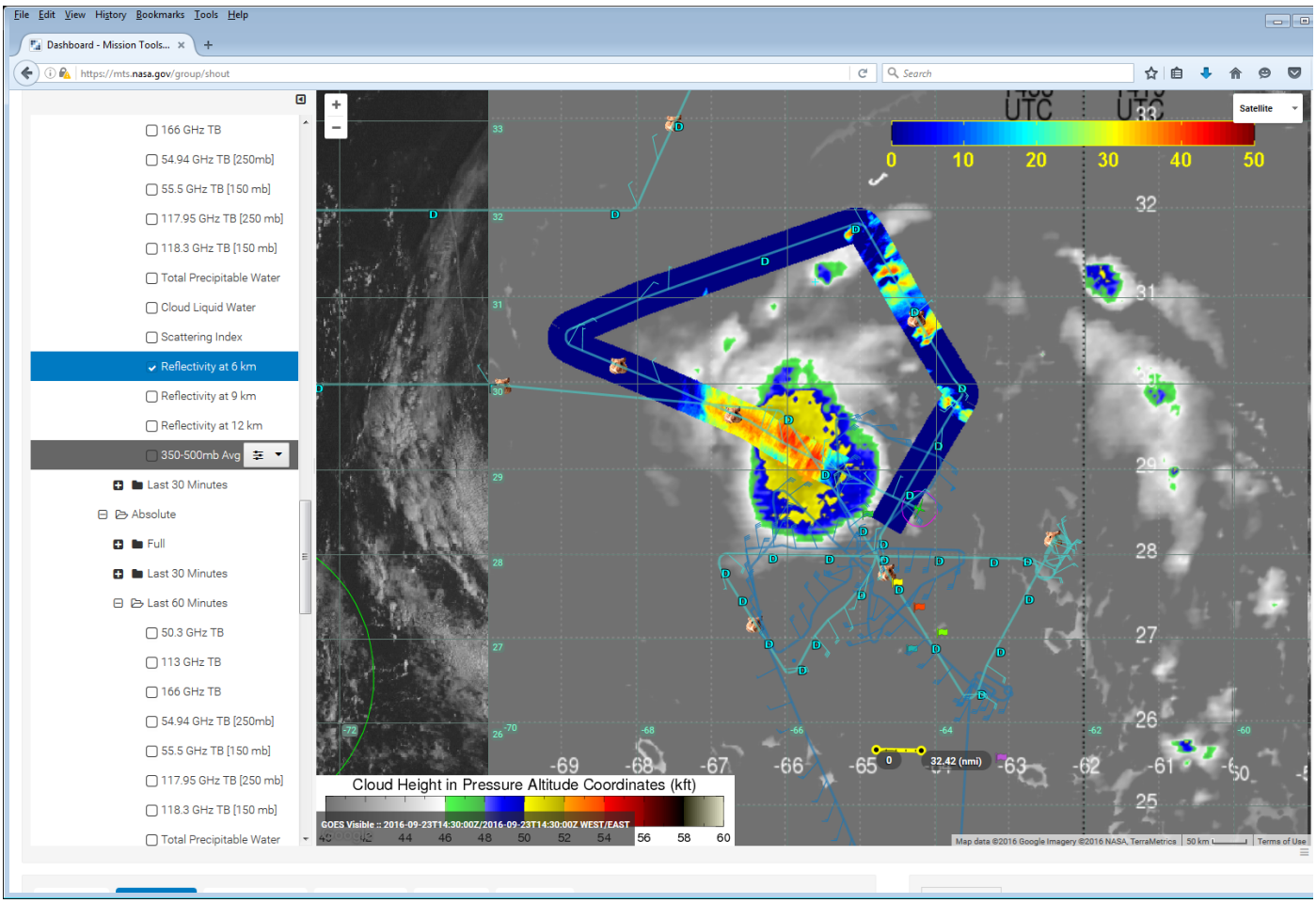


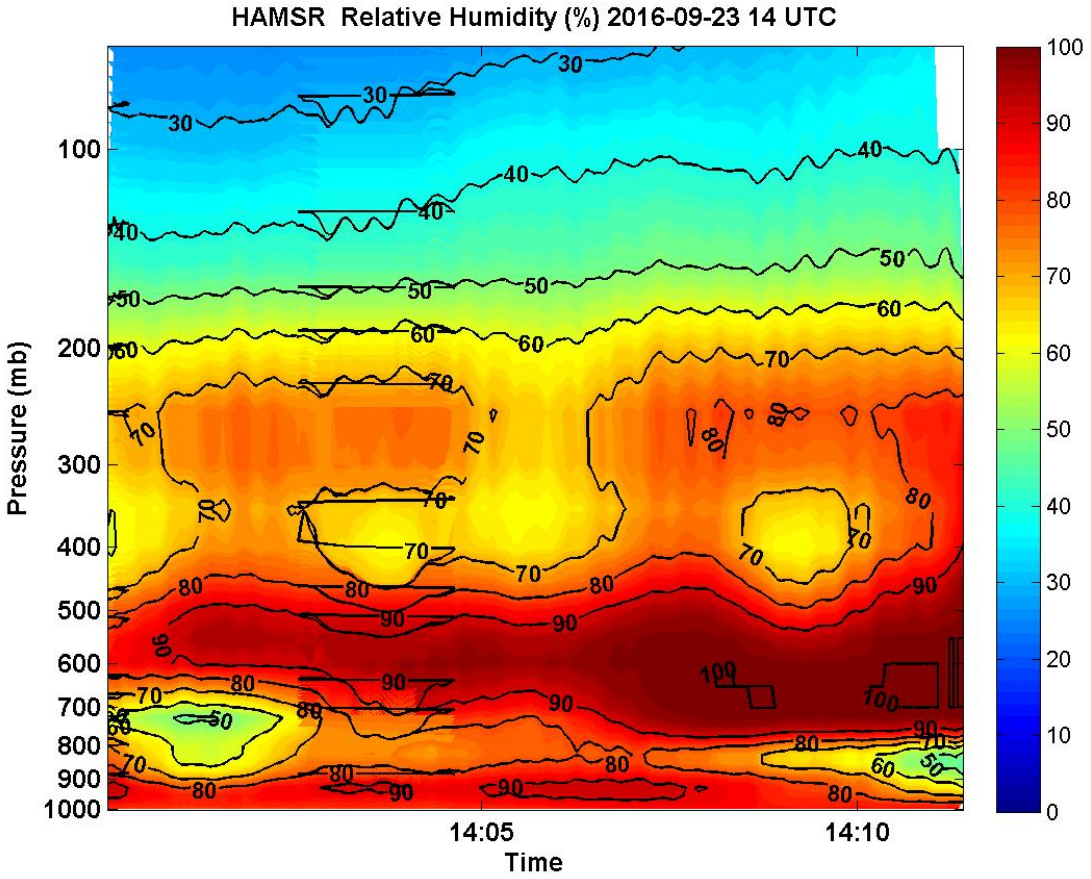
1433Z: Drop 61 at location; good drop (Dave says “outstanding sonde”)

HIWRAP from last crossing



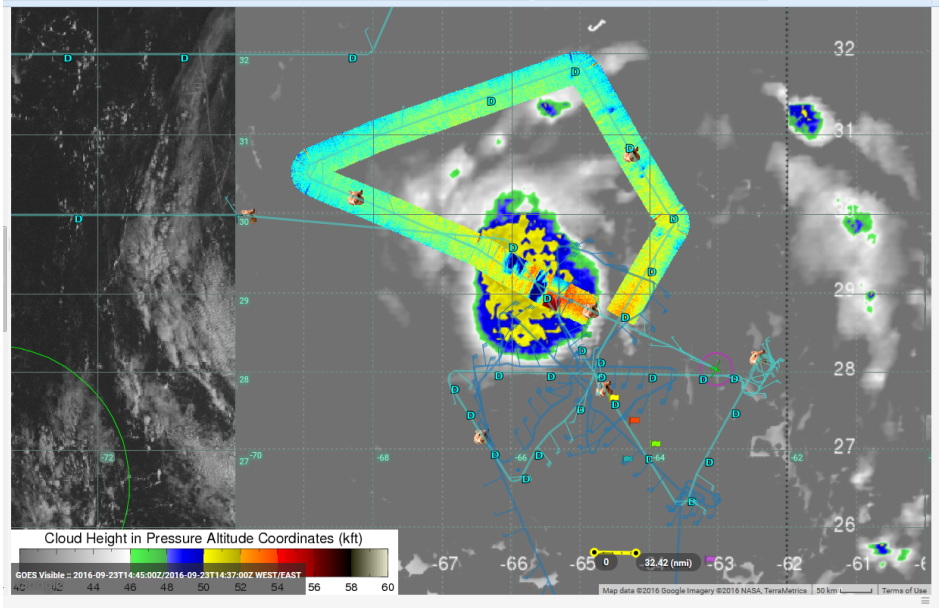
1440Z Corresponding HAMSR 6 km reflectivity


File Edit View History Bookmarks Tools Help
Dashboard - Mission Tools...
https://mts.nasa.gov/group/shout
Search
166 GHz TB
54.94 GHz TB [250mb]
55.5 GHz TB [150 mb]
117.95 GHz TB [250 mb]
118.3 GHz TB [150 mb]
Total Precipitable Water
Cloud Liquid Water
Scattering Index
Reflectivity at 6 km
Reflectivity at 9 km
Reflectivity at 12 km
350-500mb Avg
Last 30 Minutes
Absolute
Full
Last 30 Minutes
Last 60 Minutes
50.3 GHz TB
113 GHz TB
166 GHz TB
54.94 GHz TB [250mb]
55.5 GHz TB [150 mb]
117.95 GHz TB [250 mb]
118.3 GHz TB [150 mb]
Total Precipitable Water
Satellite
0 10 20 30 40 50
UTC
32.42 (nmi)
Cloud Height in Pressure Altitude Coordinates (kft)
GOES Visible :: 2016-09-23T14:30:00Z/2016-09-23T14:30:00Z WEST/EAST
44 46 48 50 52 54 56 58 60
Map data ©2016 Google Imagery ©2016 NASA, TerraMetrics
50 km
Terms of Use



1443Z: Drop 62 at location 65; good drop

HAMSR 54.94 (250 mb) from last pass. Boon reports a surprising amount of scattering



1453Z: Drop 63 at location 66; Good drop

NHC 11 EDT Discussion
000
WTNT42 KNHC 231445
TCDAT2

TROPICAL STORM KARL DISCUSSION NUMBER 37
NWS NATIONAL HURRICANE CENTER MIAMI FL AL122016
ISSUED BY THE NWS WEATHER PREDICTION CENTER COLLEGE PARK MD
1100 AM AST FRI SEP 23 2016

A NOAA P3 flight continued to fly through Karl for a few hours after the release of the last advisory, and while it didn't find winds higher than 50 kt, dropsonde data did indicate that the minimum pressure had fallen to 992 mb. Microwave data indicate that Karl is still under the influence of 15-20 kt of south-southeasterly shear. The convective pattern has continued to improve, however, with an elongated curved band extending to the northeast and east of the central convection.

With sea surface temperatures running between 29-30C for the next 24 hours and vertical shear expected to decrease slightly, it seems likely that Karl will continue to strengthen during the next couple of days. The intensity guidance is in fairly good agreement on the intensification trend, and in fact most of the models are showing Karl reaching a strength between 60 and 65 kt in about 24 hours. Therefore, the updated official forecast now shows Karl reaching hurricane intensity at that time. Continued strengthening is likely after that time, and the peak intensity shown in the official forecast is slightly higher than the previous forecast at 48 hours, which is in line with the latest guidance. Karl will be in the process of extratropical transition at that time, but the global models fields only agree that the transition will be complete by 72 hours. Karl should then be absorbed by a larger extratropical low by day 4.

The last fix from the NOAA P3 was a little east of the previous Air Force fixes, so it's possible that Karl's center has begun to move east of due north. Until we know for sure, the initial motion is set to be northward, or 360/10 kt. Karl is located near the western edge of the subtropical ridge axis, and it should become increasingly embedded in the mid-latitude westerlies during the next couple of days. Therefore, the cyclone is forecast to turn northeastward and begin accelerating within the next 24 hours, with the motion becoming even faster by 72 hours. The spread among the track models is extremely tight on this forecast cycle, and very little change was required from the previous advisory. The new

official forecast lies very close to the TVCN multi-model consensus.

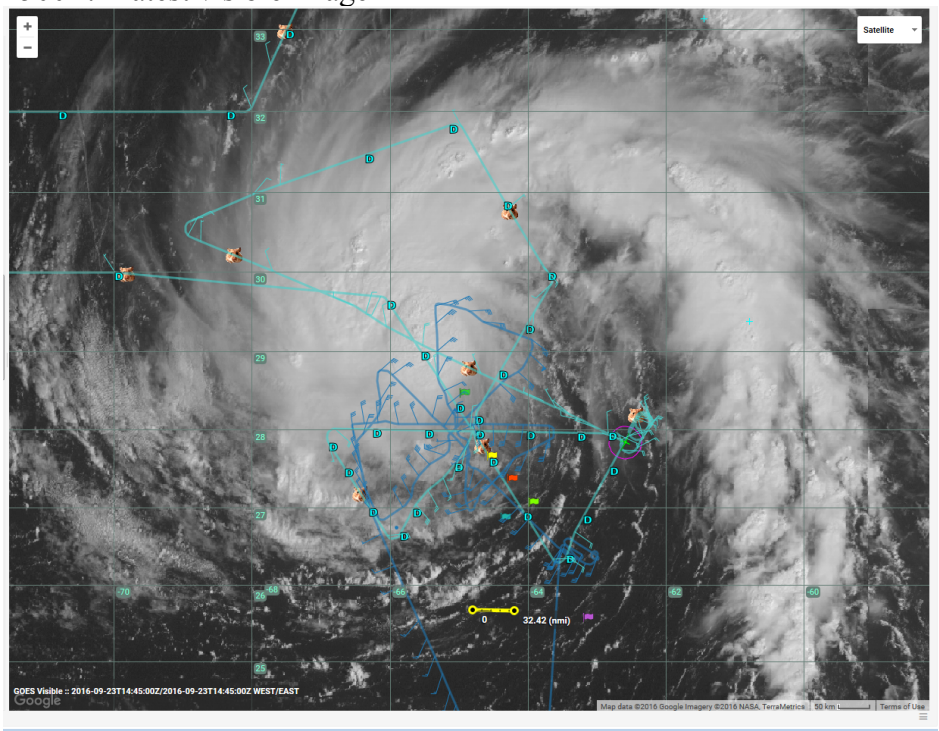
Since Karl is now forecast to become a hurricane by 24 hours while the center is passing just to the east of Bermuda, the Bermuda Weather Service has elected to issue a Hurricane Watch for the island.

FORECAST POSITIONS AND MAX WINDS

INIT 23/1500Z 28.6N 64.8W 50 KT 60 MPH
12H 24/0000Z 30.2N 64.8W 55 KT 65 MPH
24H 24/1200Z 32.3N 62.7W 65 KT 75 MPH
36H 25/0000Z 34.9N 57.8W 70 KT 80 MPH
48H 25/1200Z 38.9N 49.8W 75 KT 85 MPH
72H 26/1200Z 50.7N 29.0W 60 KT 70 MPH...POST-TROP/EXTRATROP
96H 27/1200Z...ABSORBED BY A LARGER EXTRATROPICAL LOW

$$
Forecaster Berg/Sullivan/Gerhardt/Schichtel

1500Z: Latest visible image

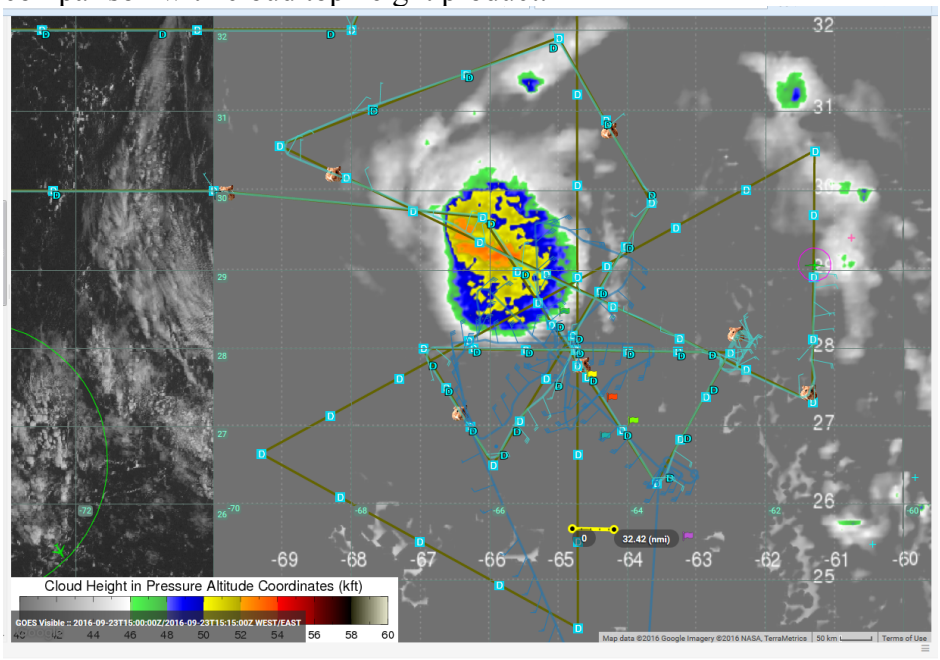


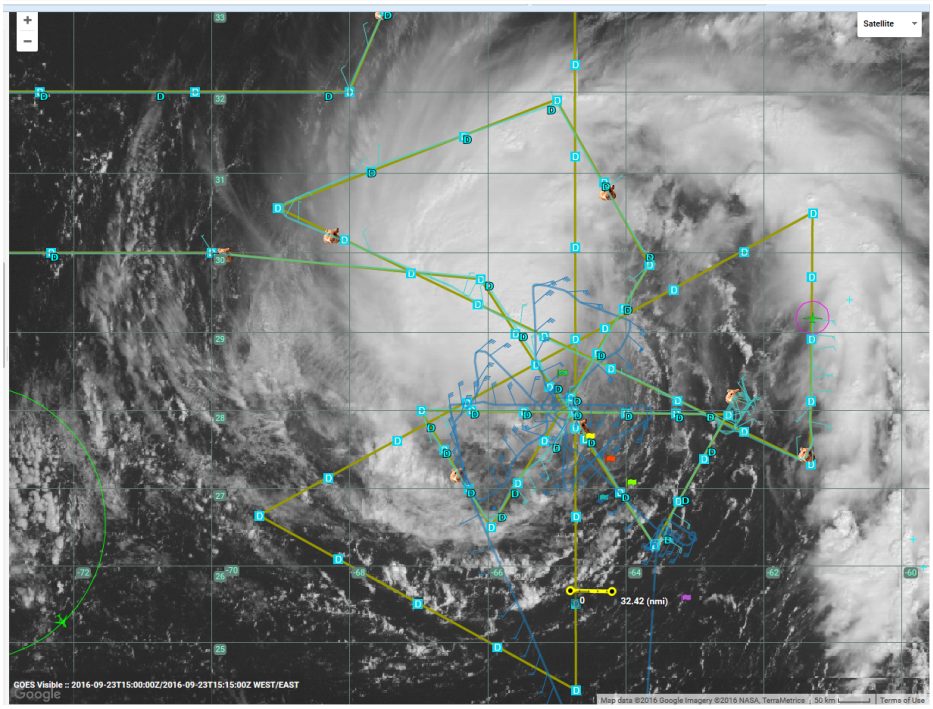
1503Z: Drop 64 at location 67; Good drop

1514Z: Drop 65 at location 68; good drop

1522Z: Drop 66 at location 69; Good drop

Seeing large offset of convection to NW side of storm as evidenced by visible imagery as well as comparison with cloud top height product:





1529Z: Drop 67 at location 70: Good drop

1537Z: Drop 68 at location 71: Good Drop

1548Z: Drop 69 at location 72; Good Drop

1554Z: Drop 70 at location 73; Good drop

1606Z: Drop 71 at location 74; Good drop

1616Z: Drop 72 at location 75; Good drop

1626Z: Drop 73 at location 76; Good drop

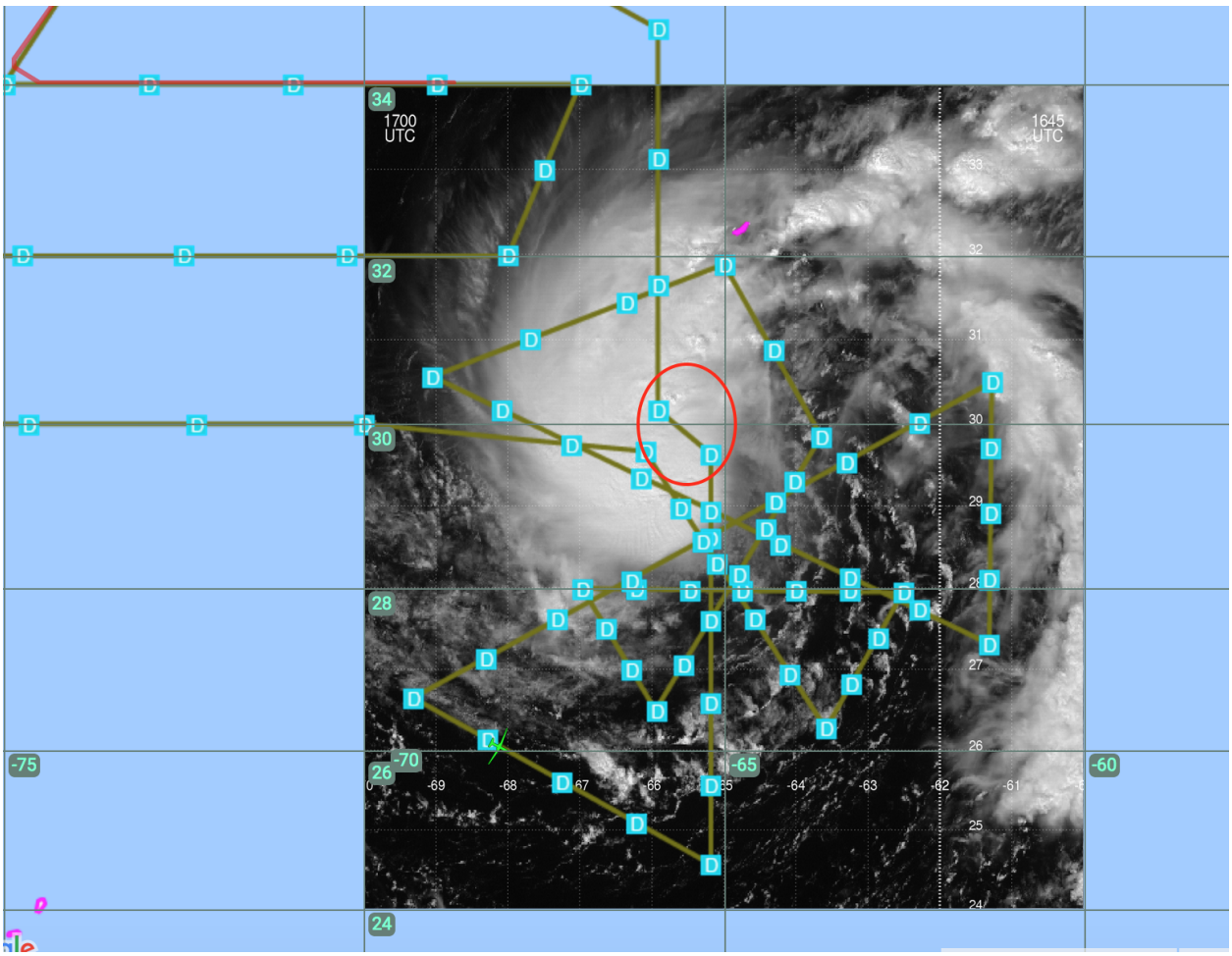
1637Z: Drop 74 at location 77; Good drop

1647Z: Drop 75 at location 78; Good drop

1658Z: Drop 76 at location 79; Good drop

1709Z: Drop 77 at location 80; Good drop

On the leg of large butterfly heading SE toward final transect. Move this transect to the west about 40 nm to hit the center and added a leg to NW to cross over convective core for HIWRAP. Added an additional drop here as well to get drop in the convective area where strongest winds may be located. This change also avoids dropping sonde over Bermuda.

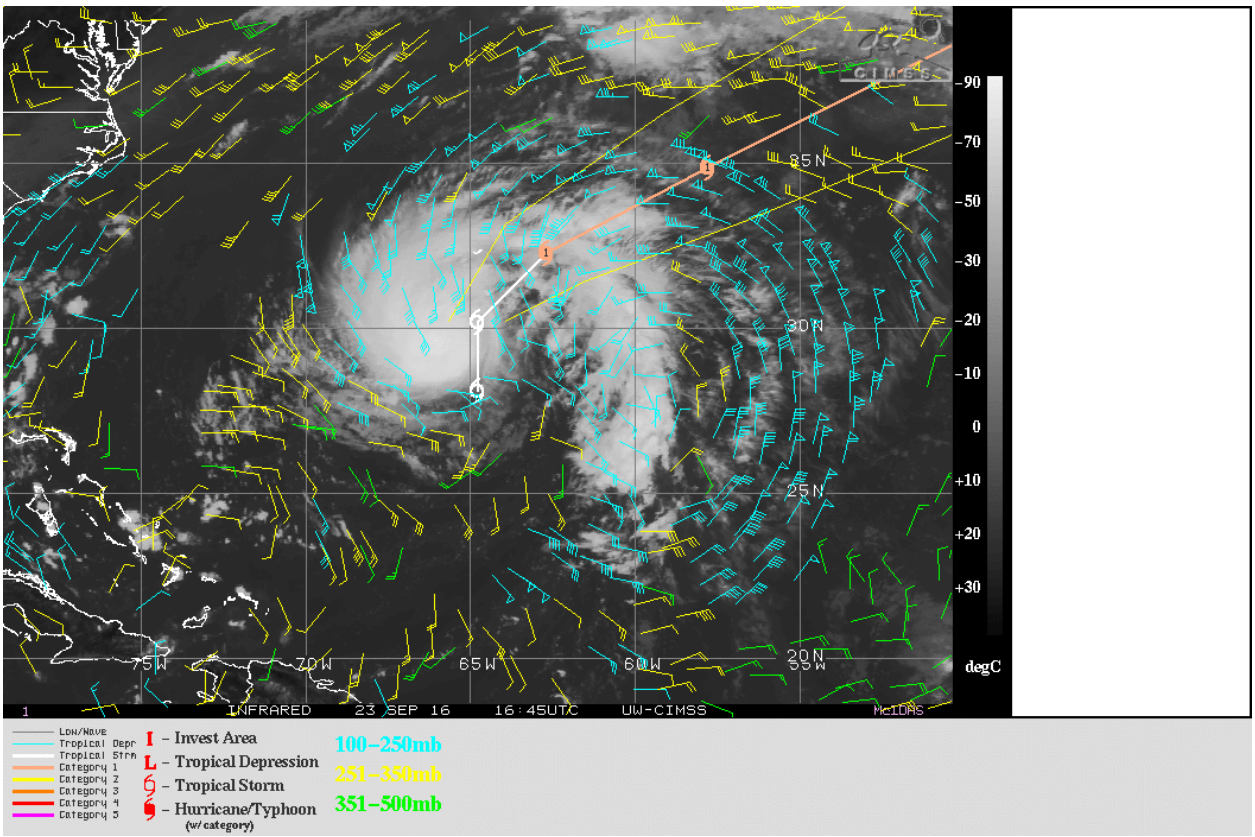


1717Z: Drop 78 at location 81; Good drop

1729Z: Drop 79 at location 82; Good drop

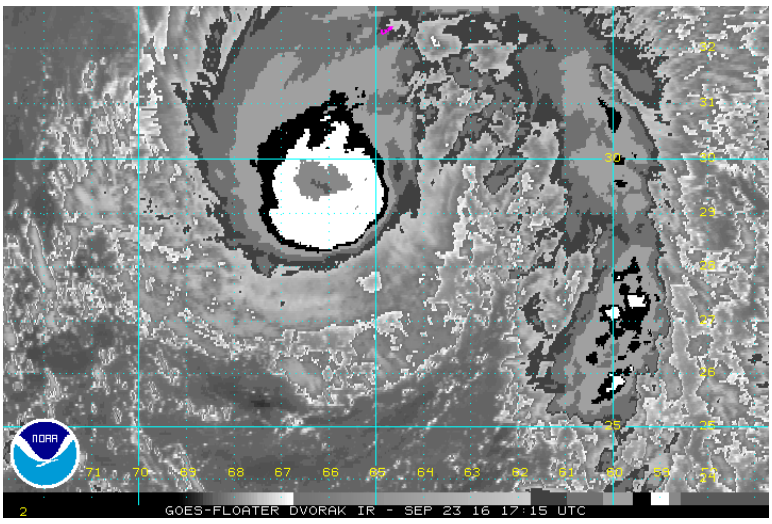
1741Z: Drop 80 at location 83; Good drop

1753Z: Drop 81 at location 84; Good drop

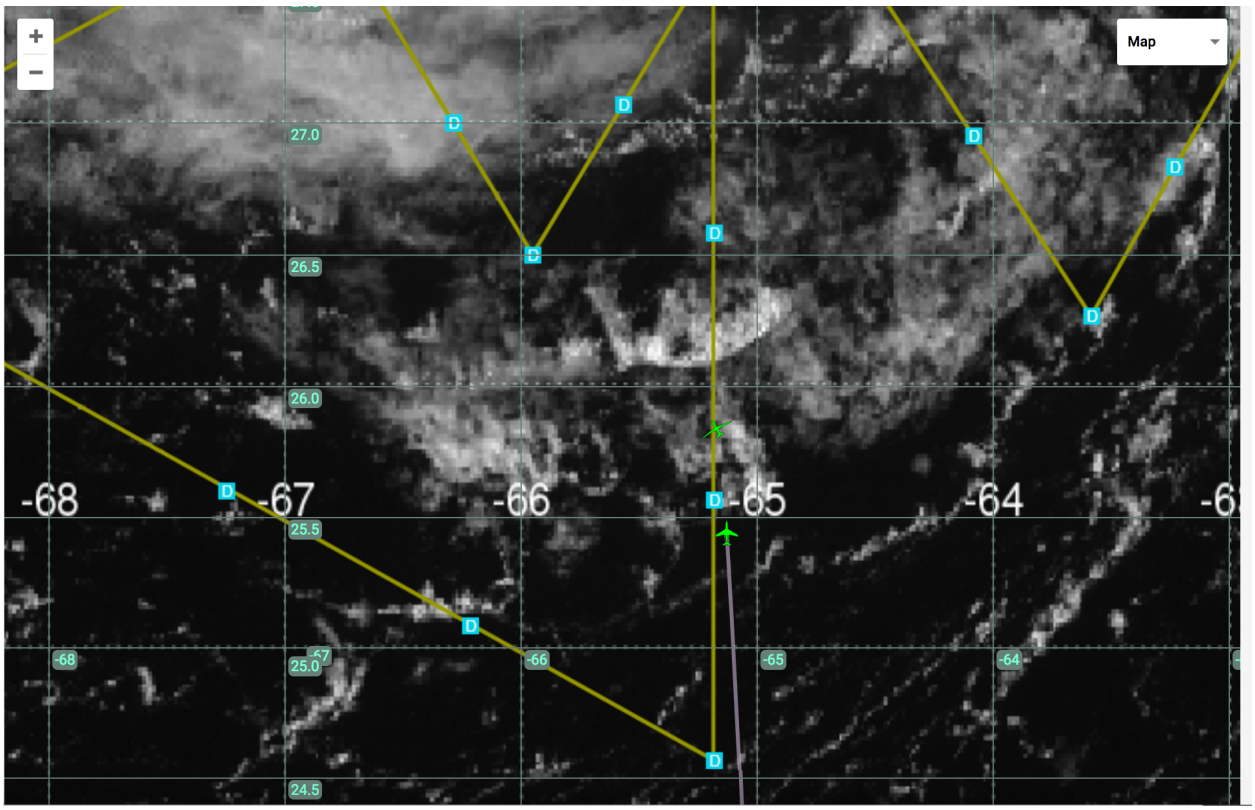


Storm continues to exhibit an excellent upper level outflow to the north of the storm and wrapping around to the east and south. Last leg of butterfly should sample this well.

TEAL just completed first center fix at 1742Z with ctr at 29 deg 03 min 65 deg 17 min with a pressure of 990 mb. Peak FL winds of 59 kts but they have not sampled the convective core on NW side yet. Steady intensification continues though the center is still partially exposed on the SE side. Cloud tops are now -80 C in the center of the CDO structure.



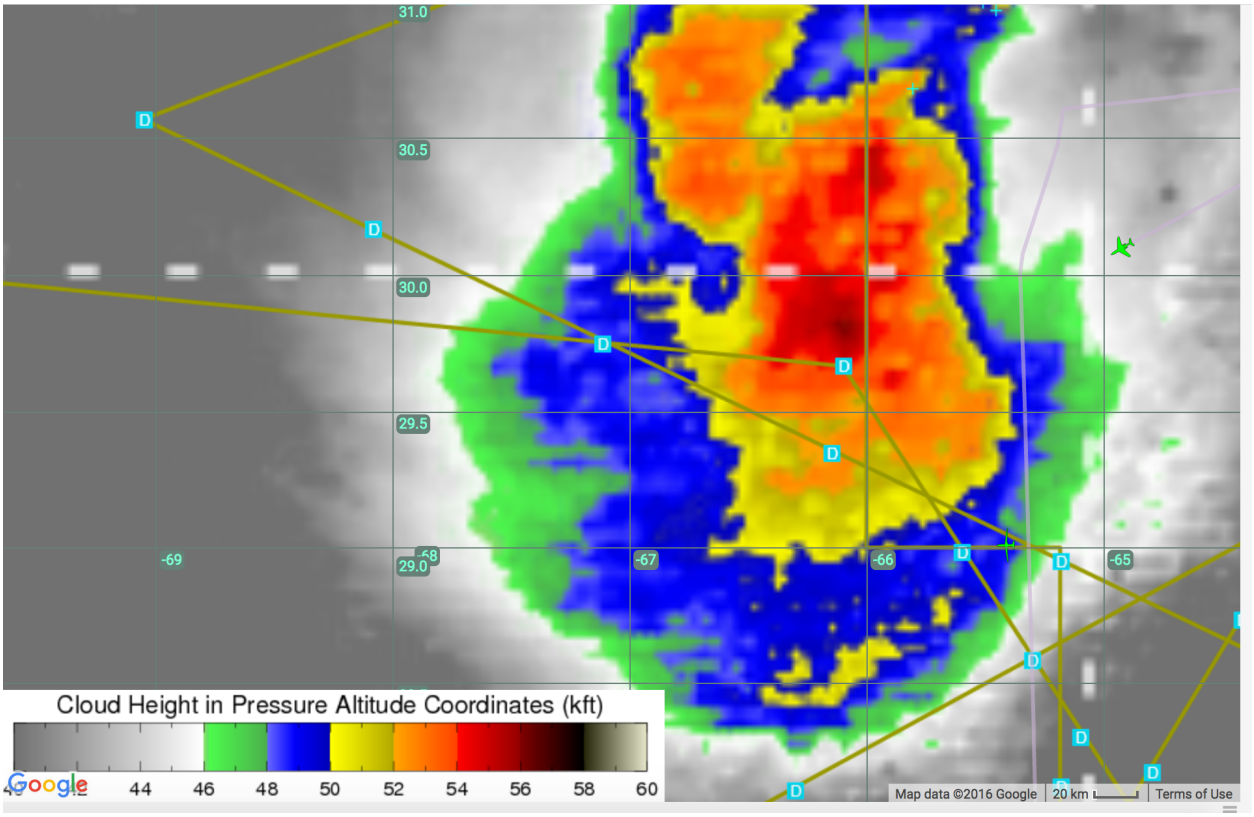
GIV is approaching from behind so suspended drop 82. Executing a loop to allow the GIV to pass then will attempt the drop again when we resume a level flight to north.



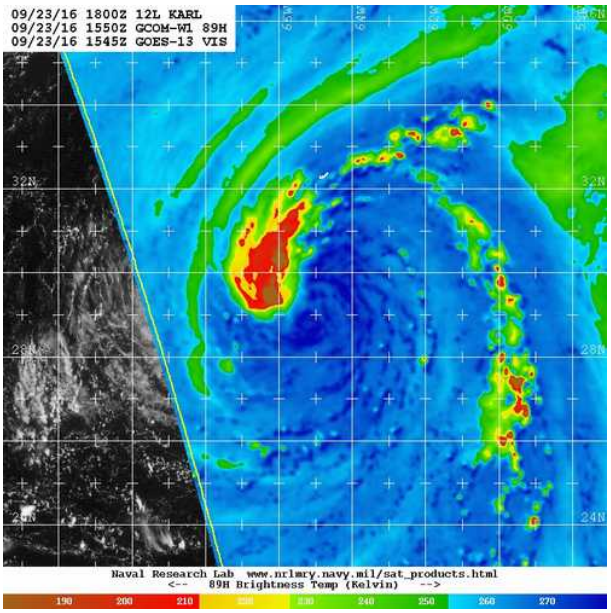
1815Z: Drop 82 at approximate location 85; Good drop

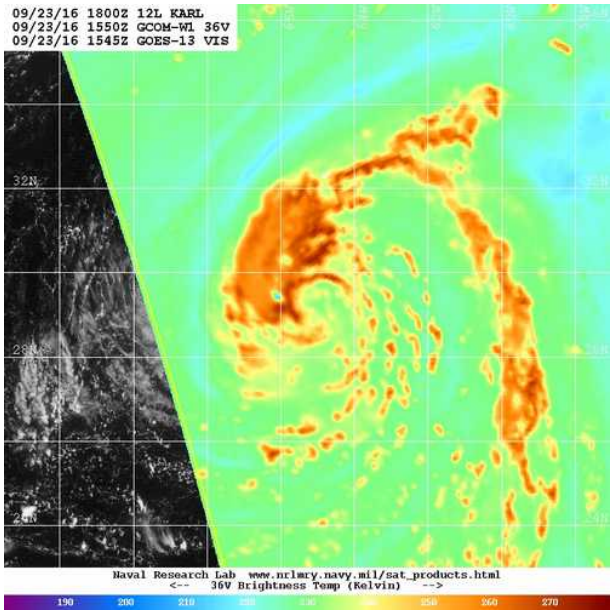
Drop 82 is the last drop transmitted due to issues with AVAPS. MS made attempts to update the flight track for more time over the convection for HIWRAP, but there was not enough flight time remaining after multiple loiters.

In order get HIWRAP maximum time over convection executing a west turn now at 29N then due north through convection along 66W to 32.5N. Will need to monitor convection as this area has had lightning with tops to 56K.



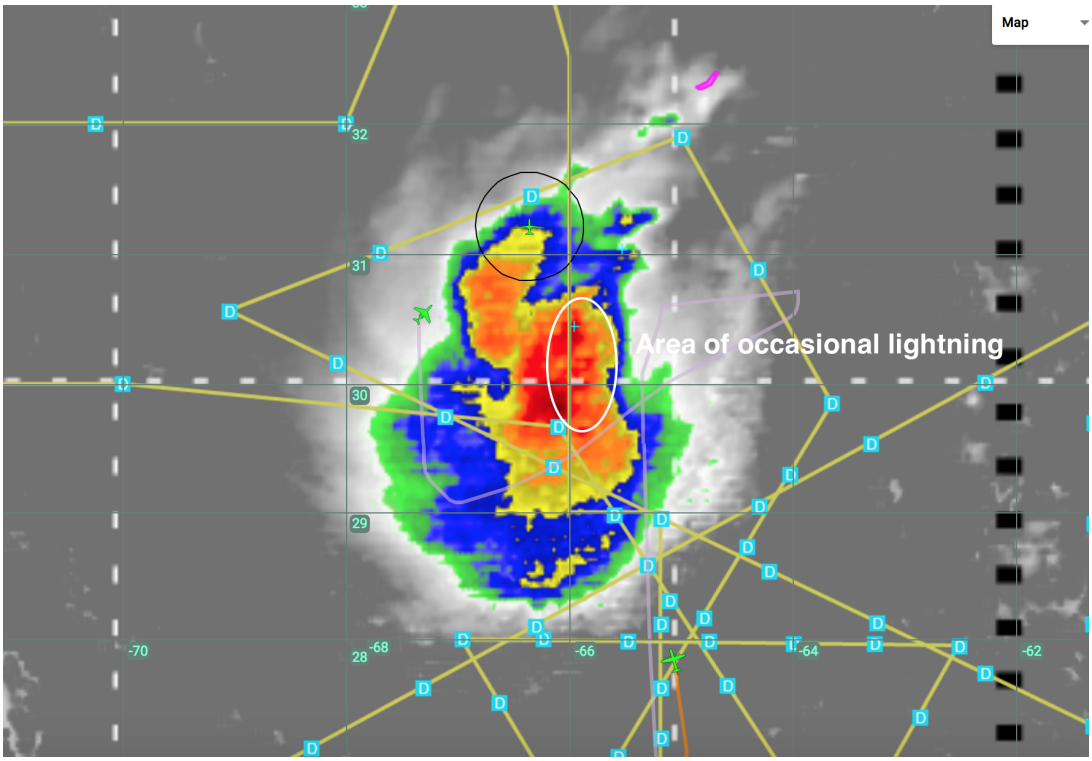
1550Z AMSR2 still shows the convection is located on the northwest side of the llcc. Current transect should cut right across this region for HIWRAP. Partial eyewall can be seen in the 36 GHz.

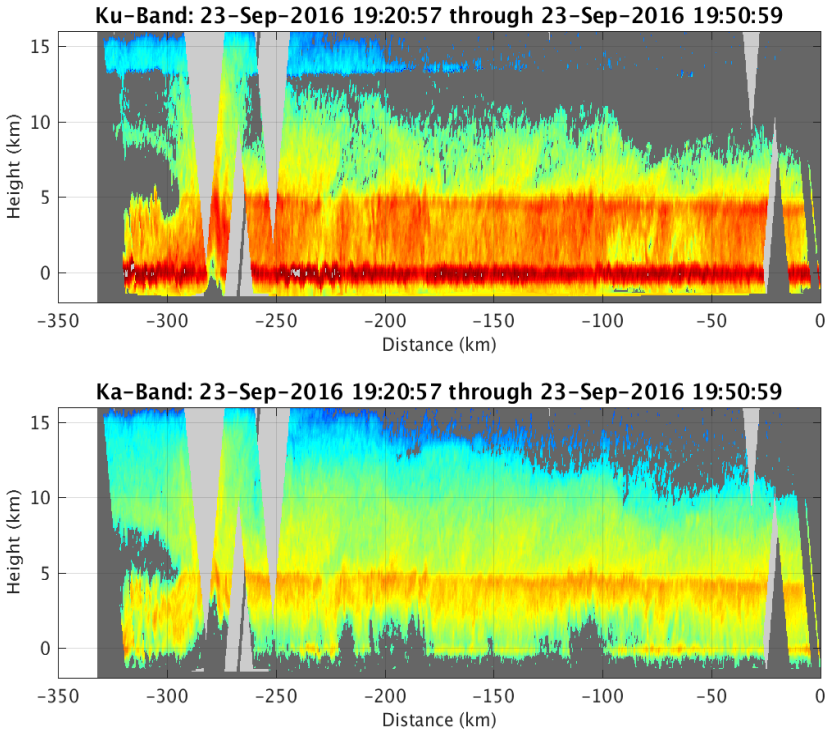




1925Z Recon reports 988 mb. Karl is approaching hurricane intensity.

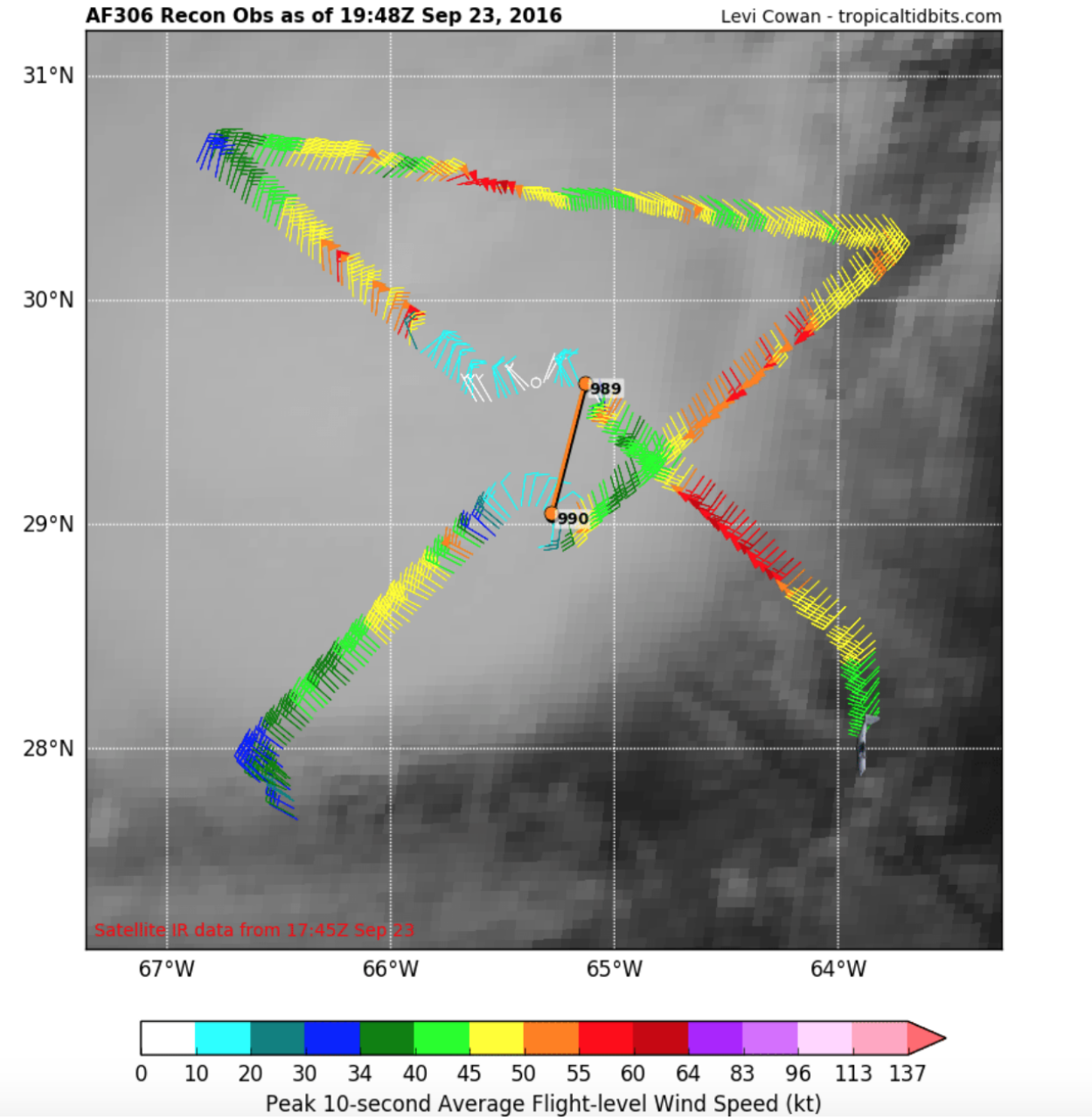
Exiting the main convective core for the trip home.



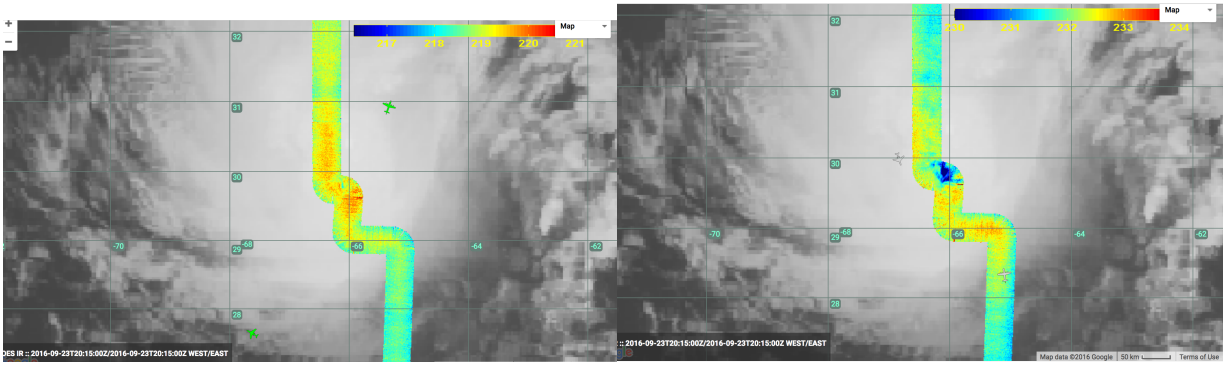


HIWRAP transect through convective core

Last two recon fixes along with animated imagery show Karl making the turn to the NNE. Center remains exposed on the southeast side of the convection due to 22 knots of southerly shear however pressures continue to fall.



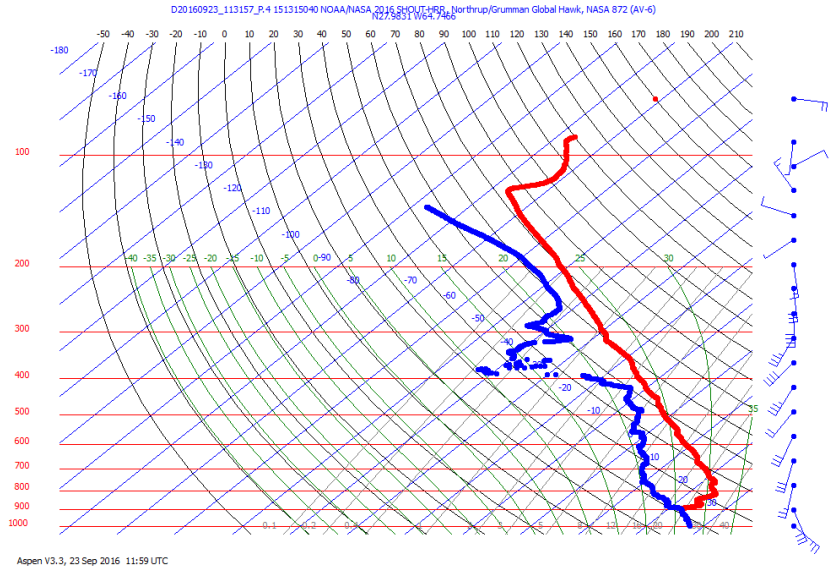
AF306 flight level winds showing 60kt winds to the SE of storm center (and a few to the N of the storm also).

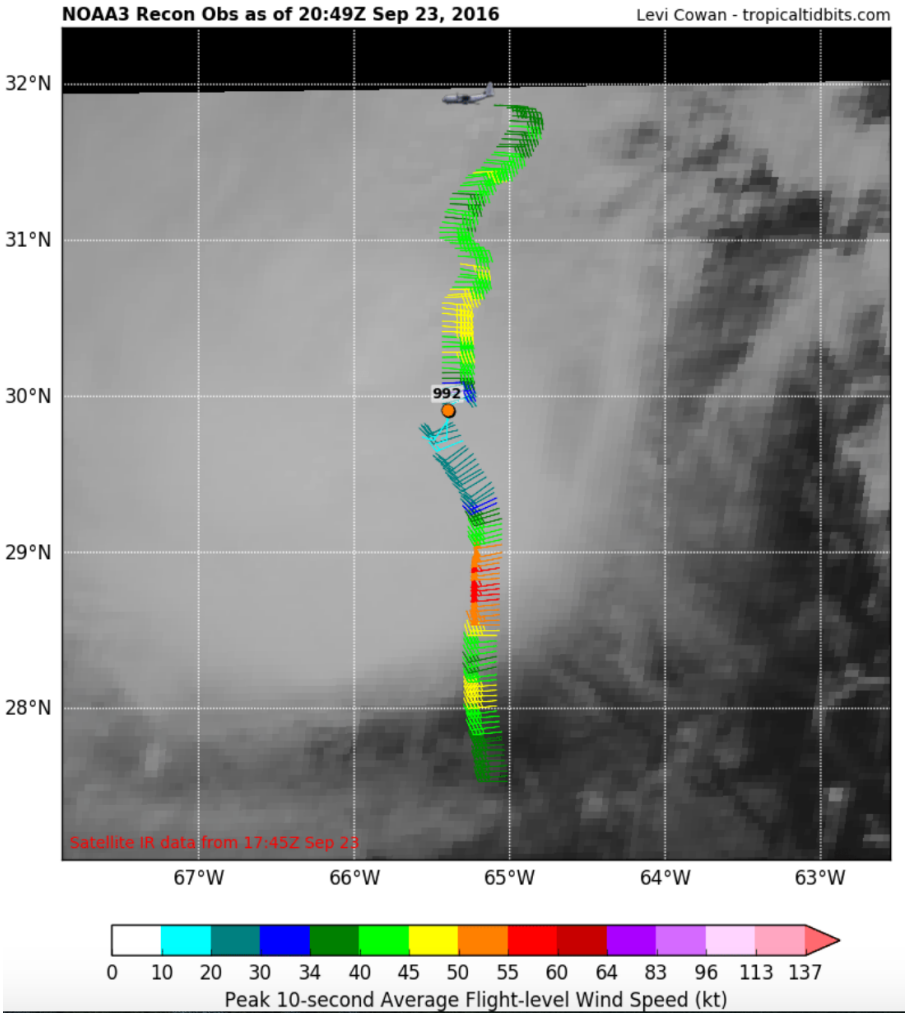


HAMSR 55.5 and 54.94 GHz transects across Karl showing the warm temperature anomaly of 2-3 K.

Aircraft continue to show a significant temperature anomaly between 850-700 mb This is in agreement with earlier dropsondes from the GH near the center which showed a significant subsidence inversion between 900-700 mb and a temperature anomaly of 9-10 C around 800 mb. The anomaly appears maximized in the lower levels likely due to the shear on the system.

000
URNT12 KWBC 232043
VORTEX DATA MESSAGE AL122016
A. 23/20:15:06Z
B. 29 deg 55 min N
  065 deg 24 min W
C. NA
D. 39 kt
E. 160 deg 54 nm
F. 263 deg 56 kt
G. 165 deg 69 nm
H. 992 mb
I. 15 C / 2304 m
J. 23 C / 2378 m
K. 8 C / NA
L. NA
M. NA
N. 12345 / NA
O. 0.1 / 1 nm
P. NOAA3 WI12A KARL OB 09
MAX FL WIND 56 KT 165 / 69 NM 19:57:48Z
CNTR DROPSONDE SFC WIND 035 / 26 KTS


D20160923_113157_P.4 151315040 NOAA/NASA 2016 SHOUT-HRD Northrup/Grumman Global Hawk, NASA 872 (AV-6)
N27.9831 W64.7466
Aspen V3.3, 23 Sep 2016 11:59 UTC


NOAA3 Recon Obs as of 20:49Z Sep 23, 2016
Levi Cowan - tropicaltidbits.com
32°N
31°N
30°N
29°N
28°N
992
Satellite IR data from 17:45Z Sep 23
67°W
66°W
65°W
64°W
63°W
0 10 20 30 34 40 45 50 55 60 64 83 96 113 137
Peak 10-second Average Flight-level Wind Speed (kt)

Latest NOAA-P3 finds winds around 55kts and mslp of 989mb at flight level (2370m) at 2015Z. Highest SFMR surface wind was 41kts on northern part of storm center.

TROPICAL STORM KARL DISCUSSION NUMBER 38
NWS NATIONAL HURRICANE CENTER MIAMI FL AL122016
ISSUED BY THE NWS WEATHER PREDICTION CENTER COLLEGE PARK MD
500 PM AST FRI SEP 23 2016

Satellite imagery continues to show a well-developed outflow pattern around Karl with the center noted on the southeastern edge of the colder cloud tops. Aircraft reconnaissance data has indicated a gradual drop in pressure to 988 mb, based on a dropsonde report of 989 mb with 12 kt of wind at the surface. A peak 850-mb flight-level wind of 62 kt was measured, which equates to an surface intensity of 50 kt. Reliable SFMR data also showed maximum surface winds around 50 kt, and that will remain the initial intensity. Latest aircraft fixes had also indicated that Karl was beginning to turn more northward as it moves around the western edge of the mid-Atlantic subtropical ridge.

Karl is expected to remain over sea surface temperatures of between 29-30C for the next 24 hours or so while at the same time, some brief relaxation in the vertical shear is forecast. These conditions should favor some continued slow strengthening, which is generally supported by a majority of models. The models also suggest that Karl could reach hurricane strength by 24 hours as the system moves to the east of Bermuda. Continued strengthening of Karl is likely through 36 hours, then it is expected to gradually transition to extratropical status by 48 hours as it becomes absorbed by a rapidly approaching cold front.

The latest official forecast has shifted Karl slightly west of the previous track during the next 12 hours, but otherwise, there are no significant changes from the previous advisory. Karl should make a sharp turn and acceleration to the northeast beyond 12 hours as it encounters increasing westerly flow in advance of an amplifying upper trough and associated cold front across the northwest Atlantic. Karl should then become absorbed by another extratropical low over the north Atlantic in 72 hours.

FORECAST POSITIONS AND MAX WINDS

INIT 23/2100Z 29.9N 65.1W 50 KT 60 MPH
12H 24/0600Z 31.3N 64.3W 55 KT 65 MPH
24H 24/1800Z 33.7N 60.8W 65 KT 75 MPH
36H 25/0600Z 37.1N 54.0W 70 KT 80 MPH
48H 25/1800Z 42.0N 44.6W 65 KT 75 MPH...POST-TROP/EXTRATROP
72H 26/1800Z...DISSIPATED

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Forecaster Sullivan/Berg