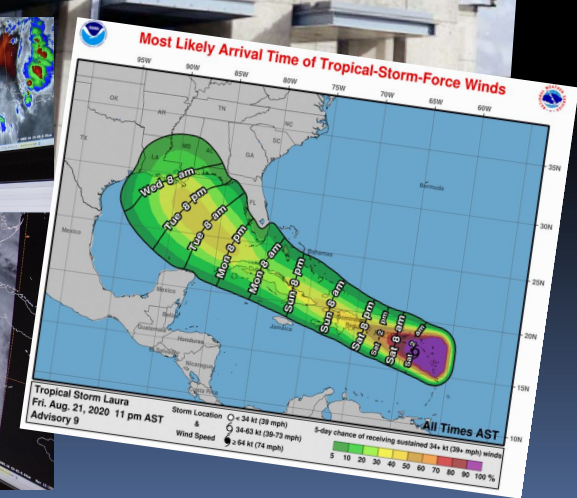
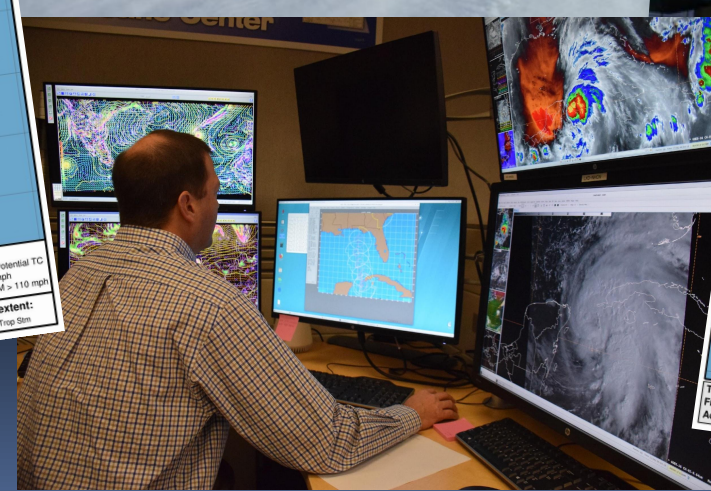
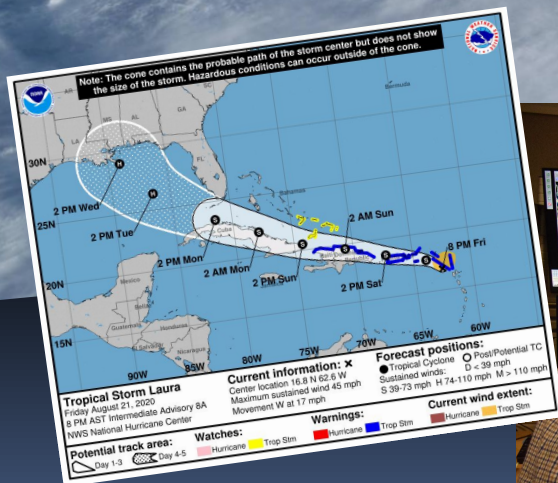


2024 WMO RA-IV Workshop Advisory Preparation Exercise



Outline

Setting the Stage (00:00-00:45)

- Importing Fixes
- Determining Initial Location, Intensity, and Size
- Send and receive model guidance

Creating the Forecast (00:45-02:00)

- Track
- Intensity
- Wind Radii

Outline

Forecast Coordination (02:00-02:15)

- Coordinate U.S. and International Watches/Warnings
- Coordinate rainfall and other TC hazards

Product Preparation (02:15-03:00)

- Public Advisory
- Discussion

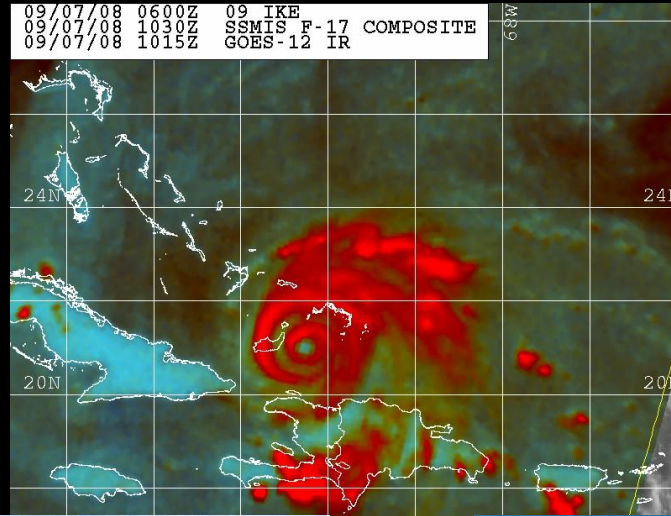
NHC Forecast Cycle

| Time (HR : MIN) | Event |
|-----------------|--|
| 00:00 | Issue Tropical Weather Outlook Issue Intermediate Public Advisory (if necessary) Synoptic time / cycle begins |
| 00:30 | Receive satellite fix data |
| 00:45 | Initialize models |
| 01:00 | Receive model guidance and <i>prepare forecast</i> |
| 02:00 | NWS / DOD hotline coordination |
| 03:00 | Advisory deadline |
| 03:15 | Media, EM briefings, social media messaging |

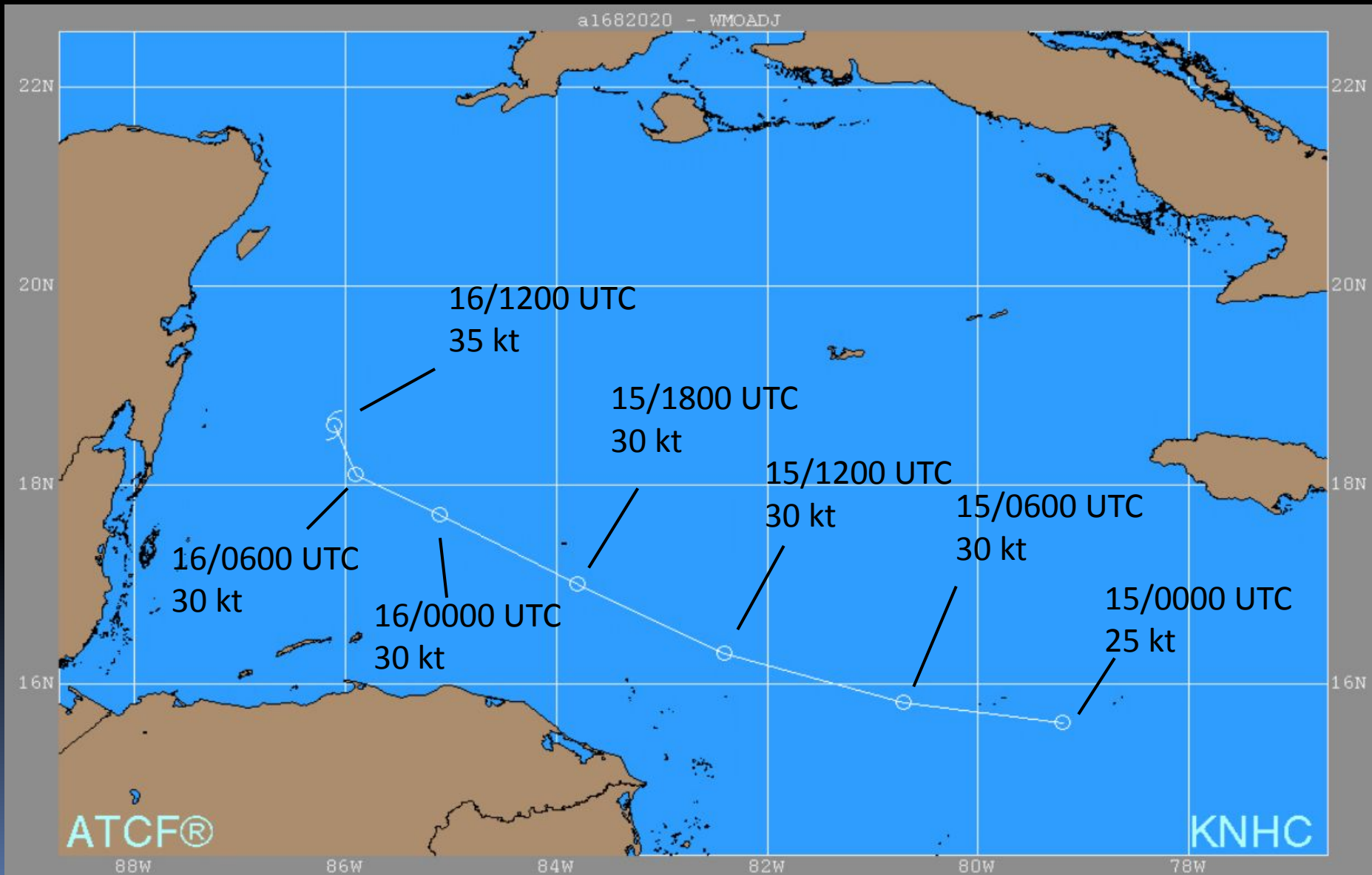
18:00 UTC

Synoptic time / cycle begins

Hurricane specialist analyzes available observations



Working Best Track in ATCF through 1200 UTC



Reconnaissance Aircraft (Air Force) Scheduled between 1800-0000 UTC

000
NOUS42 KNHC 061930
REPRPD
WEATHER RECONNAISSANCE FLIGHTS
CARCAH, NATIONAL HURRICANE CENTER, MIAMI, FL.
0330 PM EDT WED 15 APRIL 2020
SUBJECT: TROPICAL CYCLONE PLAN OF THE DAY (TCPOD)
VALID 16/1100Z TO 17/1100Z APRIL 2020
TCPOD NUMBER.....20-001

I. ATLANTIC REQUIREMENTS

1. SUSPECT AREA (WESTERN CARIBBEAN SEA)

| | |
|-------------------------|-------------------------|
| FLIGHT ONE -- TEAL 71 | FLIGHT TWO -- TEAL 72 |
| A. 16/1800Z | A. 17/0530Z |
| B. AFXXX 01DDA INVEST | B. AFXXX 0214A CYCLONE |
| C. 16/1500Z | C. 17/0245Z |
| D. NA | D. 20.9N 86.7W |
| E. 16/1730Z TO 16/2100Z | E. 17/0500Z TO 17/0830Z |
| F. SFC TO 10,000 FT | F. SFC TO 10,000 FT |

FLIGHT THREE -- TEAL 73

| |
|-------------------------|
| A. 17/1130Z,1730Z |
| B. AFXXX 0314A CYCLONE |
| C. 17/0900Z |
| D. 21.6N 86.7W |
| E. 17/1100Z TO 17/1730Z |
| F. SFC TO 10,000 FT |

2. OUTLOOK FOR SUCCEEDING DAY:

| |
|---|
| A. CONTINUE 6-HRLY FIXES IF SYSTEM DEVELOPS. |
| B. BEGIN 12-HRLY P-3 TAIL DOPPLER RADAR MISSIONS, WITH FIRST MISSION DEPARTING KLAL AT 17/2000Z. |
| C. A G-IV SYNOPTIC SURVEILLANCE MISSION FOR 19/00Z DEPARTING KLAL AT 18/1730Z. |

II. PACIFIC REQUIREMENTS

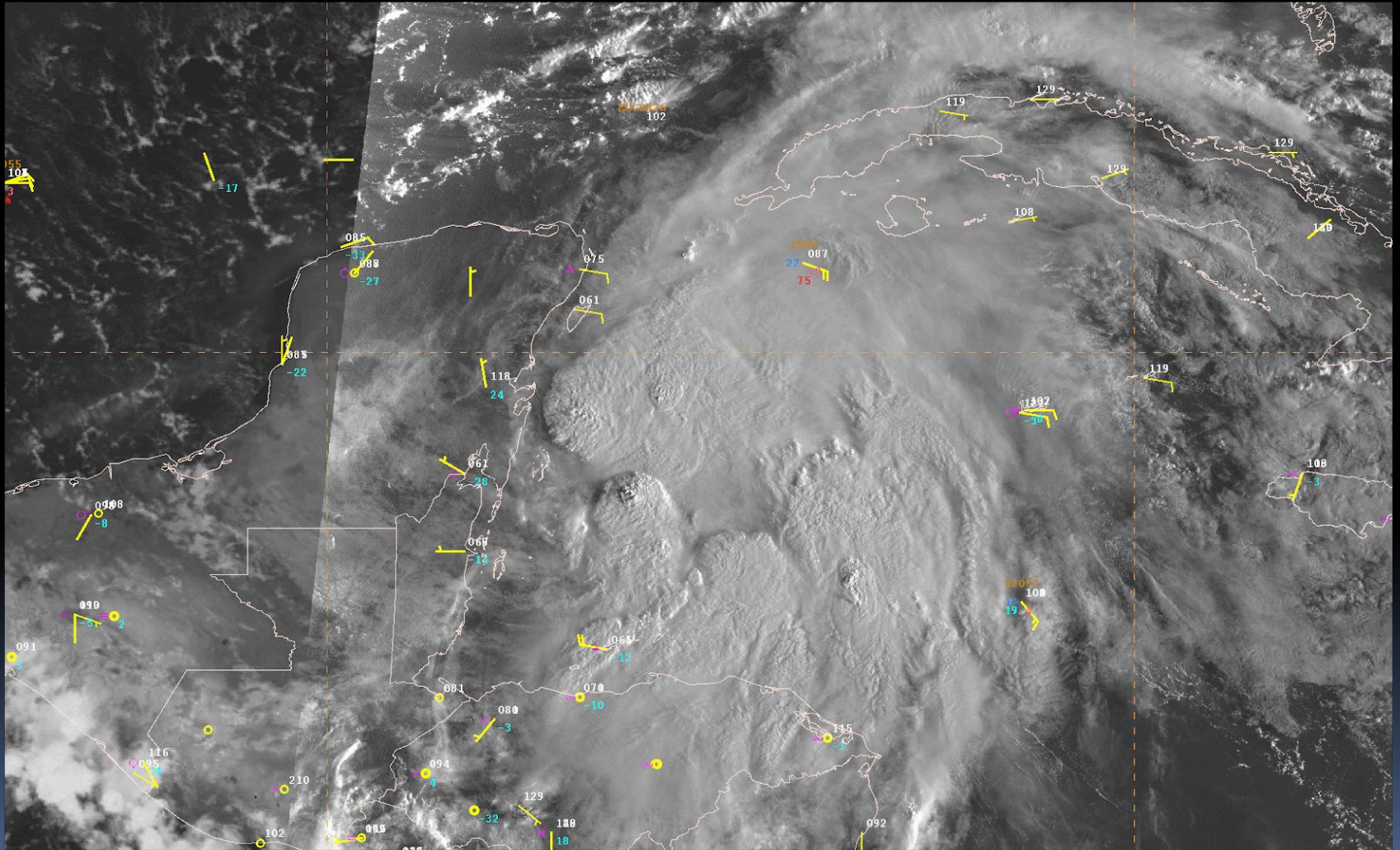
| |
|---|
| 1. NEGATIVE RECONNAISSANCE REQUIREMENTS. |
| 2. OUTLOOK FOR SUCCEEDING DAY.....NEGATIVE. |

\$\$
WJM
NNNN

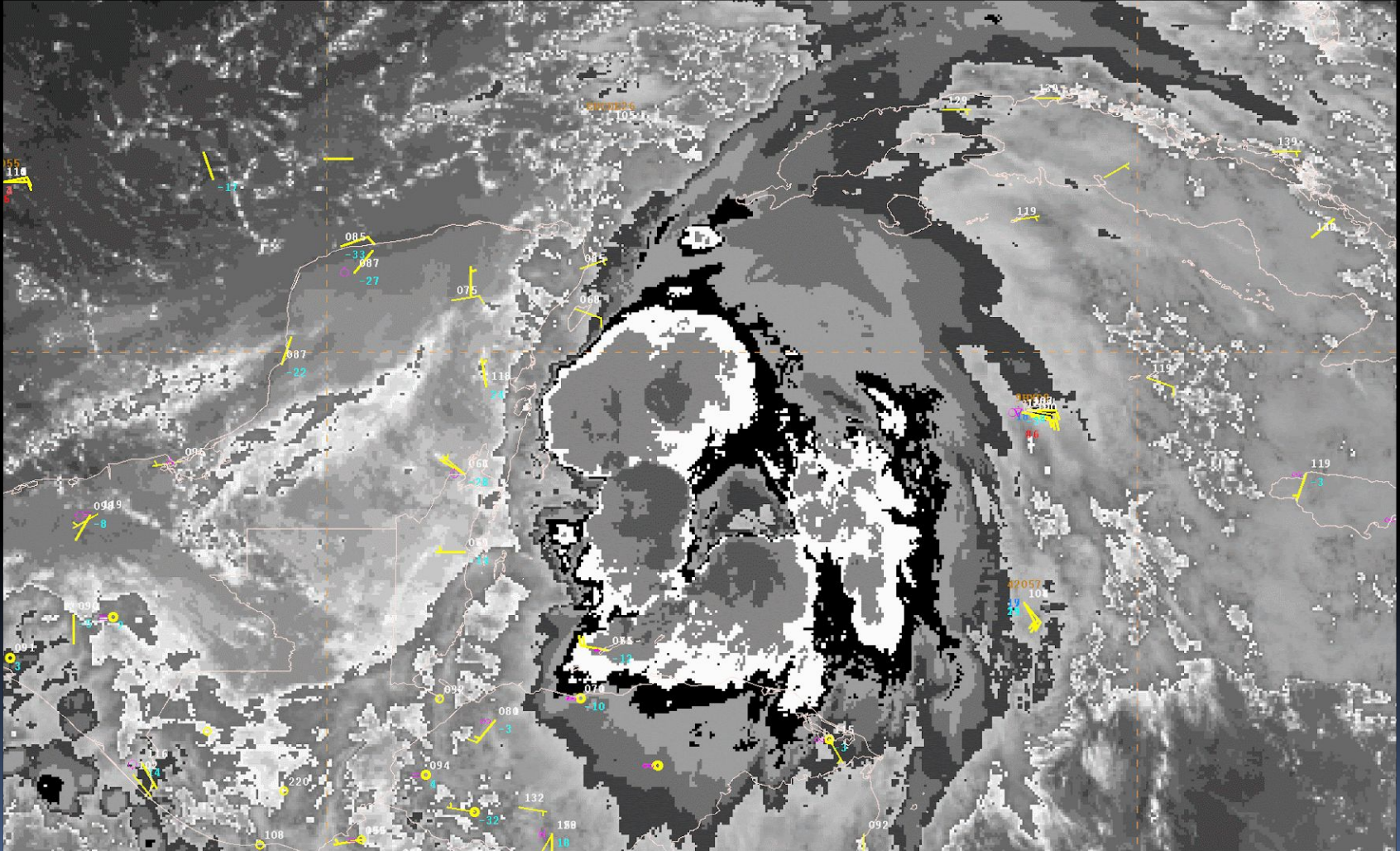
First flight into tropical storm. Mission was originally planned as an "Invest" mission, arriving at 18Z

G-IV flight planned for 0000 UTC following day

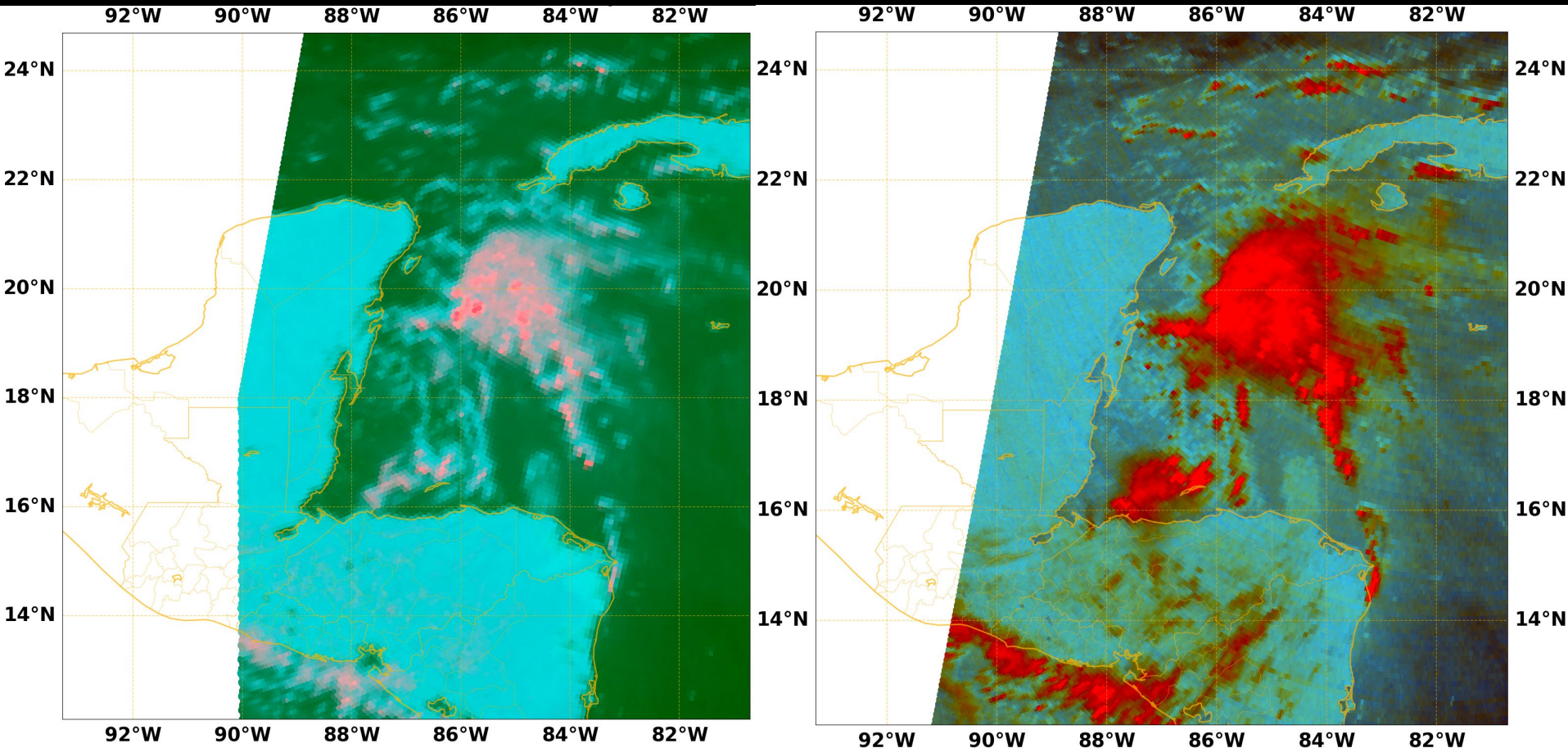
Visible Imagery



IR Imagery



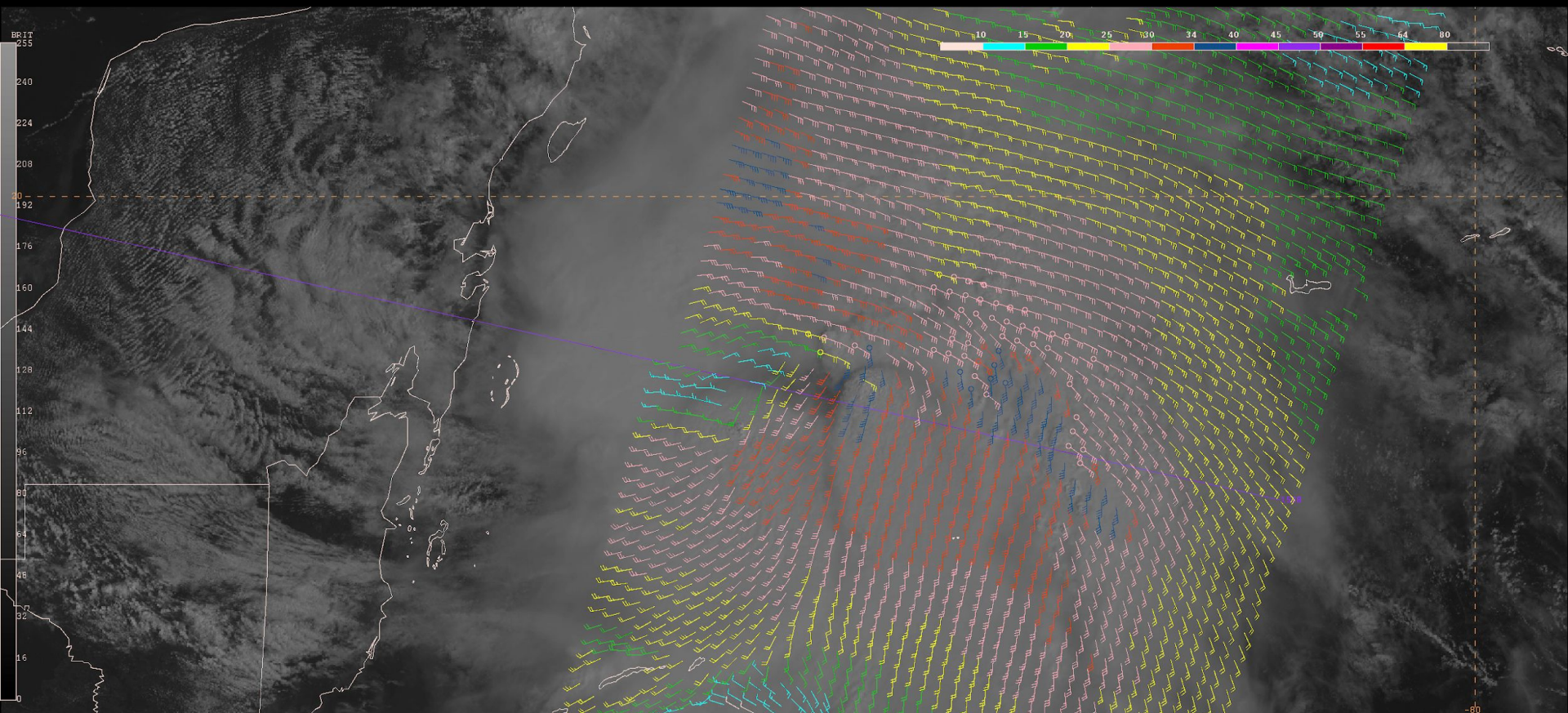
Overnight Microwave Imagery AMSR- 16/0650 UTC



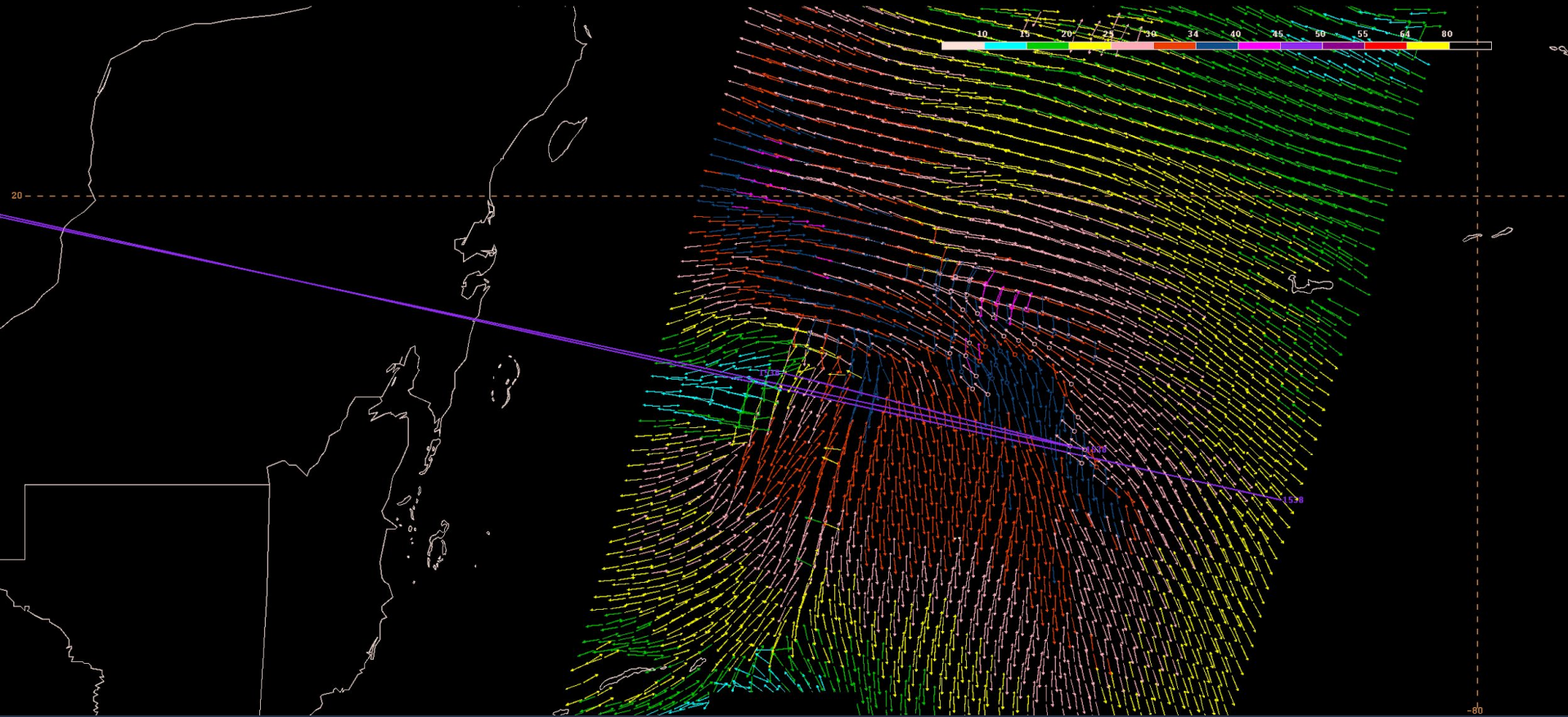
37 GHz Color Composite

89 GHz Color Composite

ASCAT-B 1514 UTC Model solution

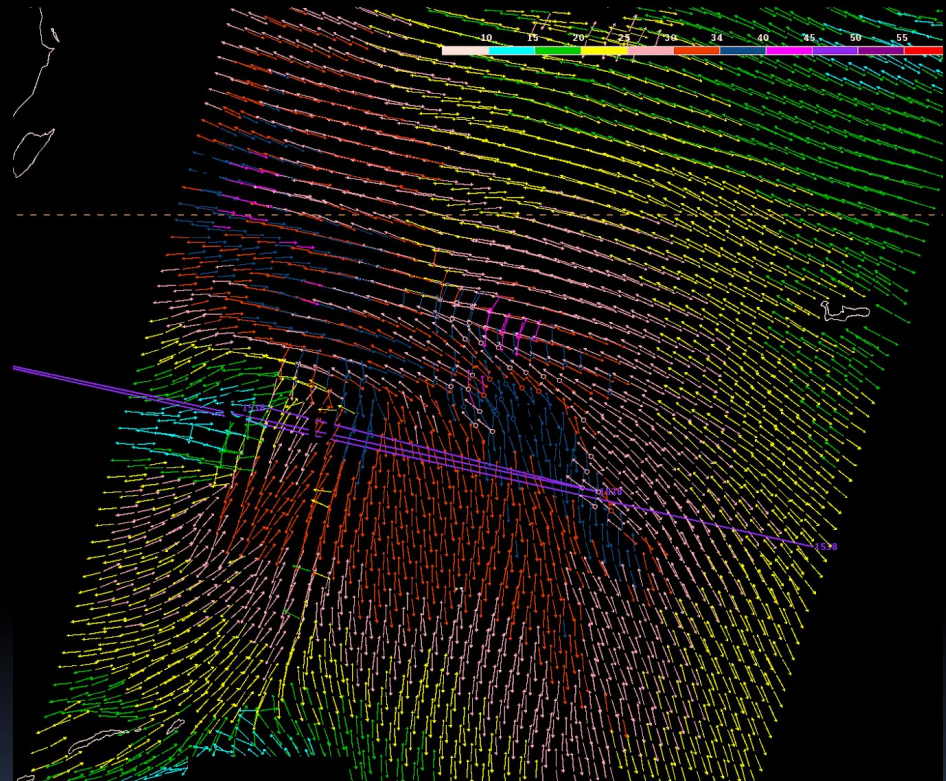
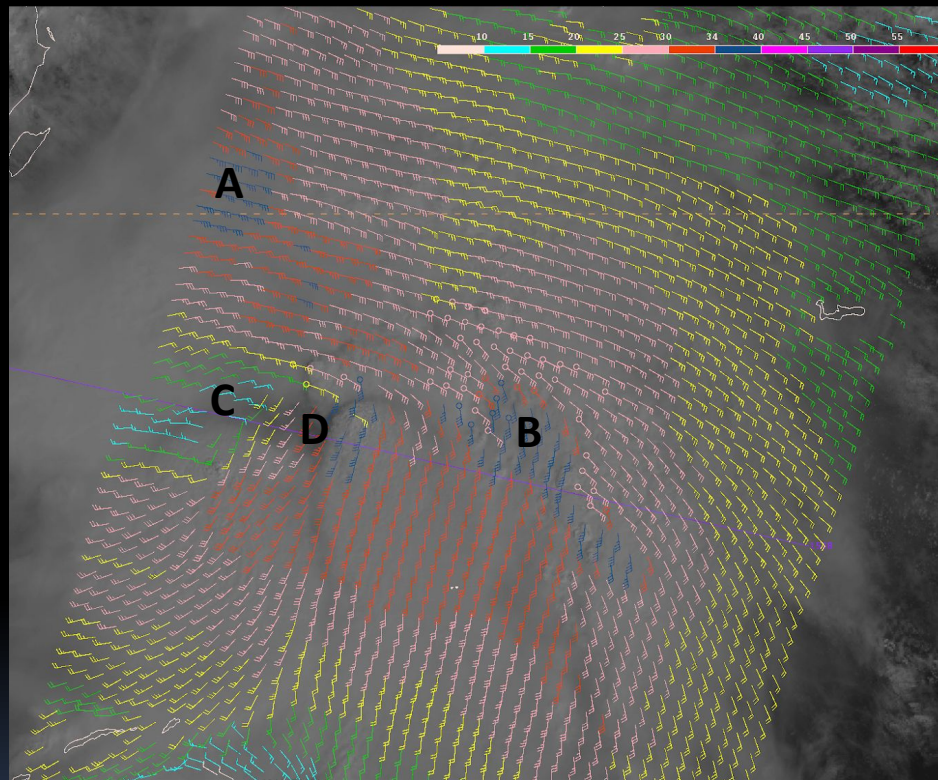


ASCAT-B 1514 UTC Ambiguities

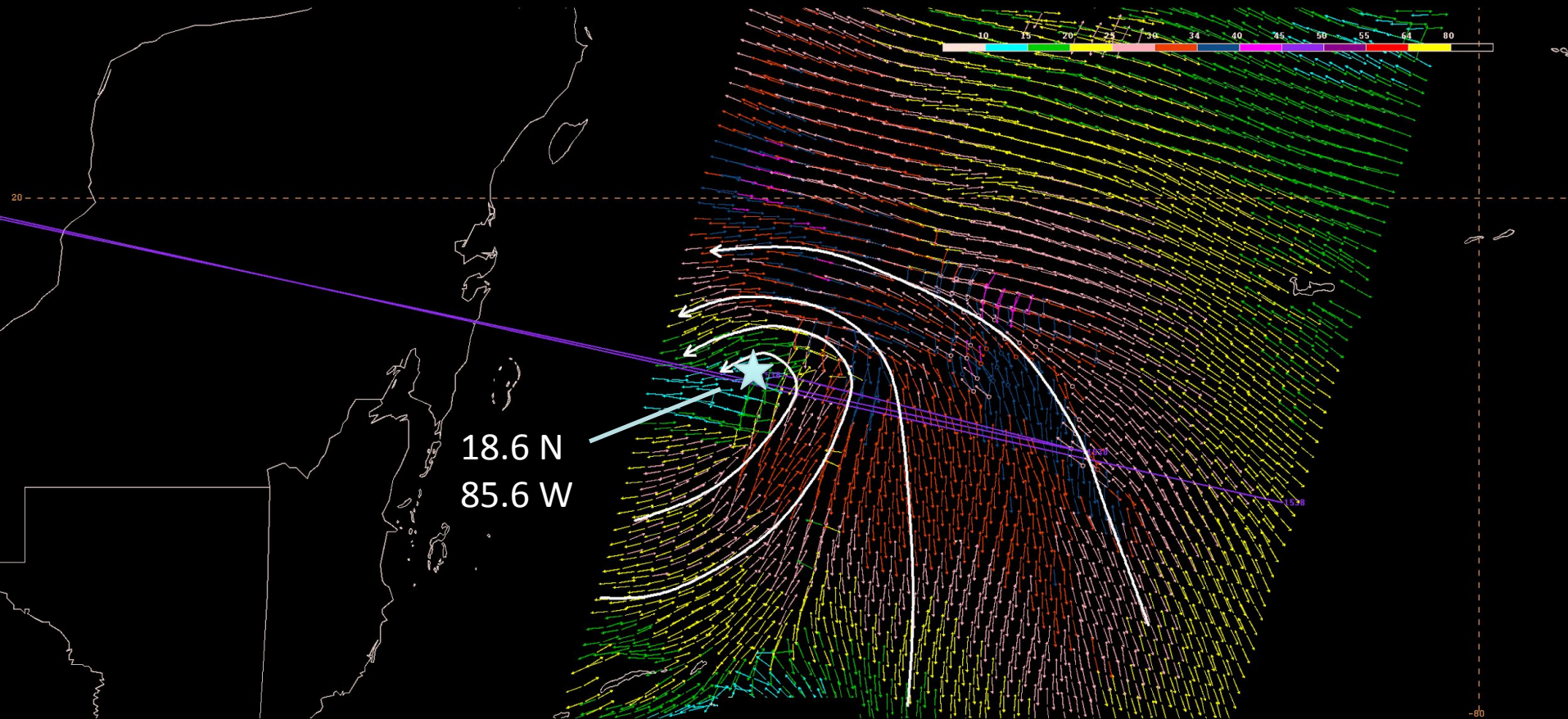


ASCAT-B 1514 UTC

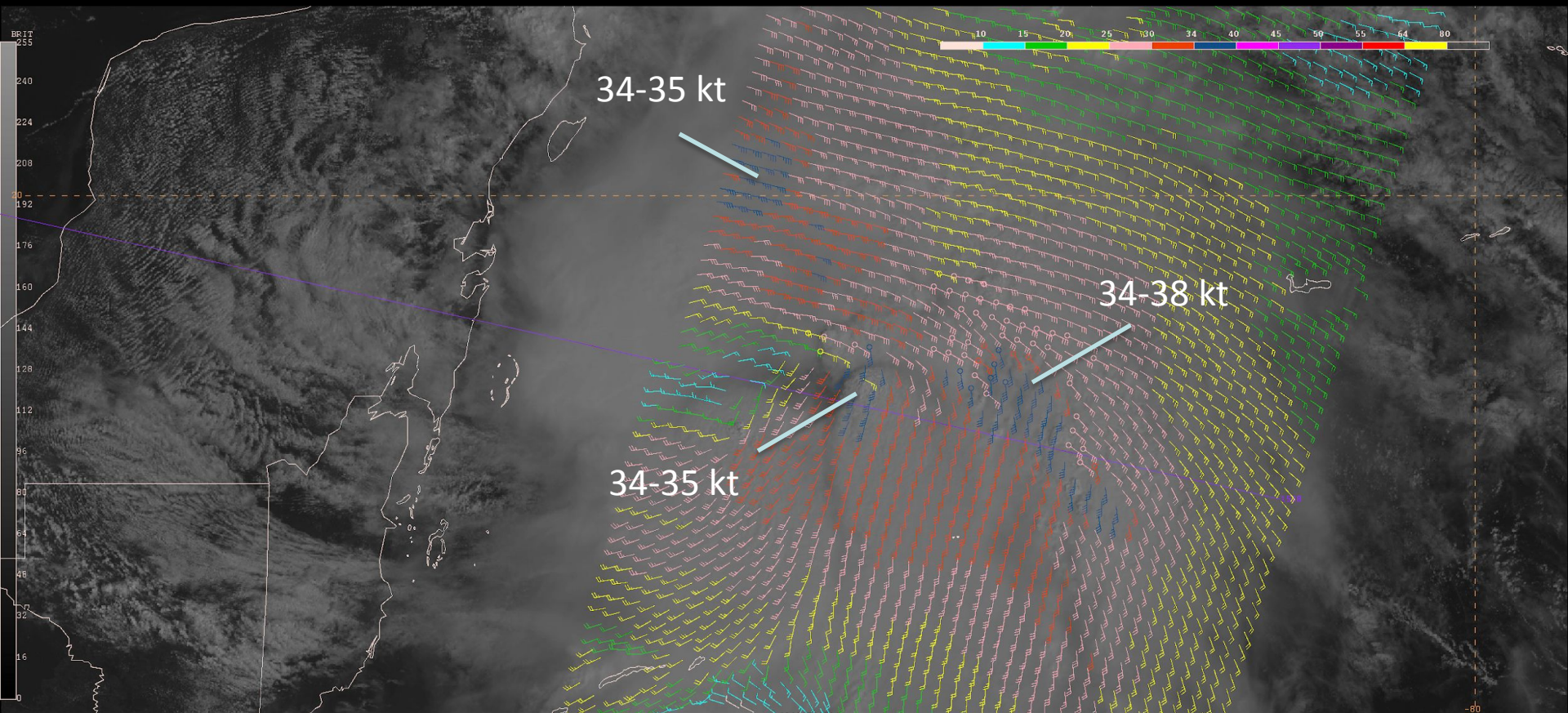
Identify the center of the Tropical Storm



ASCAT-B 1514 UTC

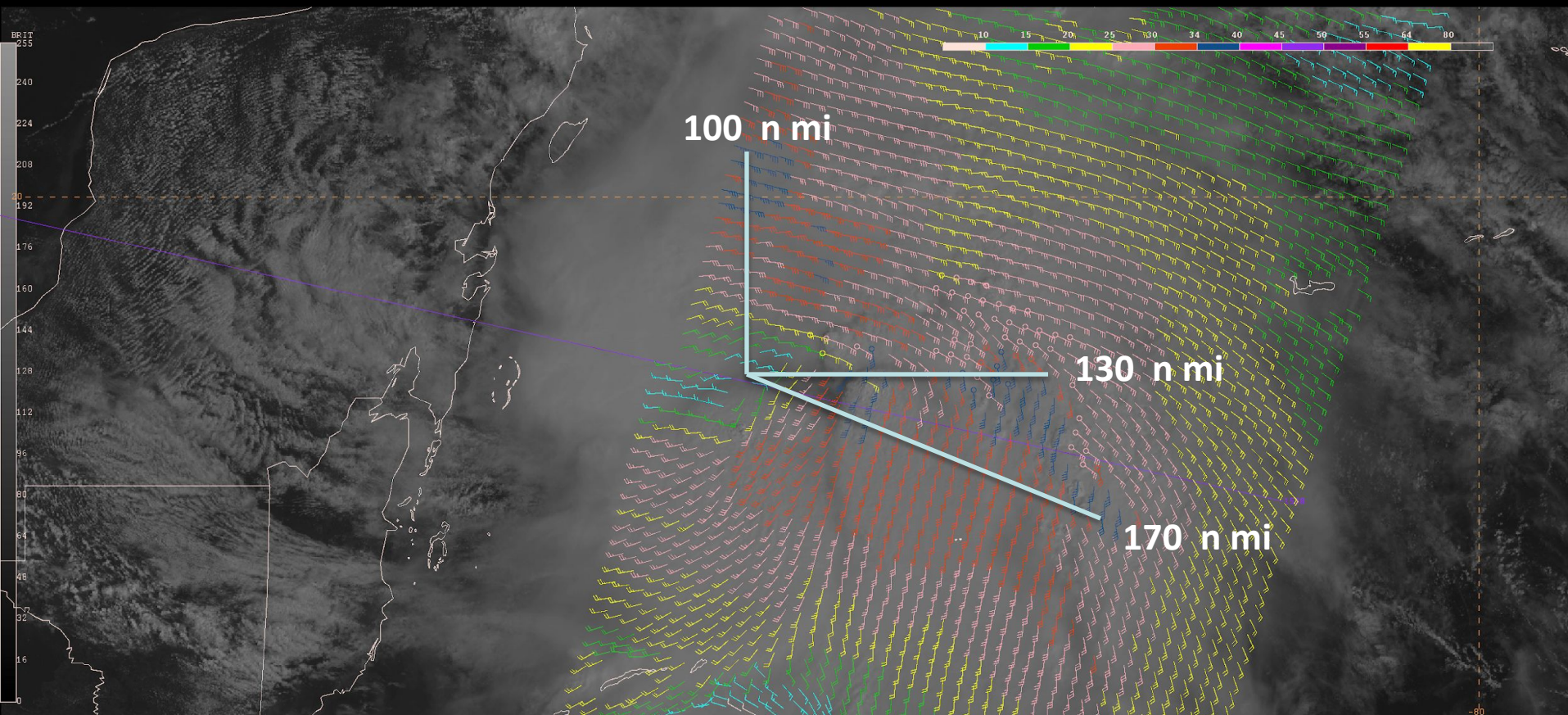


ASCAT-B 1514 UTC Intensity



Several areas of 34+ kt winds, could support an initial intensity of 40 kt after accounting for under-sampling

ASCAT-B 1514 UTC Wind Radii



NW Quadrant: at least 100 n mi (due north)

SW Quadrant: 0 (cut off, but little reason to suspect higher winds are farther west)

NE Quadrant: 130 n mi (almost due east)

SE Quadrant: 170 n mi

Let's enter the fix into the ATCF

Enter Fixes - WMOADJ al682020 (o... x) ATCF - OFCL - Area of Operations (NHC) - WMOADJ al682020 (on nhc-ls-atcfsvr1.nhc.noaa.gov)

Microwave Fix Data - WMOADJ al682020 (on nhc-ls-atcfsvr1.nhc.noaa.gov)

C/I Center Fix Max Wind Speed Fix Wind Radii Fix Min Sfc Pressure Fix

* DTG (YYYYMMDDHHMM) 202004161514

Lat 18.6 N Lon 85.6 W Confidence Good Fair Poor

* Satellite Type ASCT

Max. Wind Speed 38 kts Confidence Good Fair Poor

| | 94 kt winds (nm) | 50 kt winds (nm) | 64 kt winds (nm) |
|----|------------------|------------------|------------------|
| NE | 130 | | |
| SE | 170 | | |
| SW | 0 | | |
| NW | 100 | | |

Radii Conf. Good Fair Poor Good Fair Poor Good Fair Poor

Rain Rain rate mm/h Rain Algorithm FNMOC NESDIS RSS

SLP mb Confidence Good Fair Poor

Temp celsius Eye Diameter nm Wave Height feet Max Seas feet


Comments

* Fix Site NHC

Initials DAZ

* Fields marked with an asterisk (*) are required.

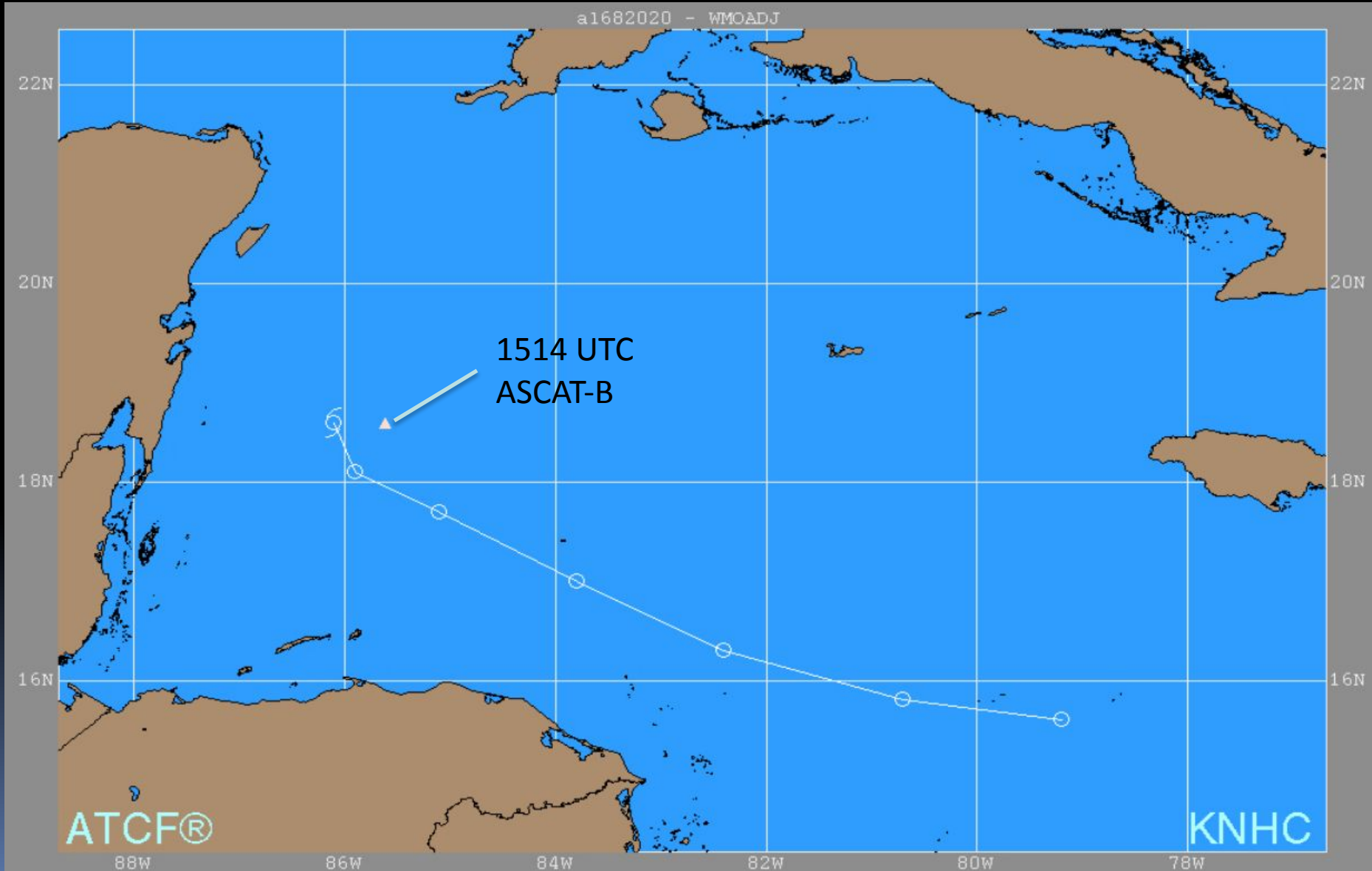
OK Cancel



Images:
Fields
raw data
clean map

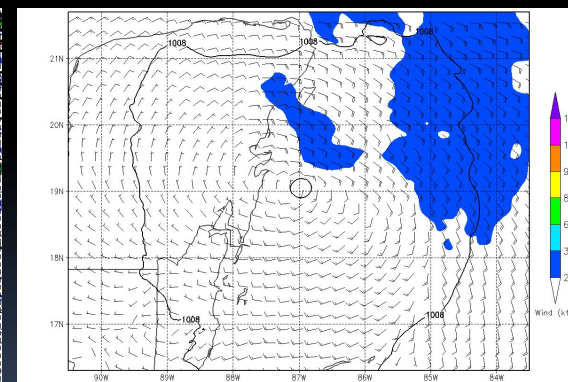
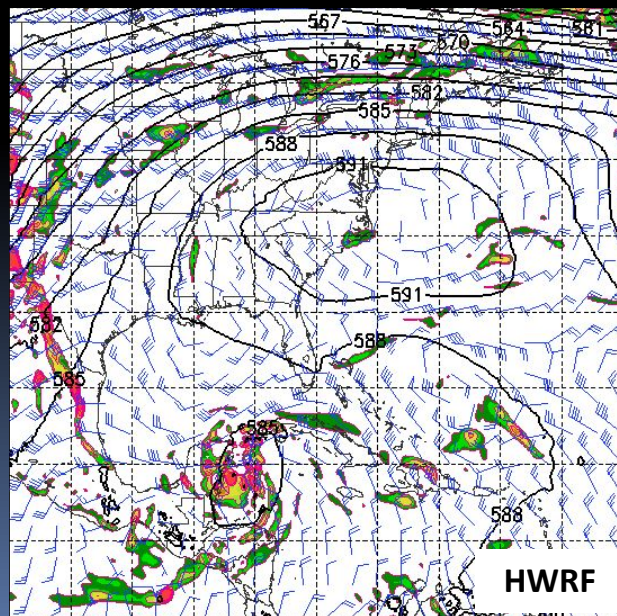
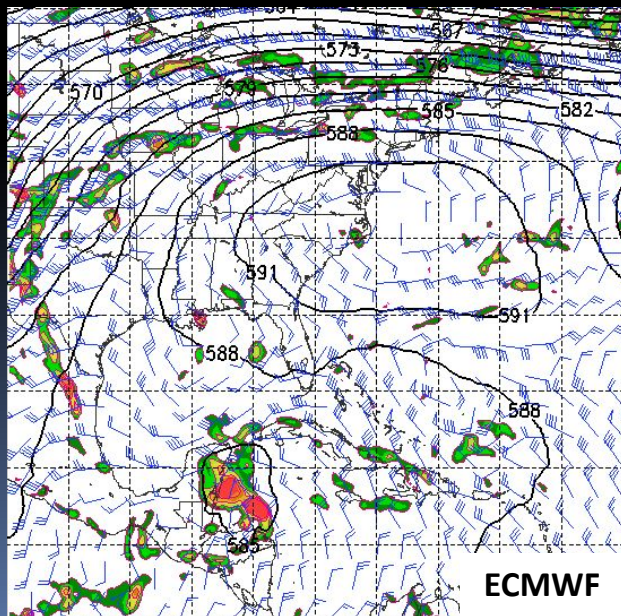
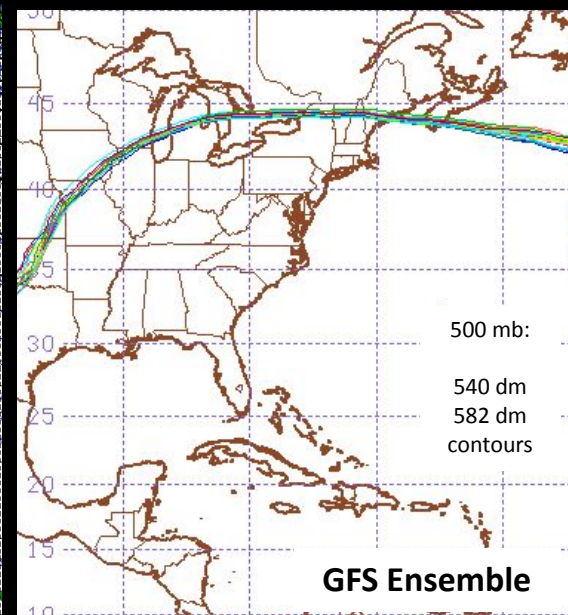
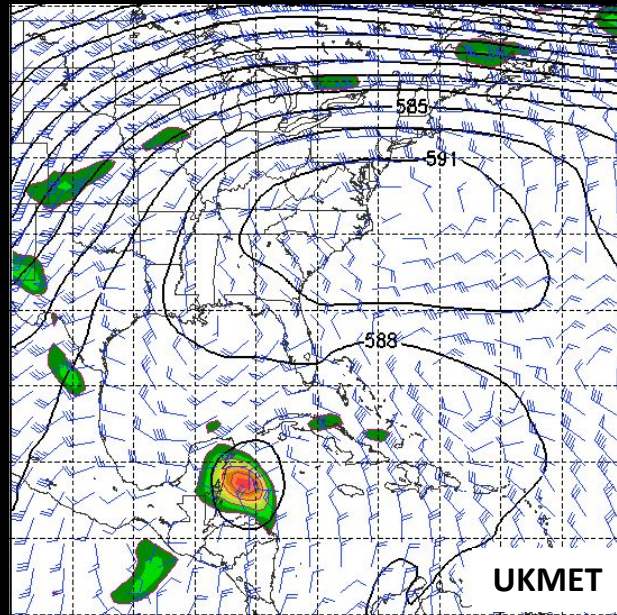
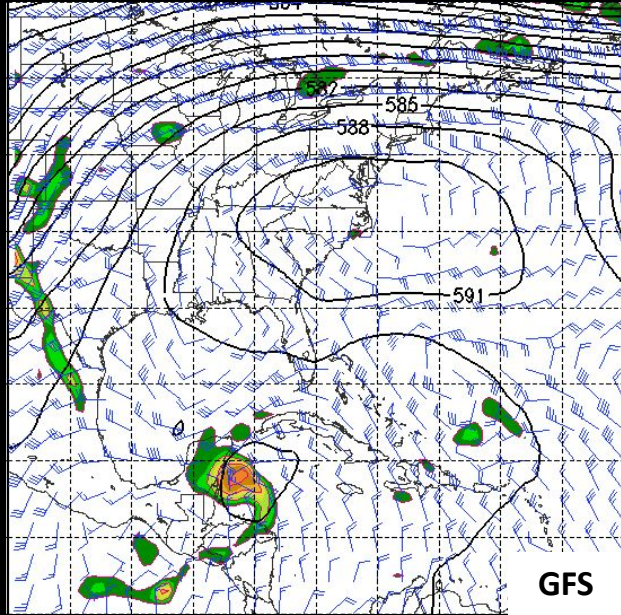
ATCF® KNHC

Working Best Track with 1514 UTC ASCAT-B Fix

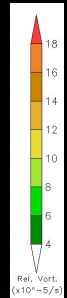
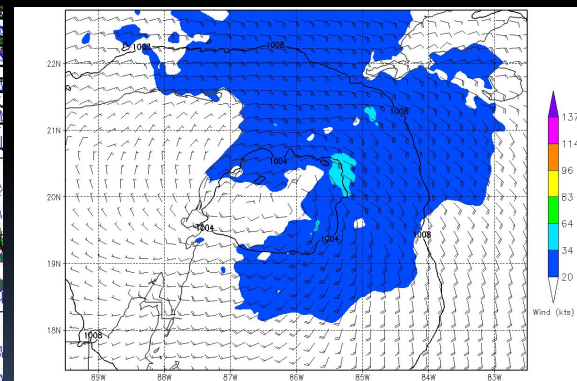
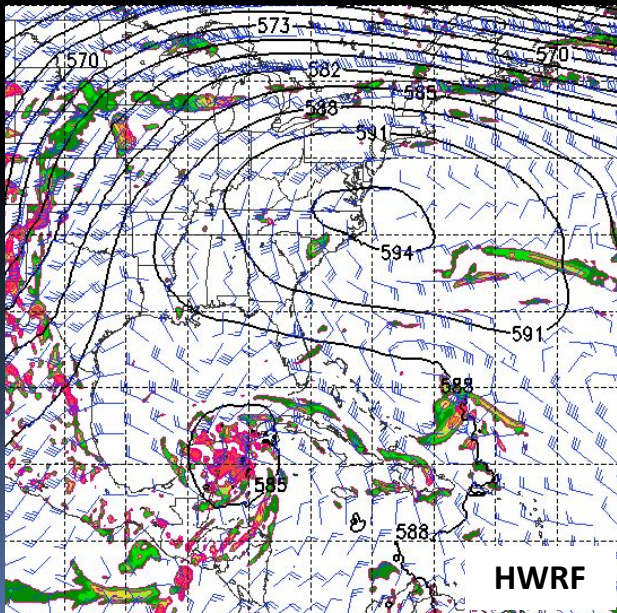
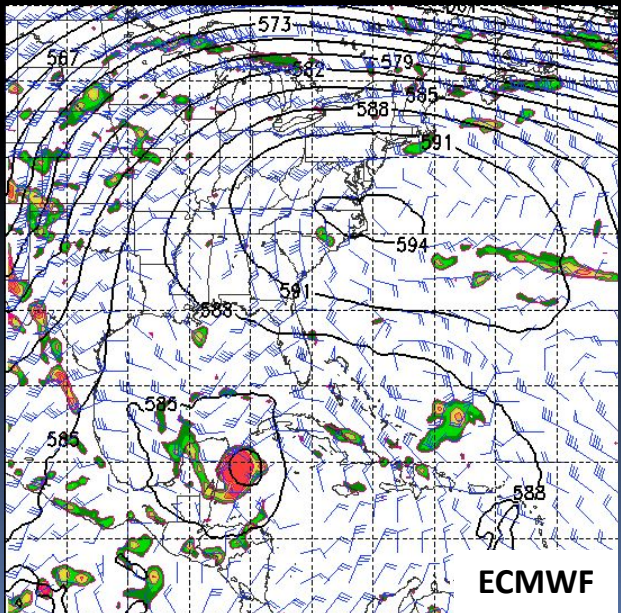
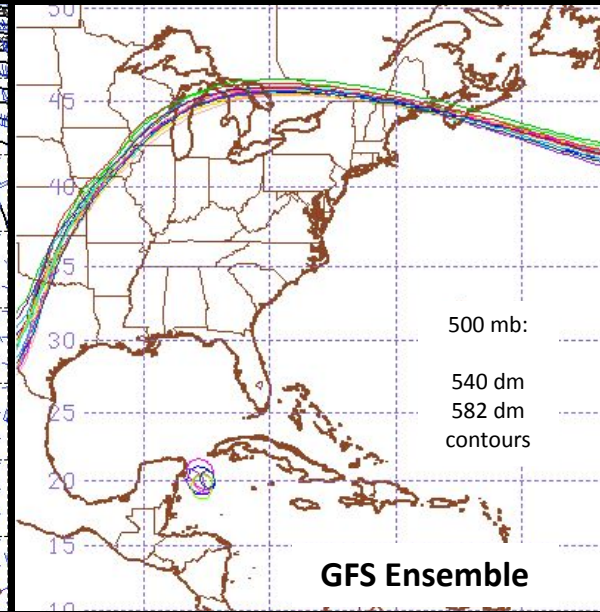
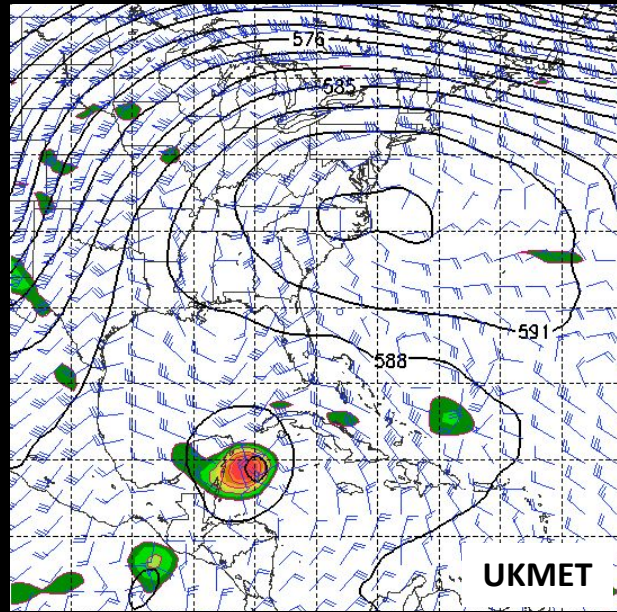
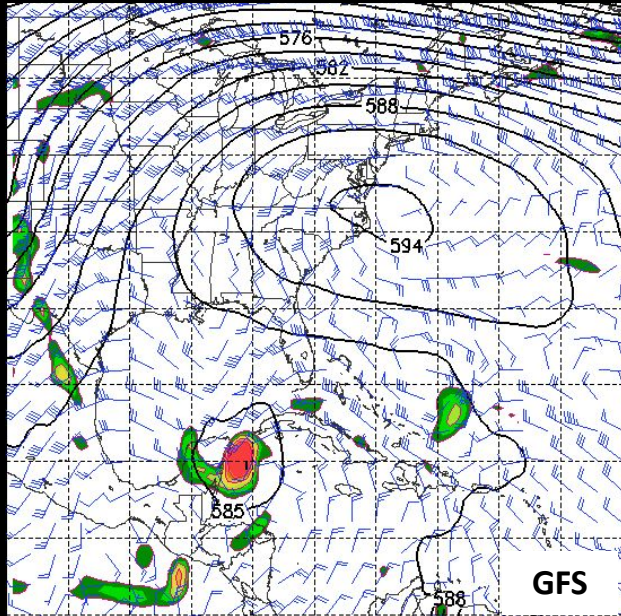


**While we wait for the Aircraft
and Satellite Fixes...
let's examine the 1200 UTC
model guidance**

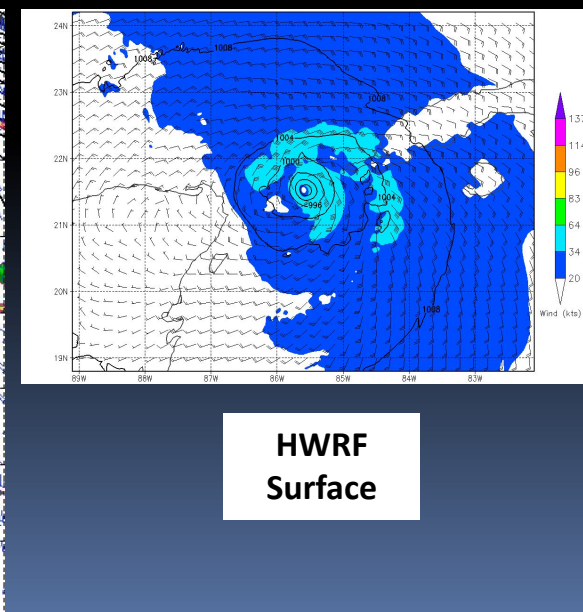
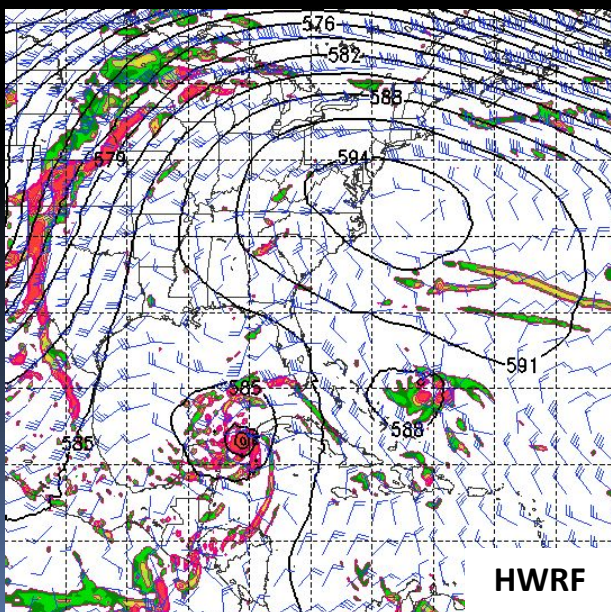
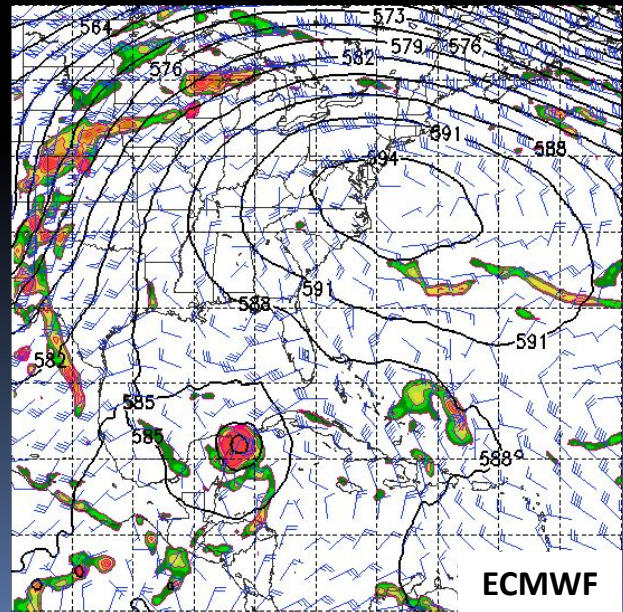
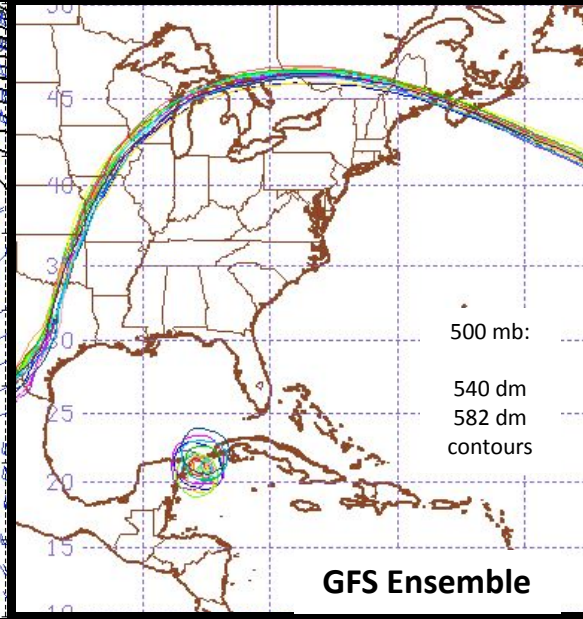
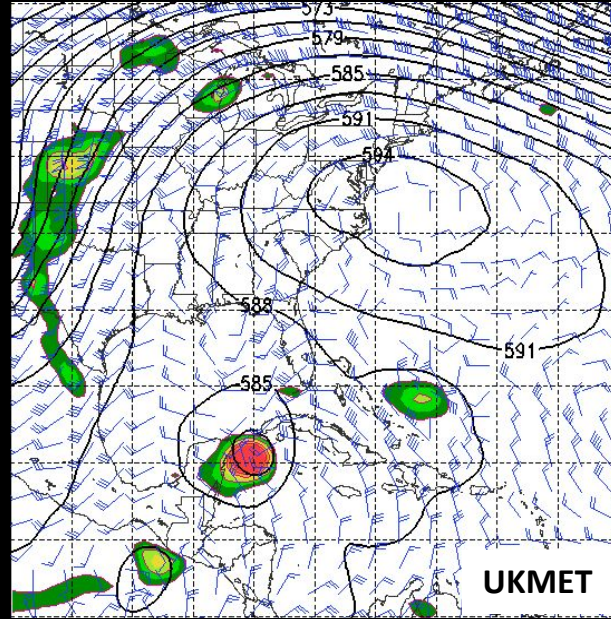
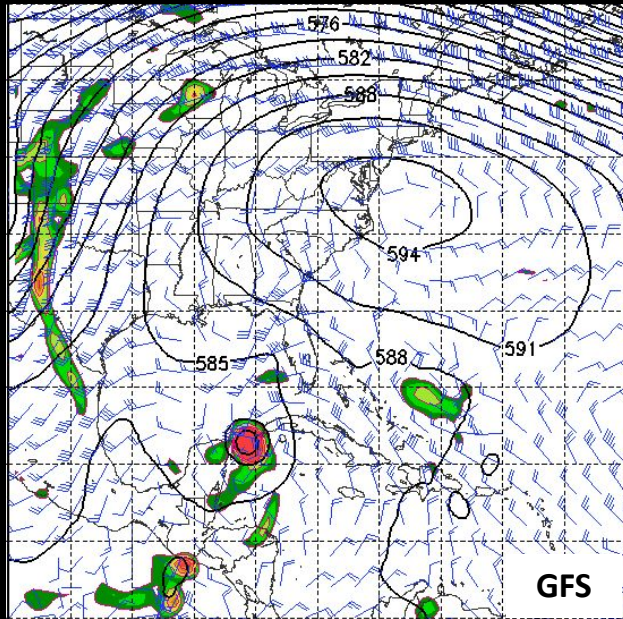
00h (initial conditions)



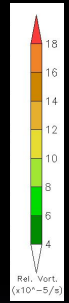
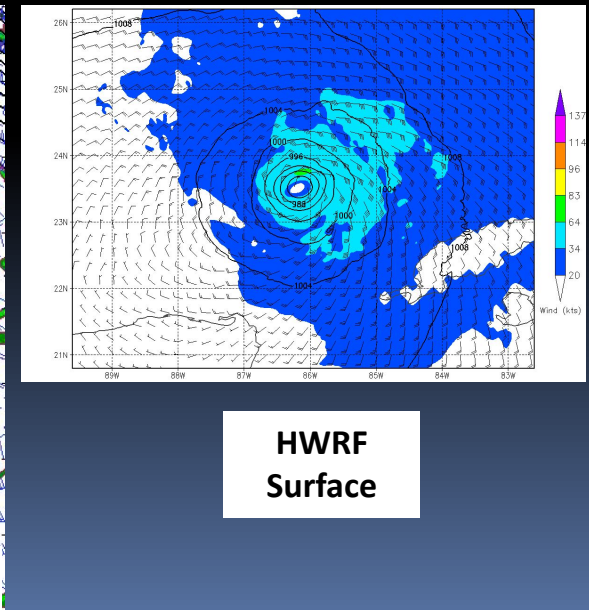
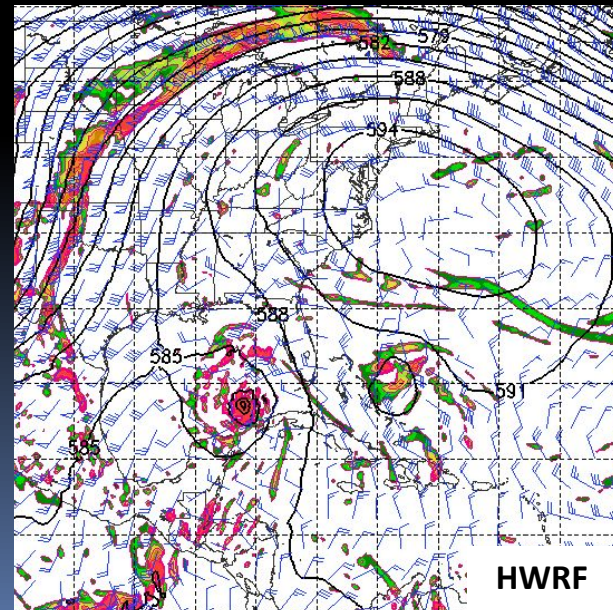
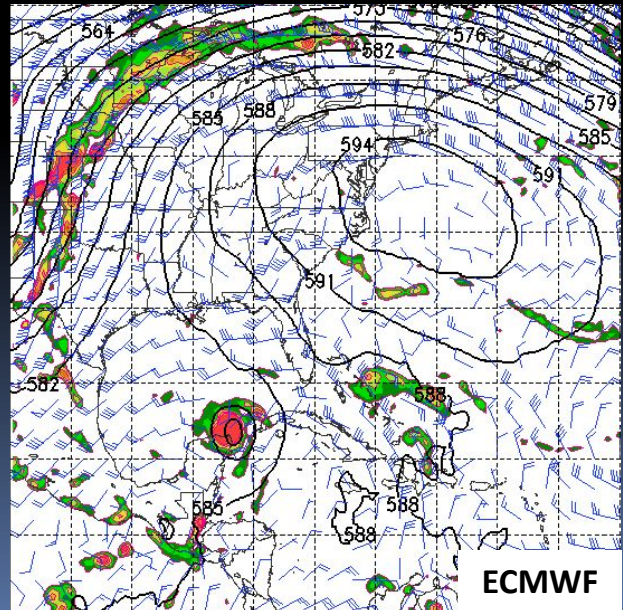
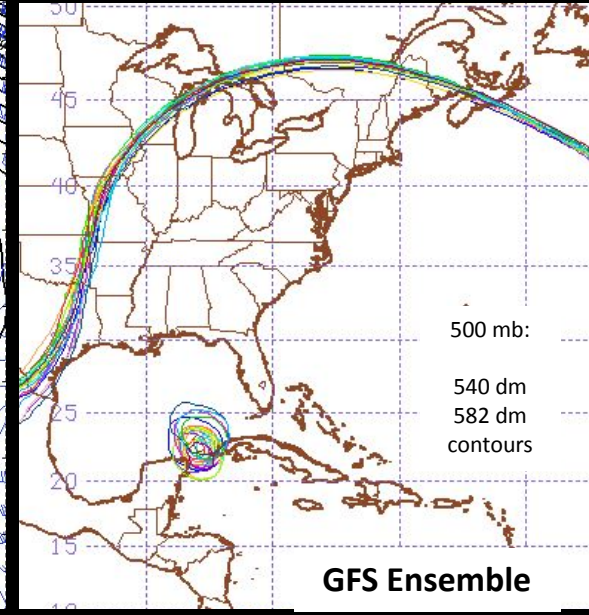
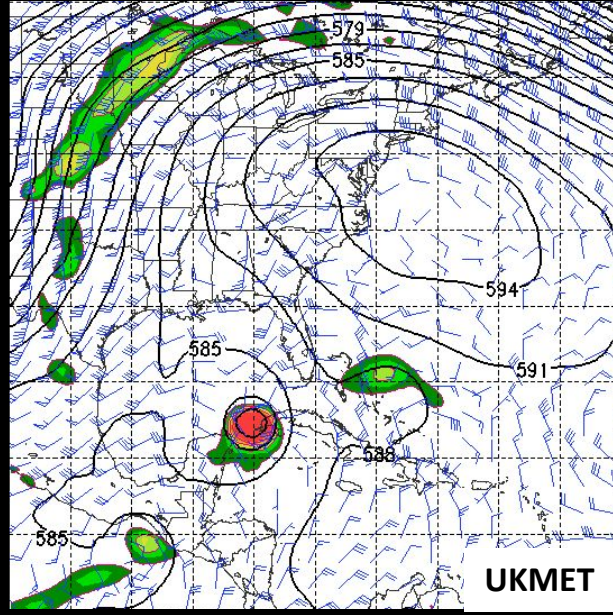
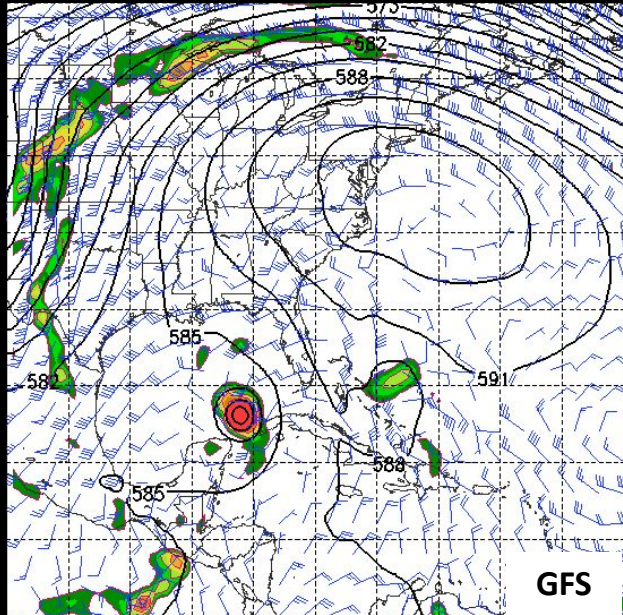
12h forecast



24h forecast

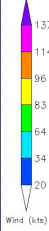
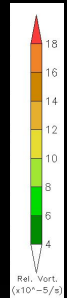
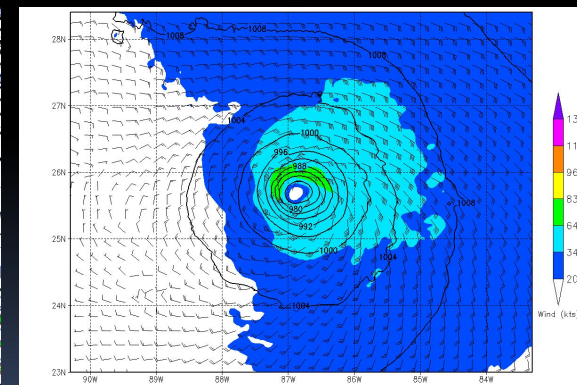
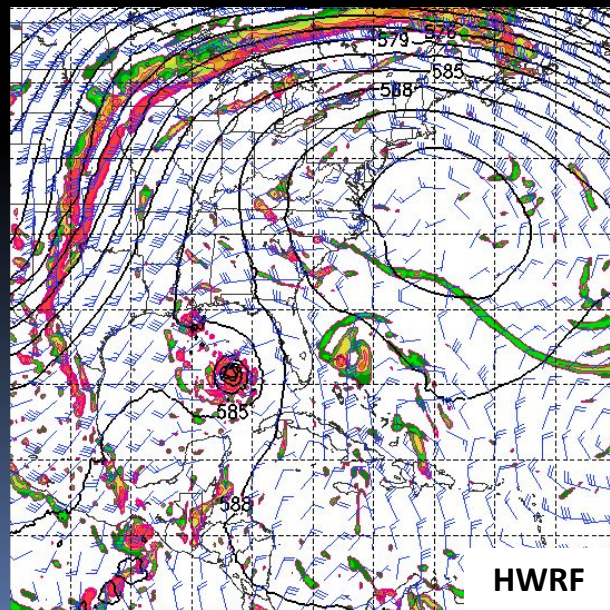
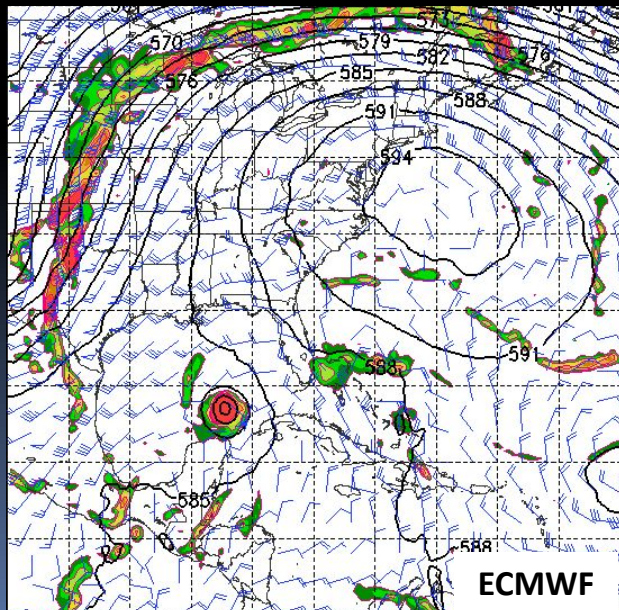
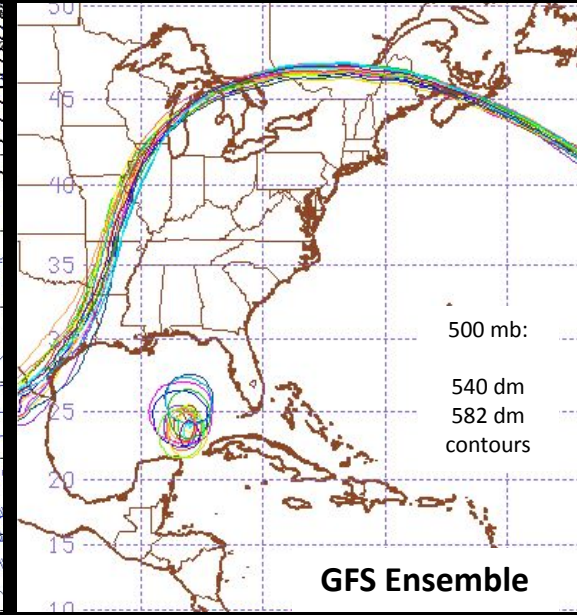
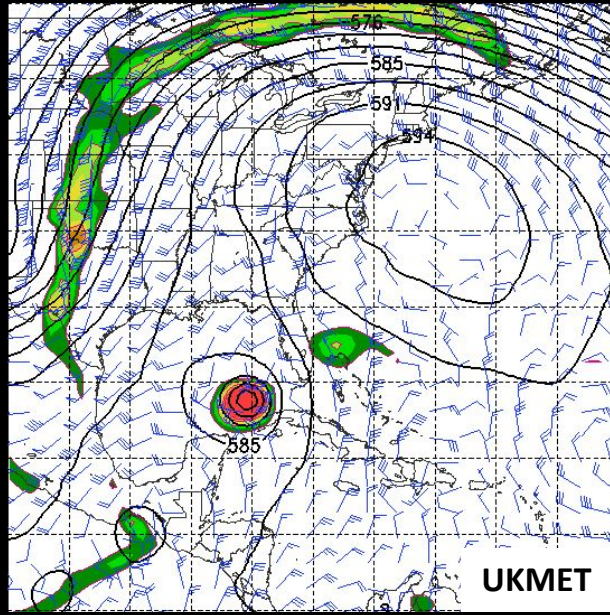
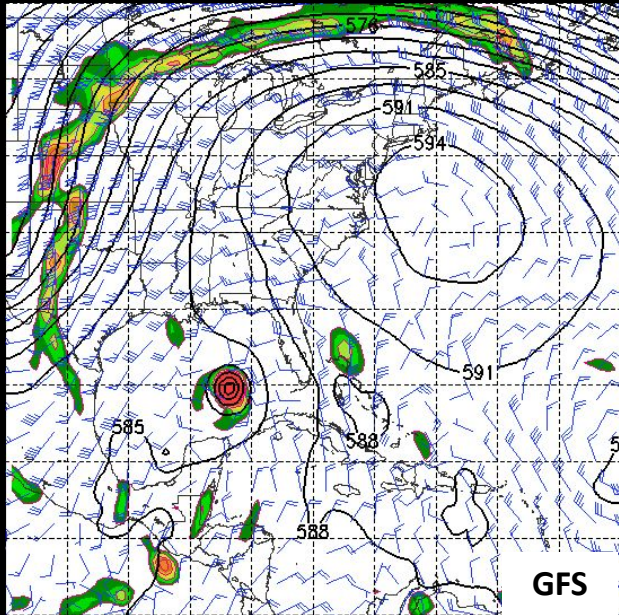


36h forecast

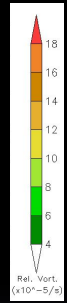
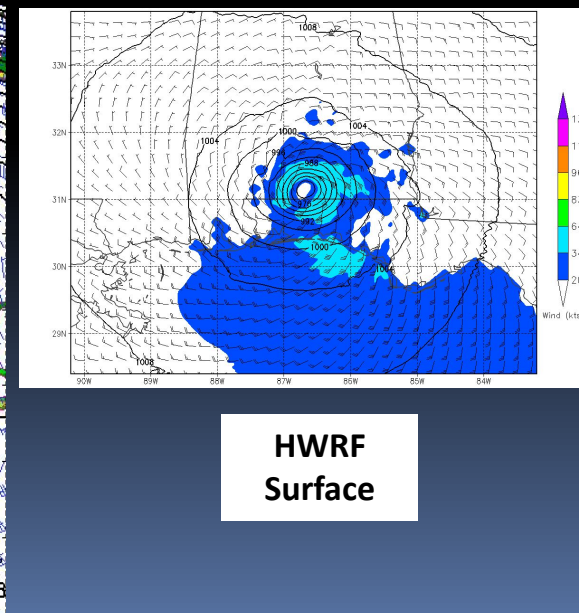
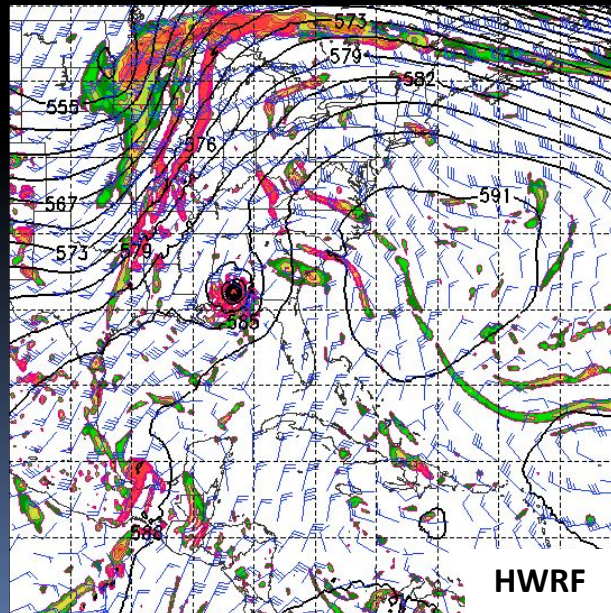
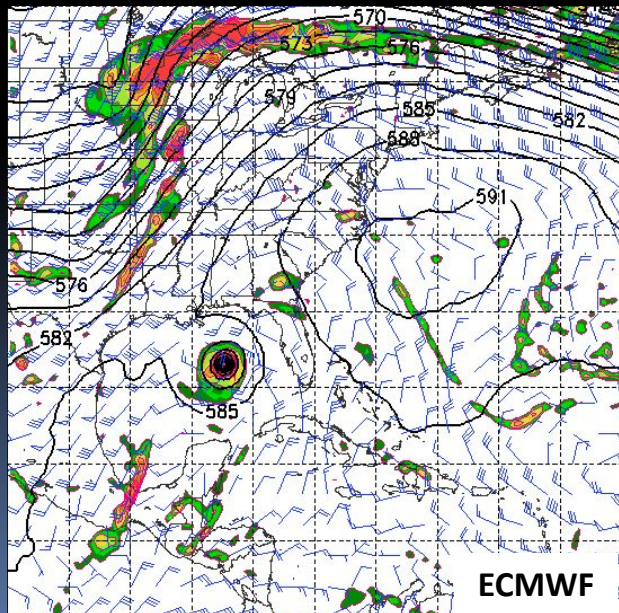
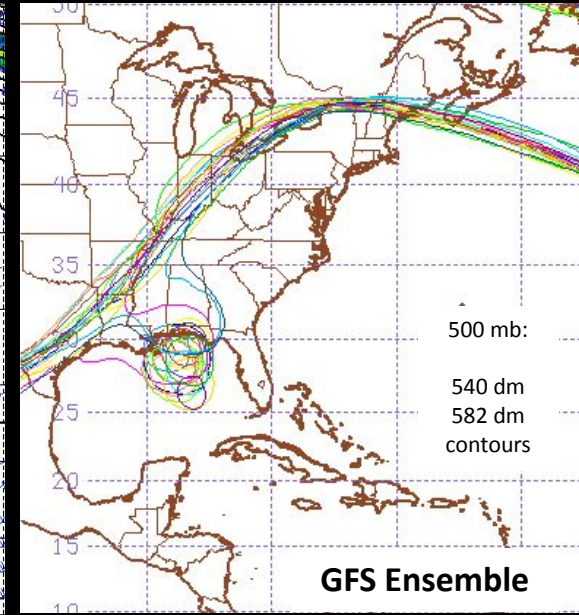
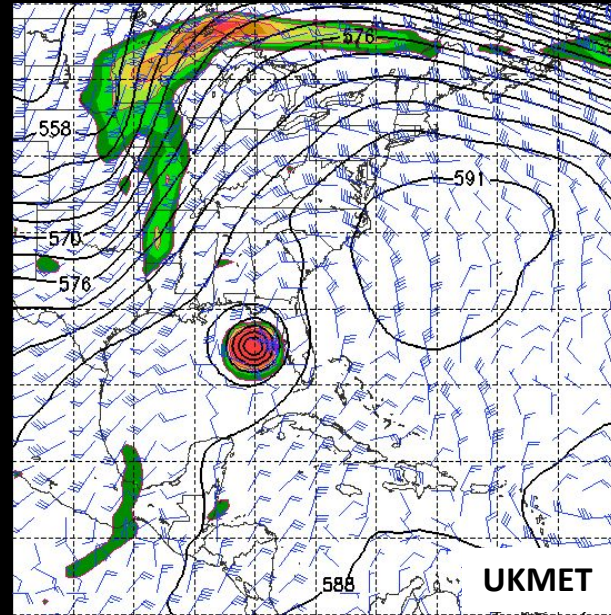
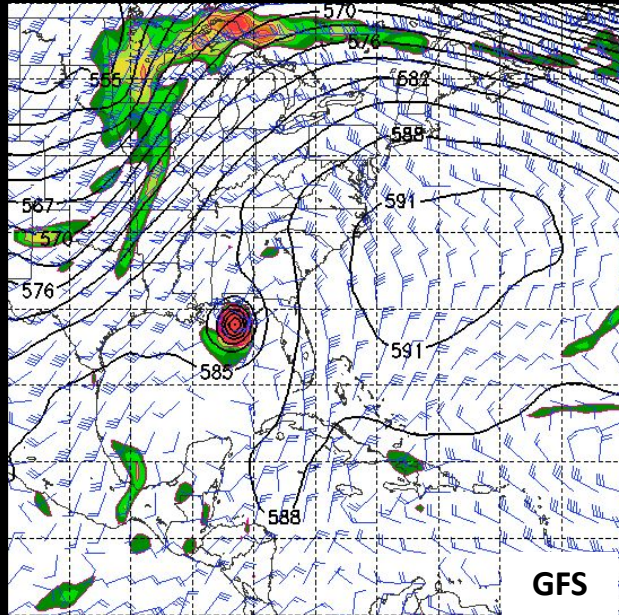


500 mb:
540 dm
582 dm
contours

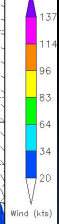
48h forecast



72h forecast



500 mb:
540 dm
582 dm
contours



18:00-18:30 UTC

Receive fix data

Hurricane specialist receives estimates of location and intensity via satellite imagery from 2 different agencies

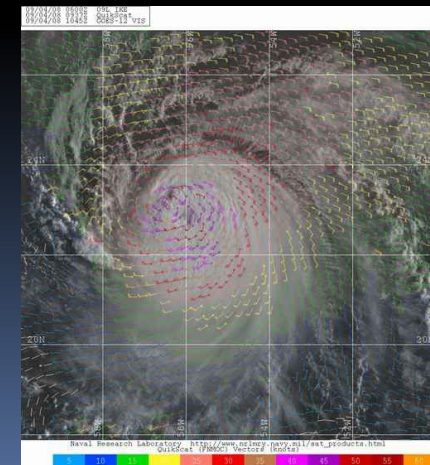
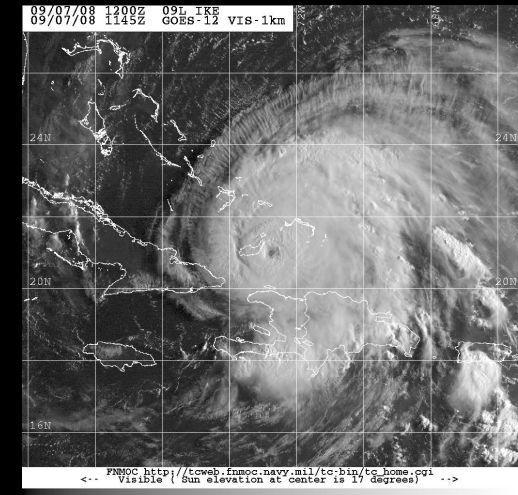
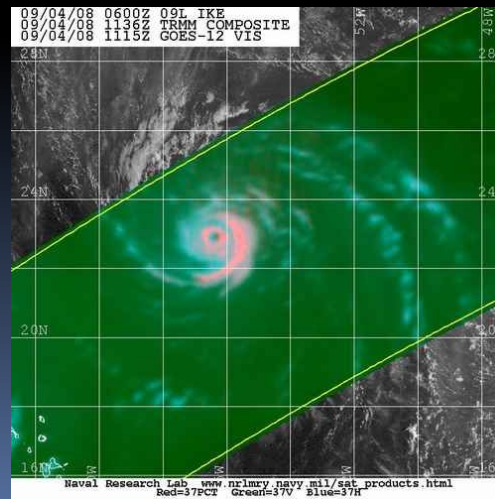
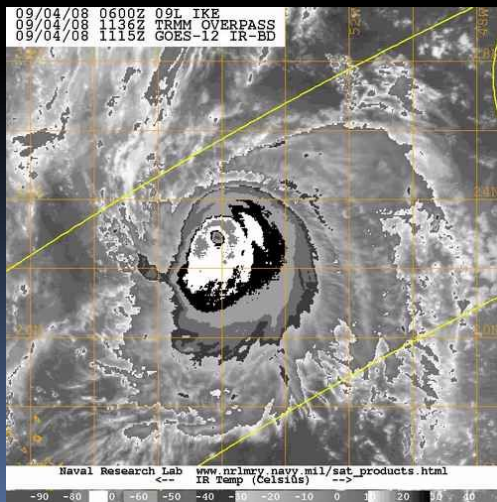
Determine the center location

Determine past motion (6-12 h)

Determine the intensity/wind speed

Determine various wind radii

34-, 50-, and 64-kt (when applicable)



18:00-18:30 UTC

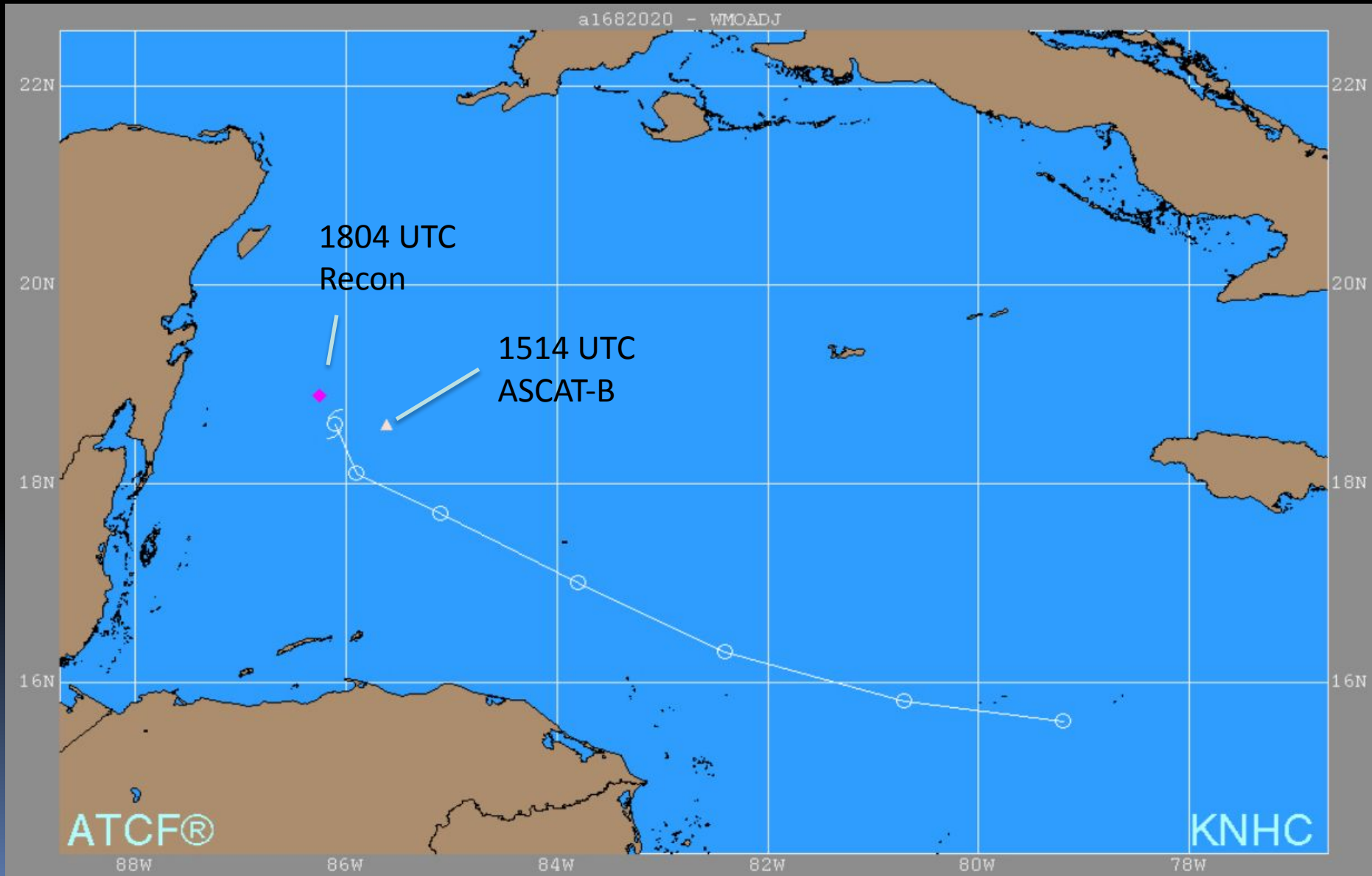
Receive fix data

```
000
URNT12 KNHC 161845
VORTEX DATA MESSAGE AL502020
A. 16/18:05:20Z
B. 18.89 deg N 086.24 deg W Position
C. 925 mb 714 m
D. EXTRAP 1001 mb Minimum pressure
E. NA
F. NA
G. NA
H. 40 kt Maximum surface wind
I. 003 deg 57 nm 17:45:00Z
J. 087 deg 42 kt
K. 010 deg 70 nm 17:41:00Z
L. 39 kt
M. 133 deg 81 nm 18:33:30Z
N. 225 deg 48 kt
O. 133 deg 105 nm 18:42:00Z
P. 21 C / 766 m
Q. 23 C / 757 m
R. 20 C / NA Maximum flight
S. 1345 / 9 level wind
T. 0.02 / 7 nm
U. AF305 0114A CYCLONE OB 07
MAX FL WIND 48 KT 133 / 105 NM 18:32:00Z
SLP EXTRAP FROM 925 MB
;
```

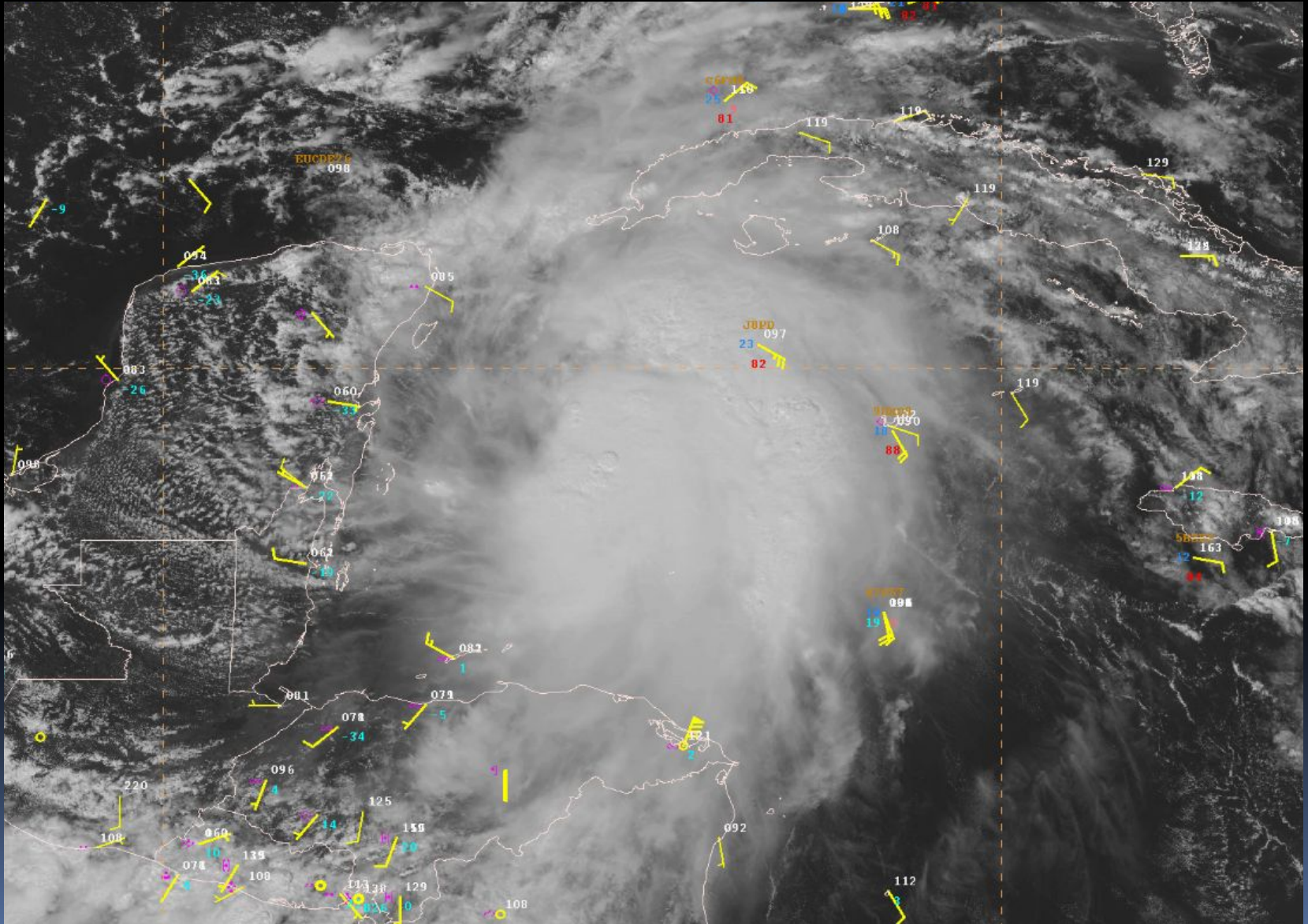
The first reconnaissance mission of this storm is underway, and the plane located the center of the tropical storm just after 18Z. Final fix with an outbound maximum flight-level wind of 48 kt, that equates to 36 kt (75%) at the surface.

Let's see how this compares to the ASCAT fix while we wait for the Dvorak fixes to arrive

Working Best Track with 1804 UTC Aircraft Fix

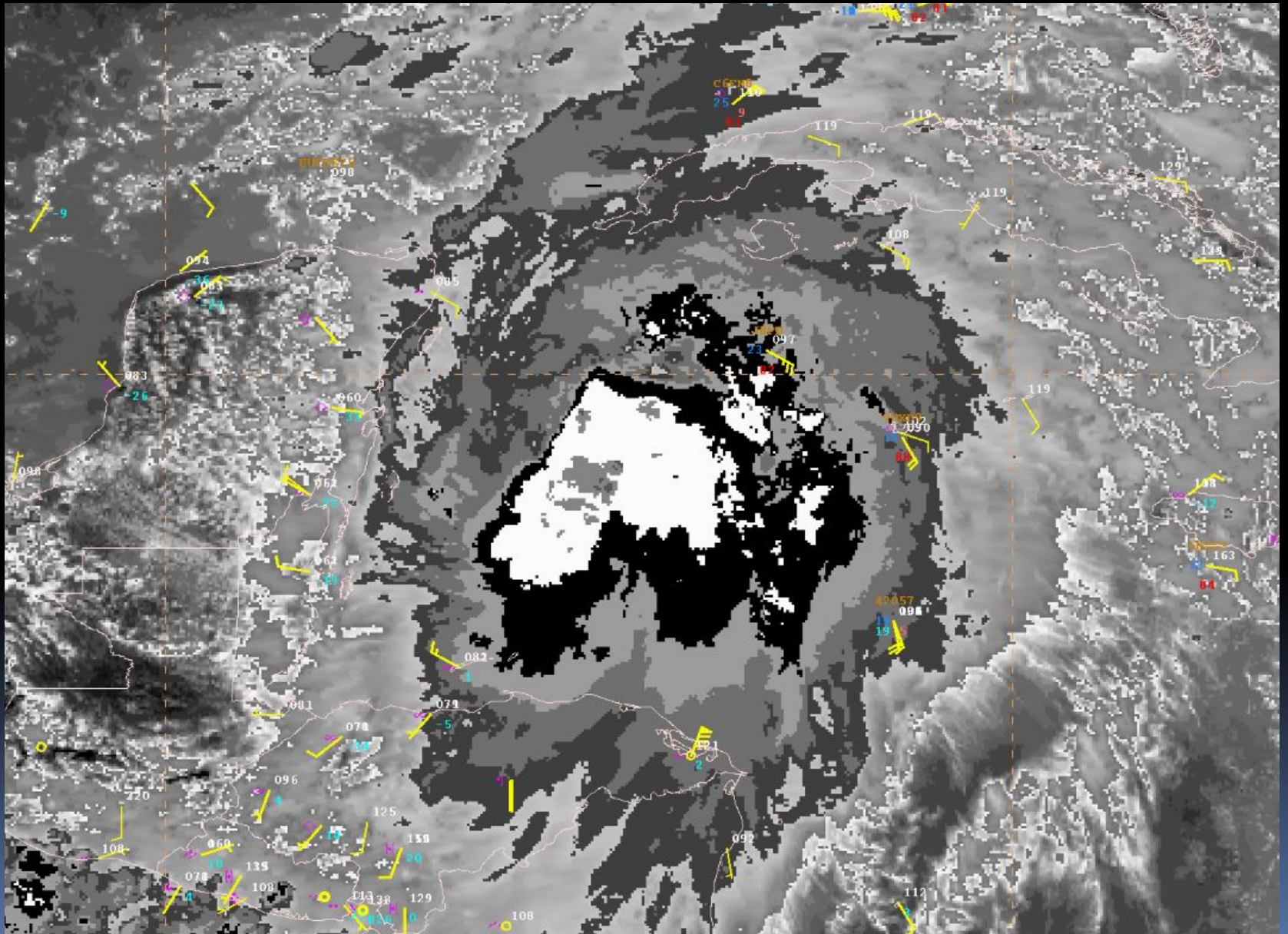


Vis Satellite Image- 1800 UTC



IR Satellite Image- 1800 UTC

BD Enhancement



18:30 UTC

TAFB and SAB Dvorak Satellite Fixes

TAFB SATELLITE CLASSIFICATION

Basin: **Atlantic** Name: **AL682020**
Date: **16 Apr 2020** Time: **18:00** UTC
Latitude: **19.2N** Longitude: **85.6W**
SATELLITE: **GOES16** CHANNEL: **VIS IR** RESOLUTION (KM): **1** LOCATION CONFIDENCE: **5**
CLASSIFICATION TYPE:
Tropical, DT = 2.5 BASED ON Curved Band WITH CF = 2.5 AND BF = 0.0
FINAL T: CURRENT INTENSITY: MAXIMUM WIND (KT): MIN PRESSURE (MB): INTENSITY CONFIDENCE:
2.5 2.5 35 1005 2
24 HR DEV TREND T: MODEL EXPECTED T: PATTERN T:
D 2.0 2.5 A
EYE DIAMETER (NM): METEOROLOGIST:
--- **ASL**
REMARKS:

SAB SATELLITE CLASSIFICATION

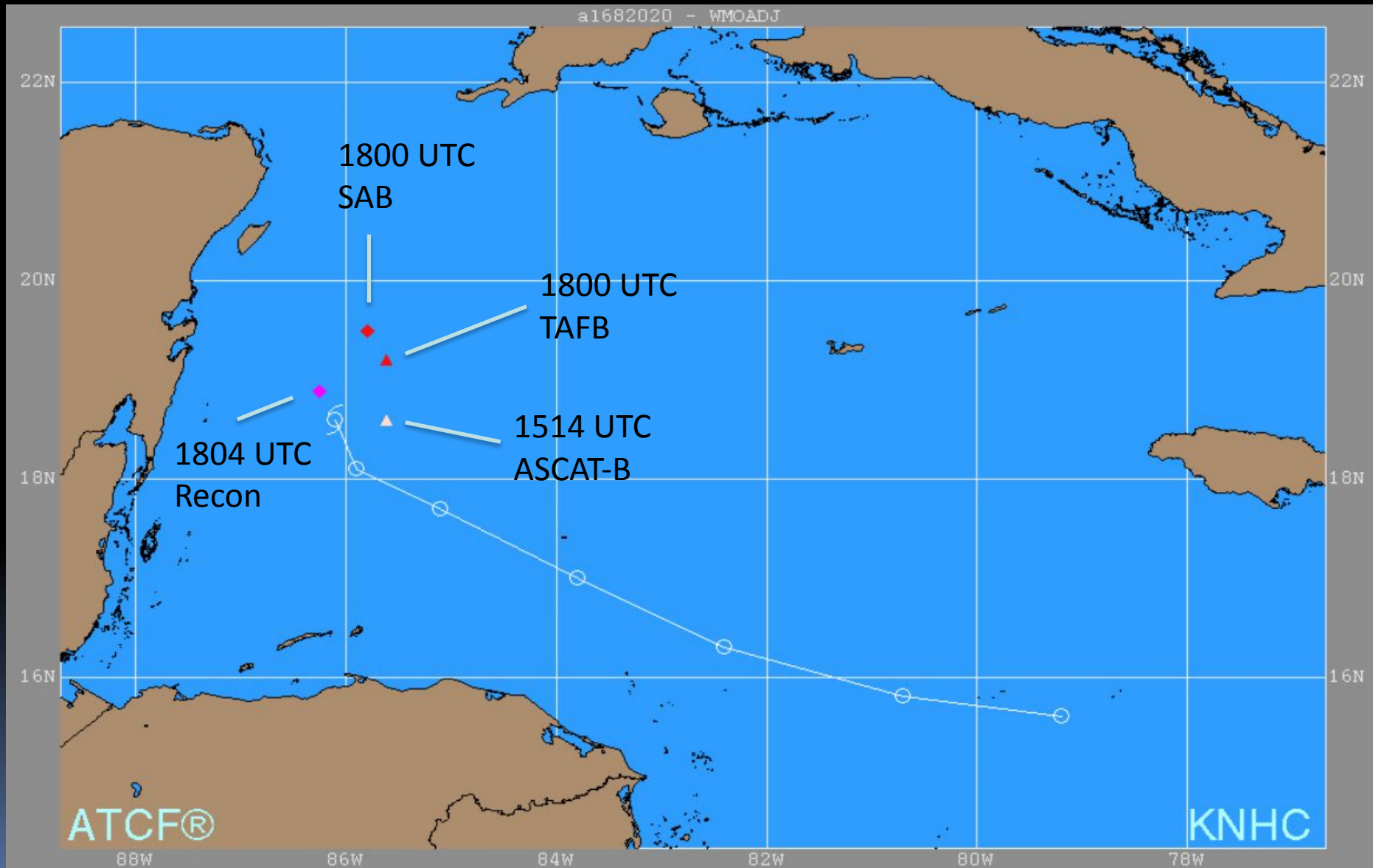
Latitude: **19.5N** Longitude: **85.8W** TIME (UTC): **1745 UTC**
T/CI NUMBER: **2.5/2.5 (35 kt)** SAT: **GOES-16**
LOCATION CONFIDENCE: **3** PIC: **VIM** ANALYST: **BZ**

PREVIOUS TAFB INTERMEDIATE FIX

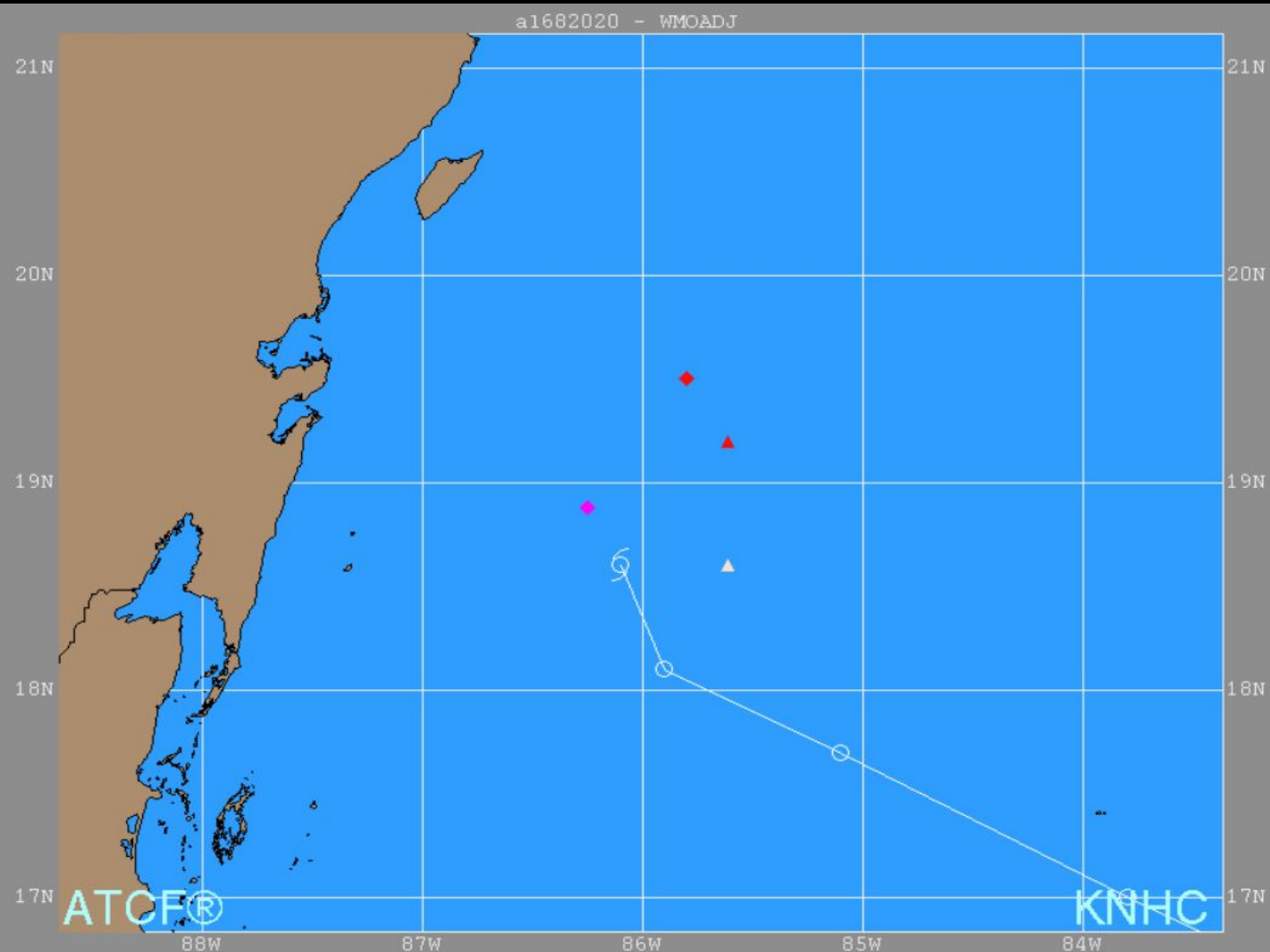
DATE: **16 Apr 2020** TIME (UTC): **15:00**
Latitude: **19.6N** Longitude: **85.8W** SAT: **GOES16**
LOCATION CONFIDENCE: **5** PIC: **VIS IR** ANALYST: **ASL**

Now it's time to enter the Dvorak fixes and see how they compare to the aircraft and the ASCAT

Now that we have all the 18z fixes, let's determine the 18z best-track position and intensity



Where do you think we should center the tropical storm at 18Z?



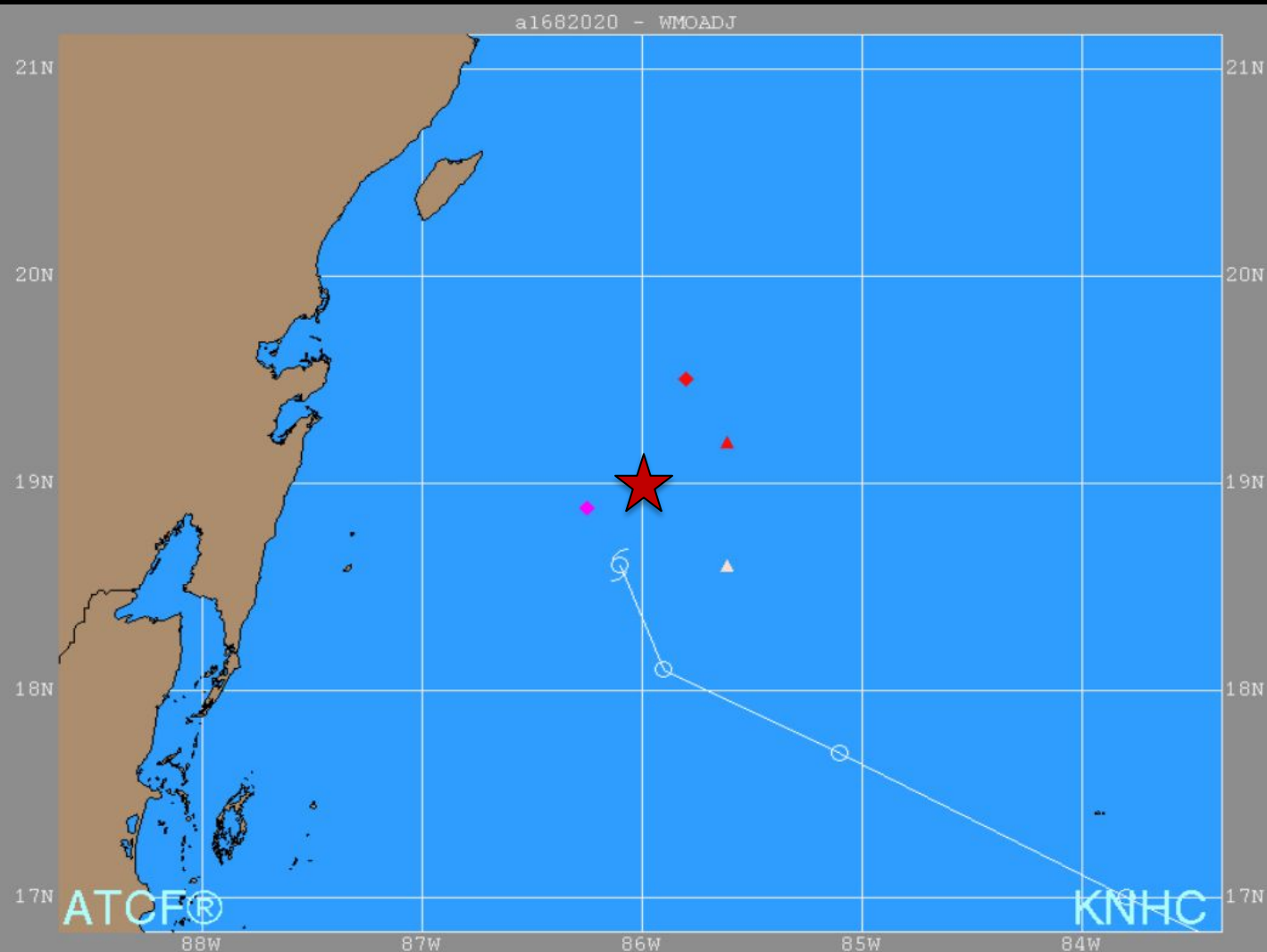
A) 18.9N 86.2W
(recon position)

B) 19.0N 86.0W
(consensus position)

C) 19.3N 85.8W
(Dvorak consensus)

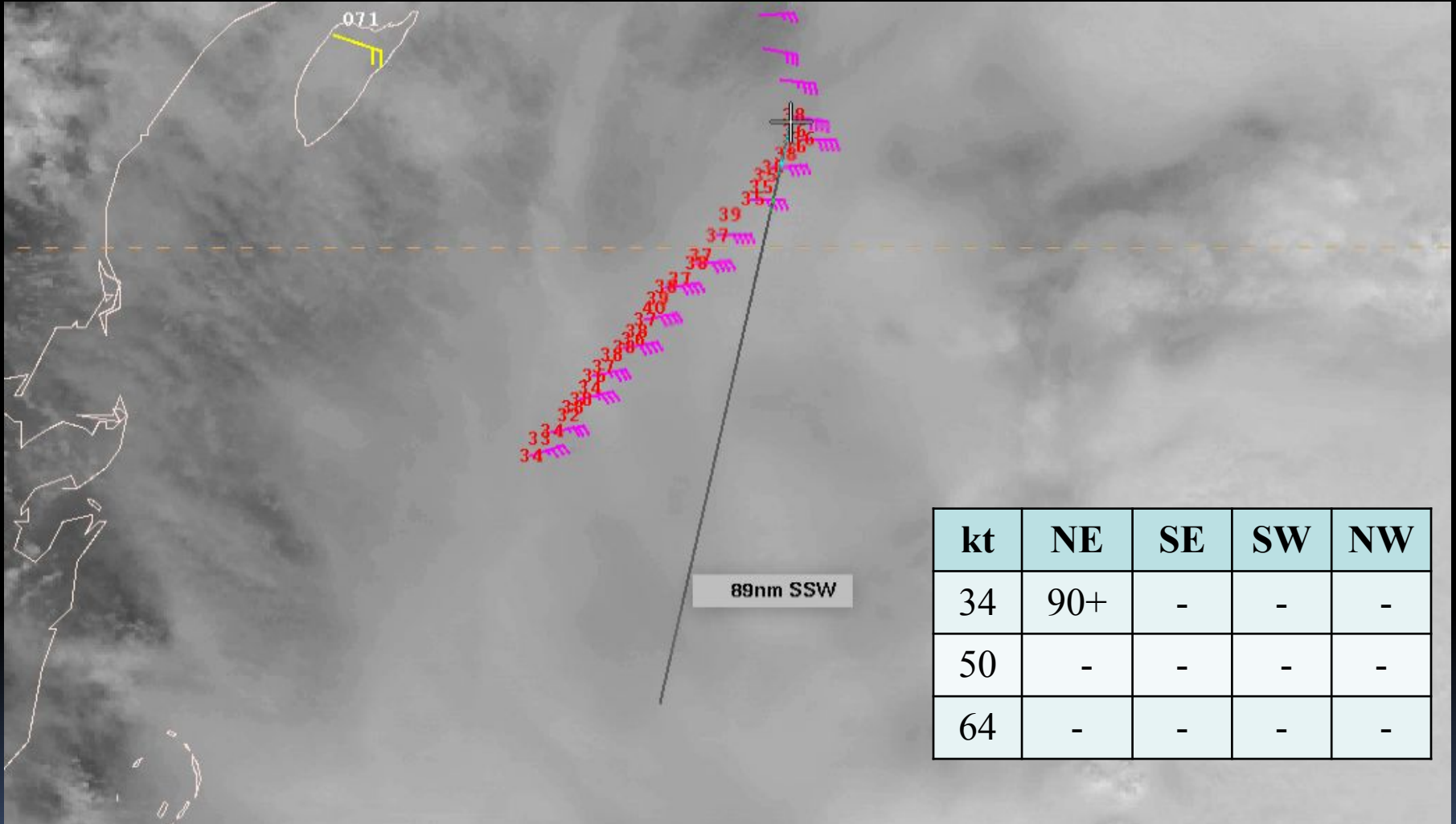
D) Somewhere else

Where do you think we should center the tropical storm at 18Z?

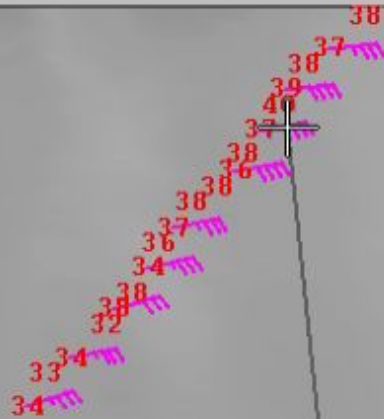


The NHC forecaster selected the consensus position, but noted the uncertainty was higher than usual

Checking Wind Radii from Aircraft Data



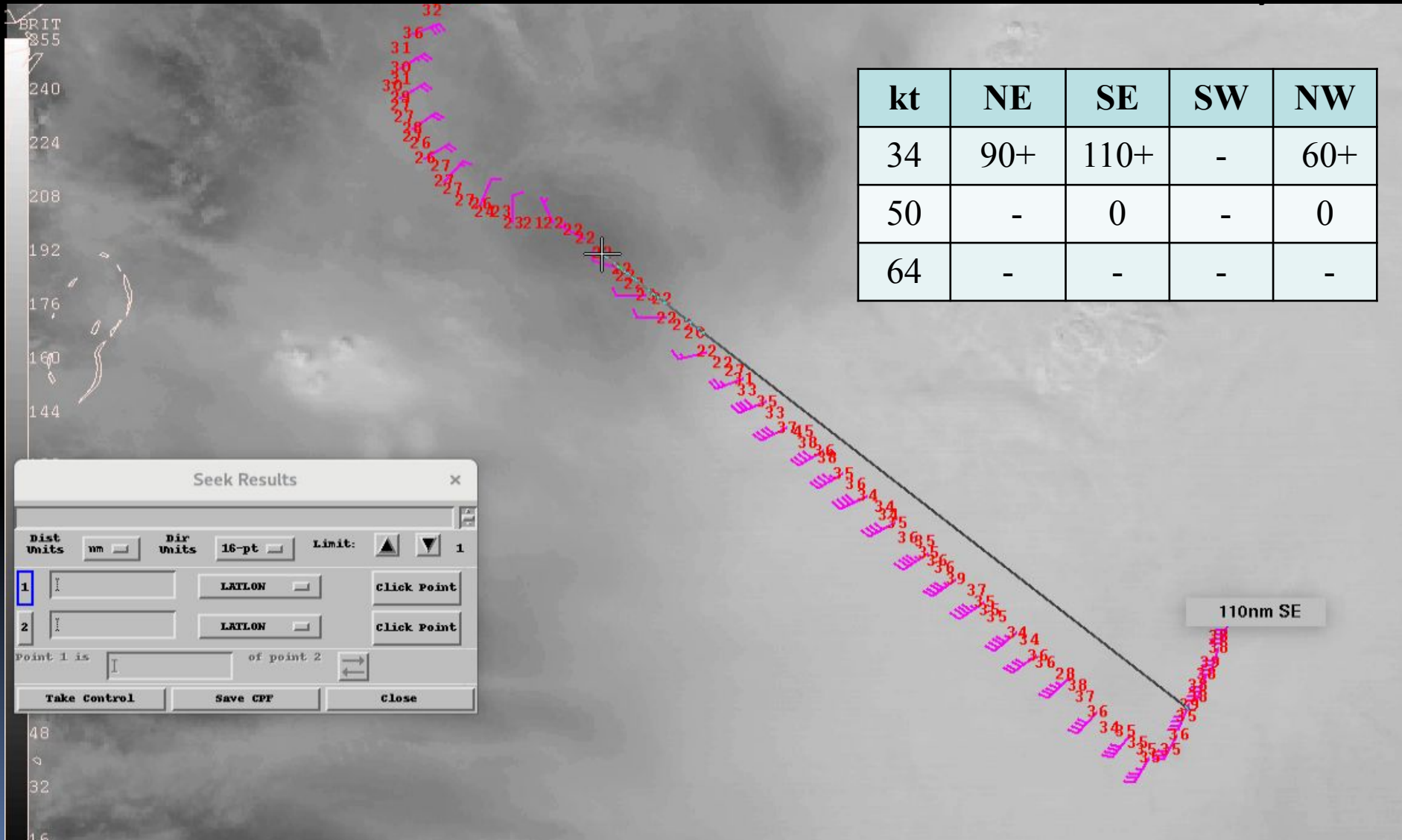
Checking Wind Radii from Aircraft Data



| kt | NE | SE | SW | NW |
|----|-----|----|----|-----|
| 34 | 90+ | - | - | 60+ |
| 50 | - | - | - | - |
| 64 | - | - | - | - |

Checking Wind Radii from Aircraft Data

Radii observed by ASCAT were larger than the sampling area of the reconnaissance aircraft, however the aircraft data appears to confirm the large nature of the circulation



Determine the intensity and pressure

| Fix Type | Intensity (kt) |
|-------------------------------|----------------|
| ASCAT-B | 38 |
| Recon (SFMR) | 40 |
| Recon (Flight-level adjusted) | 36 |
| Dvorak (TAFB) | 35 |
| Dvorak (SAB) | 35 |

What should we use for the initial intensity?

- A) 35 kt
- B) 40 kt
- C) Something else

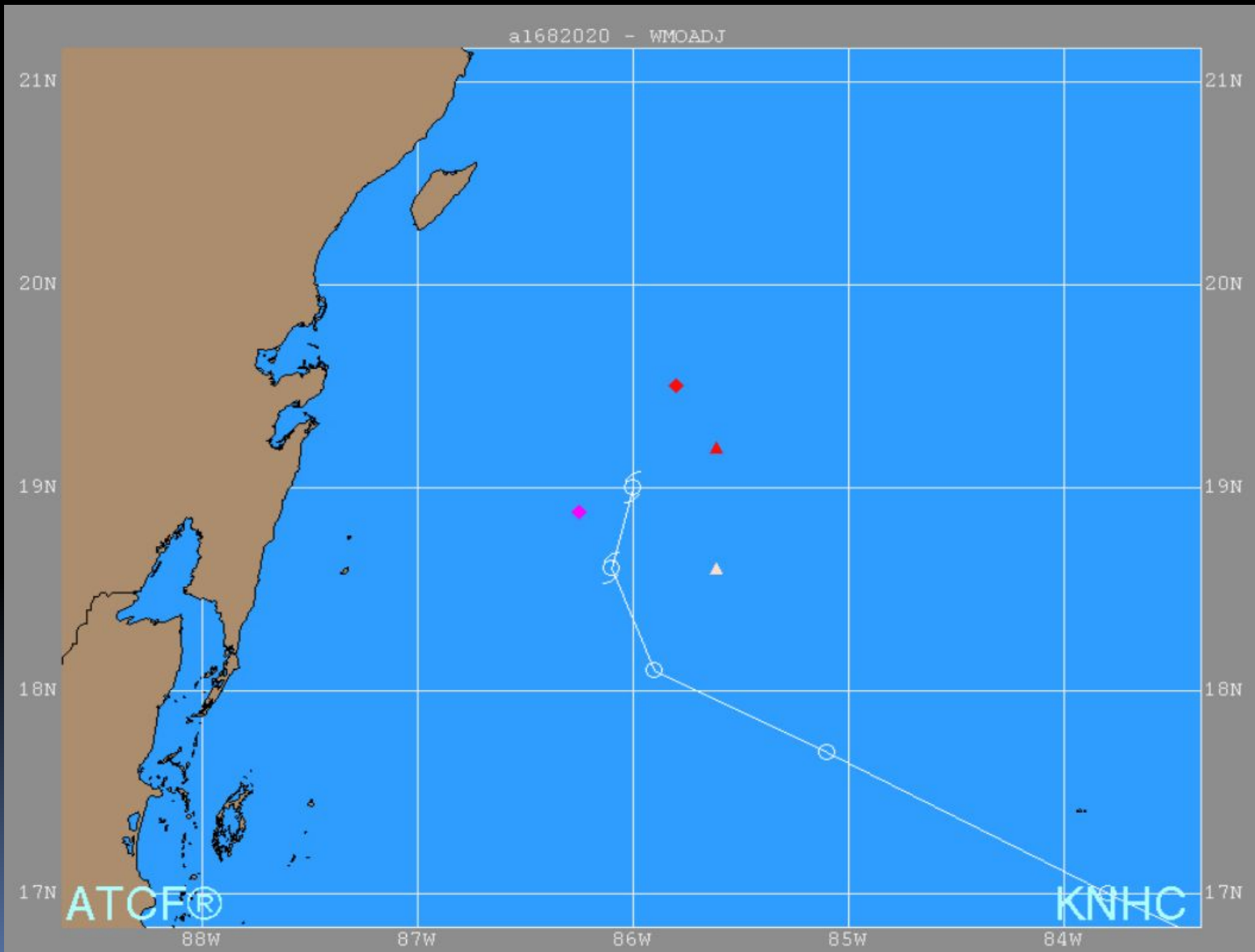
Determine the intensity and pressure

| Fix Type | Pressure (mb) |
|--|---------------|
| Aircraft (extrapolated from 925 mb) | 1001 |
| Dvorak (TAFB) | 1005 |
| Dvorak (SAB) | 1005 |
| Knaff-Zehr-Courtney W/P relationship | 999 |
| Dvorak Wind/Pressure relationship (40kt) | 1002 |

What should we use for the initial pressure?

- A) 1002 mb
- B) 1001 mb
- C) 1000 mb
- D) 999 mb

Best-Track through 1800 UTC... Ready to initialize the guidance.



Compute/Determine TC Motion

NHC typically uses a longer-term representative motion to smooth out short term wobbles, however when a cyclone is turning a motion computed from a shorter time may be necessary

6 h: 15°/ 4 kt

12 h: 355°/ 4 kt

24 h: 315°/ 7 kt

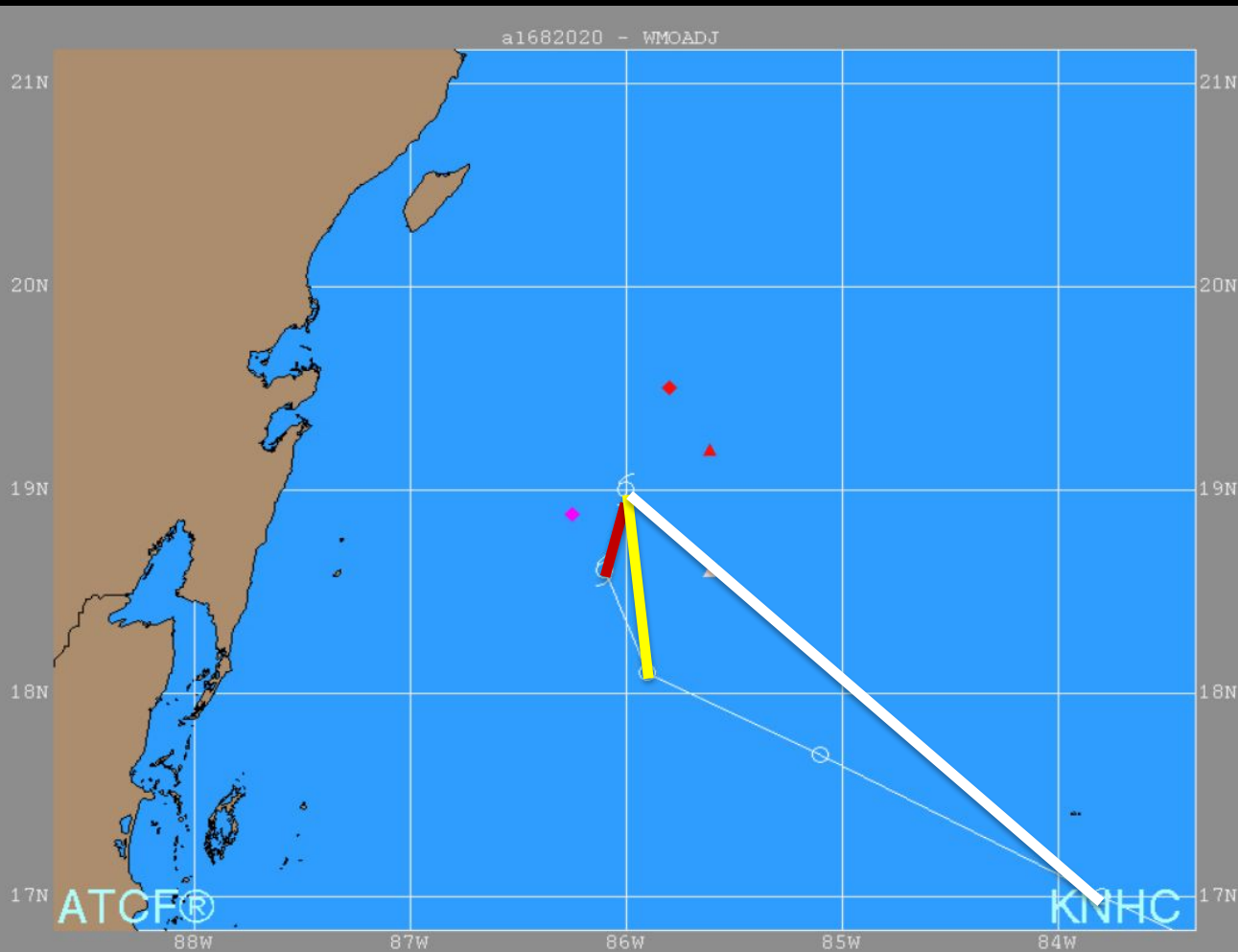
Which motion do you think is most representative?

A) 6h

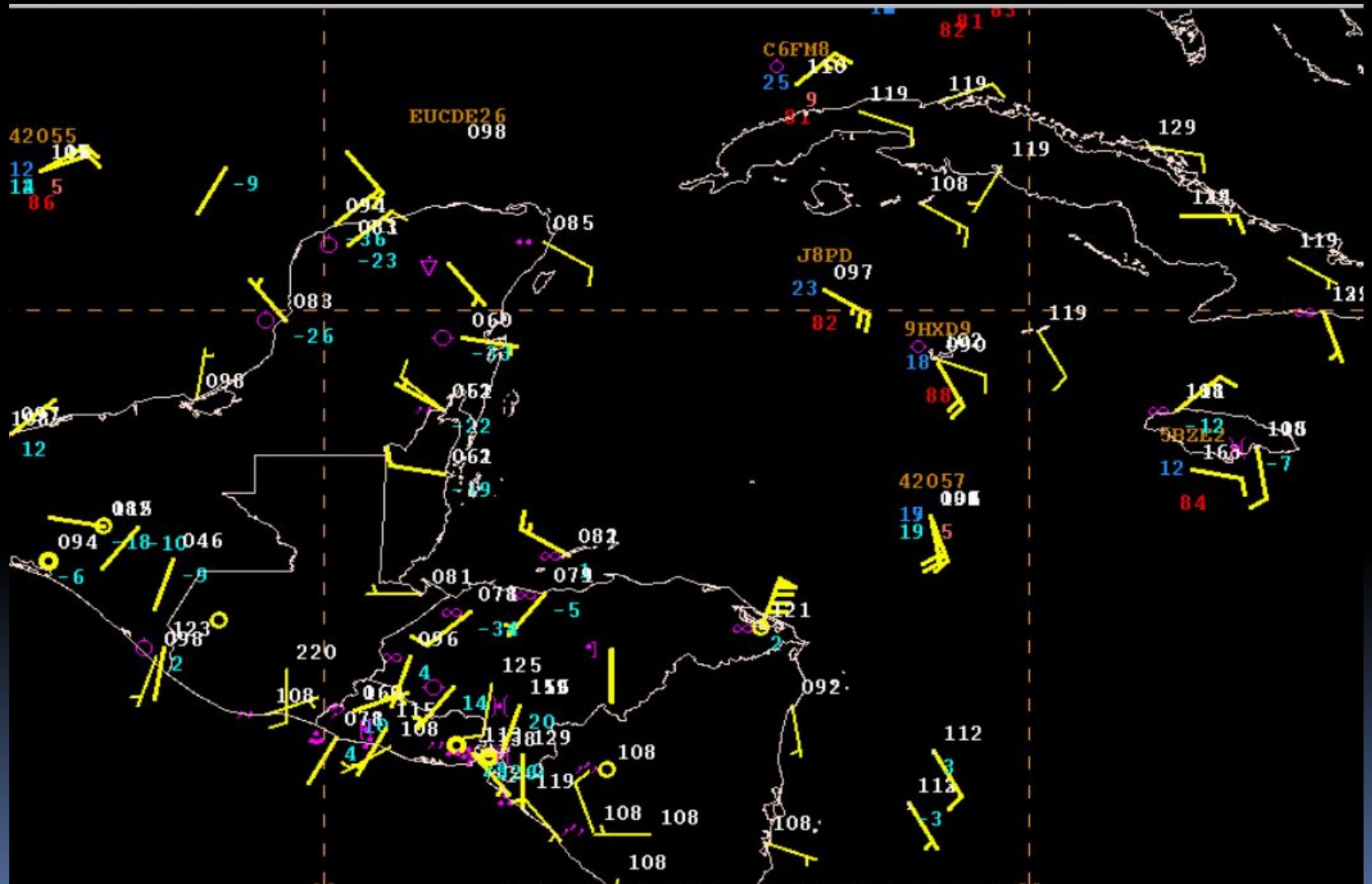
B) 12 h

C) 24 h

D) Something else



TC Size (outermost closed isobar)



Guidance parameters for 1800 UTC

Max Wind Radius
(Radius of Maximum
Wind/RMW)
determined from
aircraft, ASCAT.
important for storm
surge modeling

Vertical Extent of
Circulation: Subjective
indication of the
height/depth of a
tropical cyclone, used
by HWRF/HMON

Outermost closed
isobar computed from
surface observations.
May use global model
output when no surface
obs are available

68 2020 North Atlantic - WMOADJ

Date-Time-Group: 2020041618 ▼

| | Lat | Lon | Max Wind (kt) | Dir (deg) | Spd (kt) |
|-------------|-------------------|-------------------|---------------|-----------|----------|
| Past 24 hr: | 17.0 N | 83.8 W | 30 | | |
| Past 12 hr: | 18.1 N | 85.9 W | 30 | 314 | 7 |
| Current: | 19.0 ▼ ◆ N ◆ S | 86.0 ▼ ◆ E ◆ W | 40 ▼ | 10 ▼ | 4 ▼ |

Eye Diameter: 0 ▼ nm

Max Wind Radius: 100 ▼ nm

Vertical Extent of Circulation: Medium 700 - 400 mb ▼

Central Pressure: 1001 ▼ mb

Outermost Closed Isobar: 1010 ▼ mb

Radius Outermost Closed Isobar: 200 ▼ nm

| Speed/Quadrant | NE (nm) | SE (nm) | SW (nm) | NW (nm) |
|----------------|---------|---------|---------|---------|
| 34 kt: | 120 ▼ | 180 ▼ | 0 ▼ | 0 ▼ |
| 50 kt: | 0 ▼ | 0 ▼ | 0 ▼ | 0 ▼ |
| 64 kt: | 0 ▼ | 0 ▼ | 0 ▼ | 0 ▼ |

Buttons: Help, OK, Cancel, Guidance..., Bogus History...

18:45-19:00 UTC

Initialize models

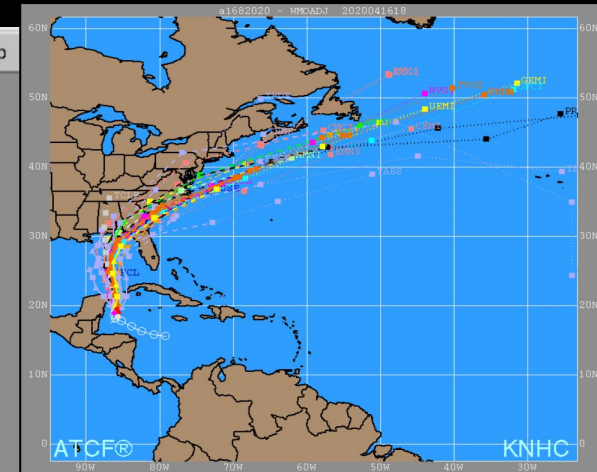
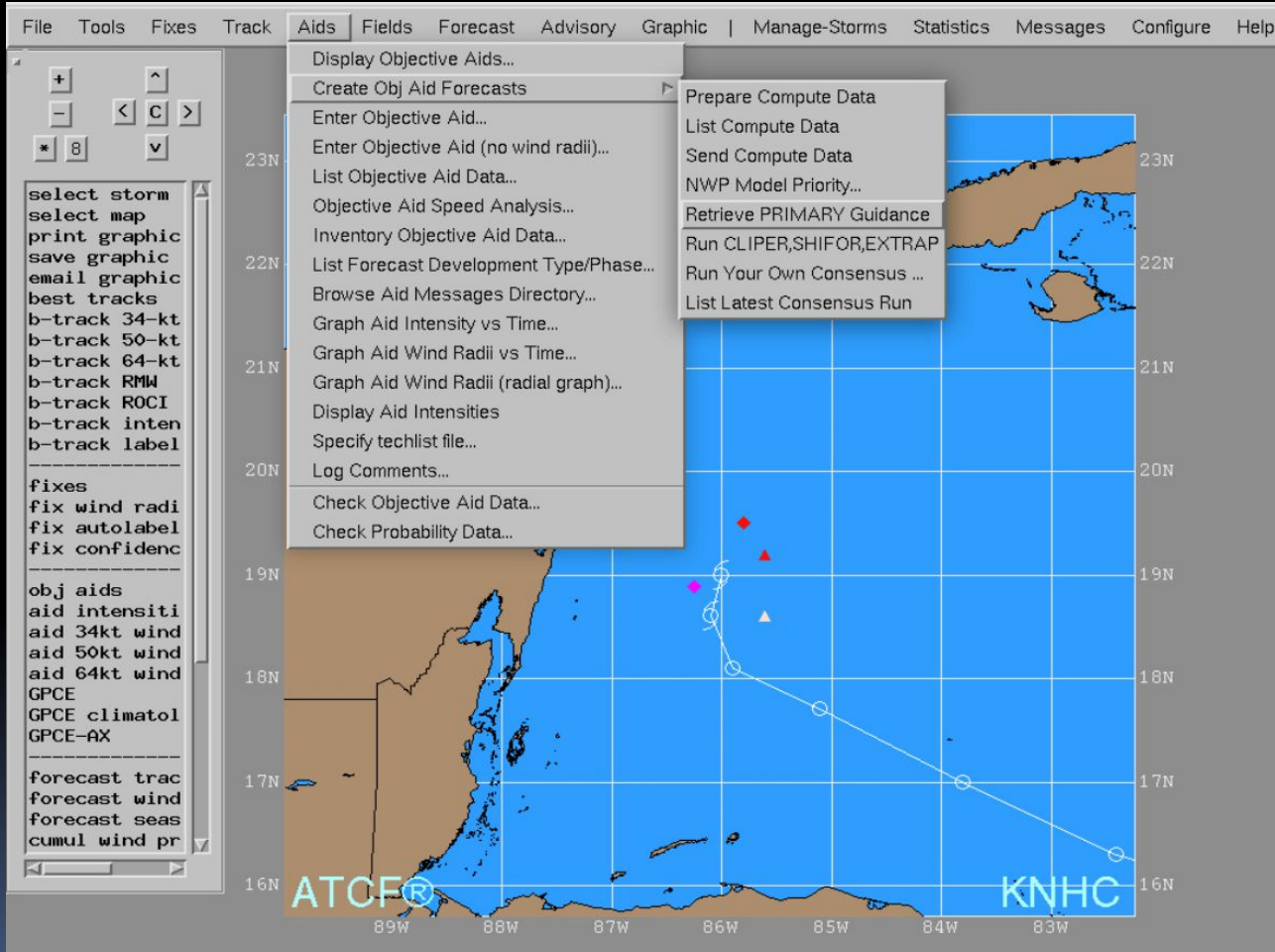
Submit the guidance to the super computer to run statistical models and the next (18Z) cycle of dynamical models. And don't forget to run the HWRF/HMON!

The screenshot displays a meteorological software interface with a map of the Caribbean region. The map shows a storm track with various data points and overlays. The interface includes a menu bar at the top with options: File, Tools, Fixes, Track, Aids, Fields, Forecast, Advisory, Graphic, Manage-Storms, Statistics, Messages, Configure, and Help. A toolbar on the left contains navigation and zoom controls. A list of options is visible on the left side, categorized into 'select storm', 'select map', 'print graphic', 'save graphic', 'email graphic', 'best tracks', 'fixes', 'obj aids', 'forecast trac', and 'forecast wind'. A context menu is open over the map, listing actions such as 'Display Objective Aids...', 'Create Obj Aid Forecasts', 'Enter Objective Aid...', 'List Objective Aid Data...', 'Objective Aid Speed Analysis...', 'Inventory Objective Aid Data...', 'List Forecast Development Type/Phase...', 'Browse Aid Messages Directory...', 'Graph Aid Intensity vs Time...', 'Graph Aid Wind Radii vs Time...', 'Graph Aid Wind Radii (radial graph)...', 'Display Aid Intensities', 'Specify techlist file...', 'Log Comments...', 'Check Objective Aid Data...', and 'Check Probability Data...'. The map shows a storm track with various data points and overlays. The ATCF and KNHC logos are visible at the bottom of the map.

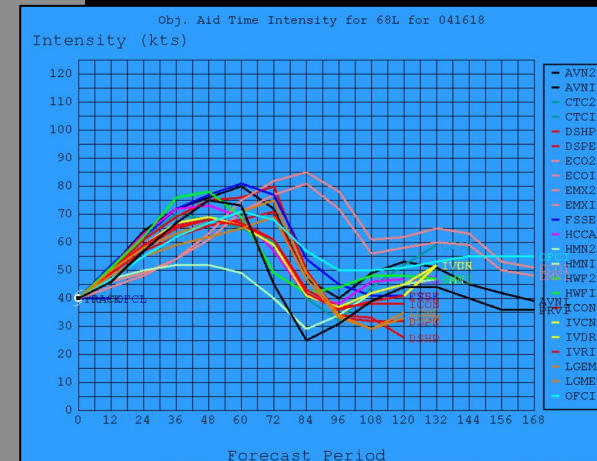
19:00 UTC

Receive model guidance

Then analyze numerical model output and prepare track, intensity, and wind radii forecasts



Track Guidance



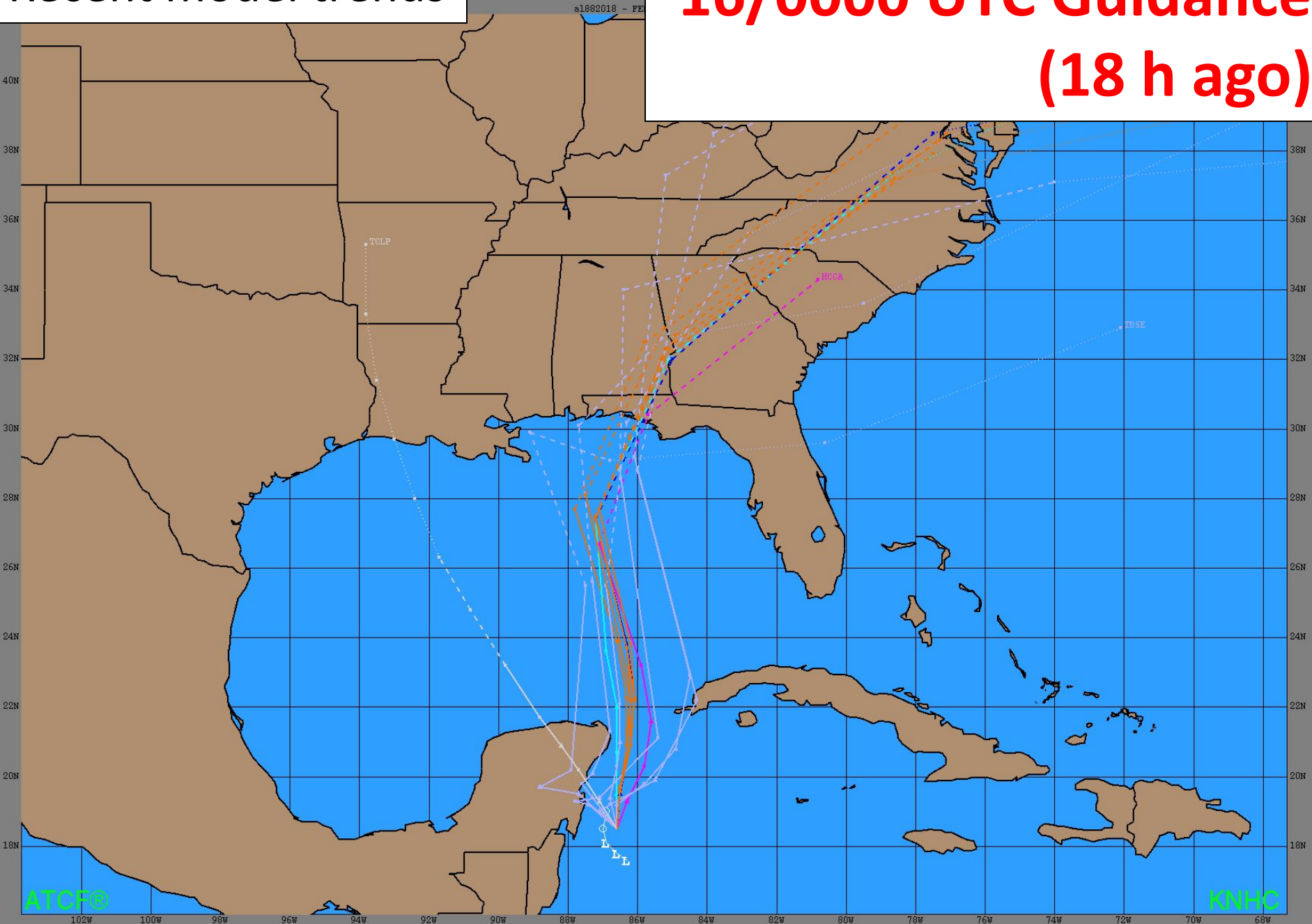
Intensity Guidance

Preparing the Track Forecast

**Before we begin, let's examine
recent model trends...**

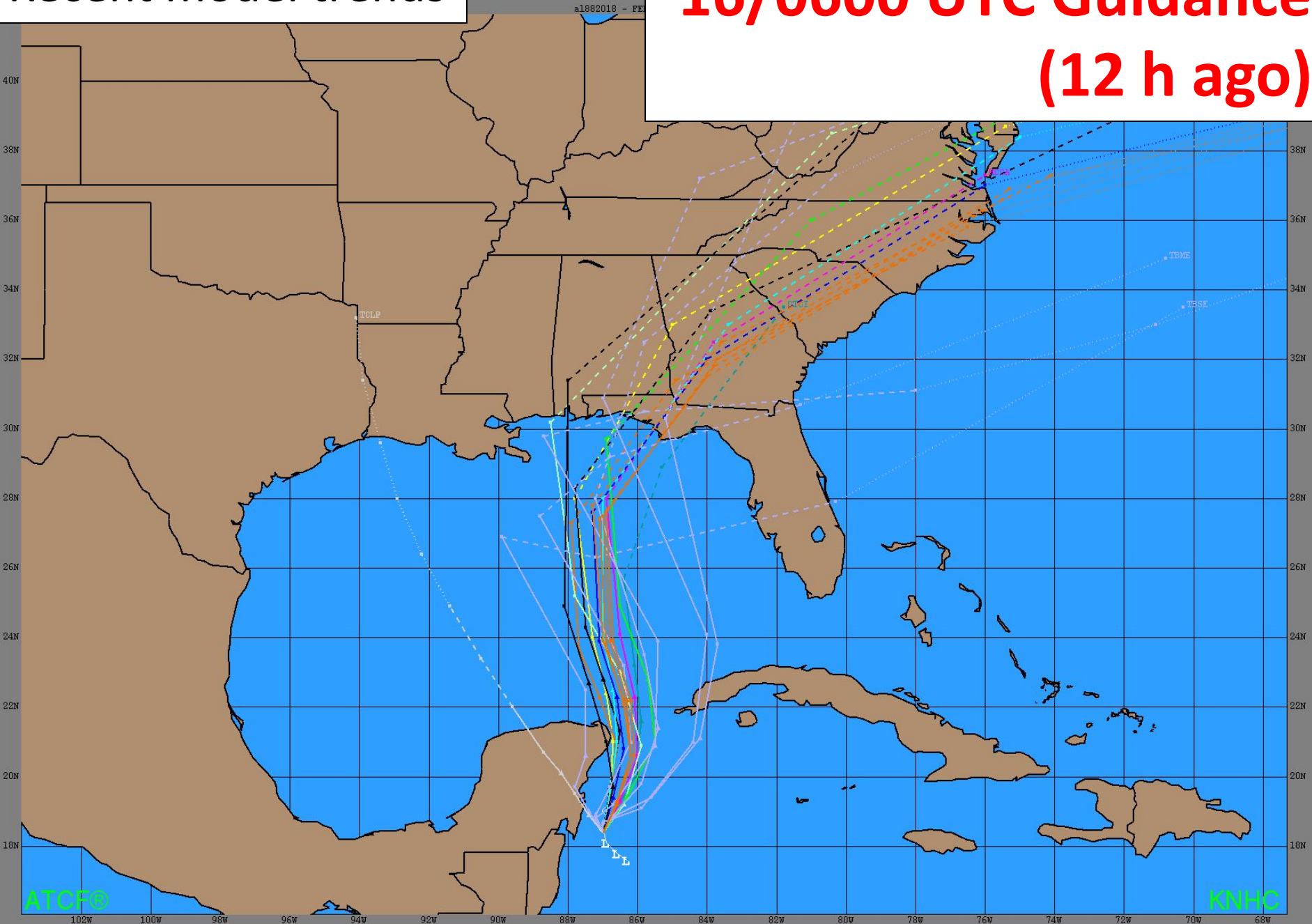
Recent model trends

**16/0000 UTC Guidance
(18 h ago)**



Recent model trends

16/0600 UTC Guidance
(12 h ago)

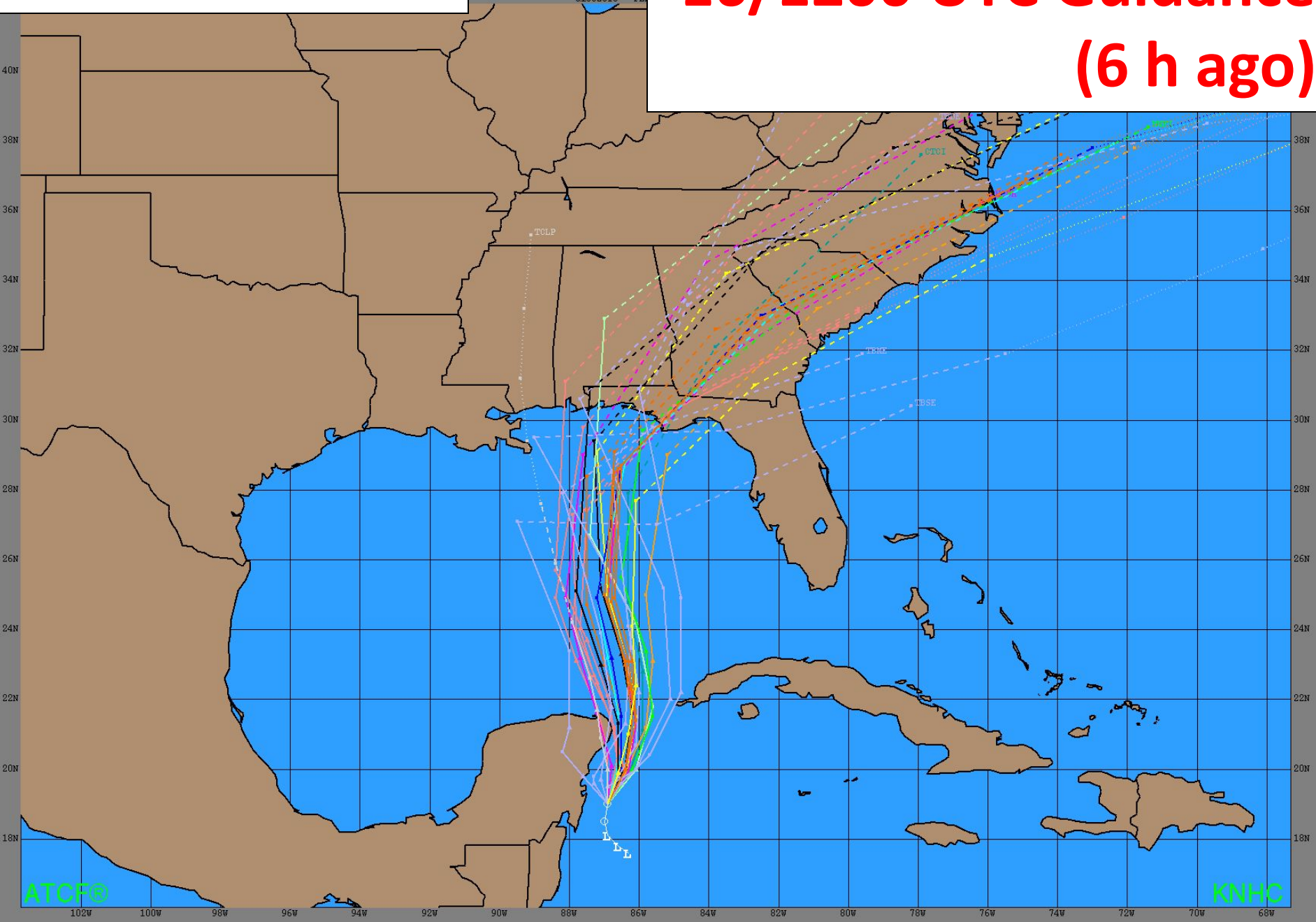


ATCF®

KNHC

Recent model trends

**16/1200 UTC Guidance
(6 h ago)**



ATCF®

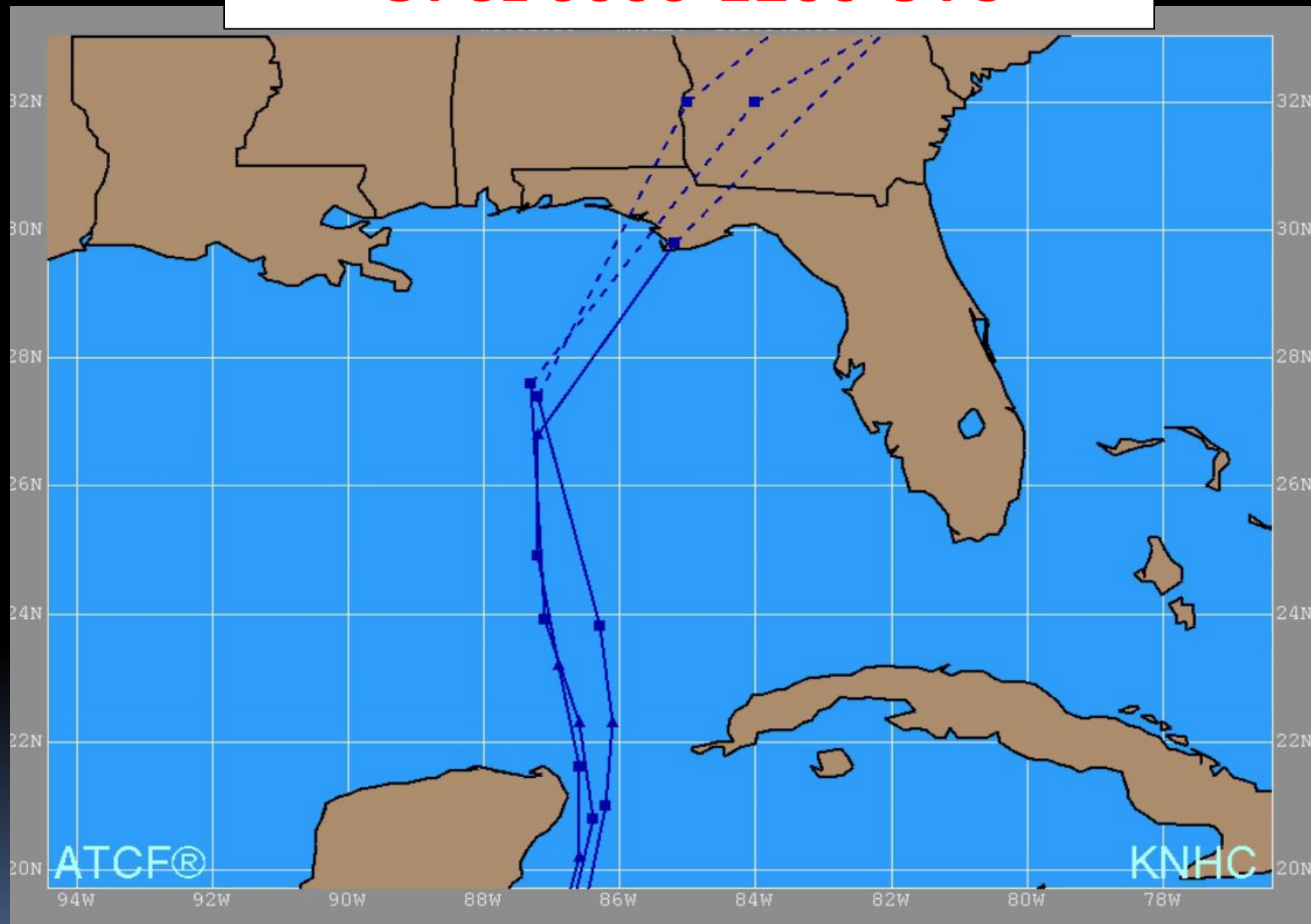
KNHC

TVCN 0000-1800 UTC



TVCN Consensus trending slightly eastward

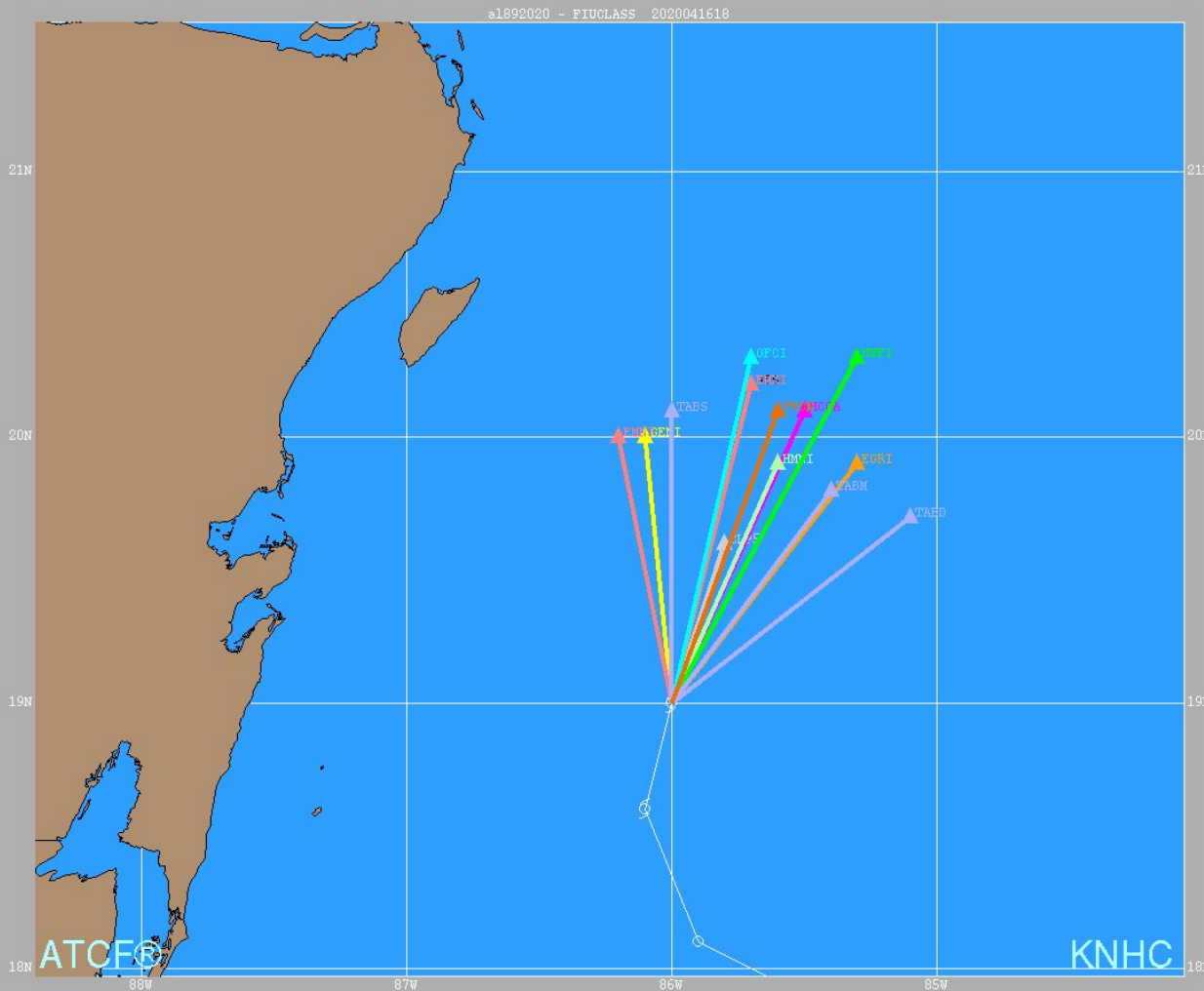
OFCL 0000-1200 UTC



OFCL also shifted slightly eastward

Let's Begin

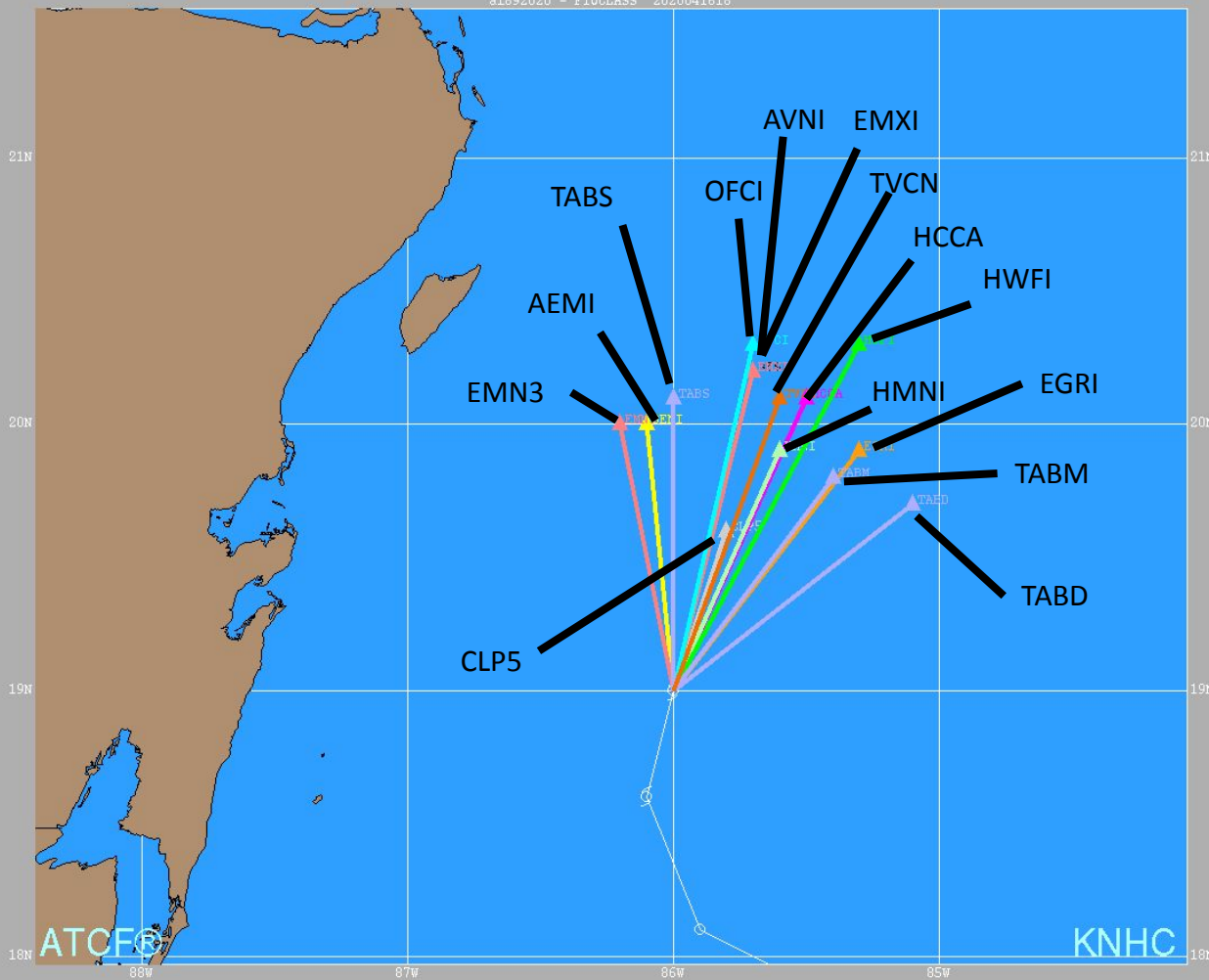
12 h forecast



| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

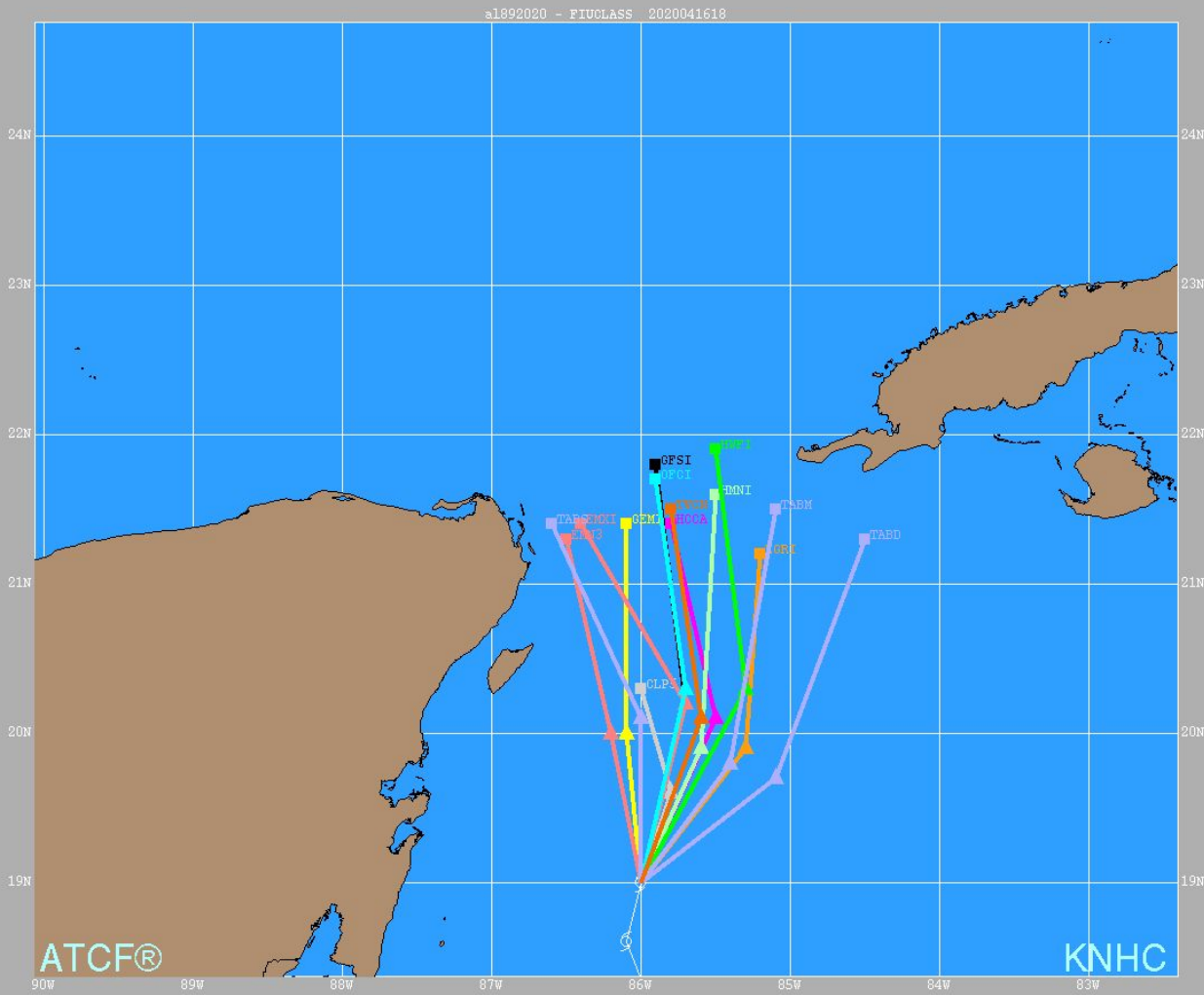
12 h forecast

a1892020 - FIUCLASS 2020041618



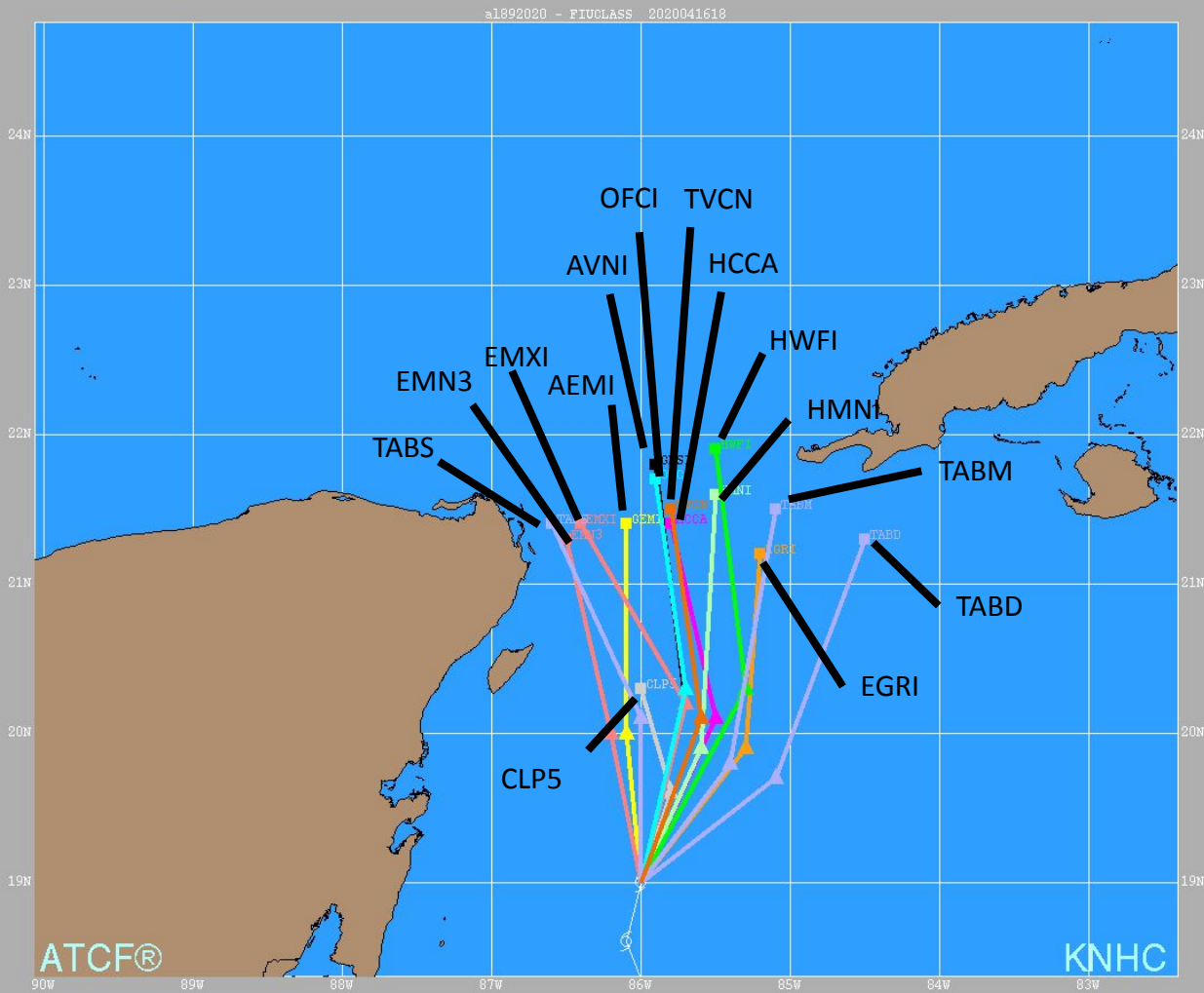
| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

24 h forecast



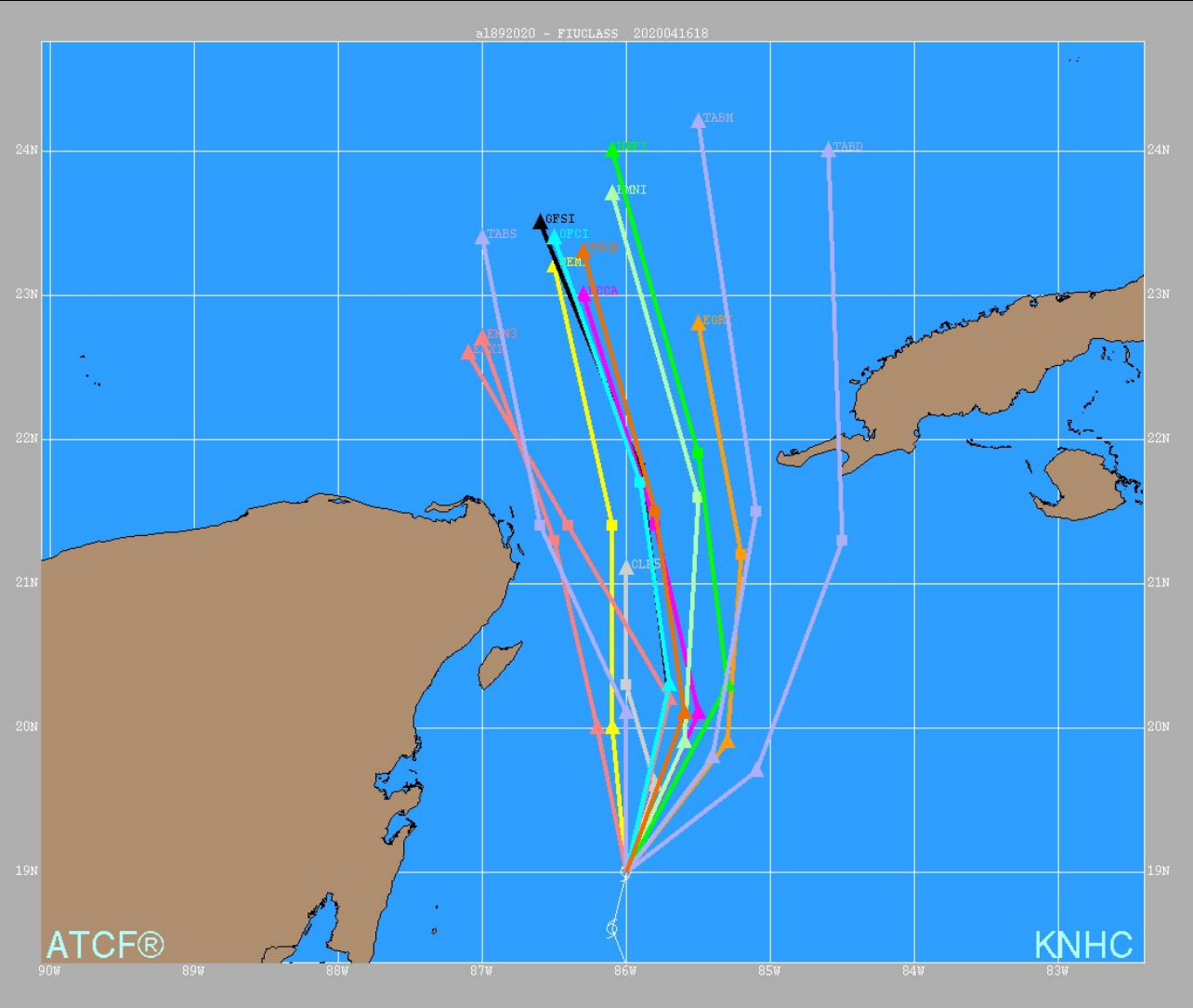
| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

24 h forecast



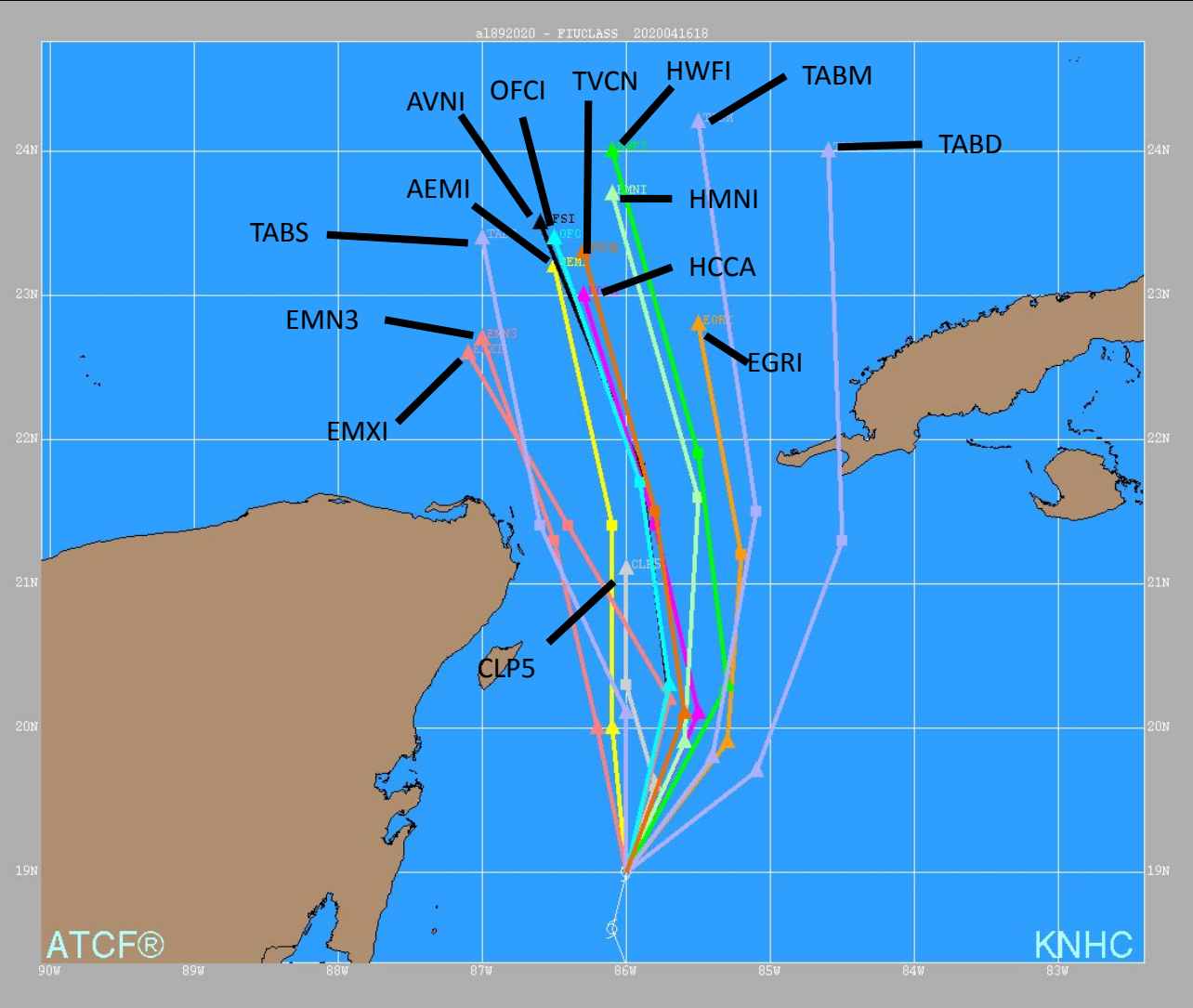
| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

36 h forecast



| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

36 h forecast

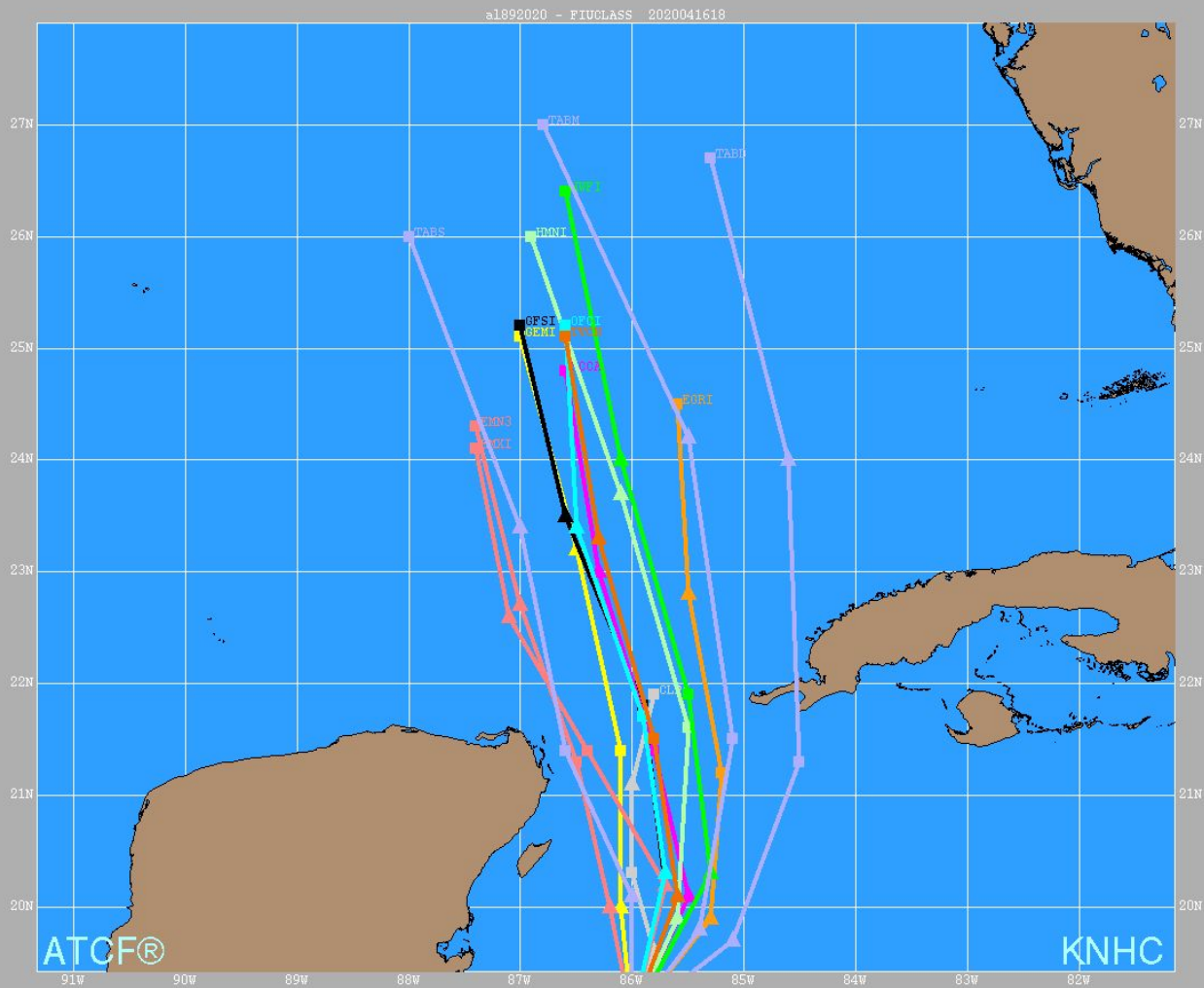


| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

**Where would you place
the 36 h forecast?**

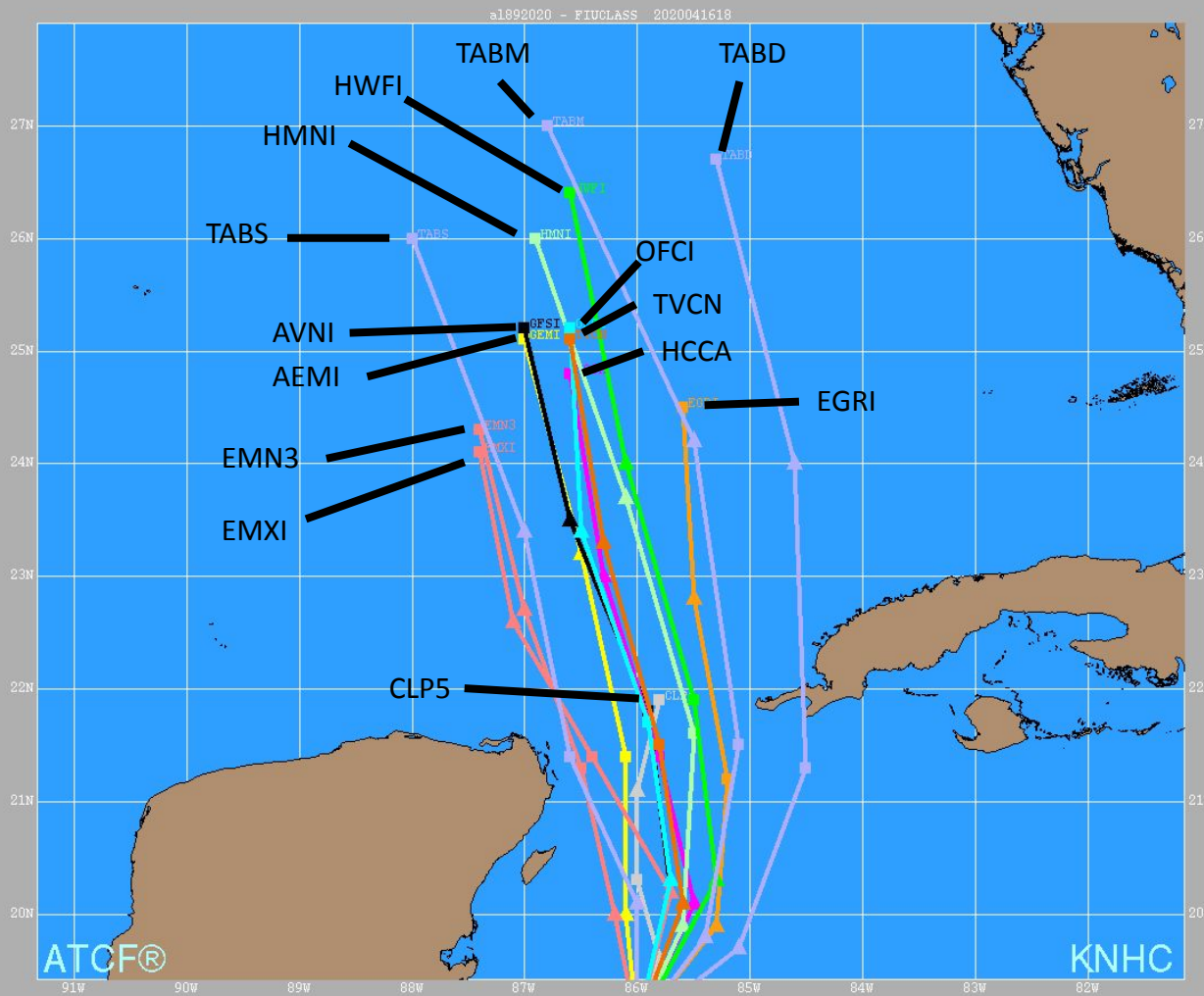
- A) 23.0N 86.0W**
- B) 23.0N 86.5W**
- C) 23.5N 86.5W**
- D) 22.5N 86.5W**

48 h forecast



| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

48 h forecast

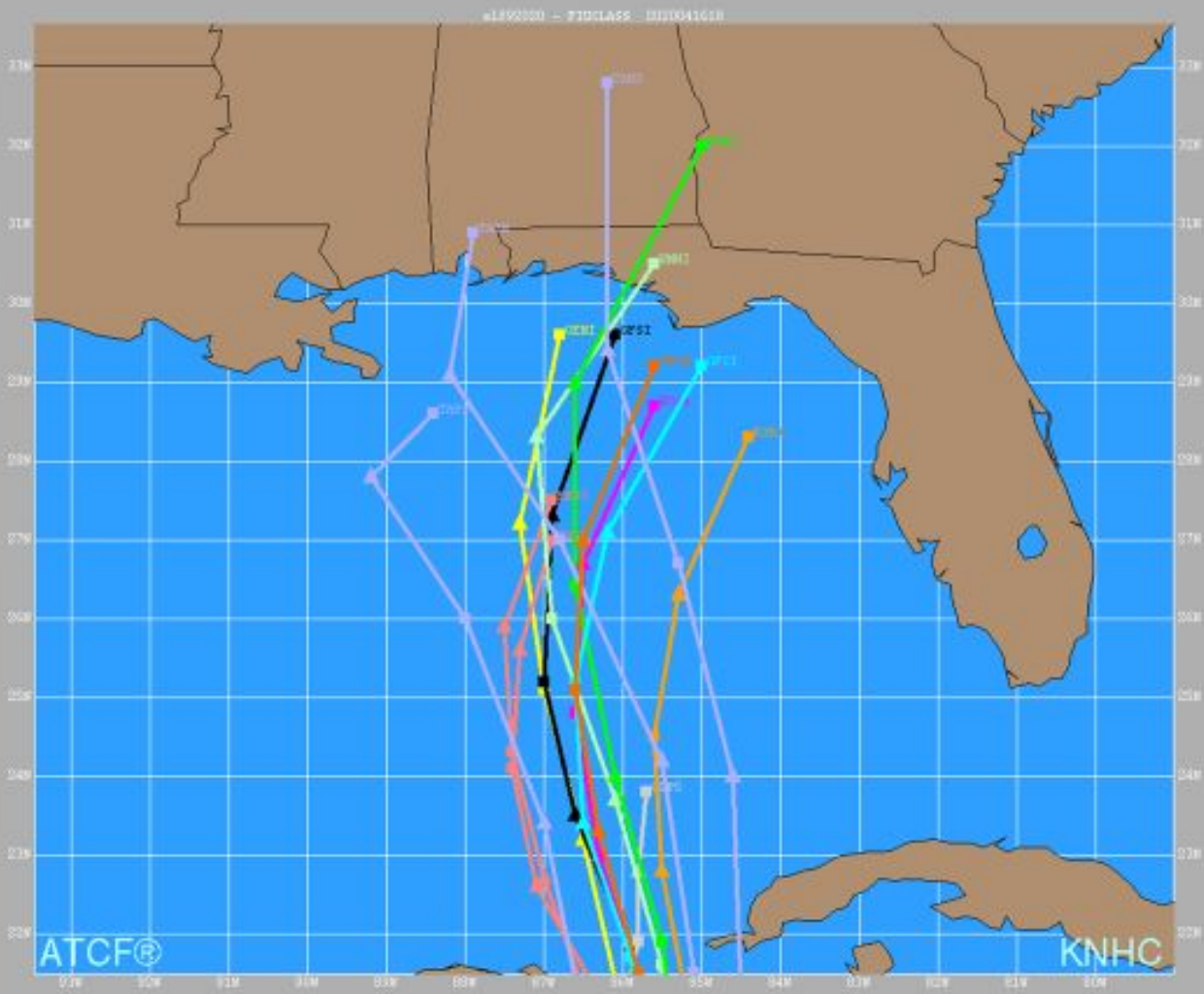


| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

**Where would you place
the 48 h forecast?**

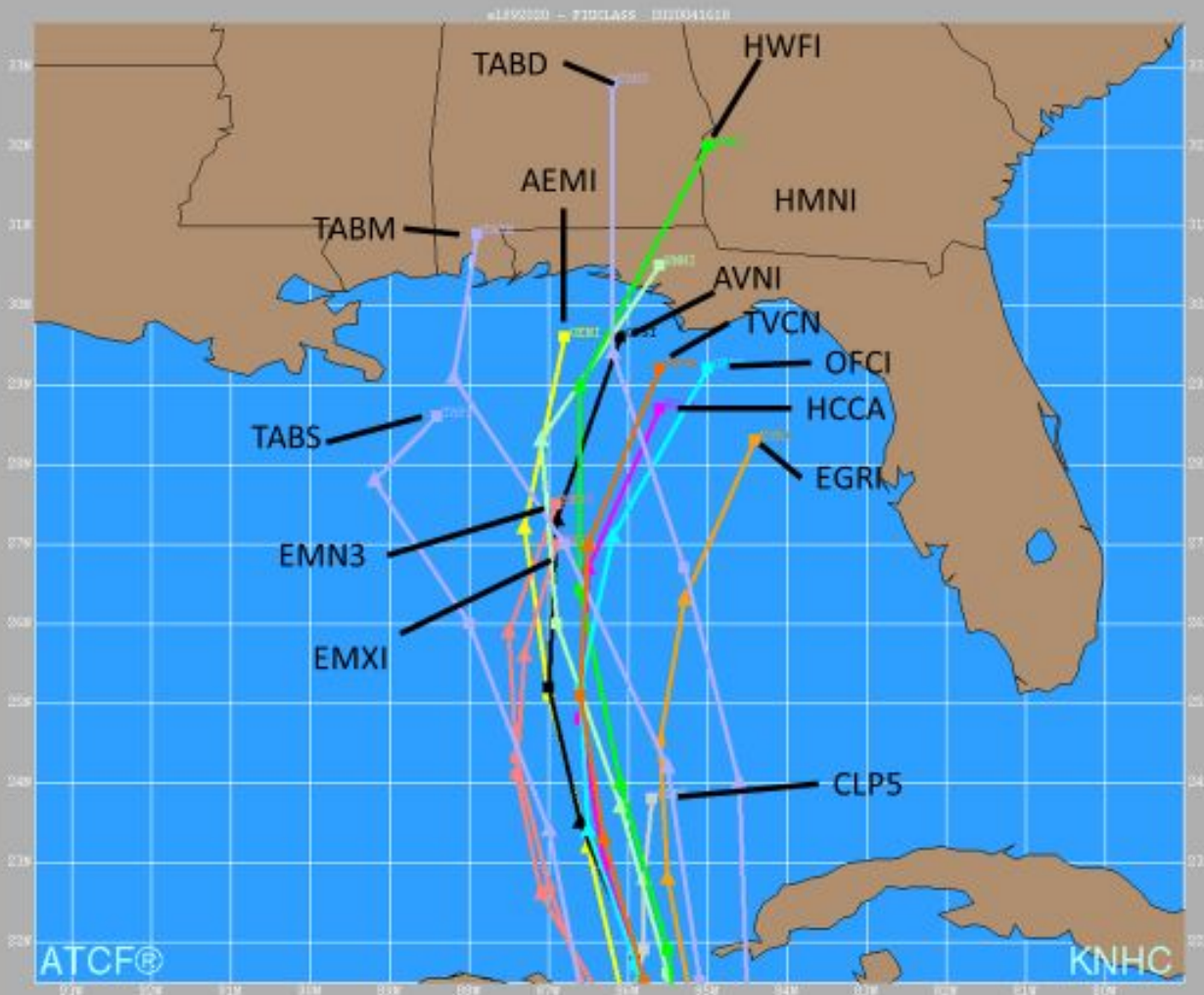
- A) 25.0N 86.5W**
- B) 25.5N 86.5W**
- C) 24.5N 86.5W**
- D) 25.0N 86.0W**
- E) 25.0N 87.0W**

72 h forecast



| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMON) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

72 h forecast



| Model/Color | Description |
|-----------------------|--|
| HWFI - Green | Hurricane WRF (WRF-NMM) |
| HMNI - Green | Hurricane Multi-Scale Ocean-coupled Non-hydrostatic model (HMNI) |
| AVNI - Black | GFS (Global) |
| EMXI - Salmon | ECMWF (Global) |
| EGRI - Orange | UK-MET (Global) |
| TABS/TABM/TABD - Pink | Trajectory Shallow/Medium/Deep |
| TVCN - Orange | Track Consensus (simple) |
| HCCA - Magenta | HFIP Corrected Consensus |
| OFCI - Cyan | Previous official forecast accounting for initial position |
| AEMI - Yellow | GFS Ensemble Mean |
| EMN3 - Orange | ECMWF Ensemble Mean |

**Where would you place
the 72 h forecast?**

- A) 30.0N 85.0W**
- B) 30.0N 86.0W**
- C) 29.0N 85.0W**
- D) 29.0N 86.0W**
- E) 28.0N 86.0W**

Preparing the Intensity Forecast

SHIPS and LGEM Guidance

Intensity (kt)

Values of the predictors

| | * ATLANTIC 2020 SHIPS INTENSITY FORECAST * | | | | | | | | | | | | |
|----------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | * IR SAT DATA AVAILABLE, OHC AVAILABLE * | | | | | | | | | | | | |
| | * SAMPLE STORM AL502020 4/16/20 18 UTC * | | | | | | | | | | | | |
| TIME (HR) | 0 | 6 | 12 | 18 | 24 | 36 | 48 | 60 | 72 | 84 | 96 | 108 | 120 |
| V (KT) NO LAND | 40 | 45 | 50 | 56 | 61 | 69 | 75 | 76 | 80 | 76 | 71 | 65 | 58 |
| V (KT) LAND | 40 | 45 | 50 | 56 | 61 | 69 | 75 | 76 | 80 | 50 | 34 | 33 | 26 |
| V (KT) LGEM | 40 | 45 | 50 | 54 | 58 | 63 | 67 | 71 | 75 | 49 | 34 | 29 | 33 |
| Storm Type | TROP | TROP | TROP | TROP | TROP | TROP | TROP | TROP | TROP | TROP | TROP | TROP | TROP |
| SHEAR (KT) | 18 | 17 | 20 | 14 | 12 | 19 | 15 | 16 | 10 | 15 | 19 | 34 | 43 |
| SHEAR ADJ (KT) | 0 | 0 | 0 | 6 | 5 | 1 | 2 | 2 | -1 | 0 | 4 | 4 | 8 |
| SHEAR DIR | 297 | 288 | 288 | 286 | 283 | 296 | 315 | 300 | 281 | 272 | 243 | 232 | 232 |
| SST (C) | 29.4 | 29.8 | 30.0 | 29.8 | 28.9 | 29.0 | 29.2 | 28.7 | 28.6 | 28.6 | 28.4 | 26.4 | 24.6 |
| POT. INT. (KT) | 156 | 164 | 169 | 165 | 149 | 151 | 155 | 147 | 146 | 147 | 146 | 123 | 108 |
| ADJ. POT. INT. | 141 | 150 | 155 | 152 | 136 | 136 | 138 | 130 | 129 | 132 | 132 | 113 | 100 |
| 200 MB T (C) | -52.7 | -52.7 | -53.0 | -52.6 | -52.3 | -52.3 | -51.6 | -51.5 | -50.8 | -51.1 | -51.1 | -51.6 | -52.4 |
| 200 MB VXT (C) | 0.8 | 0.8 | 0.7 | 0.5 | 0.7 | 0.8 | 0.9 | 1.2 | 0.9 | 1.1 | 1.2 | 0.7 | 0.6 |
| TH_E DEV (C) | 9 | 9 | 8 | 8 | 9 | 9 | 10 | 9 | 10 | 8 | 5 | 1 | 0 |
| 700-500 MB RH | 71 | 69 | 67 | 66 | 65 | 64 | 63 | 68 | 68 | 59 | 45 | 31 | 26 |
| MODEL VTX (KT) | 18 | 19 | 22 | 24 | 25 | 26 | 27 | 25 | 28 | 26 | 24 | 23 | 22 |
| 850 MB ENV VOR | 72 | 75 | 80 | 80 | 72 | 60 | 50 | 29 | 46 | 18 | 25 | 32 | 38 |
| 200 MB DIV | 60 | 45 | 25 | 43 | 48 | 23 | 35 | 49 | 60 | 41 | 101 | 66 | 70 |
| 700-850 TADV | 2 | 4 | 9 | 13 | 12 | 24 | 23 | 20 | 12 | 18 | 13 | -9 | 39 |
| LAND (KM) | 128 | 129 | 120 | 73 | 76 | 226 | 420 | 302 | 67 | -149 | -105 | 18 | 381 |
| LAT (DEG N) | 18.9 | 19.5 | 20.1 | 21.0 | 21.8 | 23.5 | 25.3 | 27.2 | 29.1 | 31.3 | 33.6 | 36.0 | 38.4 |
| LONG(DEG W) | 86.3 | 86.2 | 86.1 | 86.2 | 86.3 | 86.6 | 87.0 | 86.6 | 85.5 | 83.5 | 80.5 | 75.7 | 69.1 |
| STM SPEED (KT) | 5 | 6 | 7 | 9 | 9 | 9 | 9 | 10 | 12 | 16 | 20 | 26 | 29 |
| HEAT CONTENT | 54 | 59 | 61 | 50 | 30 | 30 | 71 | 34 | 27 | 3 | 2 | 0 | 0 |

Rapid Intensification Index probability of RI during next 24 hour

(SHIPS-RII PREDICTOR TABLE for 30 KT OR MORE MAXIMUM WIND INCREASE IN NEXT 24-h)

| Predictor | Value | RI Predictor Range | Scaled Value(0-1) | % Contribution |
|-----------------------------|---------|--------------------|-------------------|----------------|
| 12 HR PERSISTENCE (KT) | : 10.0 | -49.5 to 38.5 | 0.68 | 6.4 |
| 850-200 MB SHEAR (KT) | : 16.5 | 30.1 to 2.3 | 0.49 | 2.1 |
| HEAT CONTENT (KJ/CM2) | : 50.8 | 0.0 to 157.3 | 0.32 | 1.4 |
| STD DEV OF IR BR TEMP | : 16.1 | 36.6 to 2.8 | 0.61 | 2.3 |
| 2nd PC OF IR BR TEMP | : 0.9 | 2.9 to -2.9 | 0.34 | 1.2 |
| MAXIMUM WIND (KT) | : 40.0 | 22.5 to 132.0 | 0.47 | 0.9 |
| BL DRY-AIR FLUX (W/M2) | : 124.6 | 893.2 to -67.1 | 0.80 | 2.1 |
| POT = MPI-VMAX (KT) | : 103.9 | 28.4 to 141.4 | 0.67 | 0.4 |
| D200 (10**7s-1) | : 44.2 | -29.7 to 185.9 | 0.34 | 0.2 |
| %area of TPW <45 mm upshear | : 0.0 | 100.0 to 0.0 | 1.00 | 0.2 |

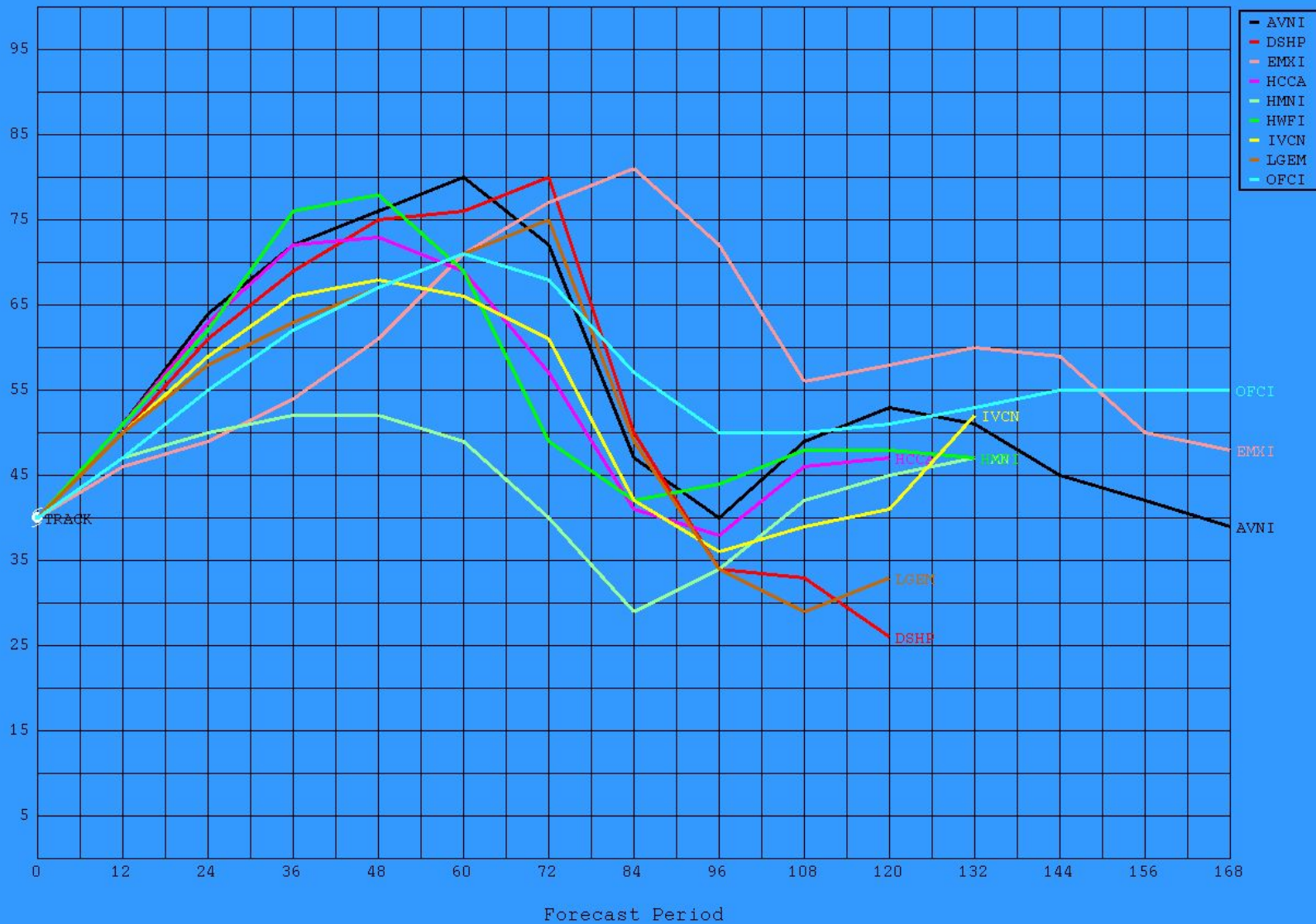
SHIPS Prob RI for 20kt/ 12hr RI threshold= 8% is 1.6 times climatological mean (5.0%)
 SHIPS Prob RI for 25kt/ 24hr RI threshold= 21% is 2.0 times climatological mean (10.9%)
 SHIPS Prob RI for 30kt/ 24hr RI threshold= 17% is 2.6 times climatological mean (6.7%)
 SHIPS Prob RI for 35kt/ 24hr RI threshold= 12% is 3.1 times climatological mean (3.8%)
 SHIPS Prob RI for 40kt/ 24hr RI threshold= 10% is 4.0 times climatological mean (2.4%)
 SHIPS Prob RI for 45kt/ 36hr RI threshold= 12% is 2.8 times climatological mean (4.5%)
 SHIPS Prob RI for 55kt/ 48hr RI threshold= 12% is 2.6 times climatological mean (4.6%)
 SHIPS Prob RI for 65kt/ 72hr RI threshold= 21% is 3.9 times climatological mean (5.4%)

Matrix of RI probabilities

| RI (kt / h) | 20/12 | 25/24 | 30/24 | 35/24 | 40/24 | 45/36 | 55/48 | 65/72 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| SHIPS-RII: | 7.9% | 21.5% | 17.2% | 11.9% | 9.6% | 12.4% | 12.0% | 20.9% |
| Logistic: | 4.9% | 12.6% | 6.9% | 3.6% | 1.2% | 4.7% | 5.3% | 10.1% |
| Bayesian: | 3.2% | 3.5% | 1.3% | 1.0% | 0.2% | 0.3% | 0.1% | 0.4% |
| Consensus: | 5.3% | 12.5% | 8.4% | 5.5% | 3.7% | 5.8% | 5.8% | 10.5% |
| DTOPS: | 10.0% | 46.0% | 34.0% | 22.0% | 8.0% | 18.0% | 26.0% | 2.0% |

Obj. Aid Time Intensity for 89L for 041618

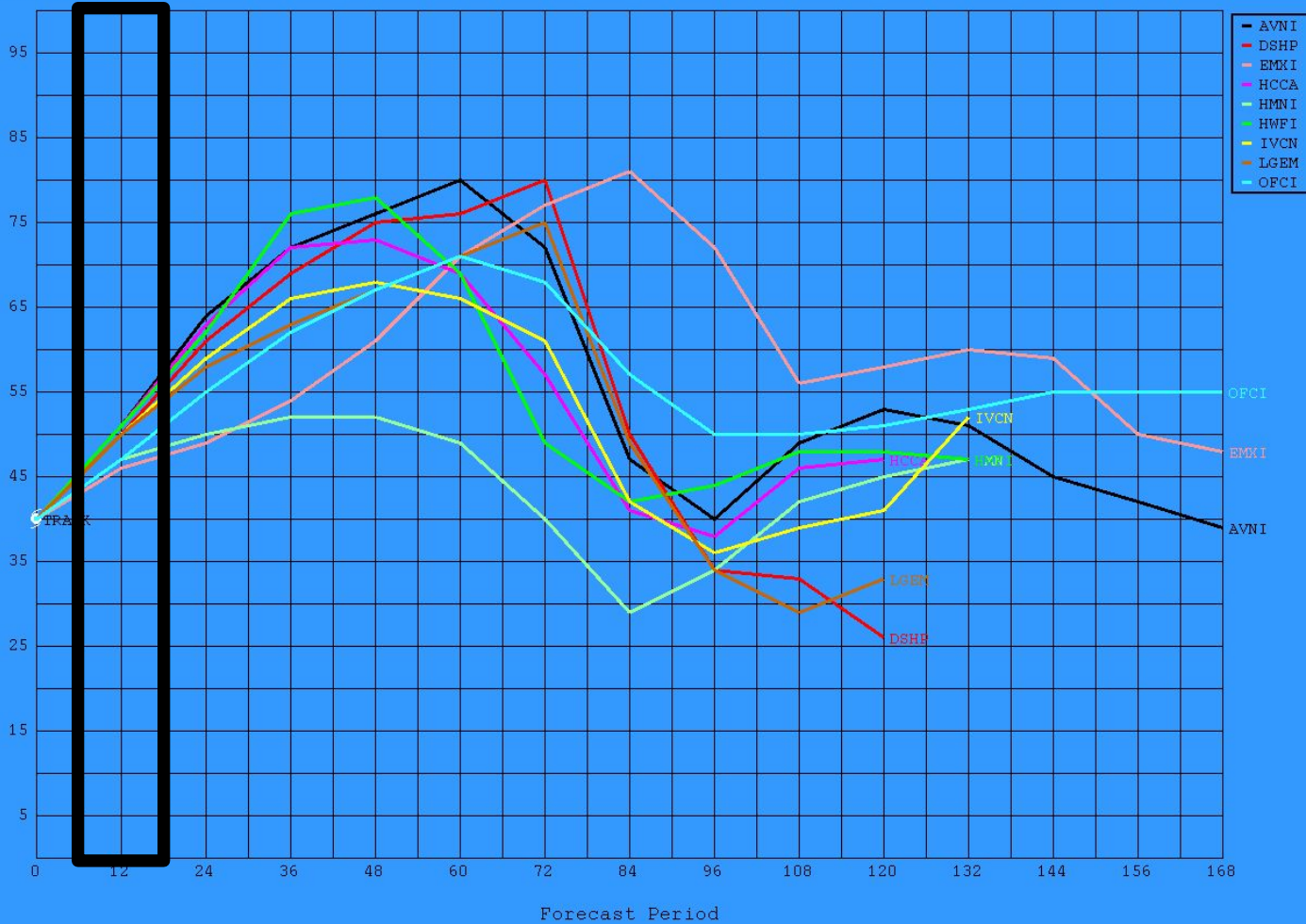
Intensity (kts)



12 h Intensity Forecast

Obj. Aid Time Intensity for 89L for 041618

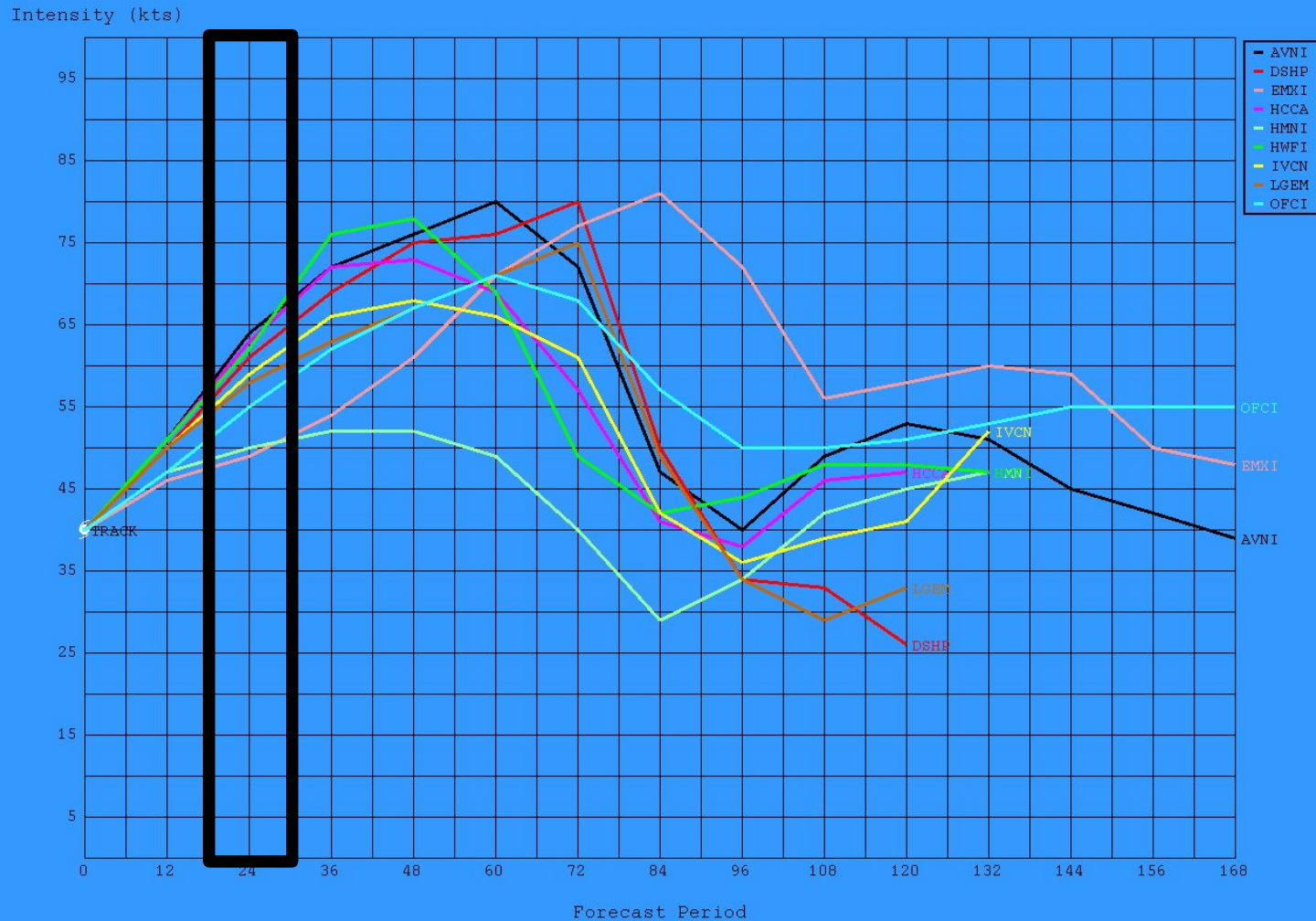
Intensity (kts)



| Model/Color | Intensity |
|----------------|-----------|
| HWFI - Green | 51 |
| HMNI - Green | 47 |
| AVNI - Black | 51 |
| EMXI - Salmon | 46 |
| DSHP - Red | 50 |
| LGEM - Orange | 48 |
| IVCN - Yellow | 50 |
| HCCA - Magenta | 51 |
| OFCI - Cyan | 47 |

24 h Intensity Forecast

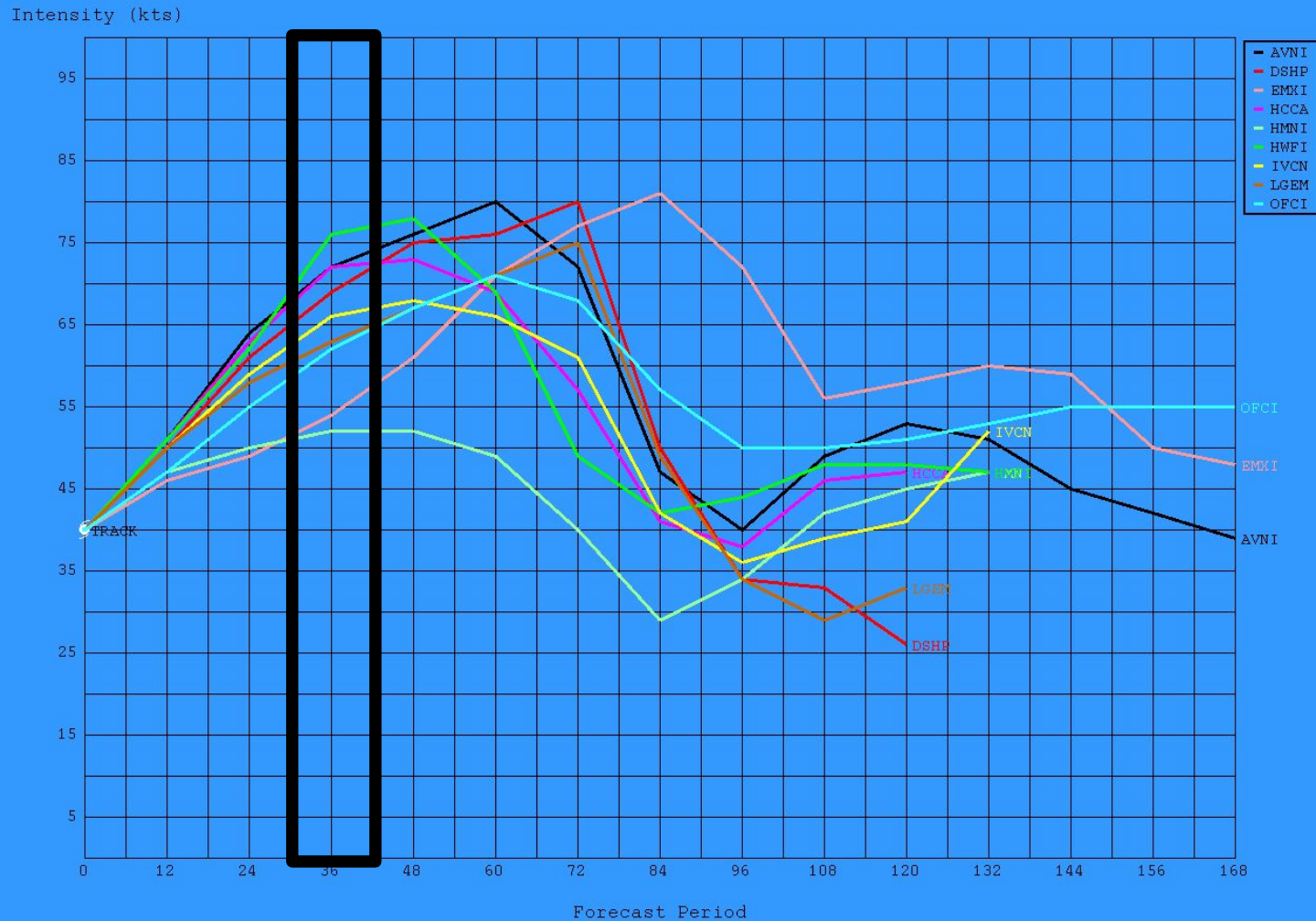
Obj. Aid Time Intensity for 89L for 041618



| Model/Color | Intensity |
|----------------|-----------|
| HWFI - Green | 62 |
| HMNI - Green | 50 |
| AVNI - Black | 64 |
| EMXI - Salmon | 49 |
| DSHP - Red | 61 |
| LGEM - Orange | 58 |
| IVCN - Yellow | 50 |
| HCCA - Magenta | 63 |
| OFCI - Cyan | 55 |

36 h Intensity Forecast

Obj. Aid Time Intensity for 89L for 041618



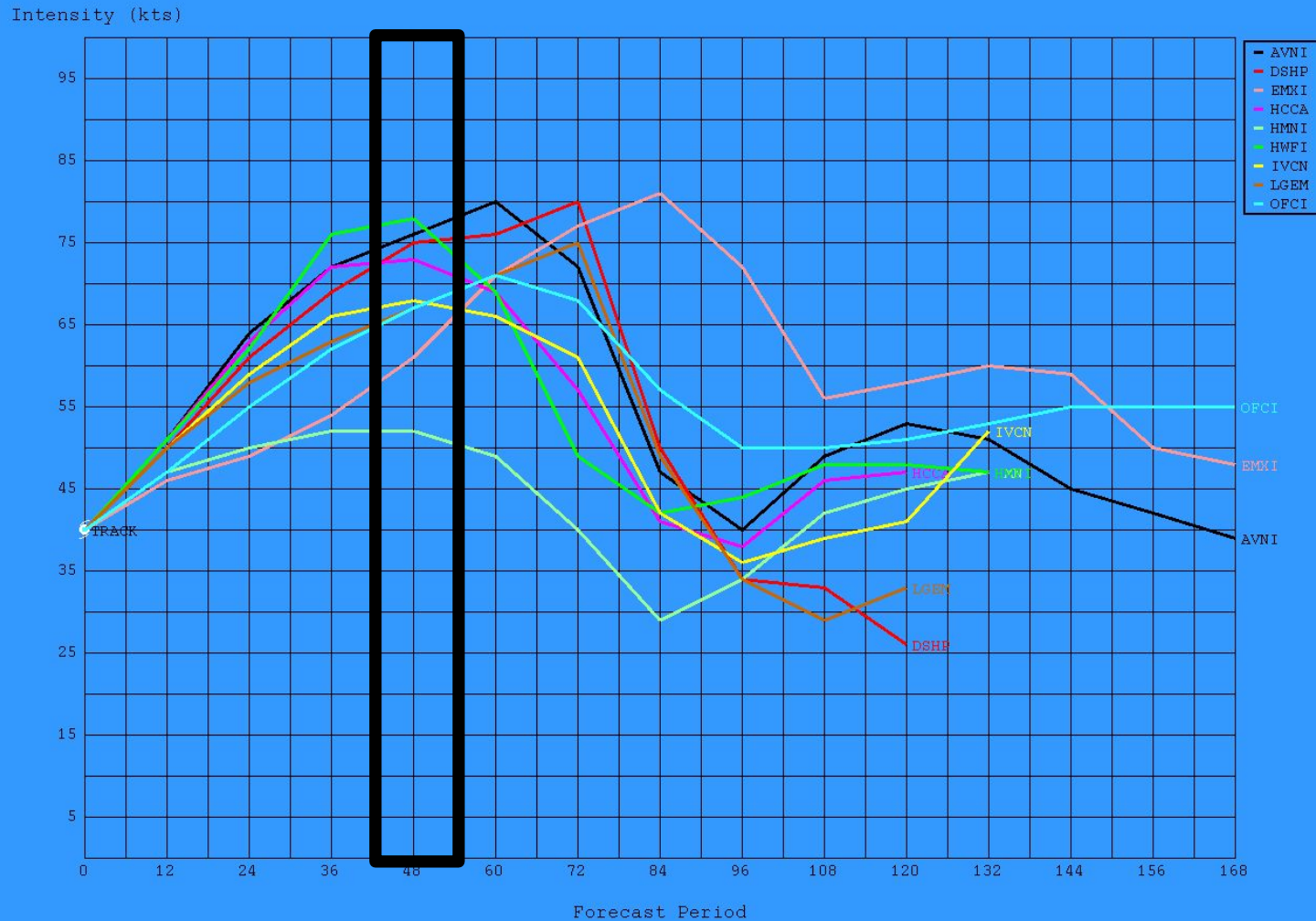
| Model/Color | Intensity |
|----------------|-----------|
| HWFI - Green | 76 |
| HMNI - Green | 52 |
| AVNI - Black | 72 |
| EMXI - Salmon | 54 |
| DSHP - Red | 69 |
| LGEM - Orange | 63 |
| IVCN - Yellow | 66 |
| HCCA - Magenta | 72 |
| OFCI - Cyan | 62 |

**What would be your
36 h intensity forecast?**

- A) 60 kt or less**
- B) 65 kt**
- C) 70 kt**
- D) 75 kt**
- E) 80 kt or greater**

48 h Intensity Forecast

Obj. Aid Time Intensity for 89L for 041618



| Model/Color | Intensity |
|----------------|-----------|
| HWFI - Green | 78 |
| HMNI - Green | 52 |
| AVNI - Black | 76 |
| EMXI - Salmon | 61 |
| DSHP - Red | 75 |
| LGEM - Orange | 67 |
| IVCN - Yellow | 68 |
| HCCA - Magenta | 73 |
| OFCI - Cyan | 67 |

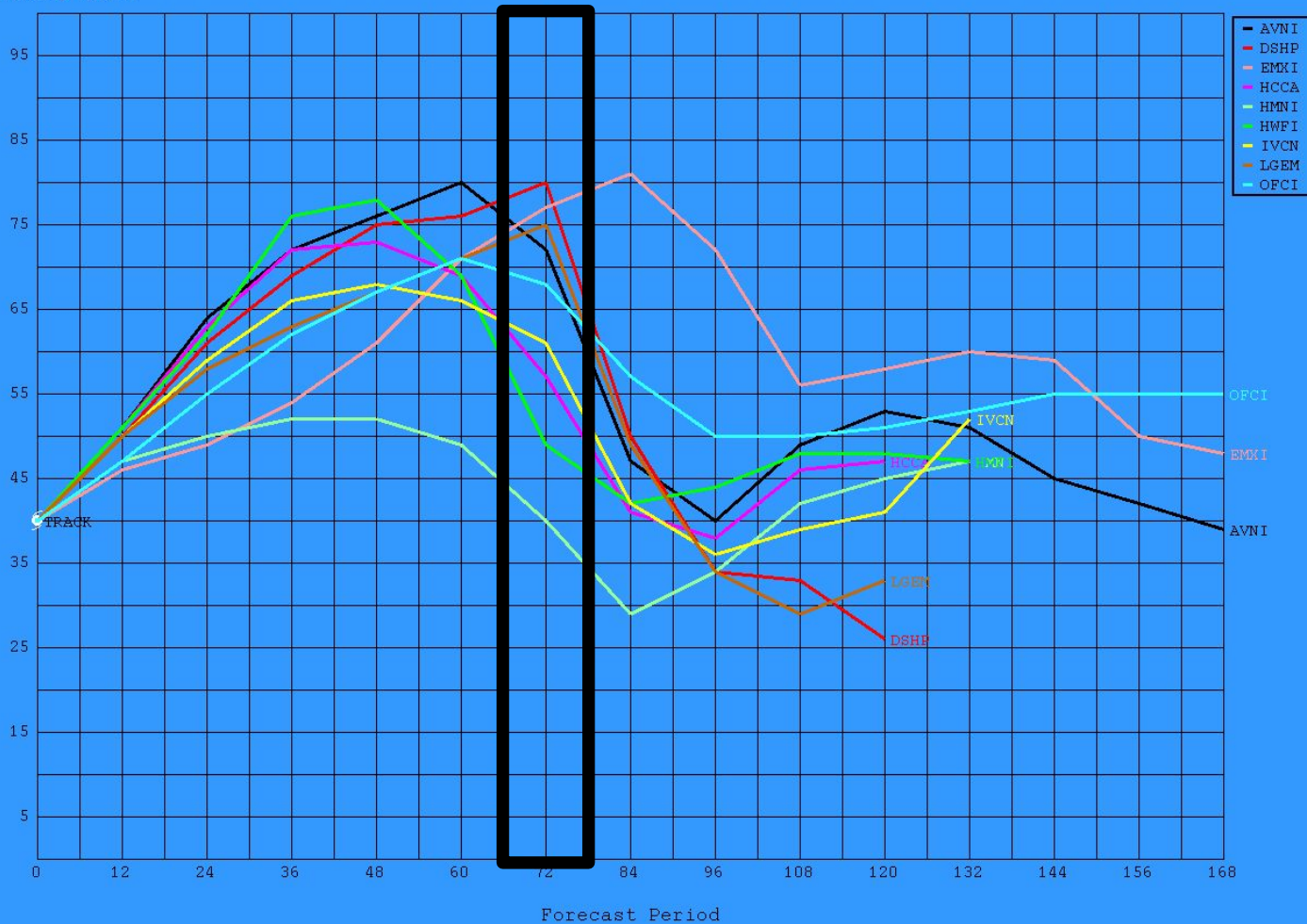
**What would be your
48 h intensity forecast?**

- A) 65 kt or less**
- B) 70 kt**
- C) 75 kt**
- D) 80 kt**
- E) 85 kt or greater**

72 h Intensity Forecast

Obj. Aid Time Intensity for 89L for 041618

Intensity (kts)



| Model/Color | Intensity |
|----------------|-----------|
| HWFI - Green | 49 |
| HMNI - Green | 40 |
| AVNI - Black | 72 |
| EMXI - Salmon | 77 |
| DSHP - Red | 80 |
| LGEM - Orange | 75 |
| IVCN - Yellow | 61 |
| HCCA - Magenta | 57 |
| OFCI - Cyan | 68 |

**What would be your
72 h intensity forecast?**

- A) 65 kt or less**
- B) 70 kt**
- C) 75 kt**
- D) 80 kt**
- E) 85 kt or greater**

19:34 UTC

New Fix Data

New aircraft data has just arrived. The aircraft measured SFMR winds of 53 kt and a maximum flight-level wind of 56 kt. Do we need to update our intensity or track forecasts and re-submit the model data?

```
000
URNT12 KNHC 161945
VORTEX DATA MESSAGE AL682020
A. 07/19:34:10Z
B. 19.19 deg N 085.78 deg W
C. 925 mb 686 m
D. EXTRAP 999 mb
E. NA
F. NA
G. NA
H. 53 kt
I. 102 deg 62 nm 19:24:00Z
J. 209 deg 56 kt
K. 105 deg 49 nm 19:28:30Z
L. 34 kt
M. 226 deg 101 nm 19:31:30Z
N. 256 deg 32 kt
O. 226 deg 106 nm 19:33:00Z
P. 21 C / 763 m
Q. 24 C / 764 m
R. 20 C / NA
S. 1345 / 09
T. 0.02 / 3 nm
U. AF305 0114A CYCLONE OB 10
MAX FL WIND 56 KT 105 / 49 NM 19:28:30Z
SLP EXTRAP FROM 925 MB
;
```

Preparing the Wind Radii Forecast

Wind Radii Forecast Dialogue Box

Enter your radii prediction (n mi) for each forecast period

Select forecast period. Radii forecasts only out to 72 h

Forecast Wind Radii Dialog - AMS al792010

TAU 12

| | NE (nm) | SE (nm) | SW (nm) | NW (nm) |
|--|---------|---------|---------|---------|
| 34 kt: <input type="checkbox"/> circle <input type="checkbox"/> quad | 130 | 90 | 40 | 100 |
| 50 kt: <input type="checkbox"/> circle <input type="checkbox"/> quad | 60 | 40 | 0 | 40 |
| 64 kt: <input type="checkbox"/> circle <input type="checkbox"/> quad | 0 | 0 | 0 | 0 |

TAU: 0, 12, 24, 36, 48, 72, 96, 120

Max Wind: 75 kts
Dir: 309
Spd: 10 kts

Use previous TAU, Use TAU 0 - all TAUs, Use DRCL - current TAU, Use DRCL - all TAUs, Delete Radii, Display Options...

Graph/Make-Forecast 34 kt radii: NE... SE... SW... NW...
Graph/Select radii (radial graph): 34 kt ... 50 kt ... 64 kt ...

Wind Radii Guidance for TAU 12

| Tech | TAU | V-Max (kts) | 34 knot radii (nm) | | | | 50 knot radii (nm) | | | | 64 knot radii (nm) | | | |
|------|-----|-------------|--------------------|-----|-----|-----|--------------------|-----|----|-----|--------------------|----|----|----|
| EHXI | 12 | 63 | 0 | 0 | 0 | 3 | | | | | | | | |
| GFDT | 12 | 94 | 215 | 209 | 127 | 167 | 134 | 125 | 45 | 128 | 74 | 71 | 0 | 52 |
| GFTI | 12 | 69 | 48 | 56 | 19 | 34 | 28 | 53 | 17 | 17 | 17 | 27 | 4 | 10 |
| HRCL | 12 | 75 | 135 | 95 | 70 | 120 | 70 | 45 | 20 | 50 | 40 | 20 | 15 | 25 |
| NGPI | 12 | 60 | 0 | 14 | 0 | 0 | | | | | | | | |
| NGPS | 12 | 53 | 177 | 121 | 68 | 93 | 70 | 0 | 0 | 75 | | | | |
| NGXI | 12 | 60 | 0 | 61 | 0 | 0 | | | | | | | | |

Current Forecast

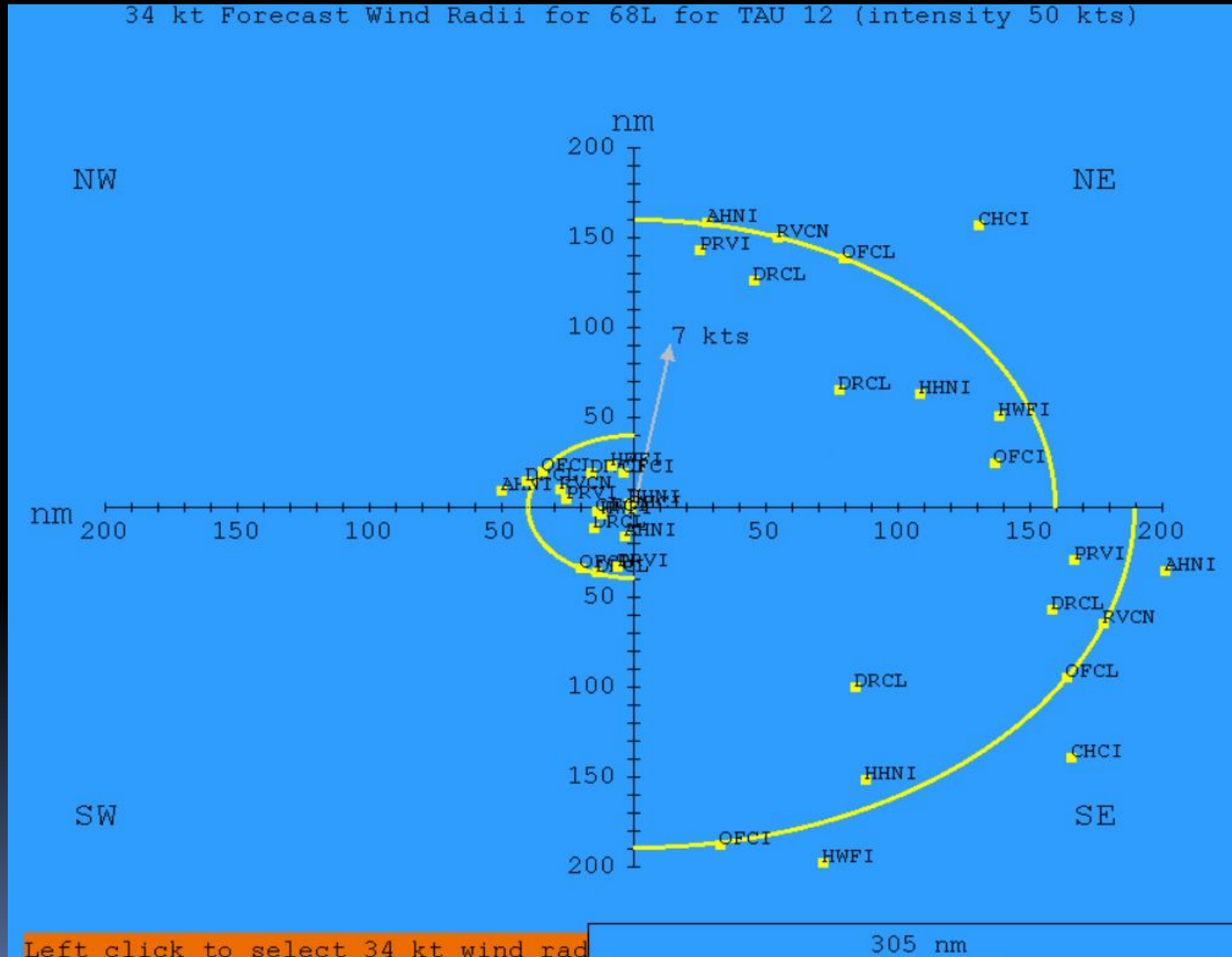
| TAU | V-Max (kts) | 34 knot radii (nm) | | | | 50 knot radii (nm) | | | |
|-----|-------------|--------------------|----|----|-----|--------------------|----|---|----|
| 0 | 60 | 130 | 90 | 40 | 100 | 60 | 40 | 0 | 40 |
| 12 | 75 | 130 | 90 | 40 | 100 | 60 | 40 | 0 | 40 |
| 24 | 90 | 130 | 90 | 40 | 100 | 60 | 40 | 0 | 40 |
| 36 | 100 | 130 | 90 | 40 | 100 | 60 | 40 | 0 | 40 |
| 48 | 110 | 130 | 90 | 40 | 100 | 60 | 40 | 0 | 40 |
| 72 | 105 | 130 | 90 | 40 | 100 | 60 | 40 | 0 | 40 |
| 96 | 85 | | | | | | | | |
| 120 | 55 | | | | | | | | |

Help, Apply, OK, Cancel

Guidance

Summary of your radii forecasts

Forecasters can use a graphical plot to complete radii forecasts



Wind Radii Forecast Dialogue Box

Forecast Wind Radii Dialog - WMOADJ al682020 (on nhc-ls-atcfsvr1.nhc.noaa.gov) x

TAU 12

NE (nm) SE (nm) SW (nm) NW (nm) TAU: 0

34 kt: circle quad 160 190 40 40 12

50 kt: circle quad 0 0 0 0 24

64 kt: circle quad 0 0 0 0 36

Use previous TAU Delete Radii 48

Use DRCL Display Options... 60

Use RVCN Use RVCN-All Taus 72

96

120

Max Wind 50 kts

Dir: 12

Spd: 7 kts

Graph/Select radii (radial graph) 34 kt ... 50 kt ... 64 kt ...

Wind Radii Guidance for TAU 12

| Tech | TAU | V-Max (kts) | 34 knot radii (nm) | | 50 knot radii (nm) | | | | 64 knot radii (nm) | |
|------|-----|-------------|--------------------|-----|--------------------|----|----|----|--------------------|---|
| HHNI | 12 | 49 | 161 | 205 | 17 | 51 | | | | |
| DRCL | 12 | 50 | 134 | 169 | 40 | 43 | 42 | 49 | 0 | 0 |
| CHCI | 12 | 50 | 204 | 217 | 2 | 0 | 6 | 4 | 0 | 0 |
| DRCL | 12 | 50 | 102 | 131 | 19 | 25 | 34 | 40 | 0 | 0 |
| HHNI | 12 | 46 | 126 | 176 | 0 | 3 | | | | |
| HWFI | 12 | 51 | 148 | 211 | 13 | 24 | 5 | 6 | 0 | 2 |
| OFCI | 12 | 47 | 139 | 191 | 14 | 20 | | | | |

Current Forecast

| TAU | V-Max (kts) | 34 knot radii (nm) | | 50 knot radii (nm) | | | | 64 knot radii (nm) | |
|-----|-------------|--------------------|-----|--------------------|----|----|----|--------------------|----|
| 0 | 40 | 120 | 180 | 0 | 0 | | | | |
| 12 | 50 | 160 | 190 | 40 | 40 | | | | |
| 24 | 55 | 165 | 215 | 30 | 55 | 35 | 35 | 0 | 20 |
| 36 | 65 | 175 | 240 | 45 | 85 | 50 | 40 | 0 | 25 |
| 48 | 65 | 180 | 250 | 55 | 90 | 55 | 45 | 10 | 30 |
| 60 | 70 | 180 | 255 | 65 | 85 | 55 | 50 | 20 | 30 |
| 72 | 70 | 180 | 260 | 70 | 80 | 40 | 40 | 20 | 20 |
| 96 | 50 | | | | | | | | |

Help Apply OK Cancel

← Summary of your radii forecasts

Now let's decide if watches or warnings are required



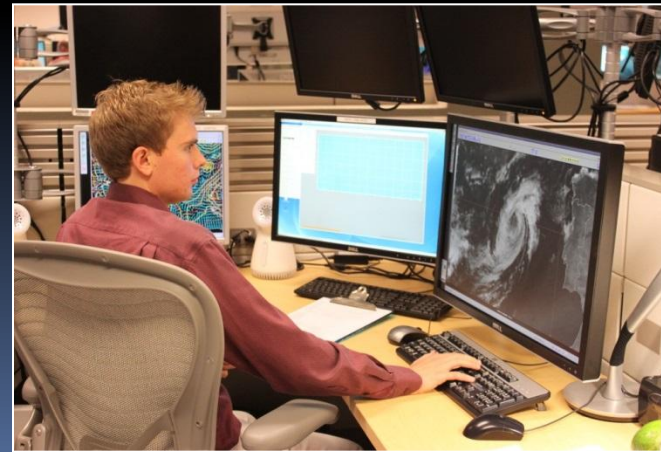
Definitions of Hurricane Watch/Warning

- Hurricane Watch: hurricane conditions are possible somewhere within the watch area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.
- Hurricane Warning: hurricane conditions are expected somewhere within the warning area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.

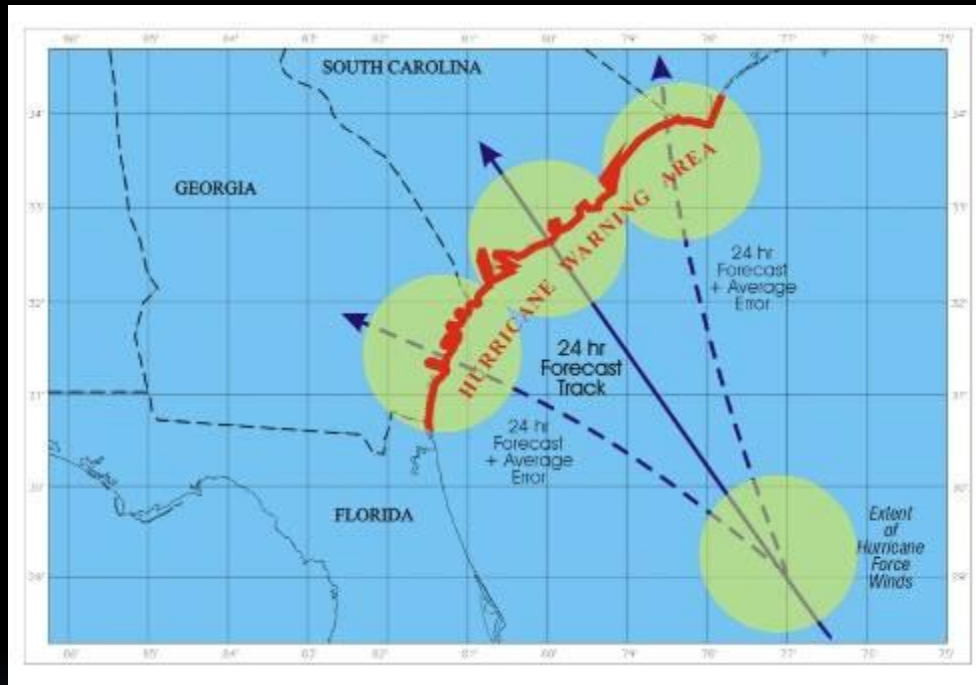


Definitions of Tropical Storm Watch/Warning

- Tropical Storm Watch: tropical storm conditions are possible somewhere within the watch area within the next 48 hours.
- Tropical Storm Warning: tropical storm conditions are expected somewhere within the warning area within the next 36 hours.



Issuing Warnings



(AVERAGE 24-HOUR FORECAST ERROR IS NOW ~50 MILES)

Warning Size is based on:

Forecast Track

Storm Size

Known uncertainties in the forecasts

Orientation of the forecast track with respect to the coast plays a major role in the size of the warning area

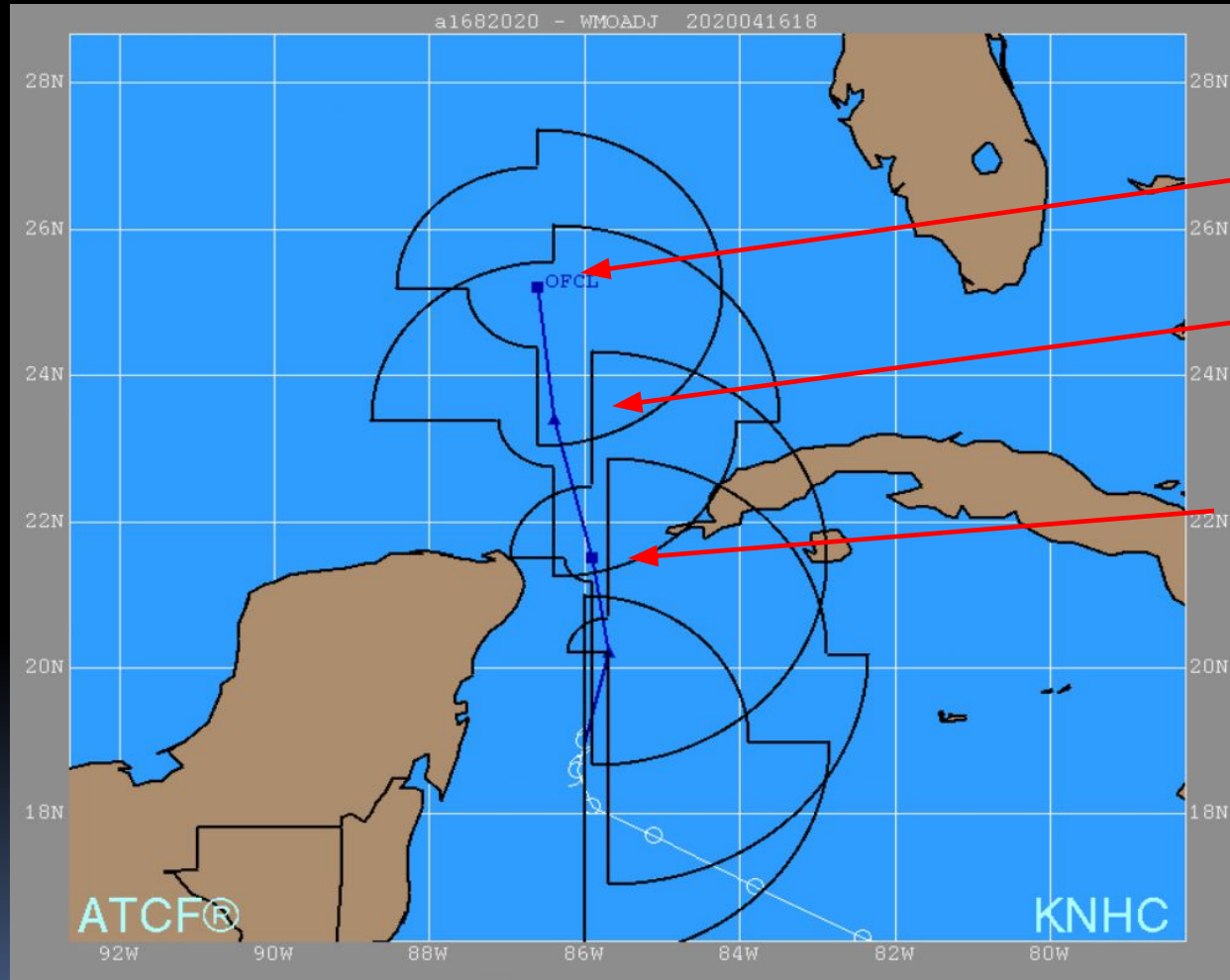
International Coordination

World MET. ORGANIZATION - Regional Association IV Coordination



Do we need watches or warnings?

Remember to consider forecast uncertainty



48 h forecast- Still time for the Gulf Coast?

36 h forecast- Florida Keys and Dry Tortugas?

12-24 h forecast- Western Cuba, the Isle of Youth, and Mexico?



**Better start calling Mexico, Cuba,
and the National Weather Service
Office in Key West...**

**If you run out of time to call NWS Key West,
you can coordinate on the hotline call**

Now type them up...

Advisory Composition Dialog - AMS a1792010

Tropical Cyclone a1792010 on 2010082918

Special Advisory Time of advisory: 0000 HMM

Forecaster Initials: DPB

Advisory number: 10 AWIPS bin number: 4

Time Zone: Atlantic Eastern Central Daylight Time

Subtropical Surface Pressure: 984 mb

Center Accuracy: 20 nm Eye Diameter: 0 nm

Forecast type...

Geography Reference: 19.3N 81.2W GRAND CAYMAN


Geography Reference: 21.6N 82.8W THE ISLE OF YOUTH

Public advisory frequency: 6 hourly 3 hourly 2 hourly

Last Advisory

Advisory Data... Edit Warning...

Help OK Cancel



Now type them up...

WATCHES AND WARNINGS

CHANGES WITH THIS ADVISORY:

None

SUMMARY OF WATCHES AND WARNINGS IN EFFECT:

A Tropical Storm Warning is in effect for...

- * The Cuban provinces of Pinar del Rio and the Isle of Youth
- * The coast of Mexico from Tulum to Cabo Catoche, including Cozumel

A Tropical Storm Warning means that tropical storm conditions are expected somewhere within the warning area, in this case within 24 hours.

Interests along the northeastern and central U.S. Gulf coast should monitor the progress of the Tropical Storm.

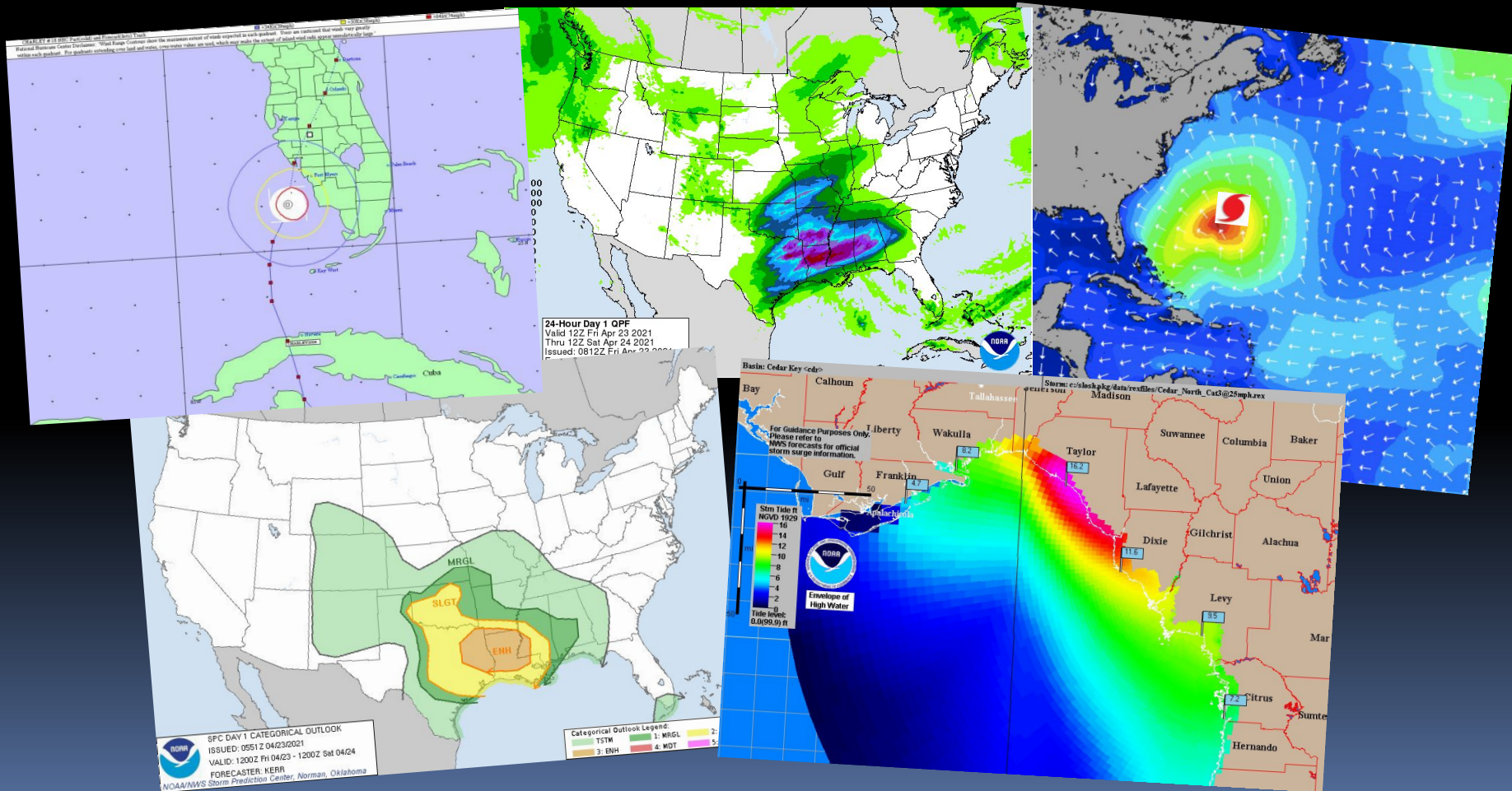
For storm information specific to your area, please monitor products issued by your national meteorological service.

20:00 UTC

NWS / DOD Coordination Call

Coordinate and determine watches/ warnings

Coordinate storm surge, rainfall, tornado, rip current hazards



20:10 UTC

Advisory Composition

**hurry up- you only have about
30-45 minutes to get it out**

Forecast/Advisory and Wind Speed Probabilities

ZCZC MIATCMAT4 ALL
TTAA00 KNHC DDHHMM

TROPICAL STORM MICHAEL FORECAST/ADVISORY NUMBER 5
NWS NATIONAL HURRICANE CENTER MIAMI FL AL142018
2100 UTC SUN OCT 07 2018

CHANGES IN WATCHES AND WARNINGS WITH THIS ADVISORY...

NONE.

SUMMARY OF WATCHES AND WARNINGS IN EFFECT...

A TROPICAL STORM WARNING IS IN EFFECT FOR...

* THE CUBAN PROVINCES OF PINAR DEL RIO AND THE ISLE OF YOUTH
* THE COAST OF MEXICO FROM TULUM TO CABO CATOCHÉ... INCLUDING
COZUMEL

A TROPICAL STORM WARNING MEANS THAT TROPICAL STORM CONDITIONS ARE
EXPECTED SOMEWHERE WITHIN THE WARNING AREA... IN THIS CASE WITHIN
24 HOURS.

INTERESTS ALONG THE NORTHEASTERN AND CENTRAL U.S. GULF COAST SHOULD
MONITOR THE PROGRESS OF MICHAEL.

TROPICAL STORM CENTER LOCATED NEAR 19.2N 85.5W AT 07/2100Z
POSITION ACCURATE WITHIN 20 NM

PRESENT MOVEMENT TOWARD THE NORTH-NORTHEAST OR 20 DEGREES AT 3 KT

ESTIMATED MINIMUM CENTRAL PRESSURE 999 MB
MAX SUSTAINED WINDS 45 KT WITH GUSTS TO 50 KT.
34 KT...120NE 180SE 05W 0NW.
12 FT SEAS...09NE 09SE 05W 0NW.
WINDS AND SEAS VARY GREATLY IN EACH QUADRANT. RADII IN NAUTICAL
MILES ARE THE LARGEST RADII EXPECTED ANYWHERE IN THAT QUADRANT.

REPEAT...CENTER LOCATED NEAR 19.2N 85.5W AT 07/2100Z.
AT 07/1800Z CENTER WAS LOCATED NEAR 19.0N 86.0W

FORECAST VALID 08/0600Z 20.1N 85.6W
MAX WIND 50 KT...GUSTS 60 KT.
50 KT...50NE 50SE 05W 0NW.
34 KT...120NE 180SE 05W 40NW.

FORECAST VALID 08/1800Z 21.5N 85.8W
MAX WIND 60 KT...GUSTS 75 KT.
50 KT...60NE 60SE 05W 20NW.
34 KT...120NE 150SE 30SW 50NW.

FORECAST VALID 09/0600Z 23.2N 86.2W
MAX WIND 70 KT...GUSTS 85 KT.
64 KT...25NE 25SE 05W 20NW.
50 KT...60NE 60SE 20SW 40NW.
34 KT...140NE 140SE 40SW 80NW.

FORECAST VALID 09/1800Z 25.0N 86.7W
MAX WIND 80 KT...GUSTS 100 KT.
64 KT...25NE 25SE 15SW 25NW.
50 KT...60NE 60SE 30SW 40NW.
34 KT...130NE 130SE 60SW 100NW.

FORECAST VALID 10/1800Z 29.2N 85.7W
MAX WIND 85 KT...GUSTS 105 KT.
50 KT...60NE 60SE 30SW 40NW.
34 KT...130NE 130SE 70SW 80NW.

EXTENDED OUTLOOK. NOTE...ERRORS FOR TRACK HAVE AVERAGED NEAR 150 NM
ON DAY 4 AND 175 NM ON DAY 5...AND FOR INTENSITY NEAR 15 KT EACH DAY

OUTLOOK VALID 11/1800Z 33.7N 80.4W...INLAND
MAX WIND 50 KT...GUSTS 60 KT.

OUTLOOK VALID 12/1800Z 39.0N 68.5W...POST-TROP/EXTRATROP
MAX WIND 55 KT...GUSTS 65 KT.

REQUEST FOR 3 HOURLY SHIP REPORTS WITHIN 300 MILES OF 19.2N 85.5W

NEXT ADVISORY AT 08/0300Z

\$\$
FORECASTER BROWN

ZCZC MIAPNSAT4 ALL
TTAA00 KNHC DDHHMM

TROPICAL STORM MICHAEL WIND SPEED PROBABILITIES NUMBER 5
NWS NATIONAL HURRICANE CENTER MIAMI FL AL142018
2100 UTC SUN OCT 07 2018

AT 2100Z THE CENTER OF TROPICAL STORM MICHAEL WAS LOCATED NEAR
LATITUDE 19.2 NORTH...LONGITUDE 85.5 WEST WITH MAXIMUM SUSTAINED
WINDS NEAR 45 KTS...50 MPH...85 KM/H.

Z INDICATES COORDINATED UNIVERSAL TIME (GREENWICH)

ATLANTIC STANDARD TIME (AST)...SUBTRACT 4 HOURS FROM Z TIME
EASTERN DAYLIGHT TIME (EDT)...SUBTRACT 4 HOURS FROM Z TIME
CENTRAL DAYLIGHT TIME (CDT)...SUBTRACT 5 HOURS FROM Z TIME

WIND SPEED PROBABILITY TABLE FOR SPECIFIC LOCATIONS

CHANCES OF SUSTAINED (1-MINUTE AVERAGE) WIND SPEEDS OF AT LEAST

...34 KT (39 MPH... 63 KM/H)...
...50 KT (58 MPH... 93 KM/H)...
...64 KT (74 MPH...119 KM/H)...

FOR LOCATIONS AND TIME PERIODS DURING THE NEXT 5 DAYS

PROBABILITIES FOR LOCATIONS ARE GIVEN AS OP(CP) WHERE

OP IS THE PROBABILITY OF THE EVENT BEGINNING DURING
AN INDIVIDUAL TIME PERIOD (ONSET PROBABILITY)

(CP) IS THE PROBABILITY OF THE EVENT OCCURRING BETWEEN
18Z SUN AND THE FORECAST HOUR (CUMULATIVE PROBABILITY)

PROBABILITIES ARE GIVEN IN PERCENT

X INDICATES PROBABILITIES LESS THAN 1 PERCENT

PROBABILITIES FOR 34 KT AND 50 KT ARE SHOWN AT A GIVEN LOCATION WHEN

THE 5-DAY CUMULATIVE PROBABILITY IS AT LEAST 3 PERCENT.

PROBABILITIES FOR 34...50...64 KT SHOWN WHEN THE 5-DAY

64-KT CUMULATIVE PROBABILITY IS AT LEAST 1 PERCENT.

- - - - WIND SPEED PROBABILITIES FOR SELECTED LOCATIONS - - - -

| TIME PERIODS | FROM 18Z SUN | | FROM 06Z MON | | FROM 06Z TUE | | FROM 18Z TUE | | FROM 18Z WED | | FROM 18Z THU | |
|--------------|--------------|---------|--------------|---------|--------------|---------|--------------|----|--------------|----|--------------|--|
| | TO | TO | TO | TO | TO | TO | TO | TO | TO | TO | TO | |
| | 06Z MON | 18Z MON | 06Z TUE | 18Z TUE | 18Z WED | 18Z THU | 18Z FRI | | | | | |

| FORECAST HOUR | (12) | (24) | (36) | (48) | (72) | (96) | (120) | | | | | |
|---------------|------|------|------|------|------|------|-------|--|--|--|--|--|
|---------------|------|------|------|------|------|------|-------|--|--|--|--|--|

| LOCATION | KT | | | | | | | | | | | |
|----------|----|--|--|--|--|--|--|--|--|--|--|--|
|----------|----|--|--|--|--|--|--|--|--|--|--|--|

| | | | | | | | | | | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|
| SABLE ISLAND | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | X(X) | 4(4) | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|-------------|----|---|------|------|------|------|------|------|------|--|--|--|
| YARMOUTH NS | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | X(X) | 4(4) | | | |
|-------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|------------|----|---|------|------|------|------|------|------|------|--|--|--|
| HYANNIS MA | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | X(X) | 8(8) | | | |
|------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|--------------|----|---|------|------|------|------|------|------|--------|--|--|--|
| NANTUCKET MA | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | X(X) | 11(11) | | | |
|--------------|----|---|------|------|------|------|------|------|--------|--|--|--|

| | | | | | | | | | | | | |
|---------------|----|---|------|------|------|------|------|------|------|--|--|--|
| NONTAUK POINT | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | X(X) | 7(7) | | | |
|---------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|----------|----|---|------|------|------|------|------|------|------|--|--|--|
| ISLIP NY | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | X(X) | 3(3) | | | |
|----------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|
| NWS EARLE NJ | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | X(X) | 3(3) | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|
| PHILADELPHIA | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 1(1) | 2(3) | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|---------------|----|---|------|------|------|------|------|------|------|--|--|--|
| ATLANTIC CITY | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 1(1) | 4(5) | | | |
|---------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|
| BALTIMORE MD | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 1(1) | 3(4) | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|

| | | | | | | | | | | | | |
|----------|----|---|------|------|------|------|------|------|------|--|--|--|
| DOVER DE | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 2(2) | 4(6) | | | |
|----------|----|---|------|------|------|------|------|------|------|--|--|--|

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|--------------|----|---|------|------|------|------|------|------|------|--|--|--|
| ANNAPOLIS MD | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 2(2) | 4(6) | | | |
|--------------|----|---|------|------|------|------|------|------|------|--|--|--|

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|---------------|----|---|------|------|------|------|------|------|------|--|--|--|
| WASHINGTON DC | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 2(2) | 4(6) | | | |
|---------------|----|---|------|------|------|------|------|------|------|--|--|--|

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|---------------|----|---|------|------|------|------|------|------|-------|--|--|--|
| CAPE HENLOPEN | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 3(3) | 9(12) | | | |
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|---------------|----|---|------|------|------|------|------|------|--------|--|--|--|
| OCEAN CITY MD | 34 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 4(4) | 13(17) | | | |
|---------------|----|---|------|------|------|------|------|------|--------|--|--|--|

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|---------------|----|---|------|------|------|------|------|------|------|--|--|--|
| OCEAN CITY MD | 50 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 1(1) | 3(4) | | | |
|---------------|----|---|------|------|------|------|------|------|------|--|--|--|

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|---------------|----|---|------|------|------|------|------|------|------|--|--|--|
| OCEAN CITY MD | 64 | X | X(X) | X(X) | X(X) | X(X) | X(X) | 1(1) | X(1) | | | |
|---------------|----|---|------|------|------|------|------|------|------|--|--|--|

Let's create the public advisory

Example of Public Advisory

ZCZC MIATCPAT4 ALL
TTAA00 KNHC DDHMM

BULLETIN

Tropical Storm Michael Advisory Number 5
NWS National Hurricane Center Miami FL AL142018
400 PM CDT Sun Oct 07 2018

...AIRCRAFT FINDS MICHAEL STRONGER...
...HEAVY RAINS EXPECTED OVER WESTERN CUBA TONIGHT AND MONDAY...
...THREAT TO THE NORTHEASTERN U.S. GULF COAST INCREASING...

SUMMARY OF 400 PM CDT...2100 UTC...INFORMATION

LOCATION...19.2N 85.5W
ABOUT 130 MI...205 KM SE OF COZUMEL MEXICO
ABOUT 190 MI...305 KM SSW OF THE WESTERN TIP OF CUBA
MAXIMUM SUSTAINED WINDS...50 MPH...85 KM/H
PRESENT MOVEMENT...NNE OR 20 DEGREES AT 3 MPH...6 KM/H
MINIMUM CENTRAL PRESSURE...999 MB...29.50 INCHES

WATCHES AND WARNINGS

CHANGES WITH THIS ADVISORY:

None

SUMMARY OF WATCHES AND WARNINGS IN EFFECT:

A Tropical Storm Warning is in effect for...
* The Cuban provinces of Pinar del Rio and the Isle of Youth
* The coast of Mexico from Tulum to Cabo Catoche, including Cozumel

A Tropical Storm Warning means that tropical storm conditions are expected somewhere within the warning area, in this case within 24 hours.

Interests along the northeastern and central U.S. Gulf coast should monitor the progress of Michael.

For storm information specific to your area, please monitor products issued by your national meteorological service.

Section headers added

Storm information first

Changes to watches and warnings in the current advisory are highlighted

Bulleted summary of all watches and warnings in effect

Example of Public Advisory Format

DISCUSSION AND OUTLOOK

At 400 PM CDT (2100 UTC), the center of Tropical Storm Michael was located near latitude 19.2 North, longitude 85.5 West. Michael is moving toward the north-northeast near 3 mph (6 km/h). A northward motion with some increase in forward speed is expected over the next few days. On the forecast track, the center of Michael will move over the Yucatan Channel on Monday, and then across the eastern Gulf of Mexico late Monday through Tuesday night, and approach the northeastern Gulf coast on Wednesday.

Data from an Air Force Reserve reconnaissance aircraft indicate that maximum sustained winds have increased to near 50 mph (85 km/h) with higher gusts. Additional strengthening is expected during the next few days, and Michael is forecast to become a hurricane Monday night or Tuesday.

Tropical-storm-force winds extend outward up to 205 miles (335 km) primarily to the east of the center.

The latest minimum central pressure reported by reconnaissance aircraft is 999 mb (29.50 inches).

Discussion of forecast motion and intensity and other pertinent information

HAZARDS AFFECTING LAND

WIND: Tropical storm conditions are expected to first reach the coast within the warning area by this evening or tonight, making outside preparations difficult or dangerous.

RAINFALL: Michael is expected to produce total rain accumulations of 3 to 7 inches over western Cuba and 2 to 4 inches over the Yucatan Peninsula and Belize through Tuesday. Isolated maximum amounts of 12 inches are possible in western Cuba. This rainfall could lead to life-threatening flash floods and mudslides in areas of mountainous terrain.

Elsewhere, outer rain bands from Michael are expected to produce total rain accumulations of 2 to 4 inches across the Florida Keys through Tuesday.

Storm hazards and impacts, shown by type

NEXT ADVISORY

Next intermediate advisory at 700 PM CDT.
Next complete advisory at 1000 PM CDT.

Timing of next advisory

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Forecaster Brown

Create Your Discussion

ZCZC MIATCDAT4 ALL
TTAA00 KNHC DDHMM

Tropical Storm Michael Discussion Number 5
NWS National Hurricane Center Miami FL AL142018
400 PM CDT Sun Oct 07 2018

Deep convection has continued to develop over the eastern semicircle of the cyclone, and data from the reconnaissance aircraft indicate that the center has re-formed farther east, closer to the convection. The Air Force aircraft has measured peak 925-mb flight-level winds of 56 kt, and believable SFMR winds of 40-45 kt. Based on these data, the initial wind speed has been increased to 45 kt.

Due to the center reformation, the initial motion estimate is a highly uncertain 020/3 kt. The overall forecast reasoning has not changed much since the previous advisory. Although there could be some additional eastward re-formation of the center, the tropical storm is forecast to begin moving northward between a ridge over the western Atlantic and a deep-layer trough over the west-central United States. A general northward motion at around 10 kt is then expected to continue during the next 2 to 3 days. After that time, Michael should turn northeastward ahead of an approaching trough. The track guidance remains in overall agreement on this scenario, however, significant along-track (forward speed and timing) differences remain. The HWRF brings Michael onshore the northern Gulf coast within 72 hours, while the ECMWF is much slower and has Michael still offshore at day 4. The new NHC track has been shifted eastward primarily in the short term due to the more eastward initial position. The latter portion of the track forecast is again close to the consensus aids due to the large along- and cross-track guidance spread.

Michael has strengthened today despite moderate westerly shear. The shear is forecast to gradually decrease over the next couple of days while the system moves over warm waters. This should allow for steady strengthening and most of the intensity models bring Michael to hurricane strength within the next couple of days. It should also be noted that the global models also significantly deepen the storm over the next 72 hours to pressures below 978 mb. The new NHC intensity forecast calls for Michael to become a hurricane in about 36 hours when the storm reaches the southeastern Gulf of Mexico. Additional strengthening is indicated through 72 hours when the storm is forecast to be near the northern Gulf coast, and the NHC forecast is near the higher SHIPS and HWRF models.

Key Messages:

Write your own

FORECAST POSITIONS AND MAX WINDS

| | | | | | |
|------|----------|-------|-------|-------|------------------------------|
| INIT | 07/2100Z | 19.2N | 85.5W | 45 KT | 50 MPH |
| 12H | 08/0600Z | 20.1N | 85.6W | 50 KT | 60 MPH |
| 24H | 08/1800Z | 21.5N | 85.8W | 60 KT | 70 MPH |
| 36H | 09/0600Z | 23.2N | 86.2W | 70 KT | 80 MPH |
| 48H | 09/1800Z | 25.0N | 86.7W | 80 KT | 90 MPH |
| 72H | 10/1800Z | 29.2N | 85.7W | 85 KT | 100 MPH |
| 96H | 11/1800Z | 33.7N | 80.4W | 50 KT | 60 MPH...INLAND |
| 120H | 12/1800Z | 39.0N | 68.5W | 55 KT | 65 MPH...POST-TROP/EXTRATROP |

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Forecaster Brown

Create Your Discussion

ZCZC MIATCDAT4 ALL
TTAA00 KNHC DDHMM

Tropical Storm Michael Discussion Number 5
NWS National Hurricane Center Miami FL AL142018
400 PM CDT Sun Oct 07 2018

Deep convection has continued to develop over the eastern semicircle of the cyclone, and data from the reconnaissance aircraft indicate that the center has re-formed farther east, closer to the convection. The Air Force aircraft has measured peak 925-mb flight-level winds of 56 kt, and believable SFMR winds of 40-45 kt. Based on these data, the initial wind speed has been increased to 45 kt.

Due to the center reformation, the initial motion estimate is a highly uncertain 020/3 kt. The overall forecast reasoning has not changed much since the previous advisory. Although there could be some additional eastward re-formation of the center, the tropical storm is forecast to begin moving northward between a ridge over the western Atlantic and a deep-layer trough over the west-central United States. A general northward motion at around 10 kt is then expected to continue during the next 2 to 3 days. After that time, Michael should turn northeastward ahead of an approaching trough. The track guidance remains in overall agreement on this scenario, however, significant along-track (forward speed and timing) differences remain. The HWRF brings Michael onshore the northern Gulf coast within 72 hours, while the ECMWF is much slower and has Michael still offshore at day 4. The new NHC track has been shifted eastward primarily in the short term due to the more eastward initial position. The latter portion of the track forecast is again close to the consensus aids due to the large along- and cross-track guidance spread.

Michael has strengthened today despite moderate westerly shear. The shear is forecast to gradually decrease over the next couple of days while the system moves over warm waters. This should allow for steady strengthening and most of the intensity models bring Michael to hurricane strength within the next couple of days. It should also be noted that the global models also significantly deepen the storm over the next 72 hours to pressures below 978 mb. The new NHC intensity forecast calls for Michael to become a hurricane in about 36 hours when the storm reaches the southeastern Gulf of Mexico. Additional strengthening is indicated through 72 hours when the storm is forecast to be near the northern Gulf coast, and the NHC forecast is near the higher SHIPS and HWRF models.

Key Messages:

1. Michael is expected to produce heavy rainfall and flash flooding over portions of western Cuba and the northeastern Yucatan Peninsula of Mexico during the next couple of days.
2. Tropical storm conditions are expected tonight over portions of western Cuba and the northeastern Yucatan Peninsula, where tropical storm warnings are in effect.
3. Michael is forecast to be a hurricane when it reaches the northeastern Gulf Coast by mid-week, and the risk of dangerous storm surge, rainfall, and wind impacts continues to increase. In addition, Michael is expected to affect portions of the Florida Gulf Coast that are especially vulnerable to storm surge, regardless of the storm's exact track or intensity. Residents in these areas should monitor the progress of this system and follow any advice given by local officials.

FORECAST POSITIONS AND MAX WINDS

| | | | | | |
|------|----------|-------|-------|-------|------------------------------|
| INIT | 07/2100Z | 19.2N | 85.5W | 45 KT | 50 MPH |
| 12H | 08/0600Z | 20.1N | 85.6W | 50 KT | 60 MPH |
| 24H | 08/1800Z | 21.5N | 85.8W | 60 KT | 70 MPH |
| 36H | 09/0600Z | 23.2N | 86.2W | 70 KT | 80 MPH |
| 48H | 09/1800Z | 25.0N | 86.7W | 80 KT | 90 MPH |
| 72H | 10/1800Z | 29.2N | 85.7W | 85 KT | 100 MPH |
| 96H | 11/1800Z | 33.7N | 80.4W | 50 KT | 60 MPH...INLAND |
| 120H | 12/1800Z | 39.0N | 68.5W | 55 KT | 65 MPH...POST-TROP/EXTRATROP |

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Forecaster Brown

Objective of the Discussion

Explain the reasoning and confidence behind the analysis and the forecast

- include the prognostic reasoning
- indicate objective techniques used
- describe other meteorological decisions
- plans for watches and warnings

Key Messages

- Cover the most critical information in concise bullets
- Used to message hazards on social media

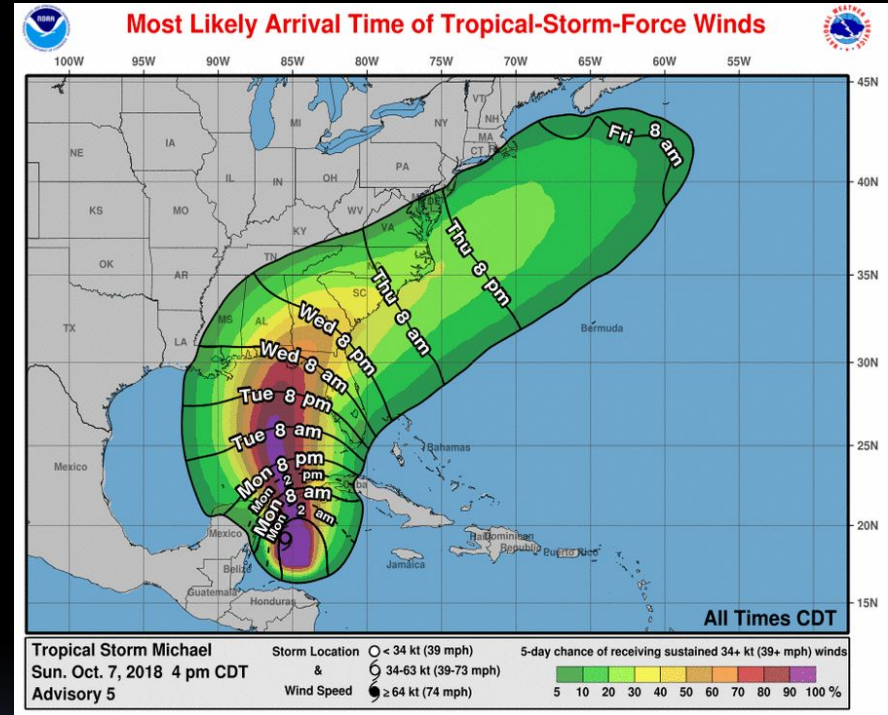
The discussion has a wide spectrum of users

- professional meteorologists
- meteorology students and professors
- the media
- emergency managers
- general public

21:00 UTC

Advisory deadline

Quick Run the Graphics- the media is calling



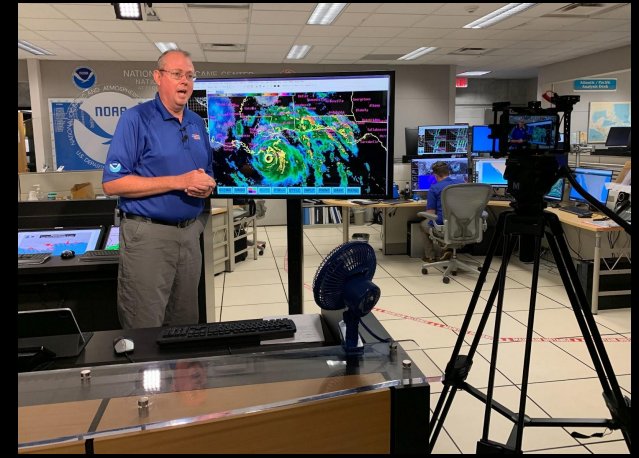
21:15 UTC

Impact-Based Decision Support (IDSS) Briefings & Media Interviews

IDSS Briefings



Media Interviews



Live: Biden visits FEMA to receive briefing on Hurricane preparedness efforts





Congratulations



**You have successfully issued
your first NHC Hurricane Forecast!**



How accurate was it?

