

# RDITT results

HFIP convened a “tiger team” to assess the impact of P3 Doppler data on track and intensity forecasts.

Three groups:

1. Penn State - EnKF, WRF-ARW
2. NOAA/EMC - one-way hybrid, HWRF
3. HRD - HEDAS, HWRF

Four sets of runs for as many cases as possible from 2008-2012:

1. no-assimilation control
2. Doppler radar data assimilated
3. HDOBs and dropwindsonde data assimilated
4. 2+3

# HEDAS

EnKF designed to work with HWRF (here V3.2)

10x10-degree stationary inner mesh, 3-km resolution

Data assimilated  $\pm 3$ h of each synoptic time

5-h spinup from 6-h-old experimental GFS EnKF ensemble

5 hly cycles to assimilate data

Data converted to storm-relative framework and randomly assigned a cycle

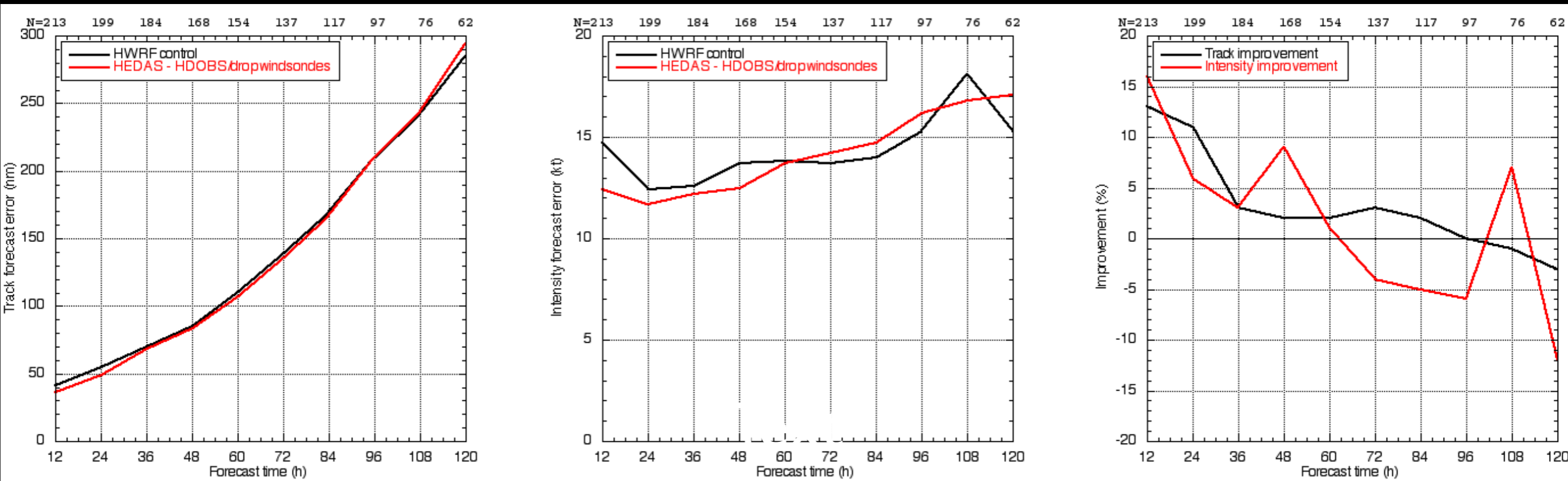
HWRF deterministic run from final ensemble-mean analysis

Almost 1400 HEDAS runs completed.

> 500 CPU years on NOAA jet computer

Each HEDAS run uses about 20xCPU of a regular HWRF run

# 1. What is the impact of the HDOBS and dropwindsonde data on HWRF forecasts?

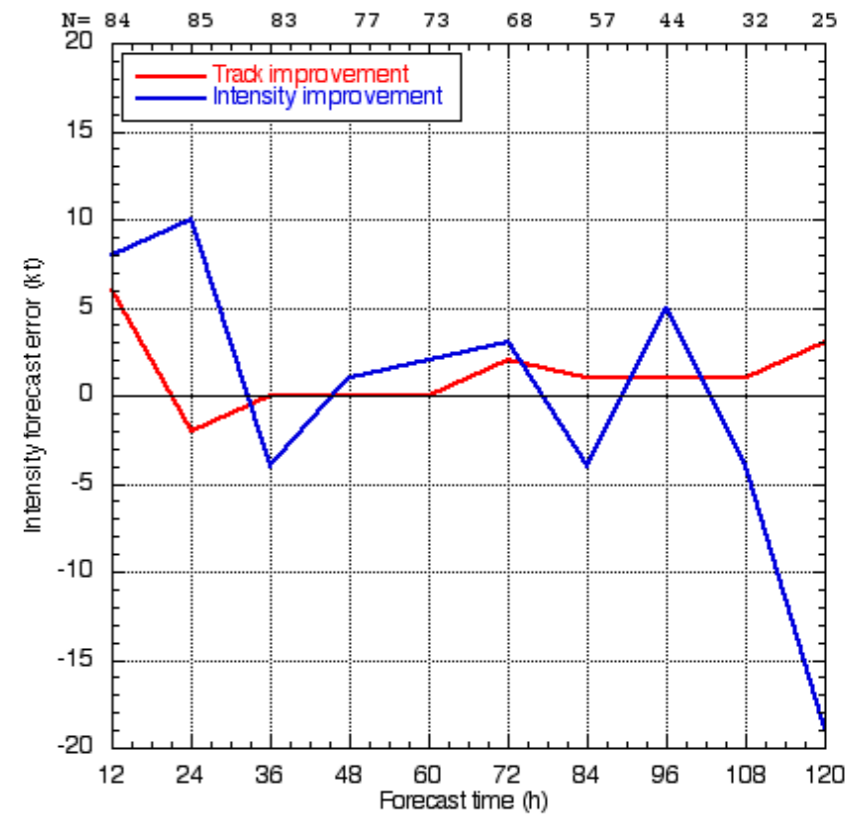
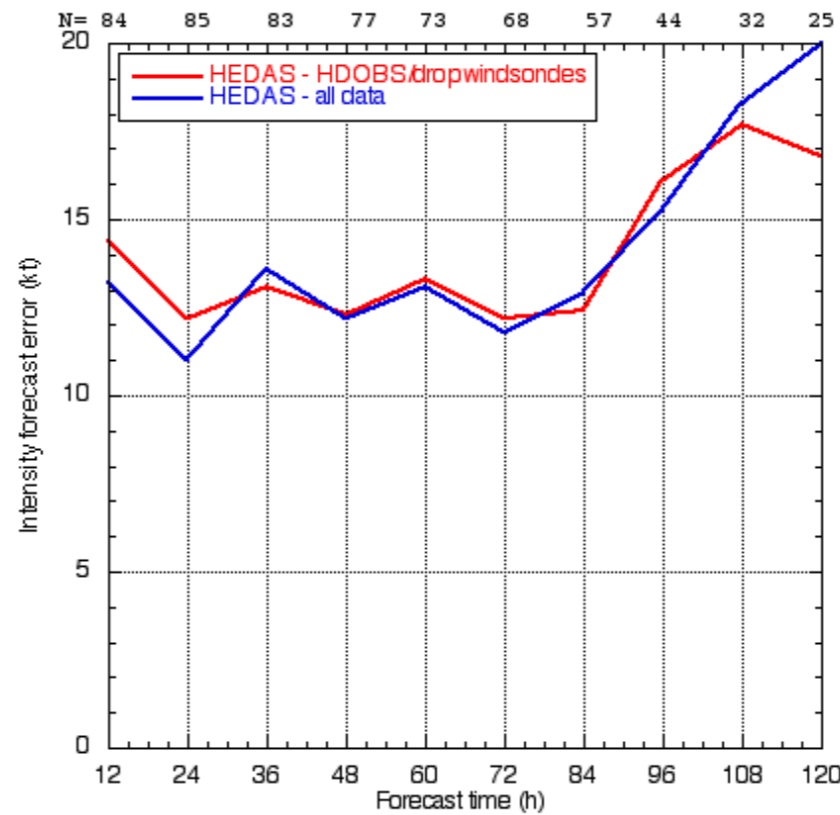
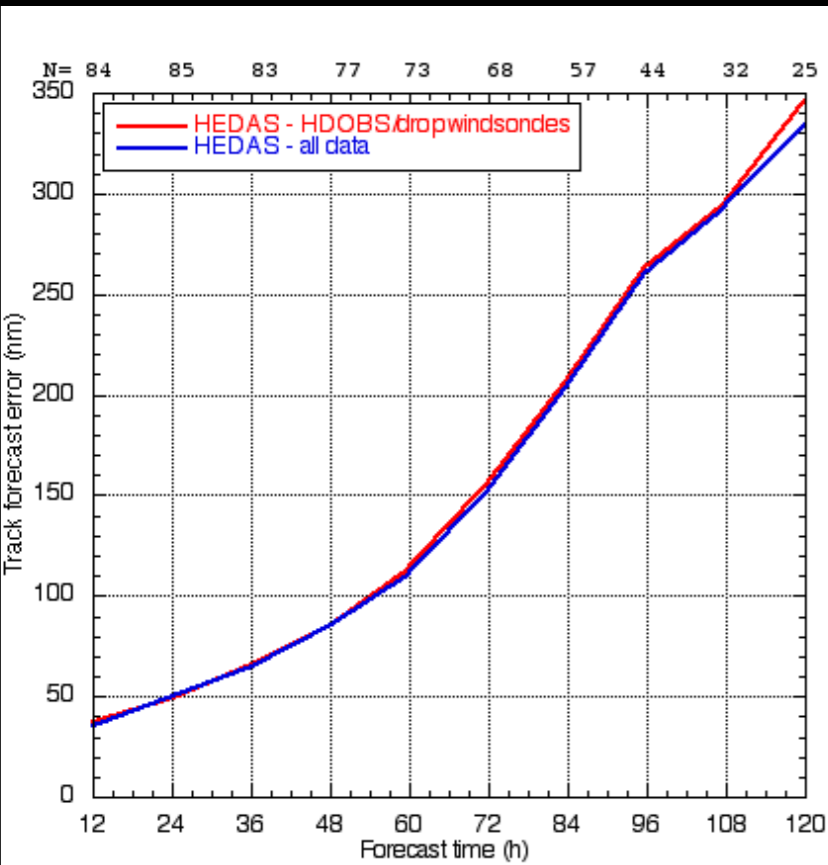


**TRACK** - forecasts are improved by up to 13% at all forecast times until 96 h. The 12-24-h forecast improvements are statistically significant at 99%. The 36- and 72-h forecast improvements are statistically significant at 90%.

**INTENSITY** - forecasts are improved by up to 16% through 60 h, and mixed thereafter. The 12-h forecast improvement is statistically significant at 99%. The 24- and 48-h forecast improvements are statistically significant at 90%.

One additional factor is the tendency of the control to not have a vortex to follow. Up to 6% of the no-assimilation control runs forecast dissipation before the runs with the HDOBS and dropwindsonde data and the real storm dissipated.

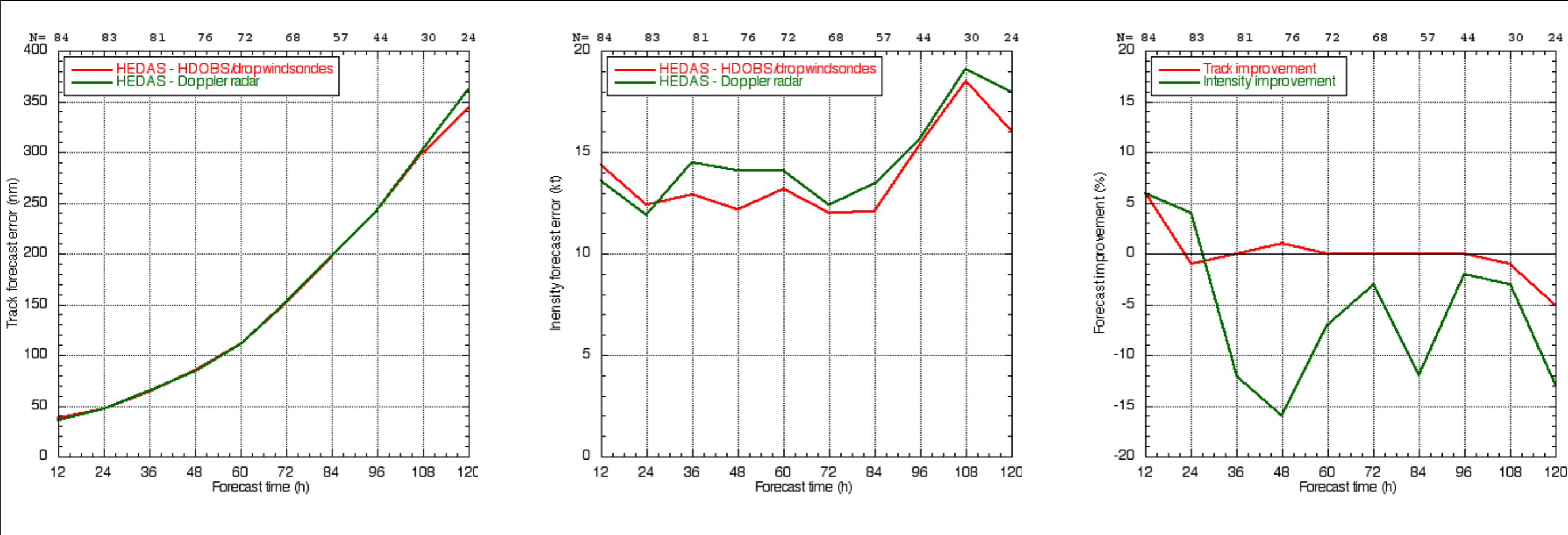
## 2. What is the impact of Doppler radar data versus just the HDOB and dropwindsonde data?



**TRACK** - the differences are small and mainly positive. The improvements at 120 h are statistically significant at the 90% level.

**INTENSITY** - the Doppler radar data improves short-range forecasts by up to 10%, after which the results are mixed. The improvement at 12 h is statistically significant at 90%. The degradation at 120 h is also statistically significant at 90%.

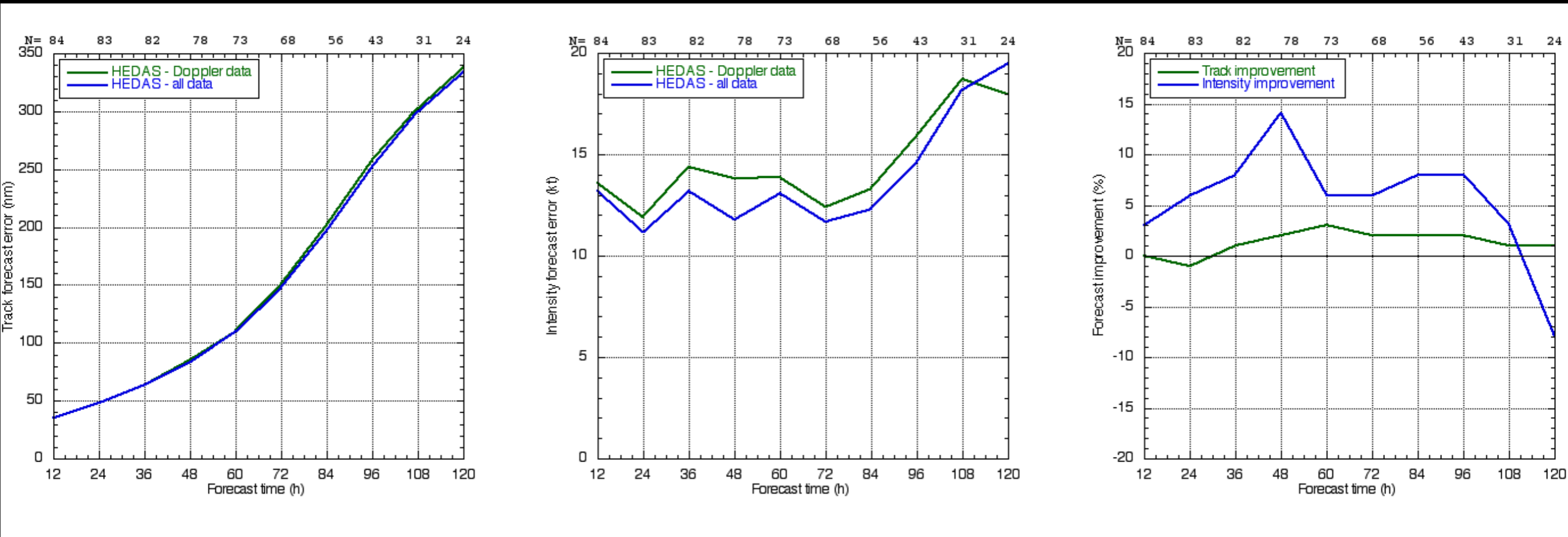
# 3. Are Doppler radar or HDOB/dropwindsonde data more important for track and intensity forecasts?



**TRACK** - the differences are small, and none are statistically significant.

**INTENSITY** - the forecasts with Doppler radar data assimilated are worse than those with HDOB/dropwindsonde data assimilated at most times, and the differences are significant at 90% at 36, 48, 96, and 120 h.

# 4. What is the impact of HDOB and dropwindsonde data versus just the Doppler radar data?



**TRACK** - there are slight differences, none of which are statistically significant.

**INTENSITY** - The HDOB/dropwindsonde data provide some improvement over just Doppler radar data.

# CONCLUSIONS

The HDOB and dropwindsonde data improve both track and intensity forecasts in the short range. This is in contrast to the results that the EMC group got on this question.

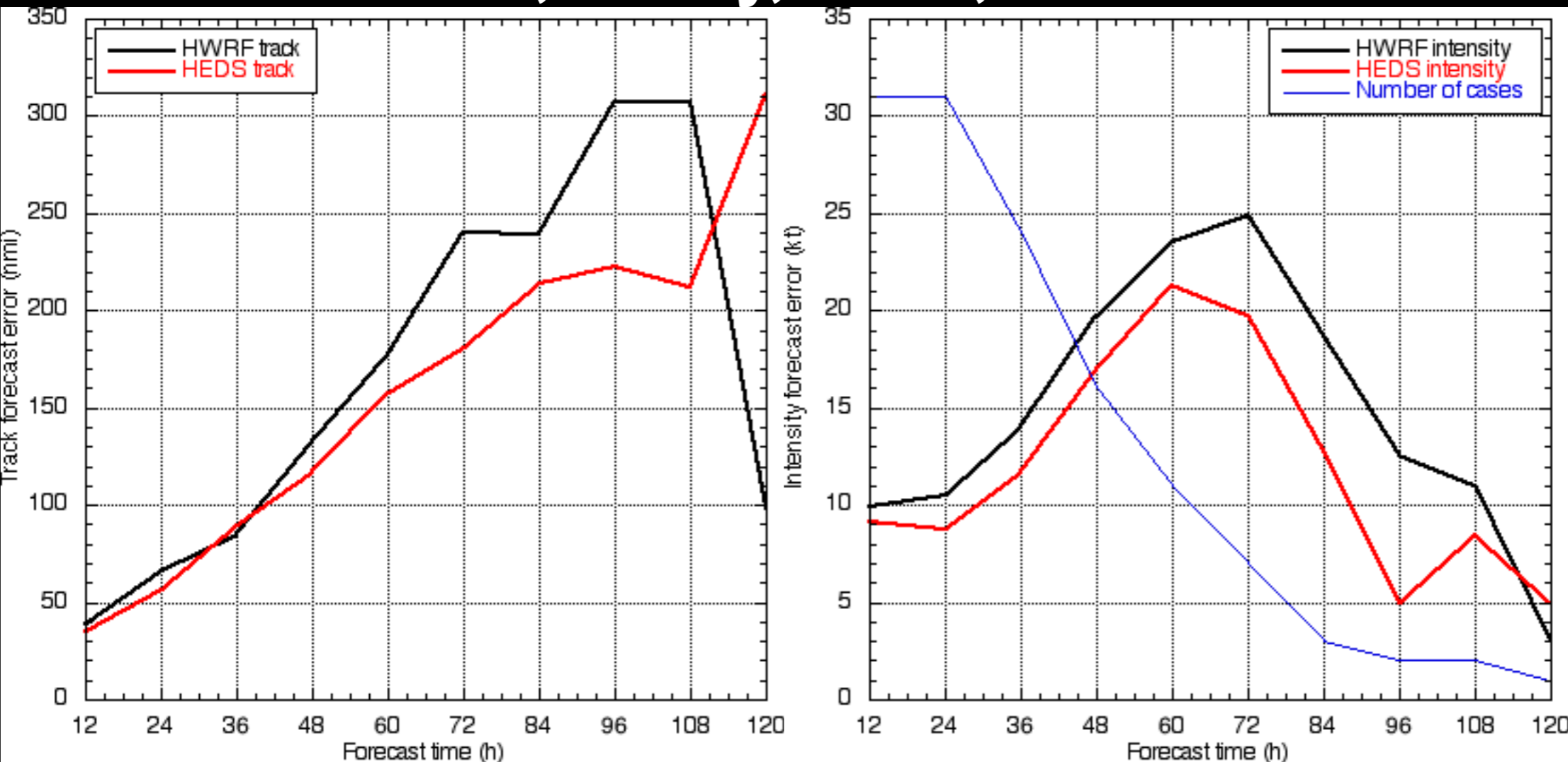
The Doppler radar data provides some improvement to short-range track and intensity forecasts. There is a significant degradation to 120-h intensity forecasts, though the sample then is small.

The HDOB/dropwindsonde data provide better intensity forecasts than the Doppler radar data. The Doppler radar data do provide some improvement in the short range, but these are not statistically significant.

The HDOB and dropwindsonde data provide some improvement in intensity forecasts over just the Doppler radar data.

# 2013 HEDAS runs

Aberson, Aksoy, Klotz, Sellwood

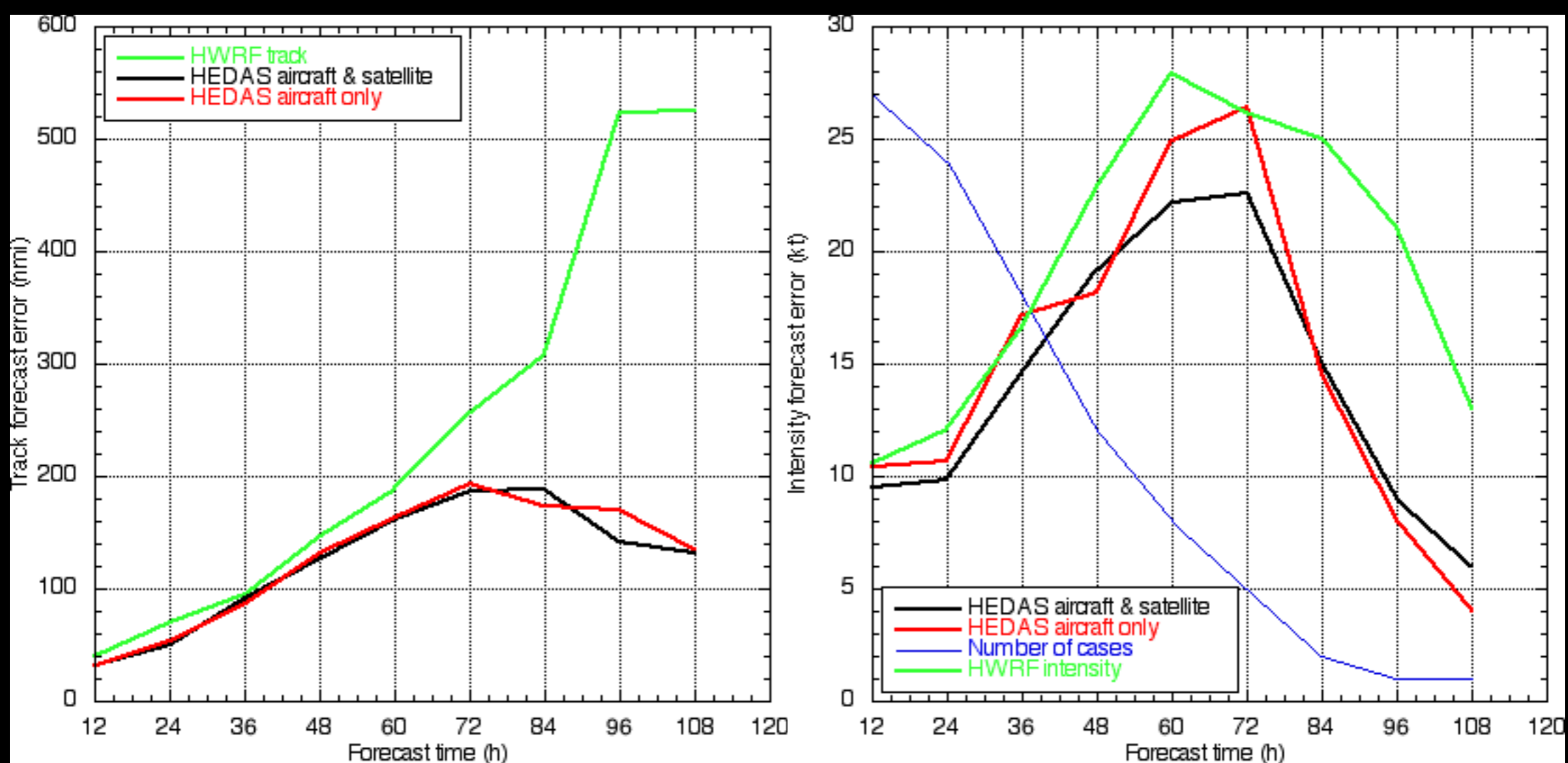


Data:  
aircraft,  
GPS/AIRS  
retrievals,  
AMVs

**Track and intensity forecasts largely improved by HEDAS.**

**It should be noted that HWRF has advantage of having ocean coupling and upgraded system whereas our runs do not.**





**Intensity forecasts largely improved by satellite data over aircraft only. Track forecasts are not greatly changed by aircraft data.**

**Satellite data allow for more consistent development and dissipation of systems as revealed by number of cases.**

# New website

<http://storm.aoml.noaa.gov/hedas>



## HWRFX

HURRICANE WEATHER  
RESEARCH AND FORECASTING  
EXPERIMENTAL SYSTEM

**Disclaimer:** All products in this website are experimental research products created by NOAA's Hurricane Research Division (HRD). For official National Weather Service products visit the National Hurricane Center website. Click here to view HRD's [data usage policy](#).

### Step 1: Select a year to start

Select a year

2013 (5 forecasts/2 storms)

Select a storm

AL912013 - DORIAN91L

Select a date

2013-07-29 18Z

Select a model

HWRFX

Select a model configuration

09:03km, HEDAS WITH HDOBS AND

Show All Products

Open in new window

#### Related Links

[NOAA Hurricane Research Division Official Blog | Facebook Page](#)

[HWRFX Portal Main Page](#)

[Operational HWRFX Runs 2012](#)

[Sites With Comparable Products](#)

[CIMSS Tropical Cyclones](#)  
(Shear and Steering plots)

[Navy/NRL Tropical Cyclones](#)  
(MW satellite imagery)

Your feedback is welcome!  
**CLICK HERE!**  
Let NOAA know what you think!

### Product Preview

Parent-domain-9km

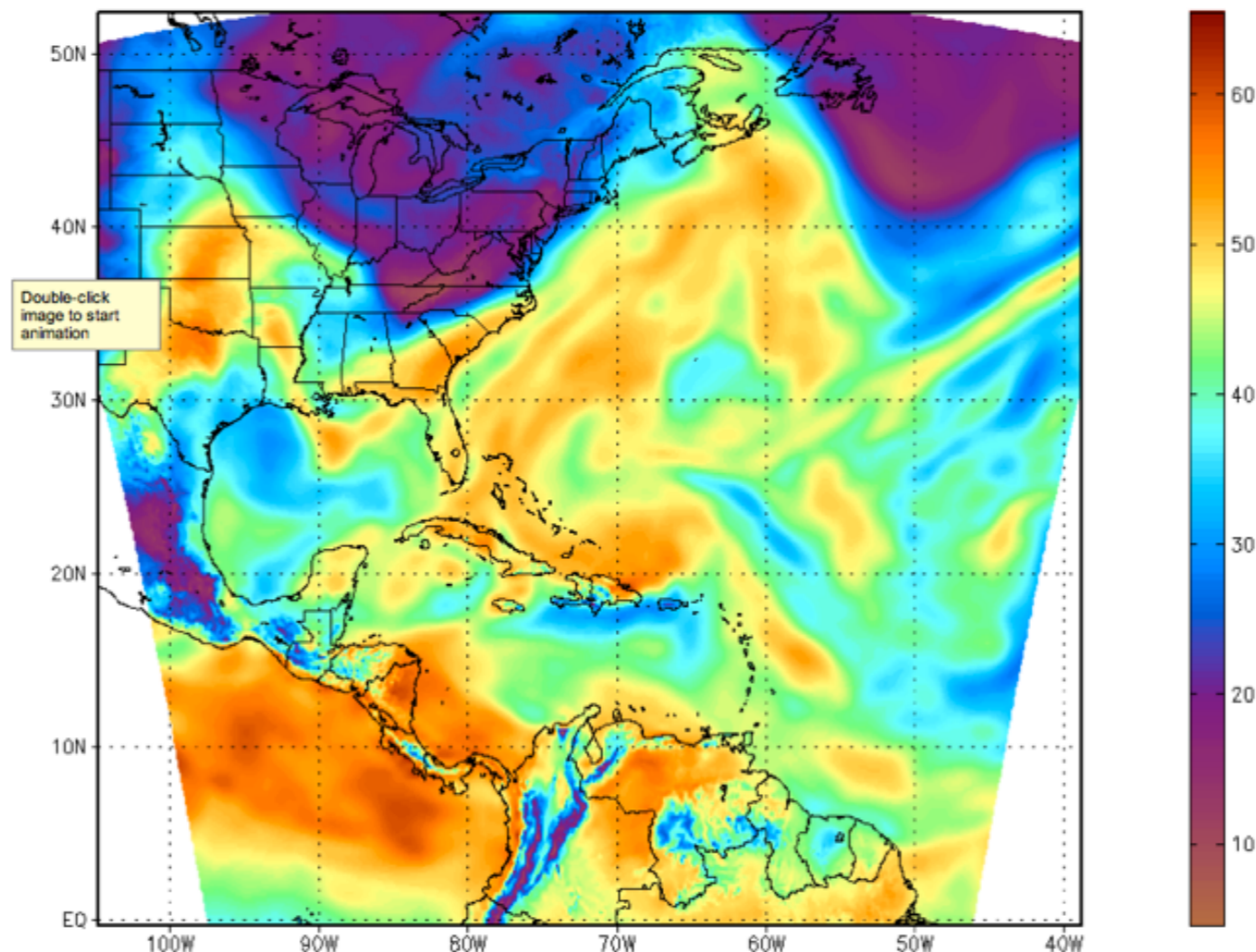
Total Precipitable Water (CIMSS style)

HEDAS | DORIAN91L 2013-07-29 18Z | HWRFX: 09:03km, HEDAS WITH HDOBS AND DROPWINDSONDES

Animation Speed 1 5 (2 FPS)

Experimental Product

Total precipitable water [mm] 2hr

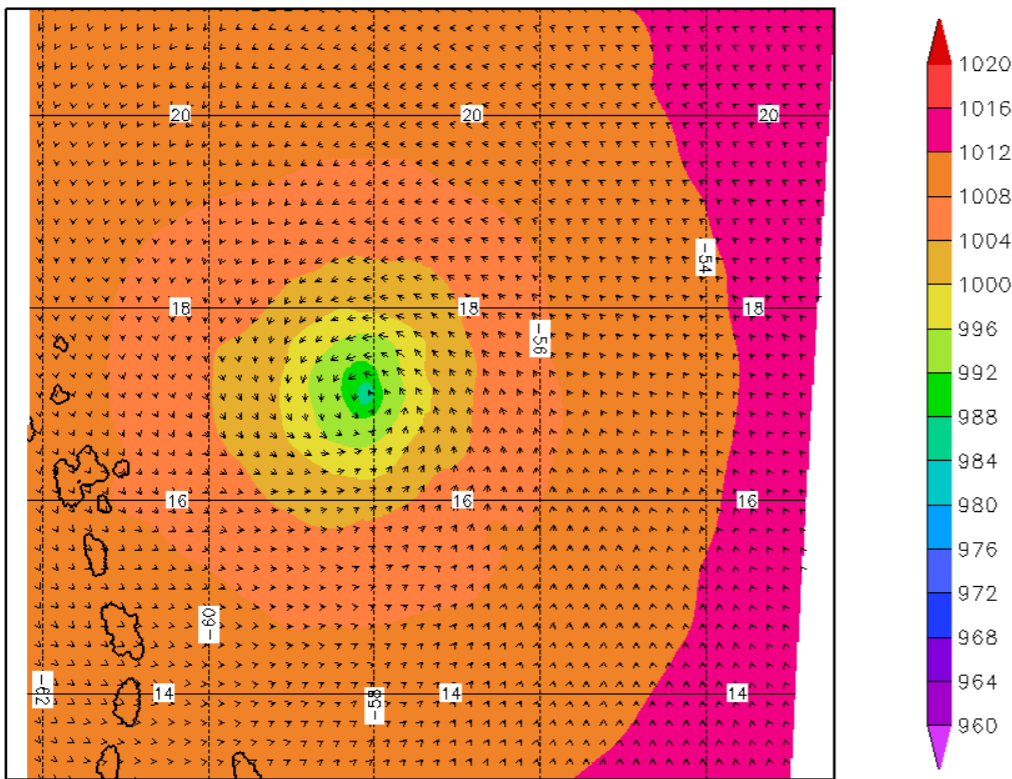


Initial date: 2013072918

Graphics available every hour on two meshes

Experimental Product

Mean sea-level pressure [mb]



Minimum pressure: 986.075 mb

50

Initial date: 2010082912

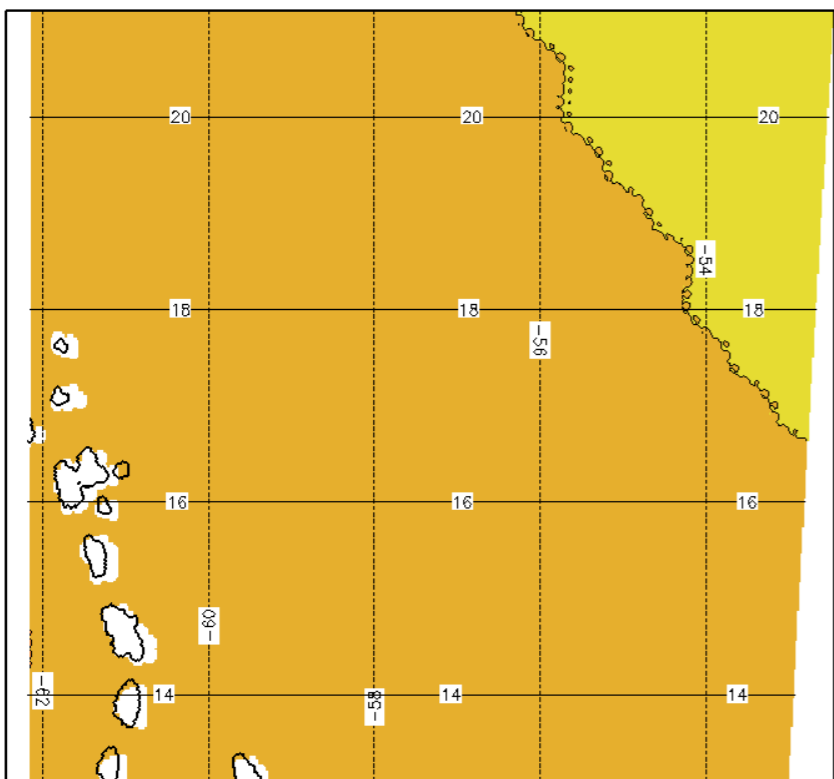
# Surface: Surface pressure (with minimum value written)

# Surface wind (with maximum value written)

# SST

Experimental Product

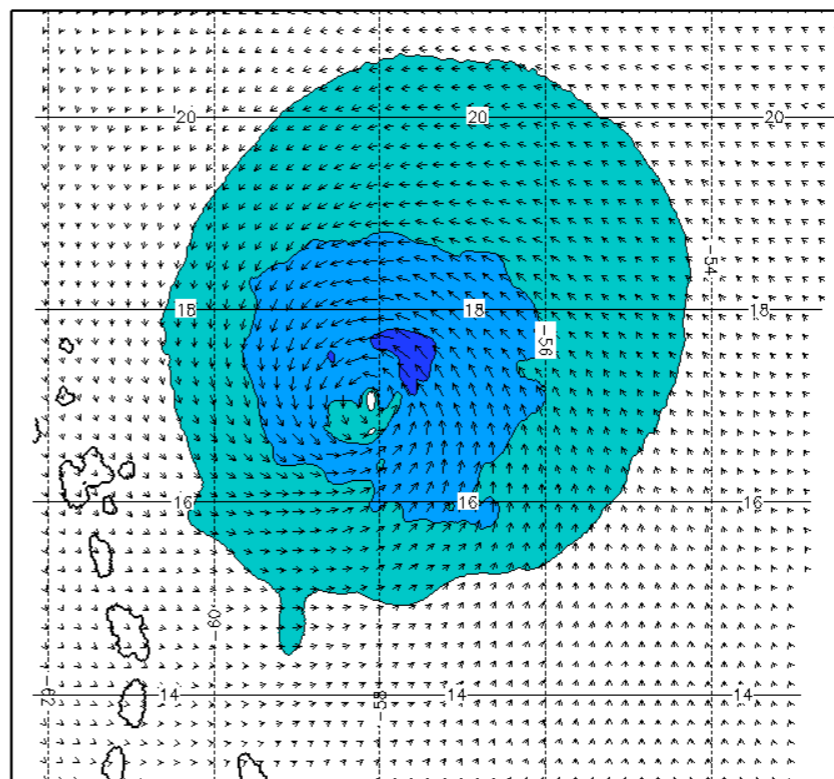
sea surface temperature [C]



Initial date: 2010082912

Experimental Product

10-m wind-speed [kt]

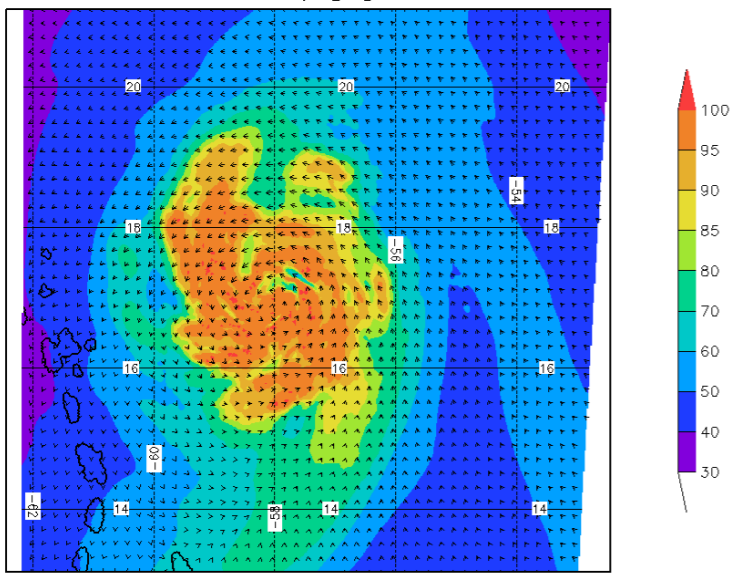


Maximum wind speed: 60.563 kt

50

Initial date: 2010082912

500-mb relative humidity [%] 2h



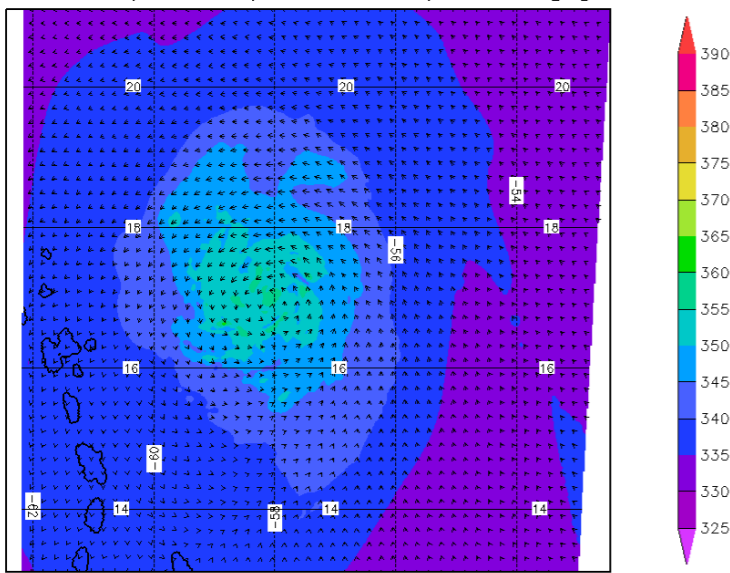
Initial date: 2010082912

# 850, 700, 500, and 200 hPa:

## Relative humidity

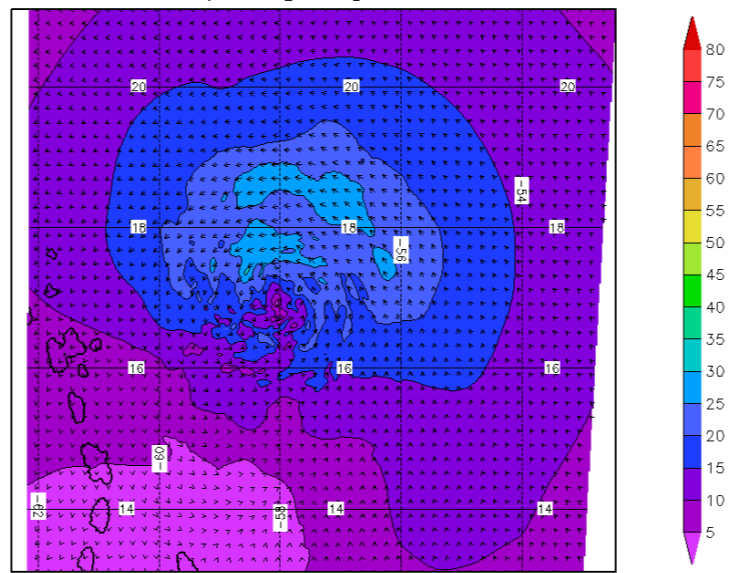
## Equivalent potential temperature

500-mb equivalent potential temperature [K] 2h



Initial date: 2010082912

500-mb wind speed [ms<sup>-1</sup>] 2h

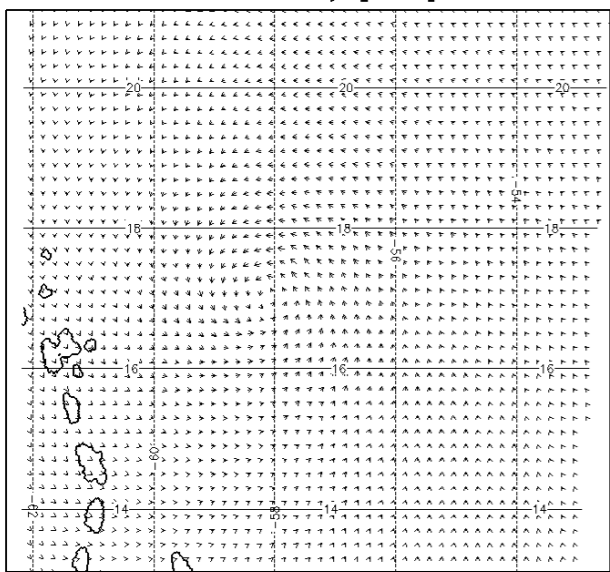


Initial date: 2010082912

## Horizontal wind velocity

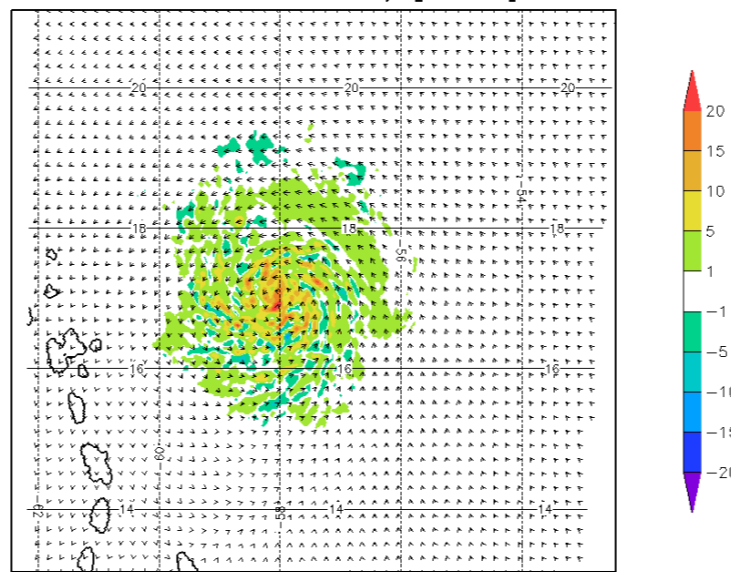
## Vertical velocity

500-mb vertical velocity [ms<sup>-1</sup>] 2h



Initial date: 2010082912

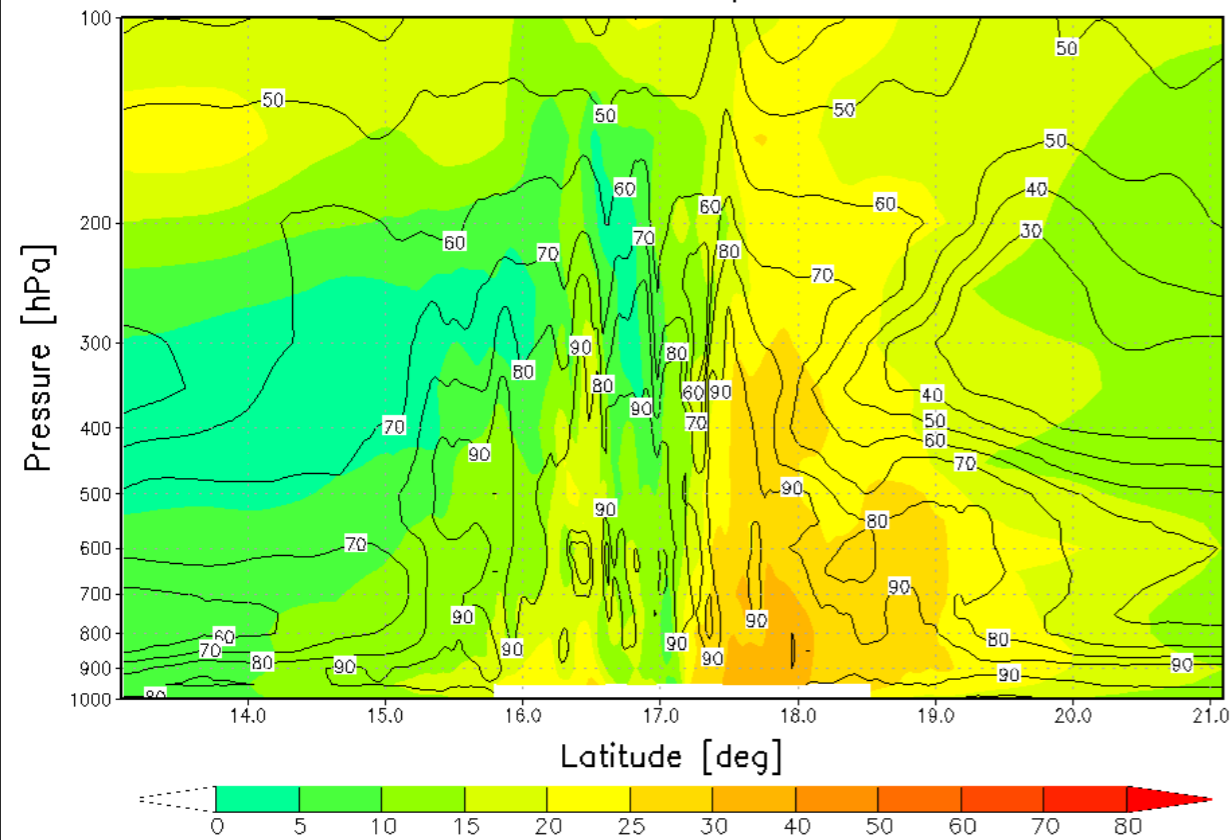
500-mb relative vorticity [10<sup>-4</sup>s<sup>-1</sup>] 2h



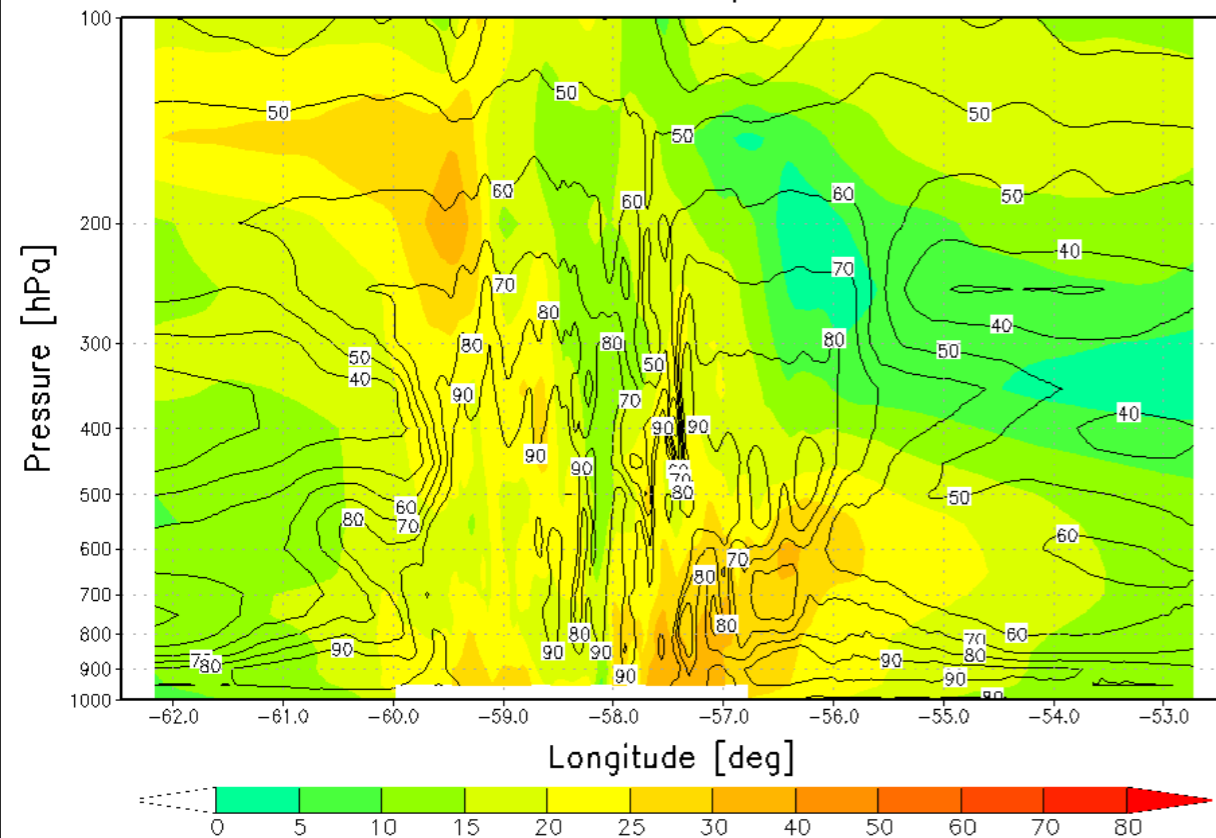
Initial date: 2010082912

## Relative vorticity

N-S X-Sec. Wind Speed [ $\text{ms}^{-1}$ , shaded] and RH [%], contoured]  
EARL07L 2010082912, 2h  
Center LON= -58.14, LAT= 17.15



E-W X-Sec. Wind Speed [ $\text{ms}^{-1}$ , shaded] and RH [%], contoured]  
EARL07L 2010082912, 2h  
Center LON= -58.14, LAT= 17.15



# Cross sections:

North-south and east-west  
through storm center

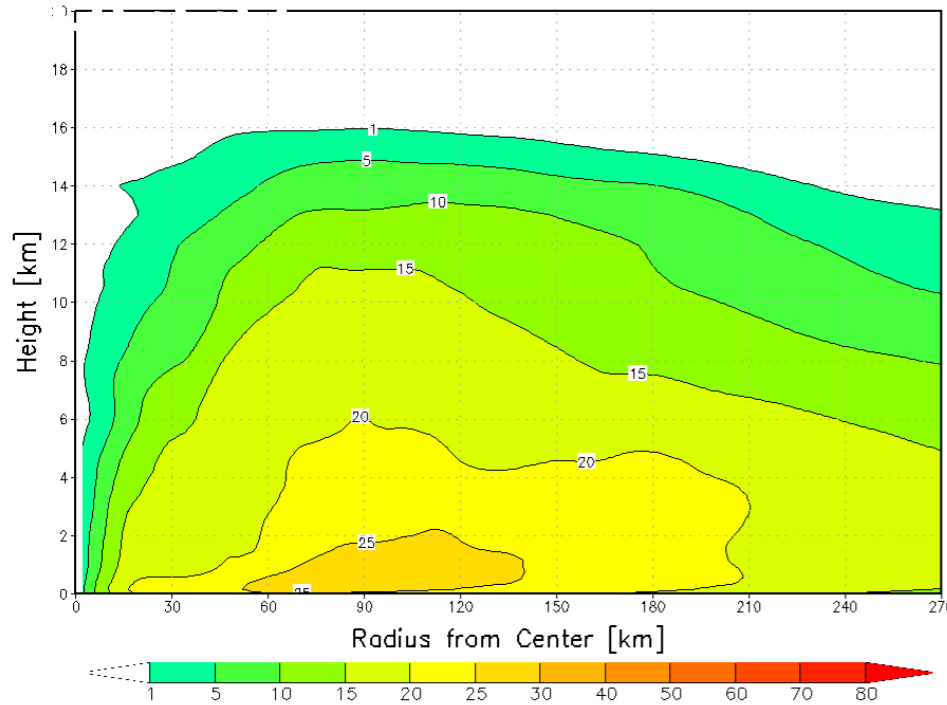
Wind speed and relative  
humidity

# Azimuthal means:

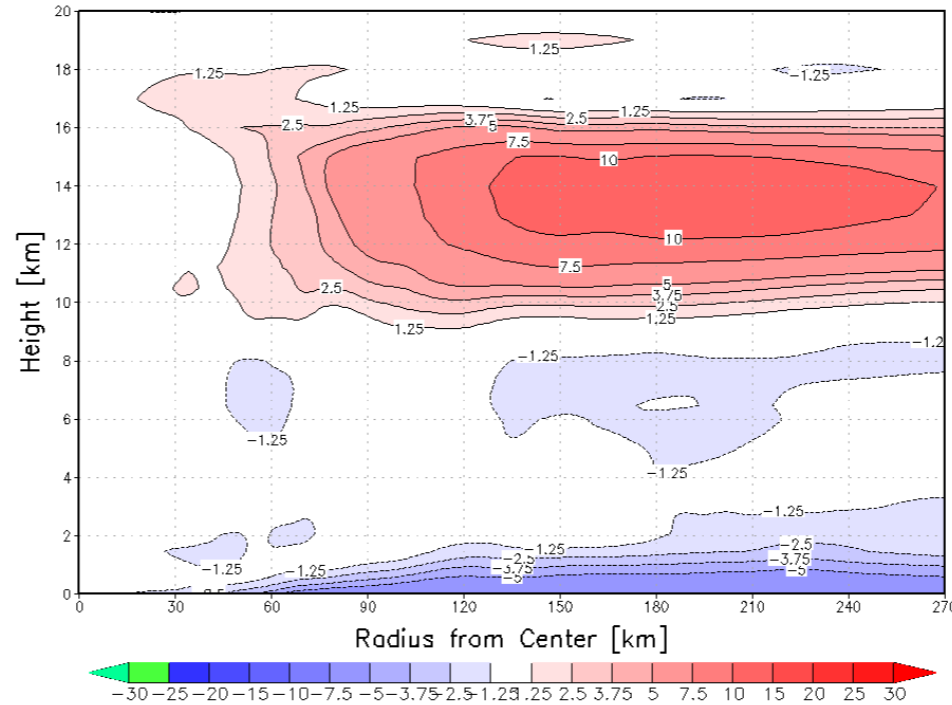
Tangential wind speed, radial wind speed, vertical wind

relative vorticity

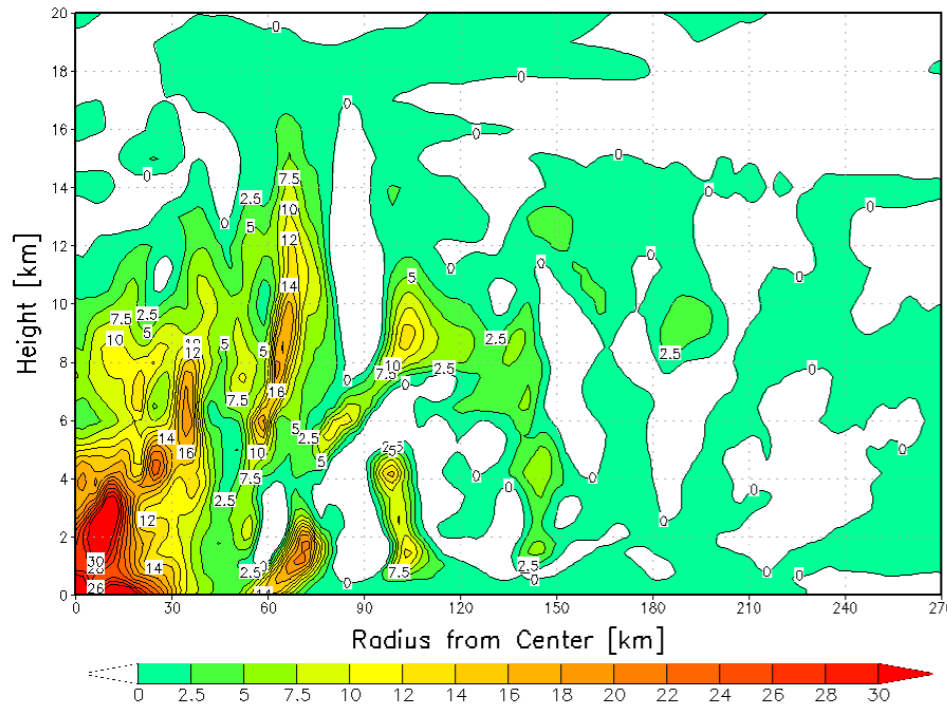
Azimuthal Mean Tangential Wind Speed [ $\text{ms}^{-1}$ ]  
Forecast Hour 2



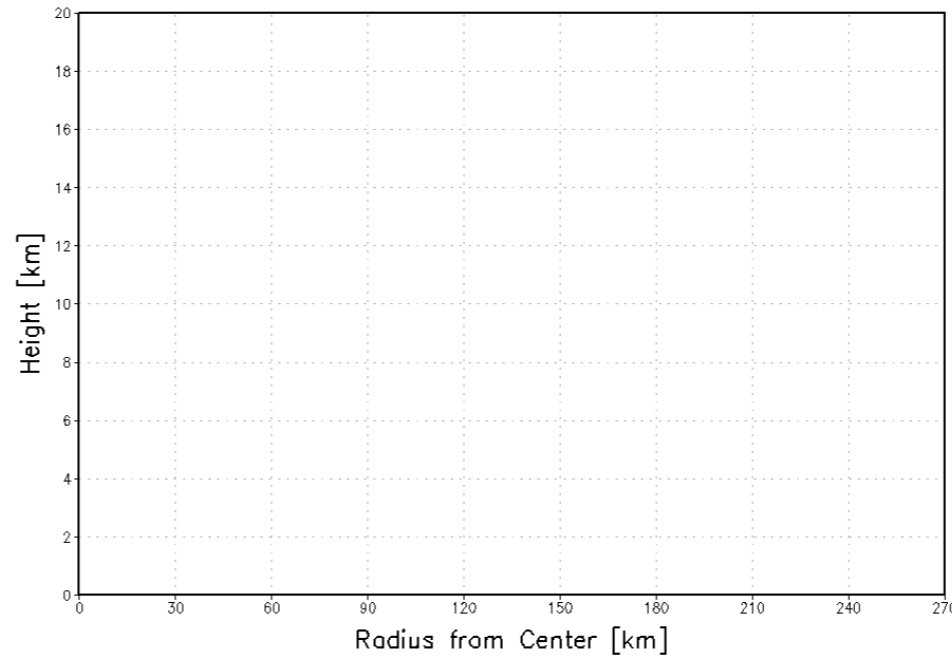
Azimuthal Mean Radial Wind Speed [ $\text{ms}^{-1}$ ]  
Forecast Hour 2



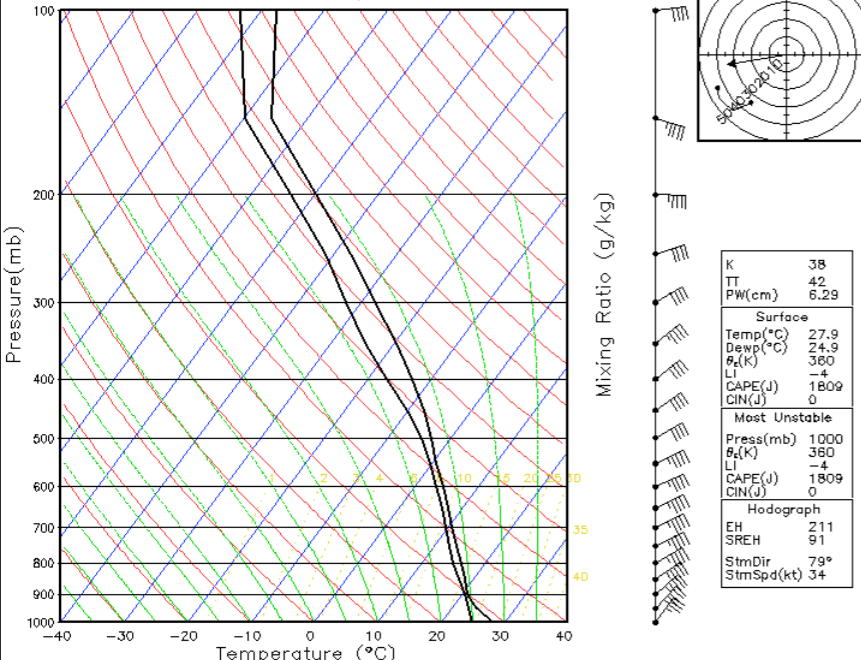
Azimuthal Mean Relative Vorticity [ $\text{s}^{-1}$ ]  
Forecast Hour 2



Azimuthal Mean Vertical Wind Speed [ $\text{ms}^{-1}$ ]  
Forecast Hour 2

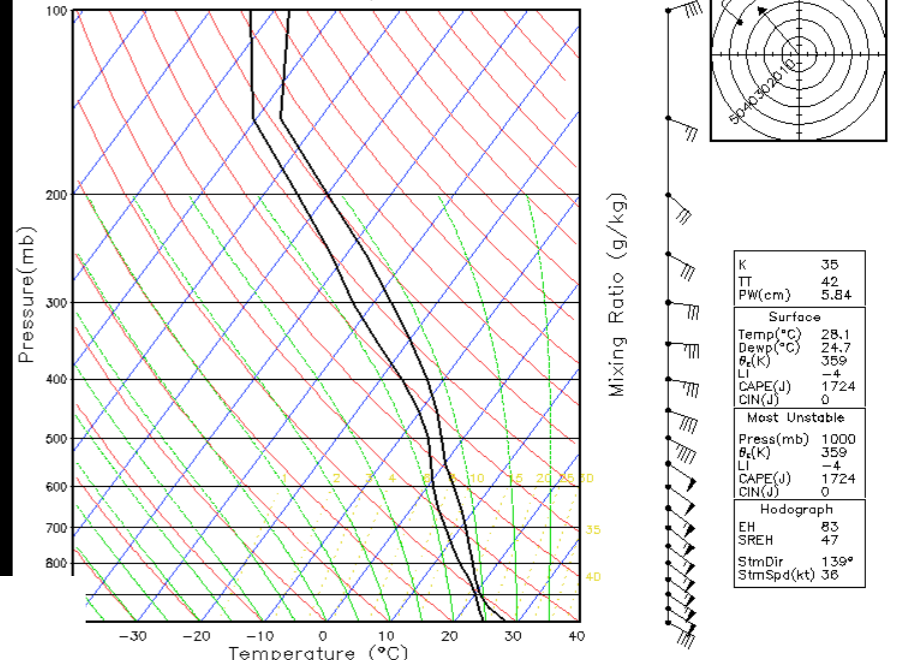


Average in NW quadrant within 200 km of the center  
EARL07L 2010082912 2h  
Center LON= -58.14, LAT= 17.15



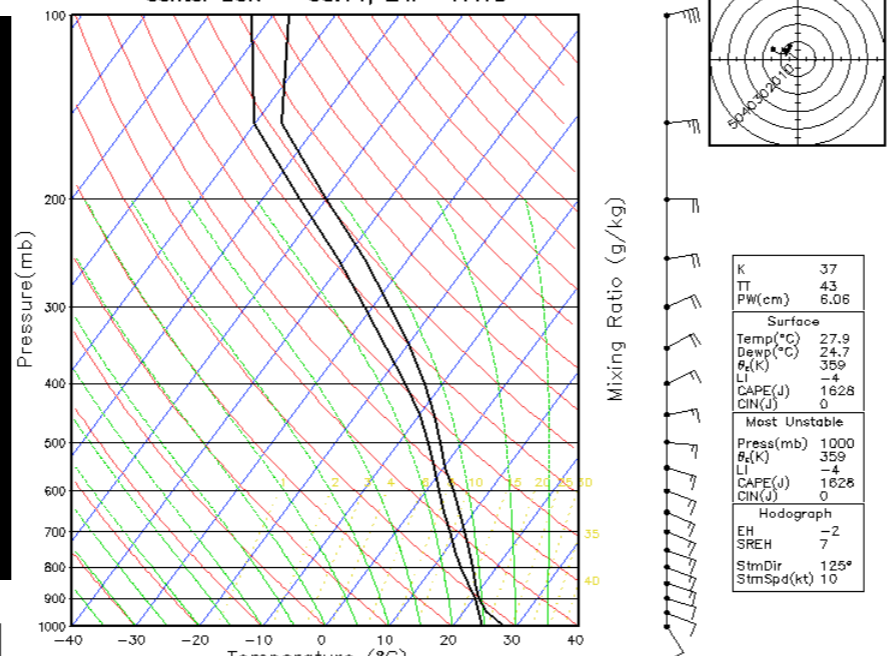
# Skew-T diagrams and calculated indices

Average in NE quadrant within 200 km of the center  
EARL07L 2010082912 2h  
Center LON= -58.14, LAT= 17.15



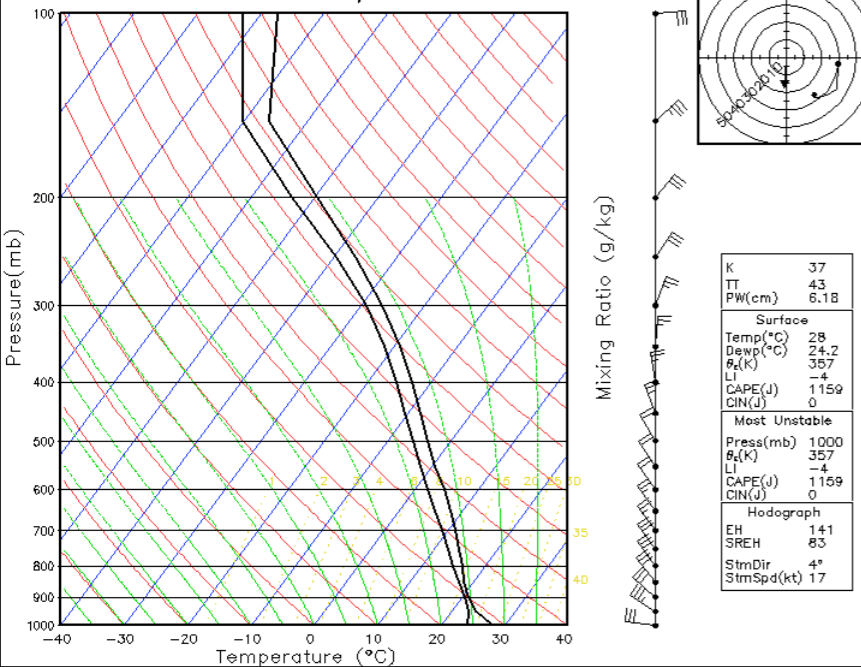
Four quadrants to 200 km

Average within 200 km of the center  
EARL07L 2010082912 2h  
Center LON= -58.14, LAT= 17.15



Storm-centered to 200 km and 500 km

Average in SW quadrant within 200 km of the center  
EARL07L 2010082912 2h  
Center LON= -58.14, LAT= 17.15



Average in SE quadrant within 200 km of the center  
EARL07L 2010082912 2h  
Center LON= -58.14, LAT= 17.15

