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 ±3h 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

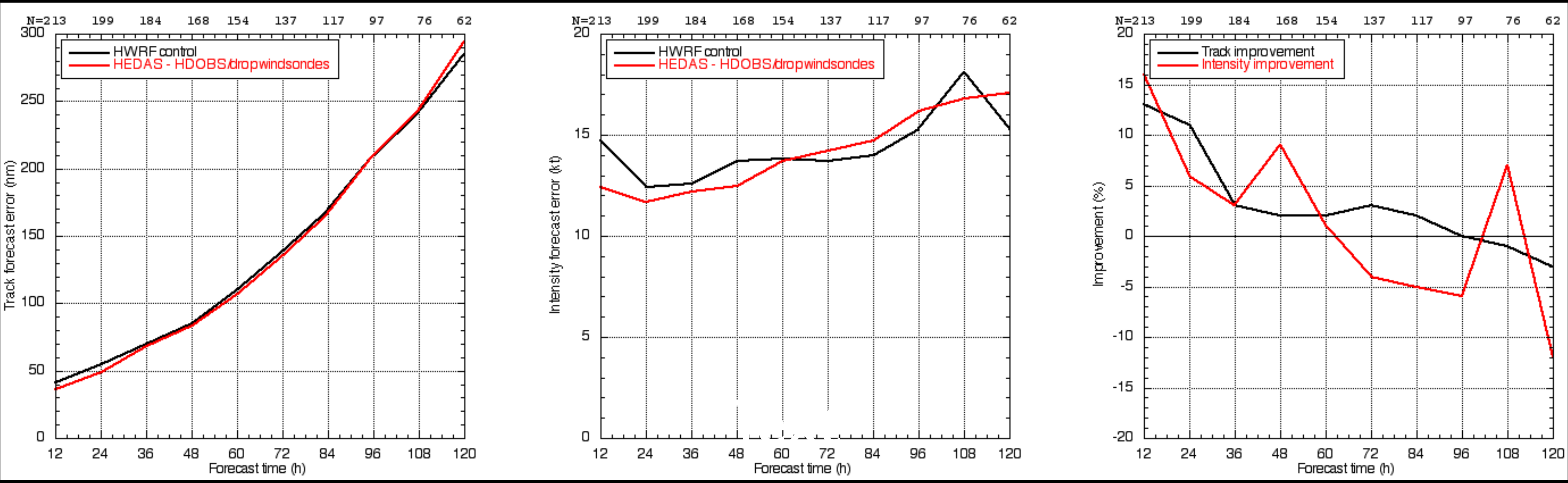
HWRF deterministic run from final ensemble-mean analysis

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?

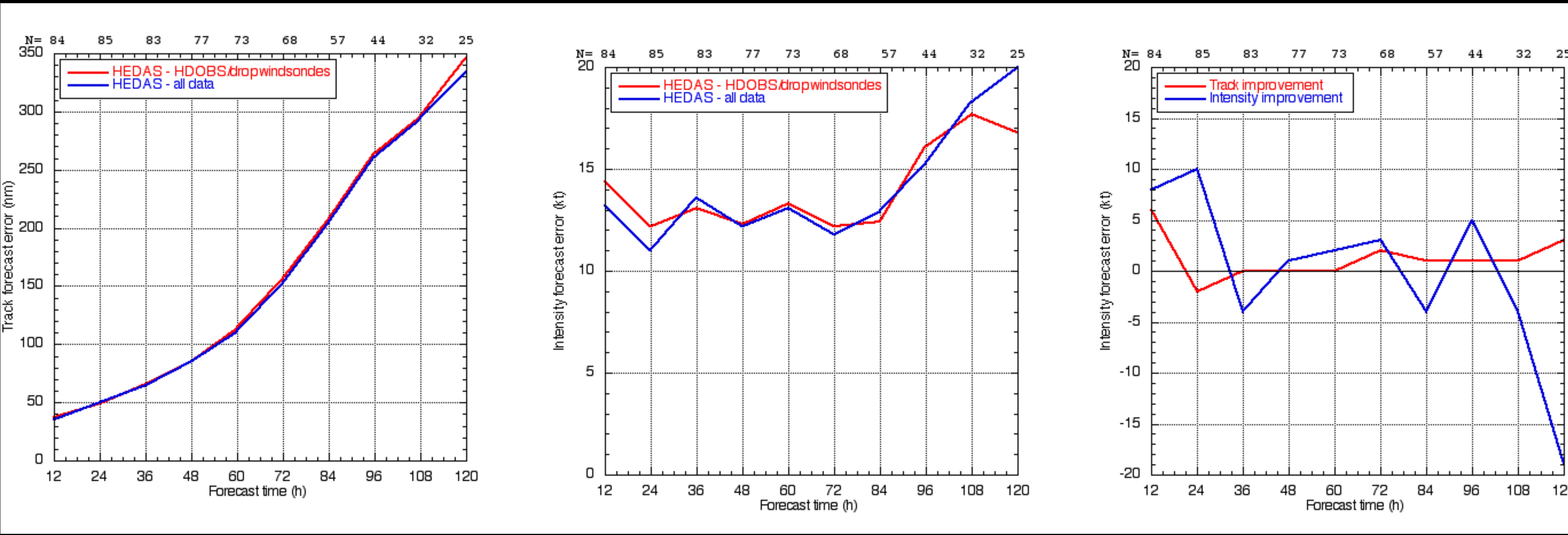


TRACK - forecasts are improved by up to 13% at all forecast times until 96 h. The 12-24-h forecast improvements are statistically significant at 99%. The 36- and 72-h forecast improvements are statistically significant at 90%.

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 HDOB and dropwindsonde data and the real storm dissipated.

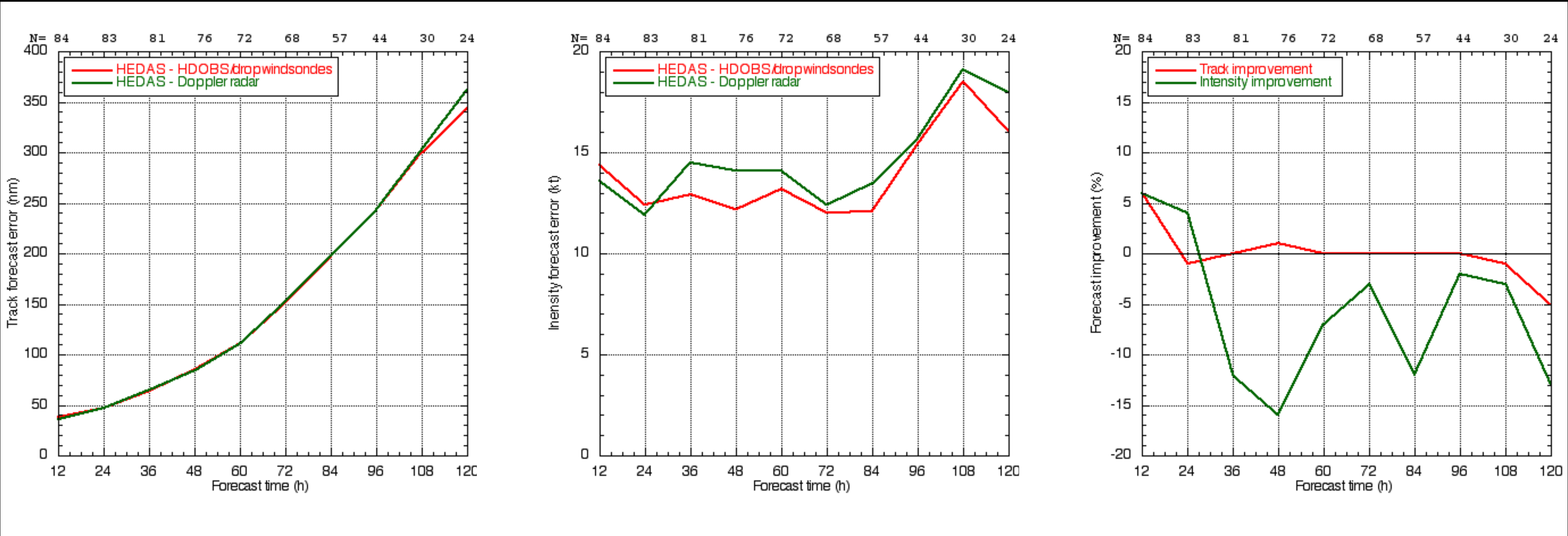
2. What is the impact of Doppler radar data versus just the HDOB and dropwindsonde data?



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%.

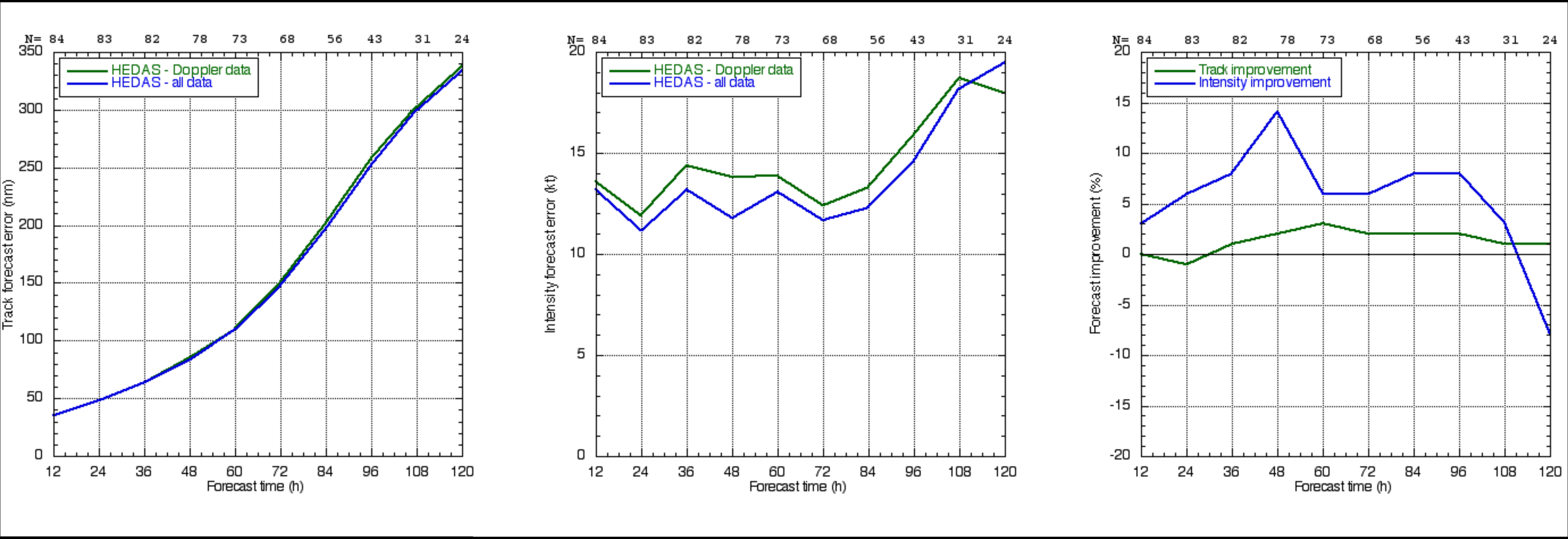
3. Are Doppler radar or HDOB/dropwindsonde data more important for track and intensity forecasts?



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 HDOBS/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.

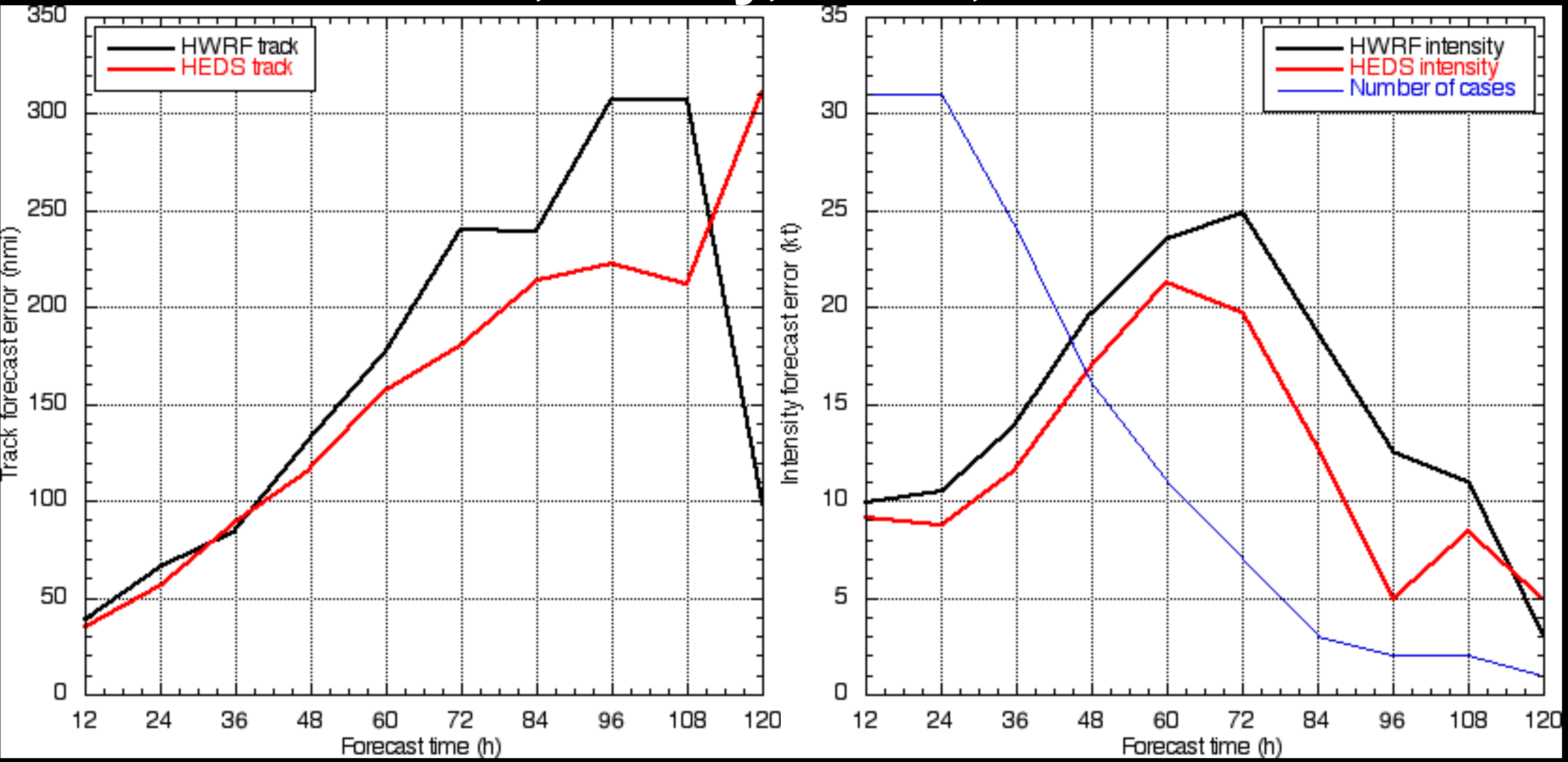
The Doppler radar data provides some improvement to short-range track and intensity forecasts. There is a significant degradation to 120-h intensity forecasts, though the sample then is small.

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

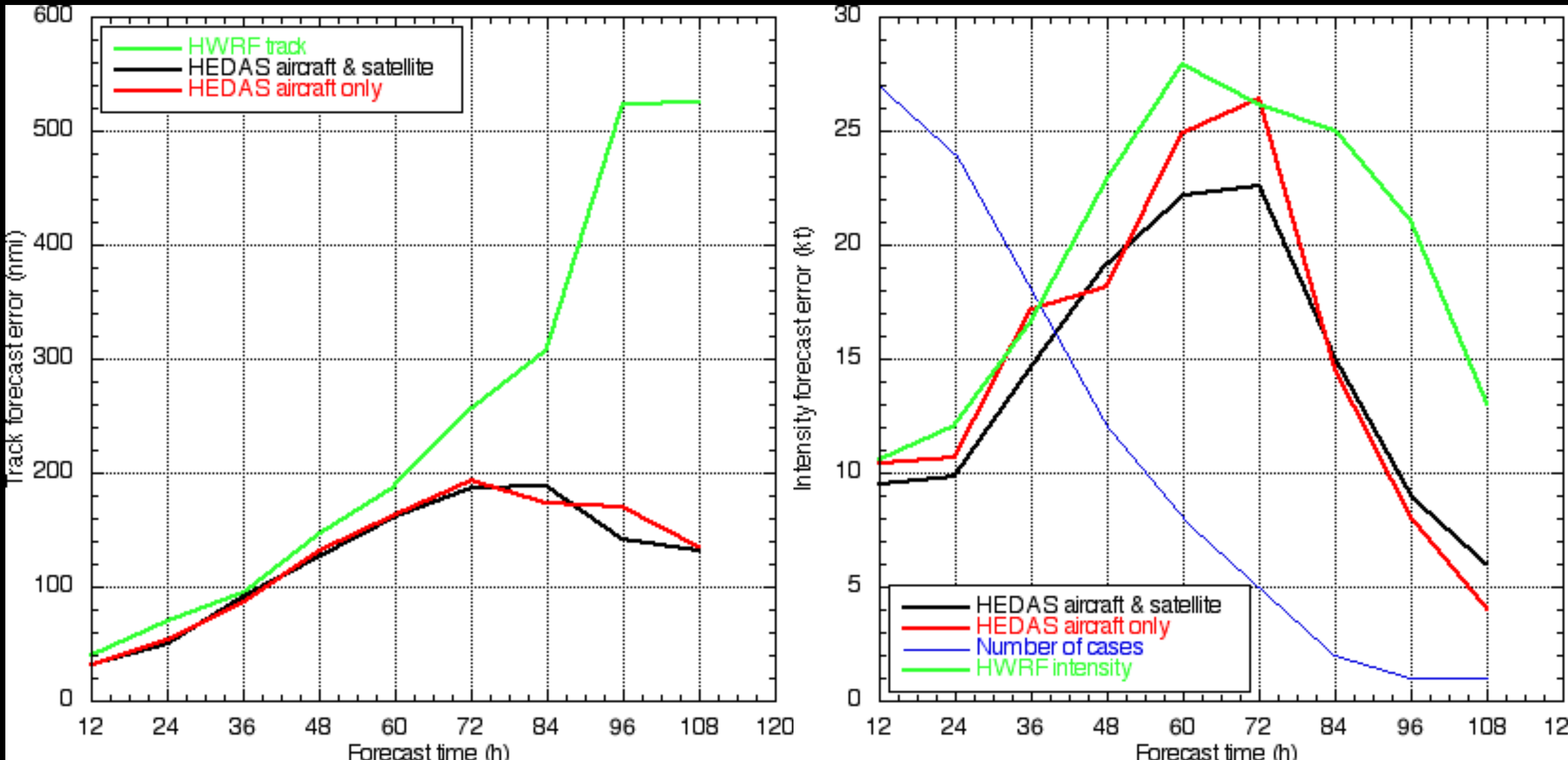
Aberson, Aksoy, Klotz, Sellwood



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.

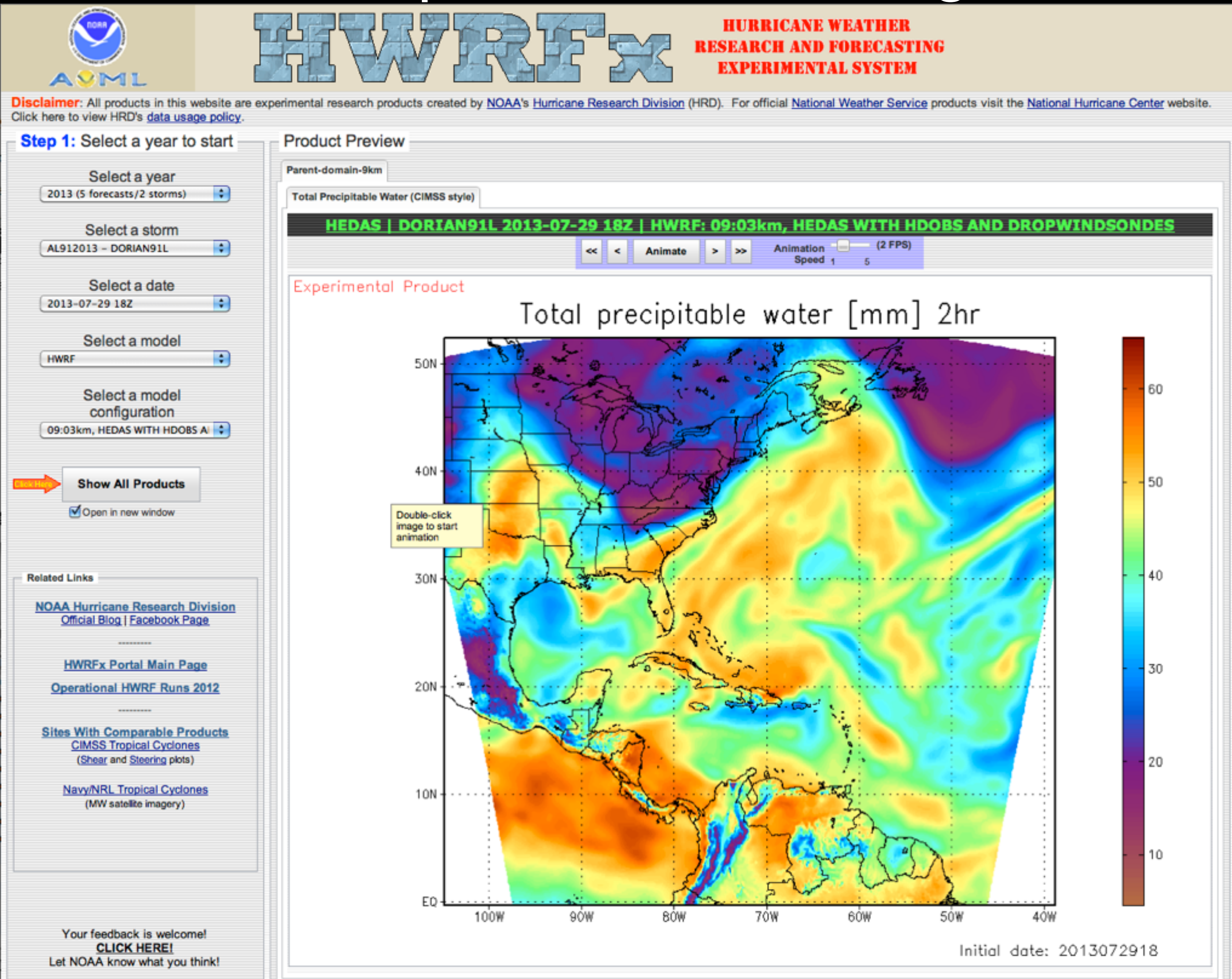


Intensity forecasts largely improved by satellite data over aircraft only. Track forecasts are not greatly changed by aircraft data.

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



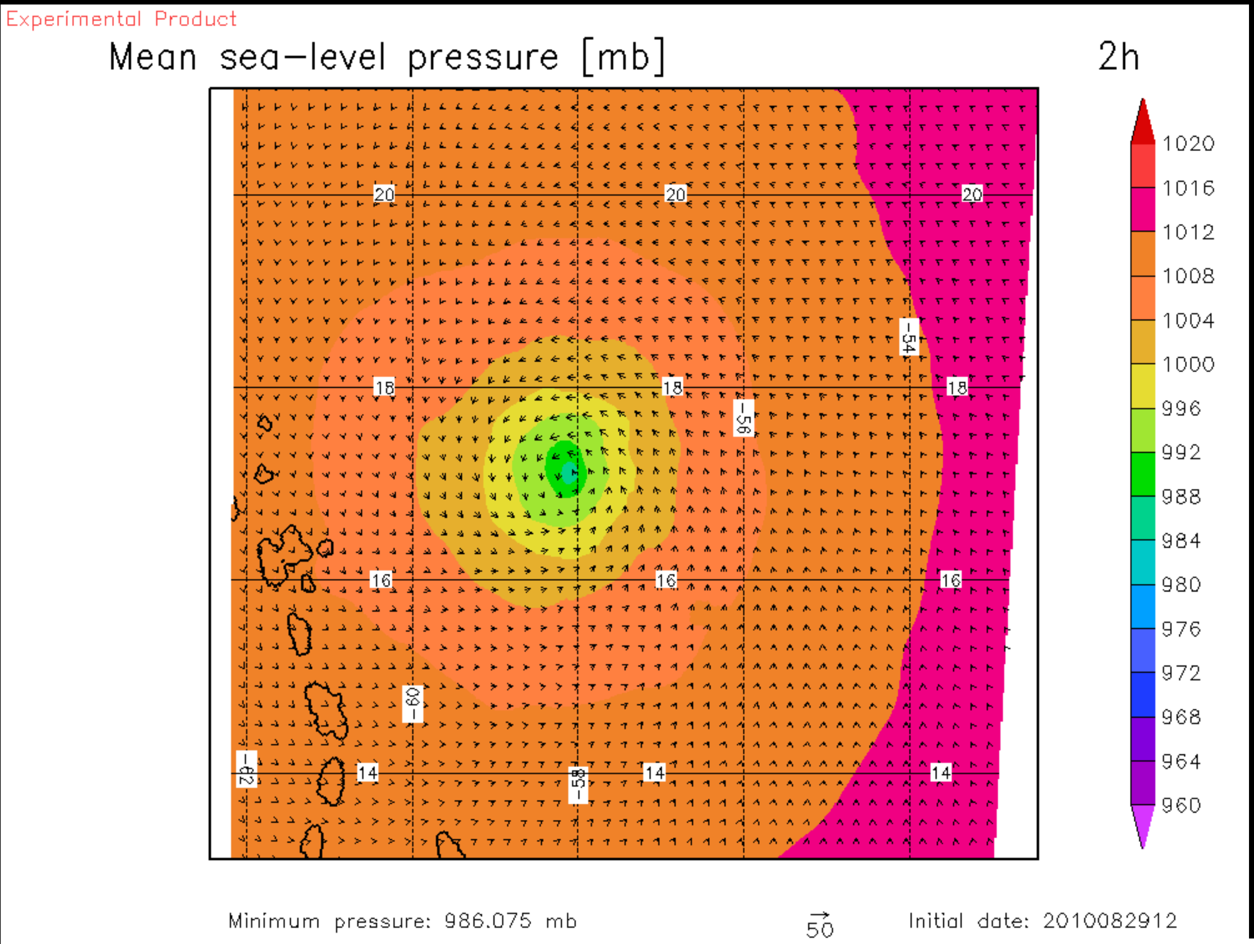
Graphics available every hour on two meshes

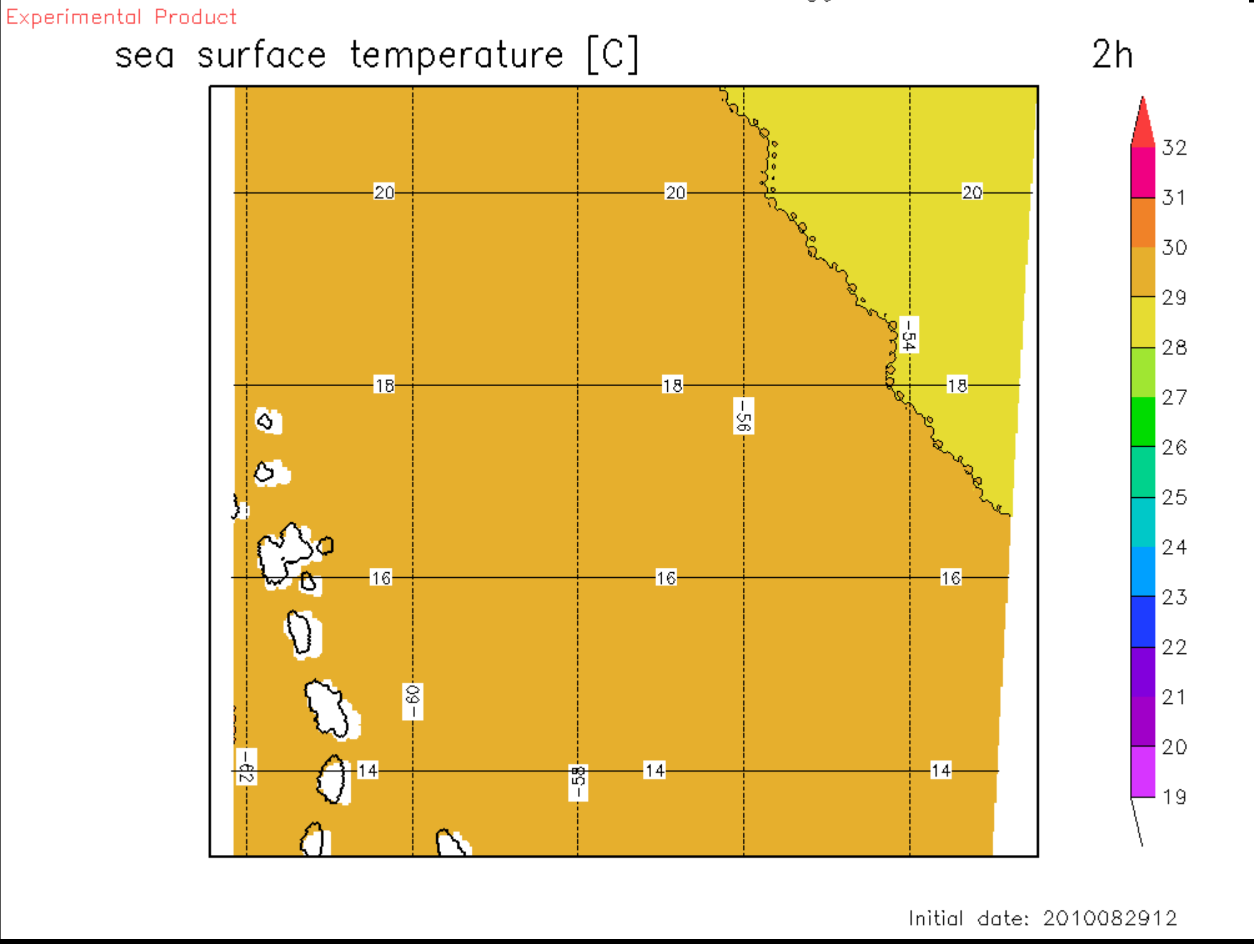
Surface:

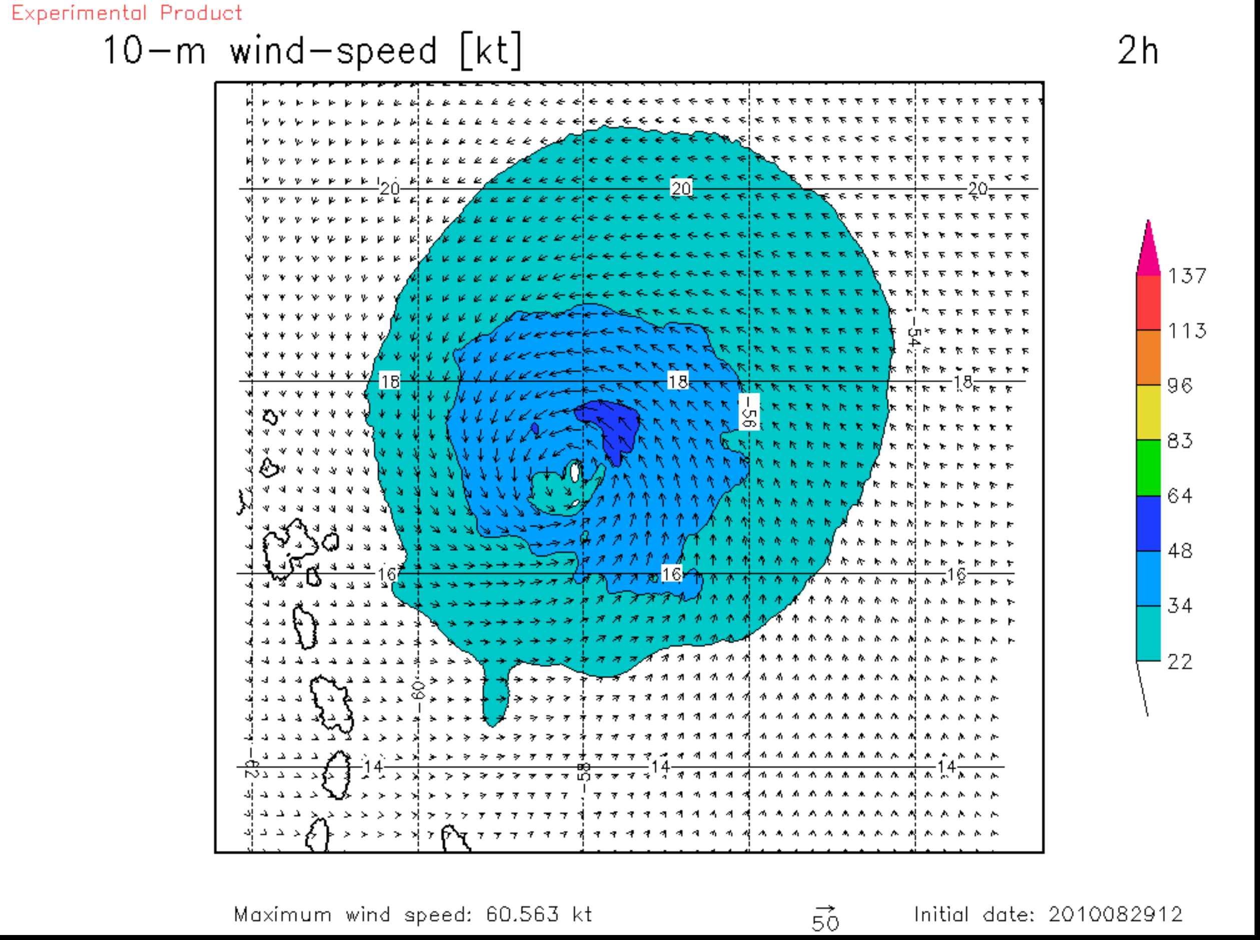
Surface pressure (with minimum value written)

Surface wind (with maximum value written)

SST







850, 700, 500, and 200 hPa:

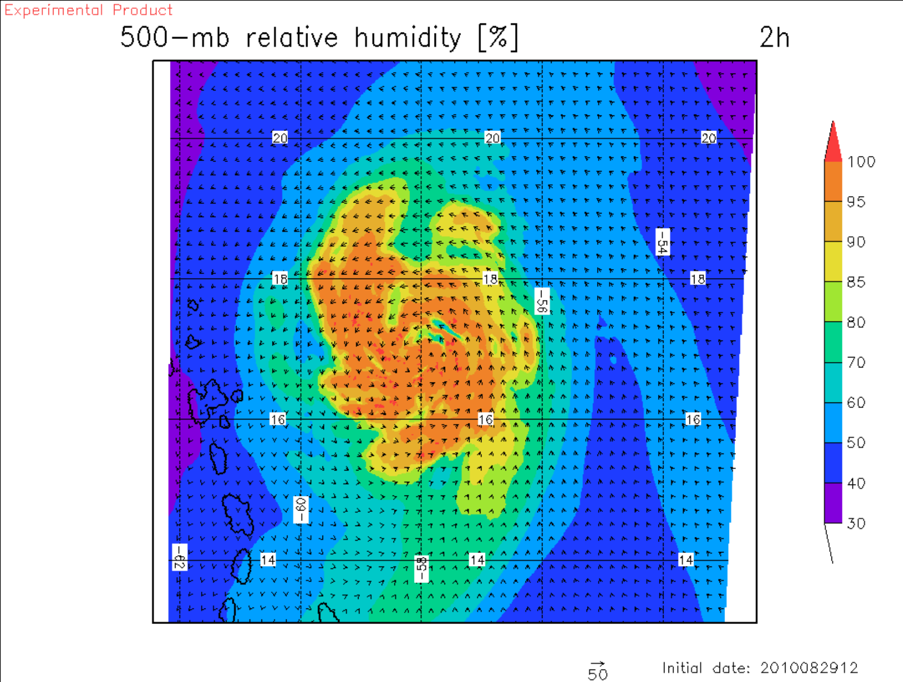
Relative humidity

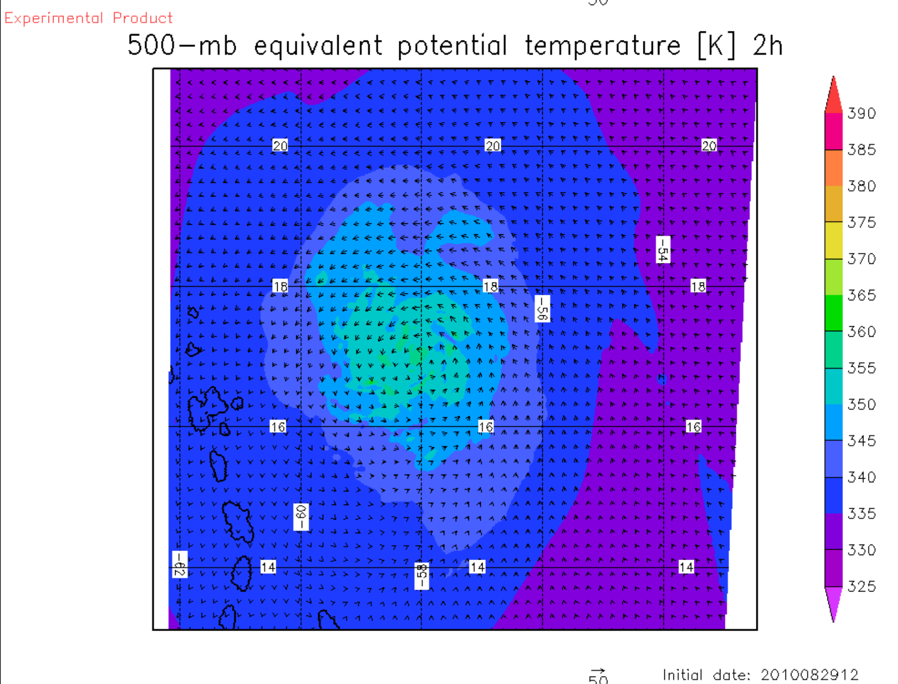
Equivalent potential temperature

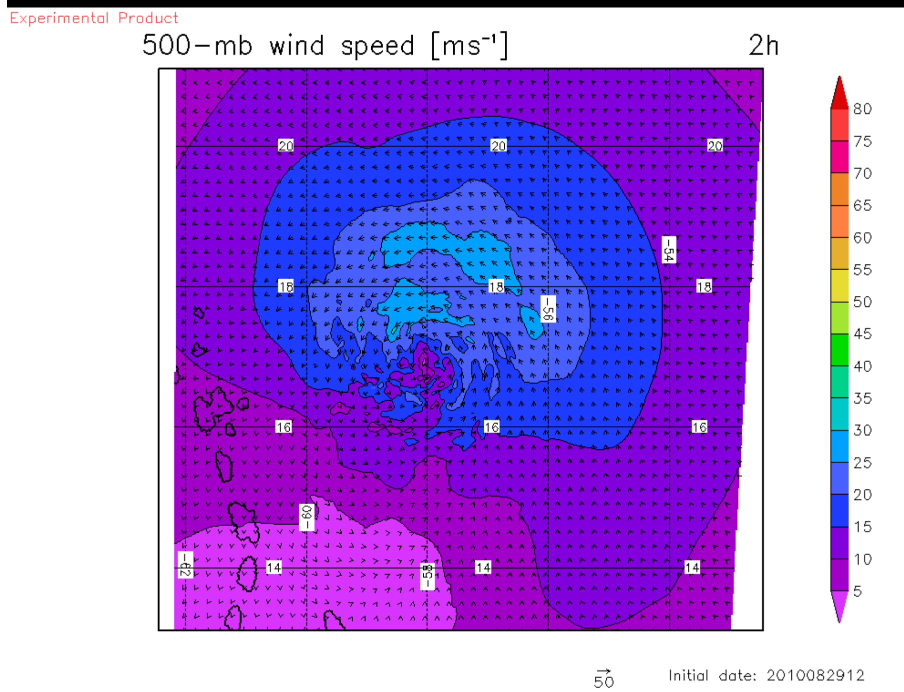
Horizontal wind velocity

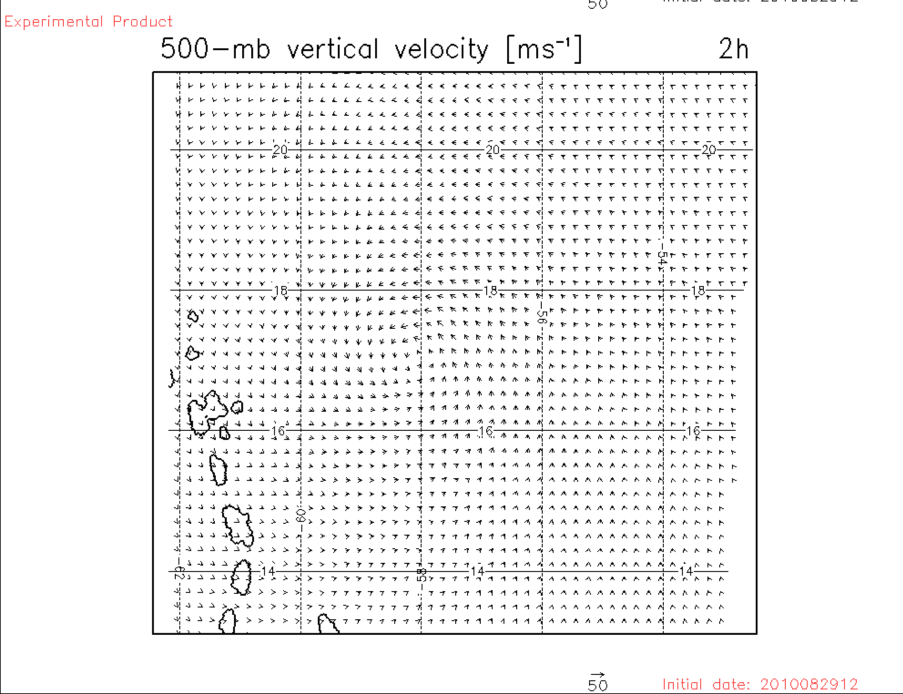
Vertical velocity

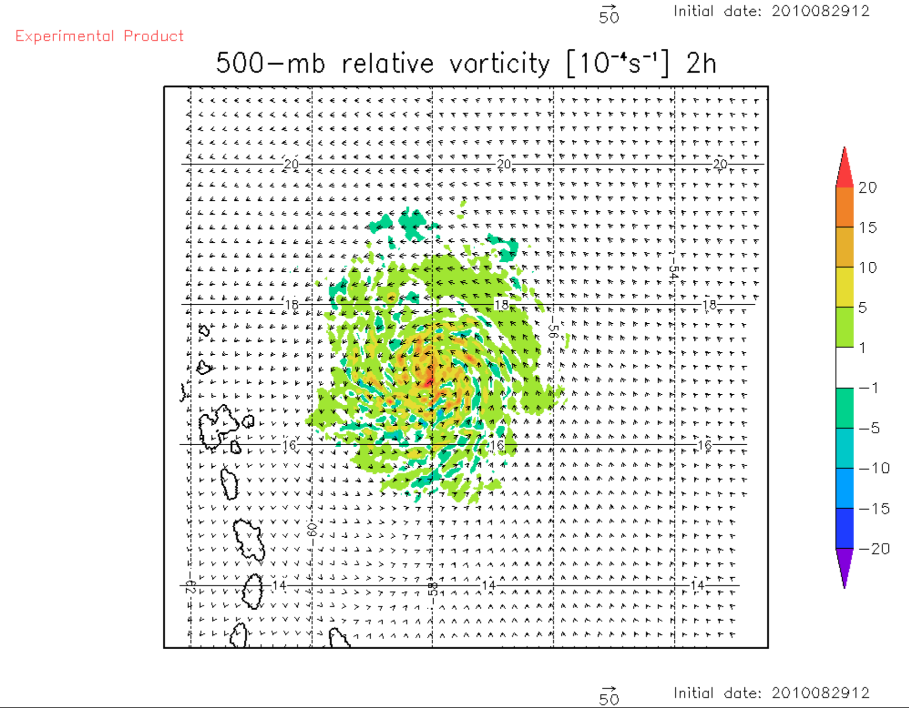
Relative vorticity

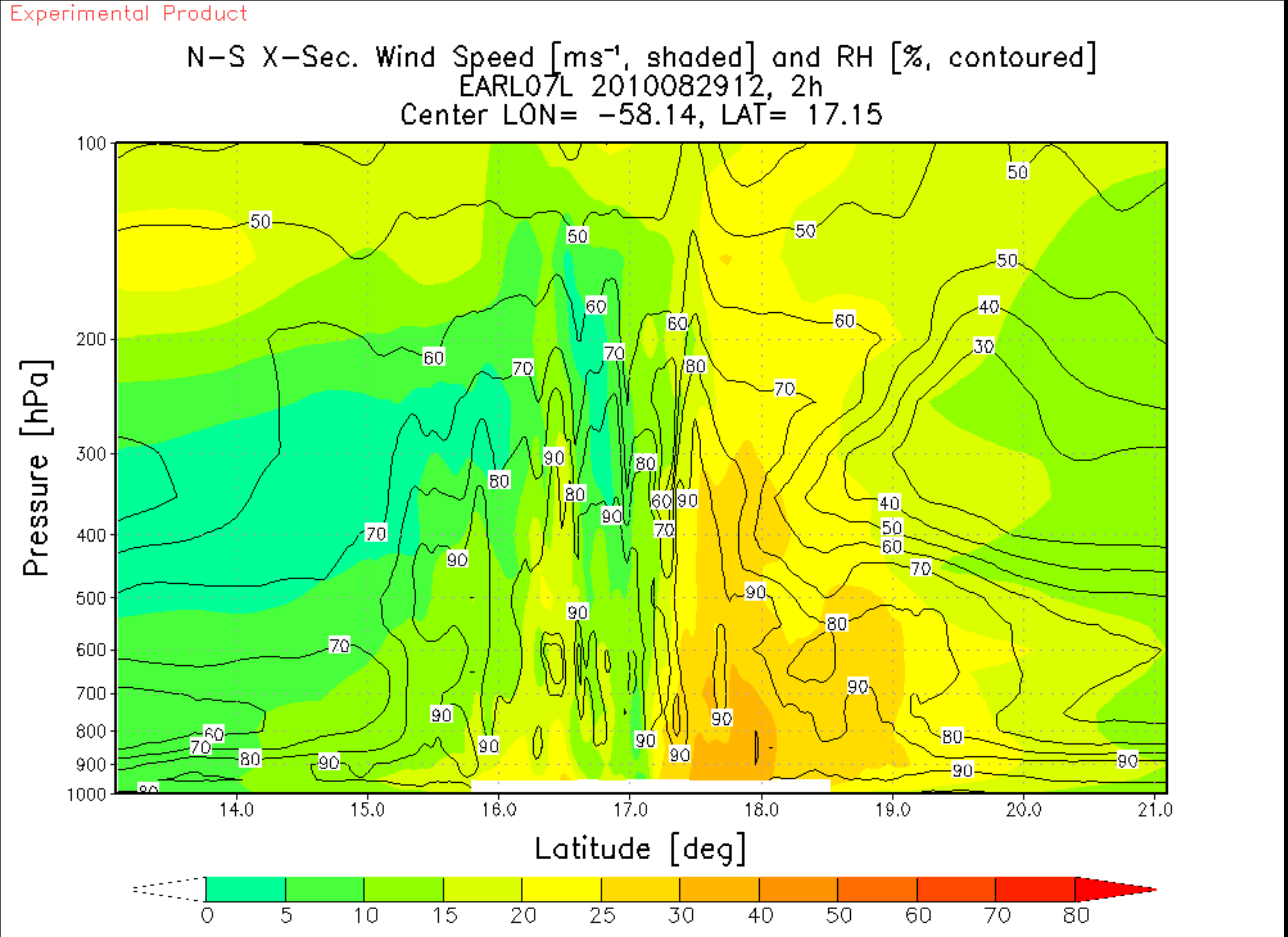


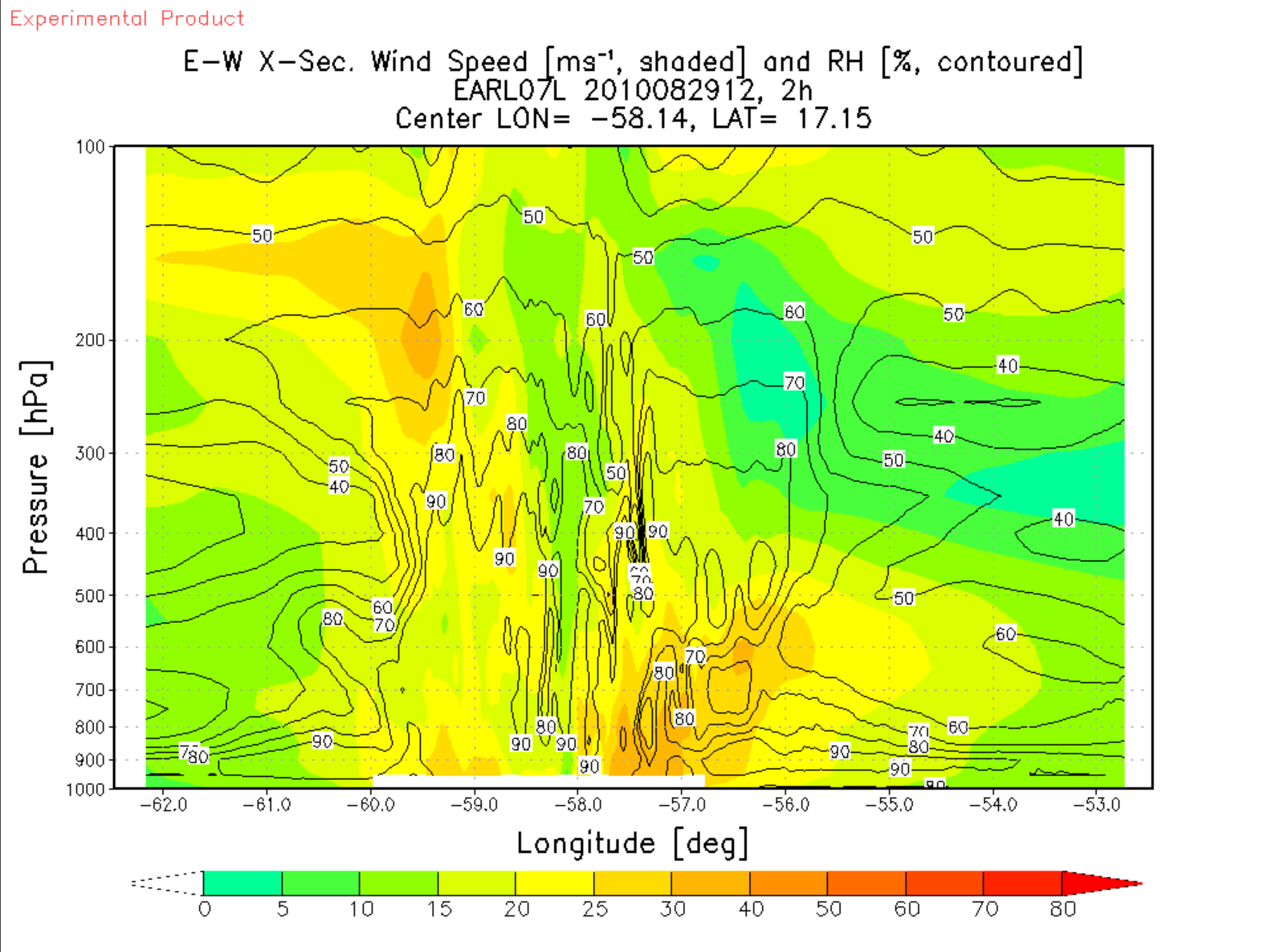












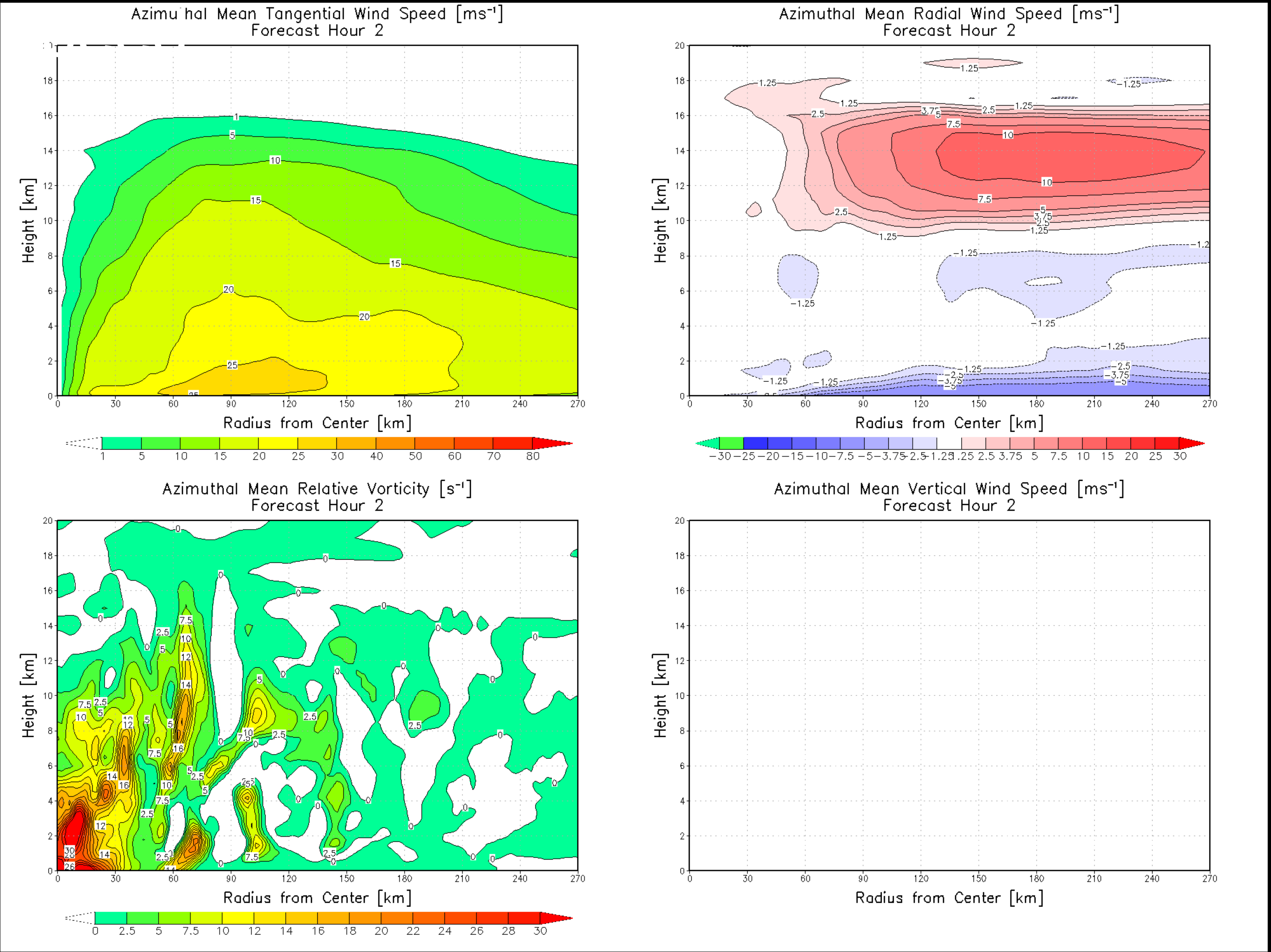
Cross sections:

North-south and east-west through storm center

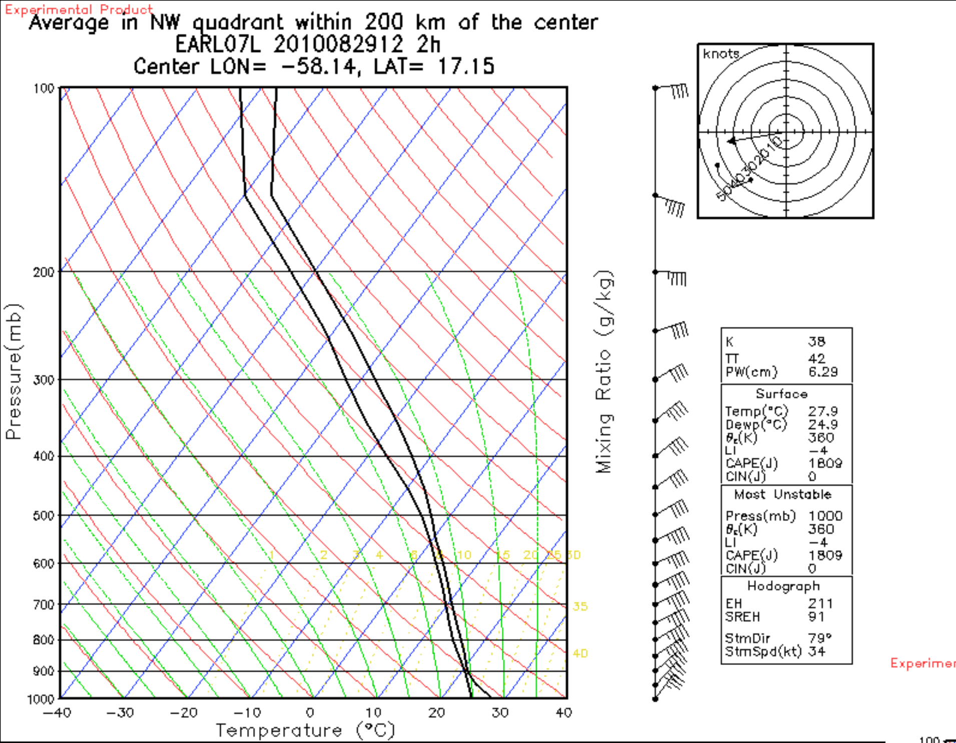
Wind speed and relative humidity

Azimuthal means:

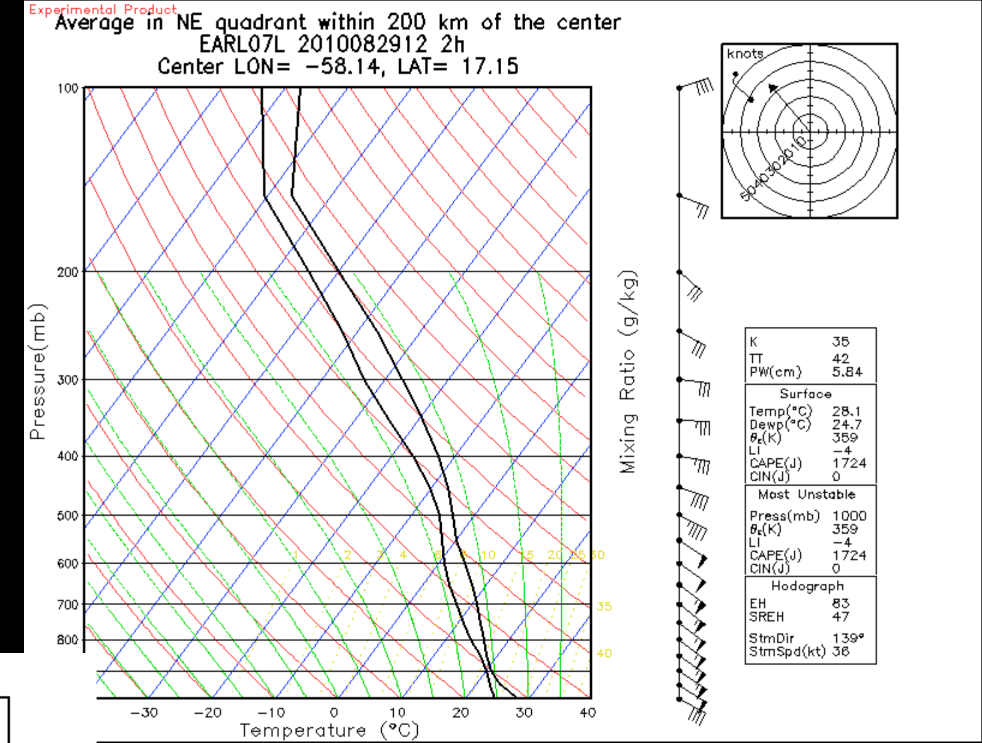
Tangential wind speed, radial wind speed, vertical wind

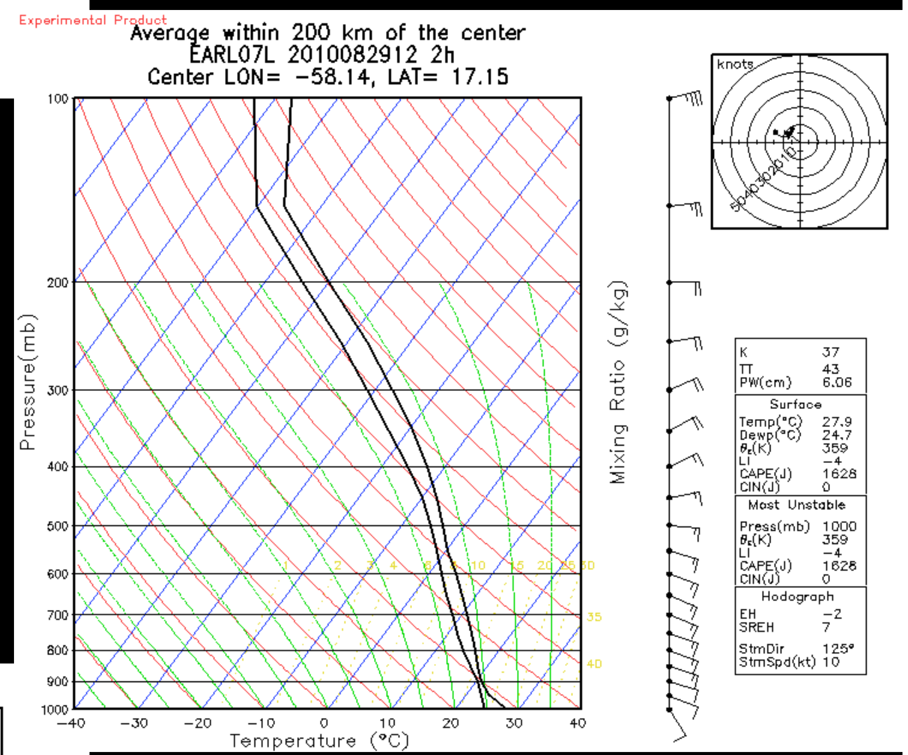


relative vorticity



Skew-T diagrams and calculated indices





Four quadrants to 200 km

Storm-centered to 200 km and 500 km