

# NWS OCEAN PREDICTION CENTER

## 2012 MSC/COMET Winter Weather Course

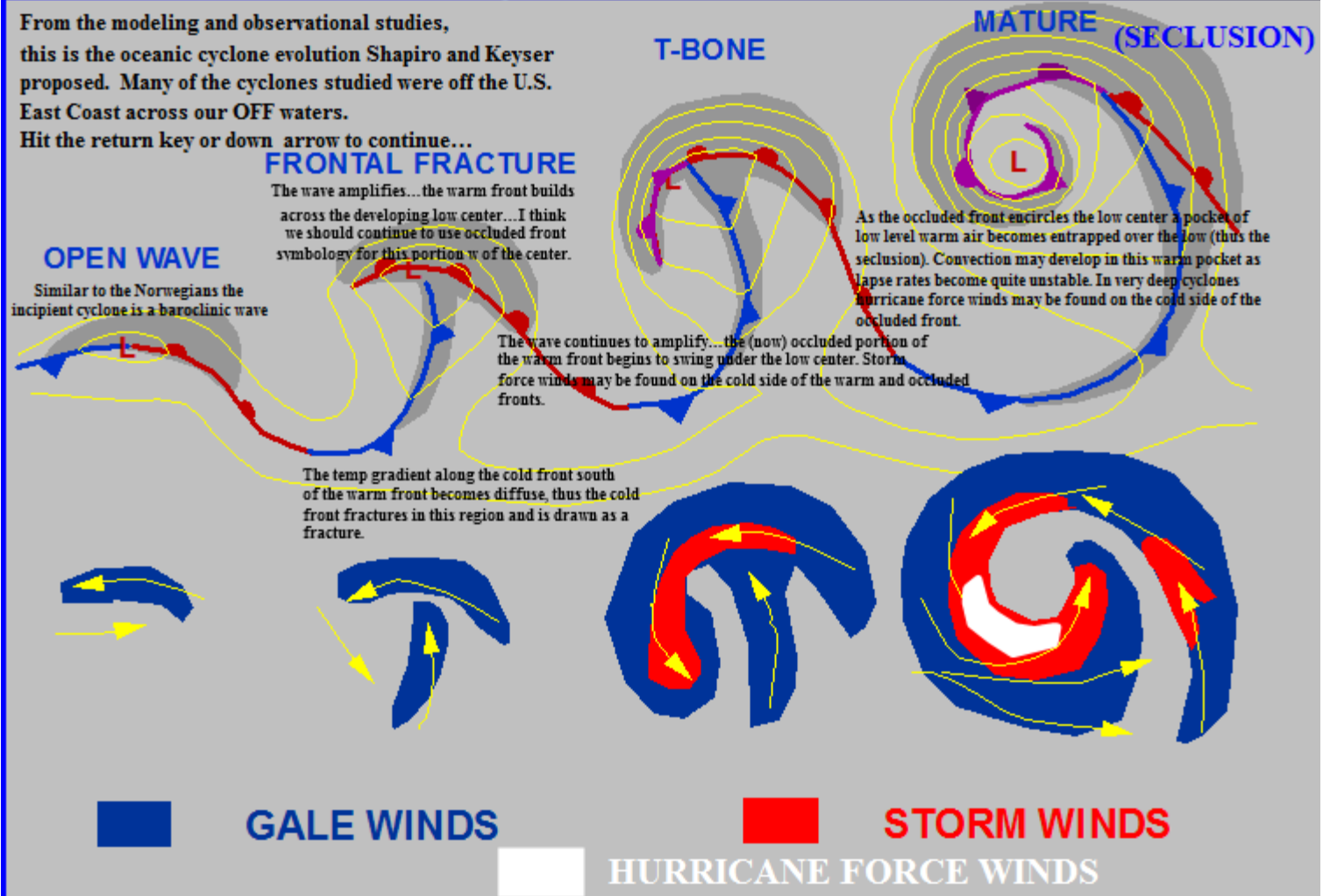
**Paul Vukits**  
**Lead Forecaster**  
**[Paul.Vukits@noaa.gov](mailto:Paul.Vukits@noaa.gov)**



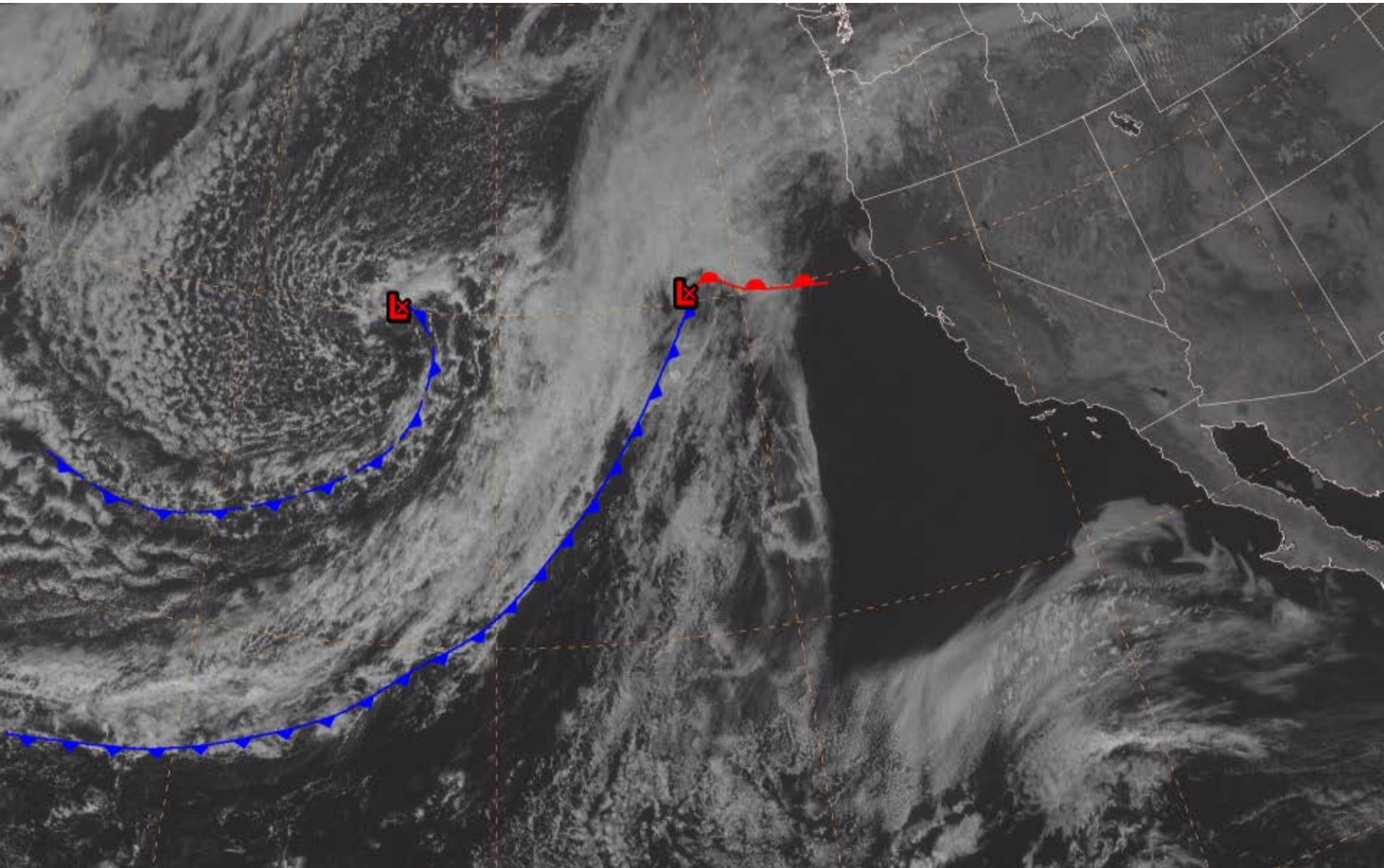
# The evolution – Shapiro Keyser Cyclone

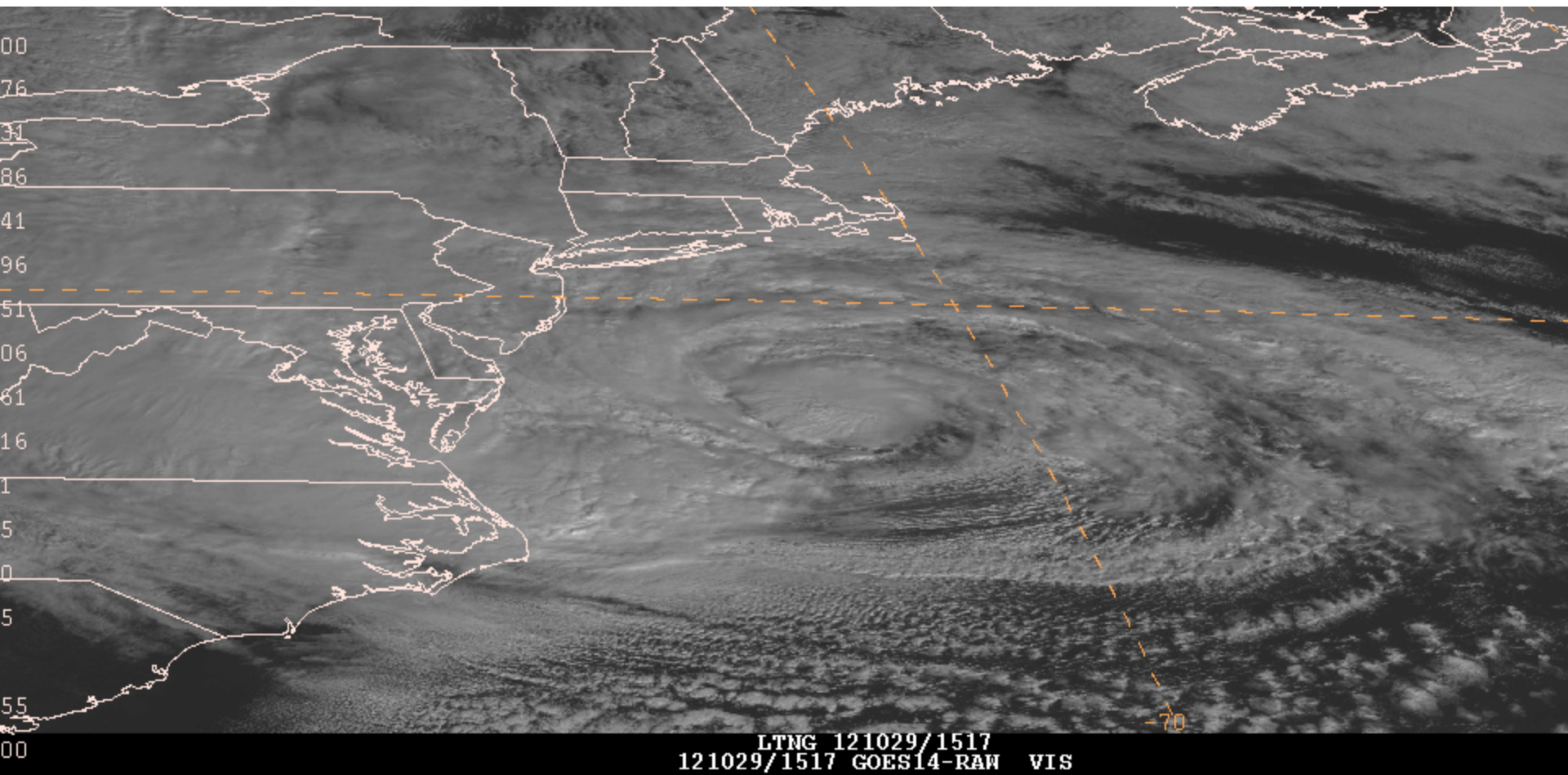
From the modeling and observational studies, this is the oceanic cyclone evolution Shapiro and Keyser proposed. Many of the cyclones studied were off the U.S. East Coast across our OFF waters.

Hit the return key or down arrow to continue...



# Satellite Neph Analysis

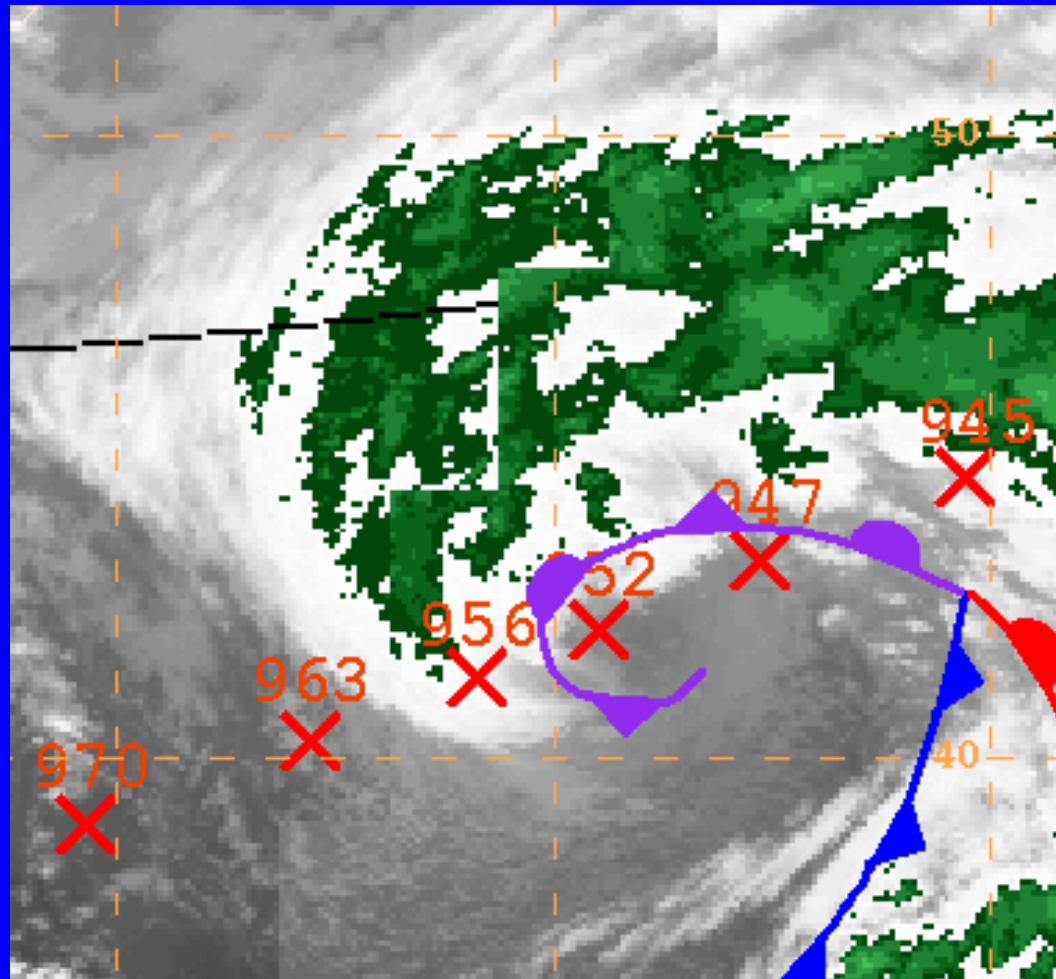




# GOES 14 Hurricane Sandy 29 Oct 2012



# Smigelski – Mogil – Burt Technique for Estimating Central Pressure of Extratropical Cyclones



The worksheet and graph can be photocopied and used for the life cycle of any storm (initial development through and including initial filling). Since all storms we have studied so far developed and reached maturity in 84 hours or less, the amount of space allotted each storm should be sufficient.

### Cloud Pattern Curvature and Its Relationship to Central Pressure

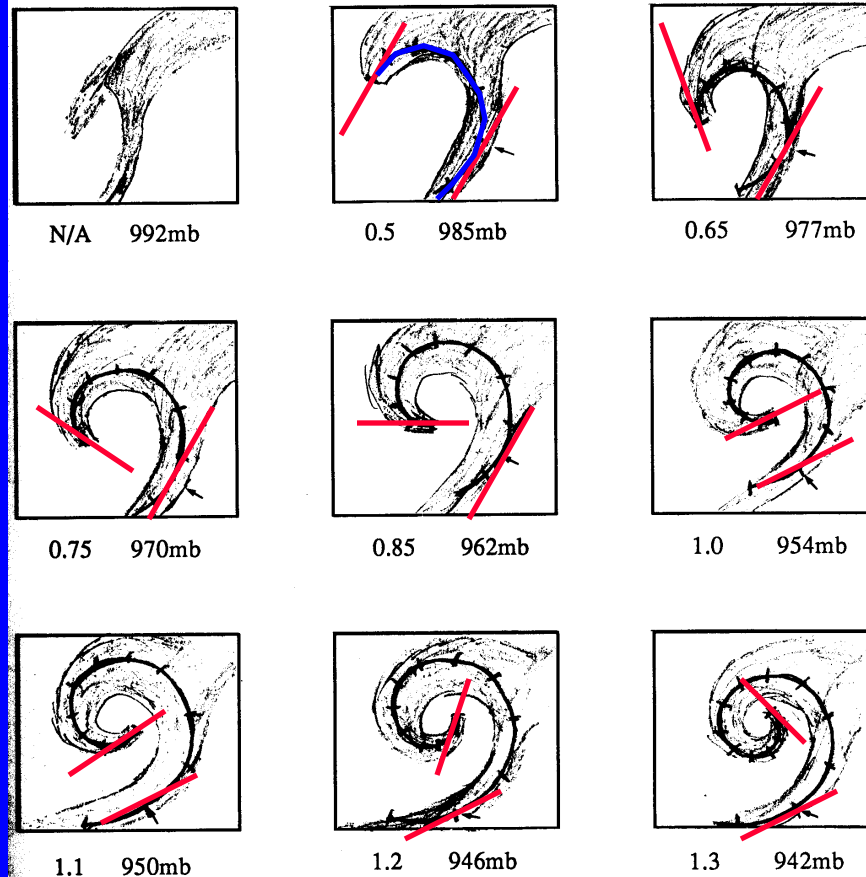
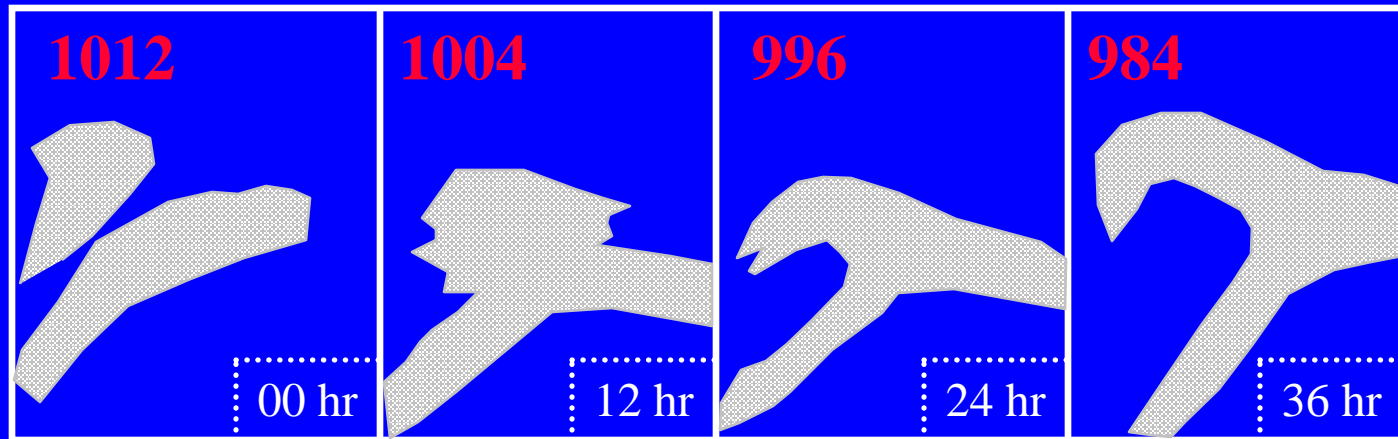


Figure 7. Cloud measurement in tenths of a ten degree log spiral (tick marks) and associated central pressures. Shading indicates middle and high clouds only.

# Pacific Zonal Example – 12 hour Interval

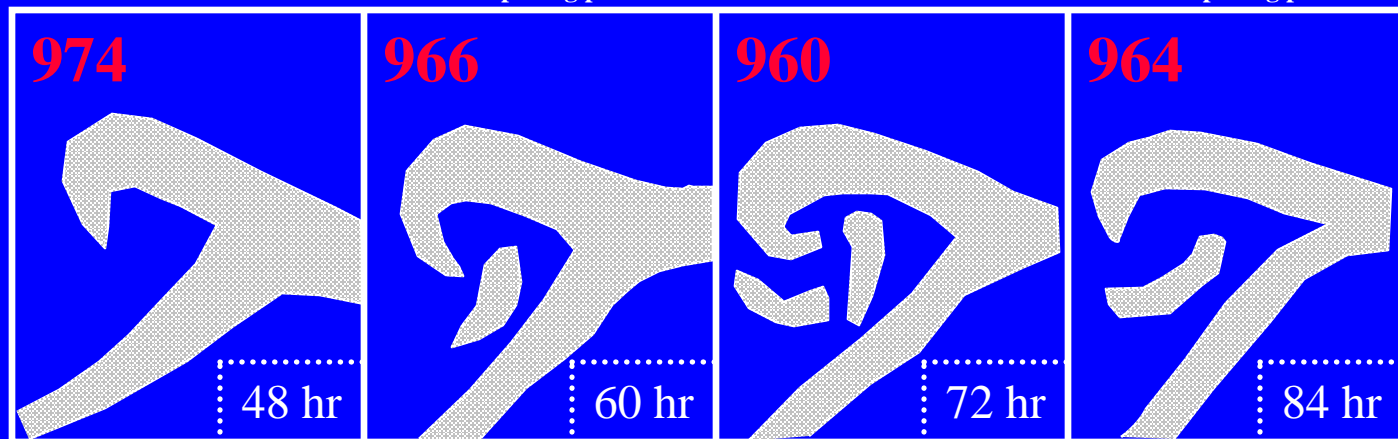


Baroclinic leaf with upstream Vorticity lobe – 1012 mb

Cusp of comma begins to emerges as vorticity lobe approaches.  
8 mb deepening past 12 hrs.

Tail of comma cusp becomes better defined.  
8 mb deepening past 12 hrs.

Comma tail begins to push toward the back edge of the baroclinic band.  
12 mb deepening past 12 hrs.



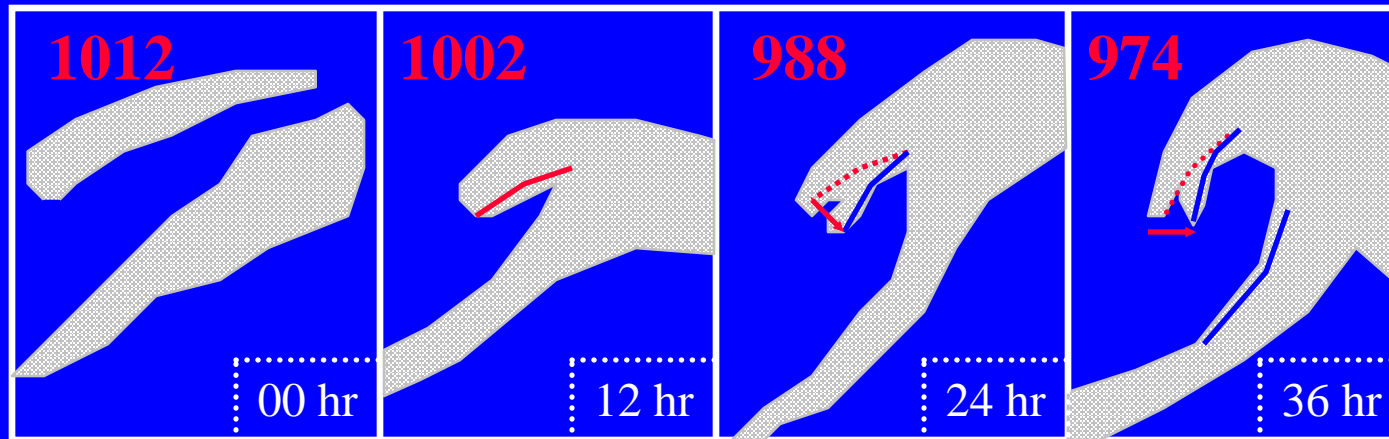
Comma tail continues to wrap toward the baroclinic band. continued intensification.  
10 mb deepening past 12 hrs.

Convection has broken out near center.  
8 mb deepening past 12 hrs.

More convection. Triple point shears eastward. .  
6 mb deepening past 12 hrs.  
**Cyclone max intensity.**

System continues to shear.  
4 mb filling past 12 hrs.

# Pacific Meridional Example – 12 hour Interval



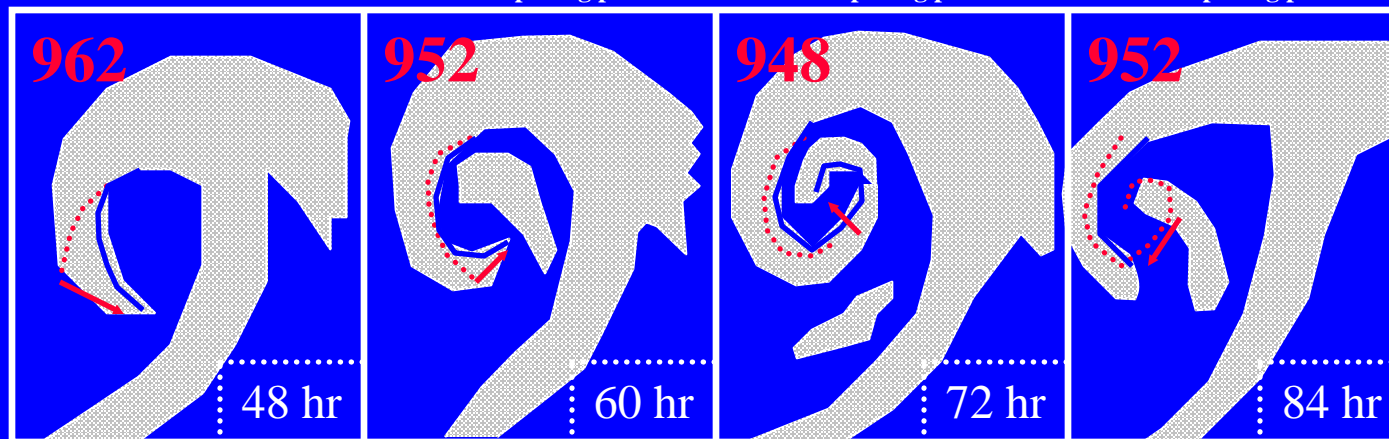
Trailing edge  
Of  
Baroclinic band

Baroclinic leaf with upstream  
Vorticity lobe – 1012 mb

Cusp of comma either  
emerges or forms as  
vorticity lobe approaches.  
10 mb deepening past 12 hrs.

Tail of comma cusp begins to  
wrap up and push toward  
back edge of baroclinic band.  
14 mb deepening past 12 hrs.

Comma tail continues to  
push toward the back edge of  
the baroclinic band.  
14 mb deepening past 12 hrs.



Continued intensification.  
12 mb deepening past 12 hrs.

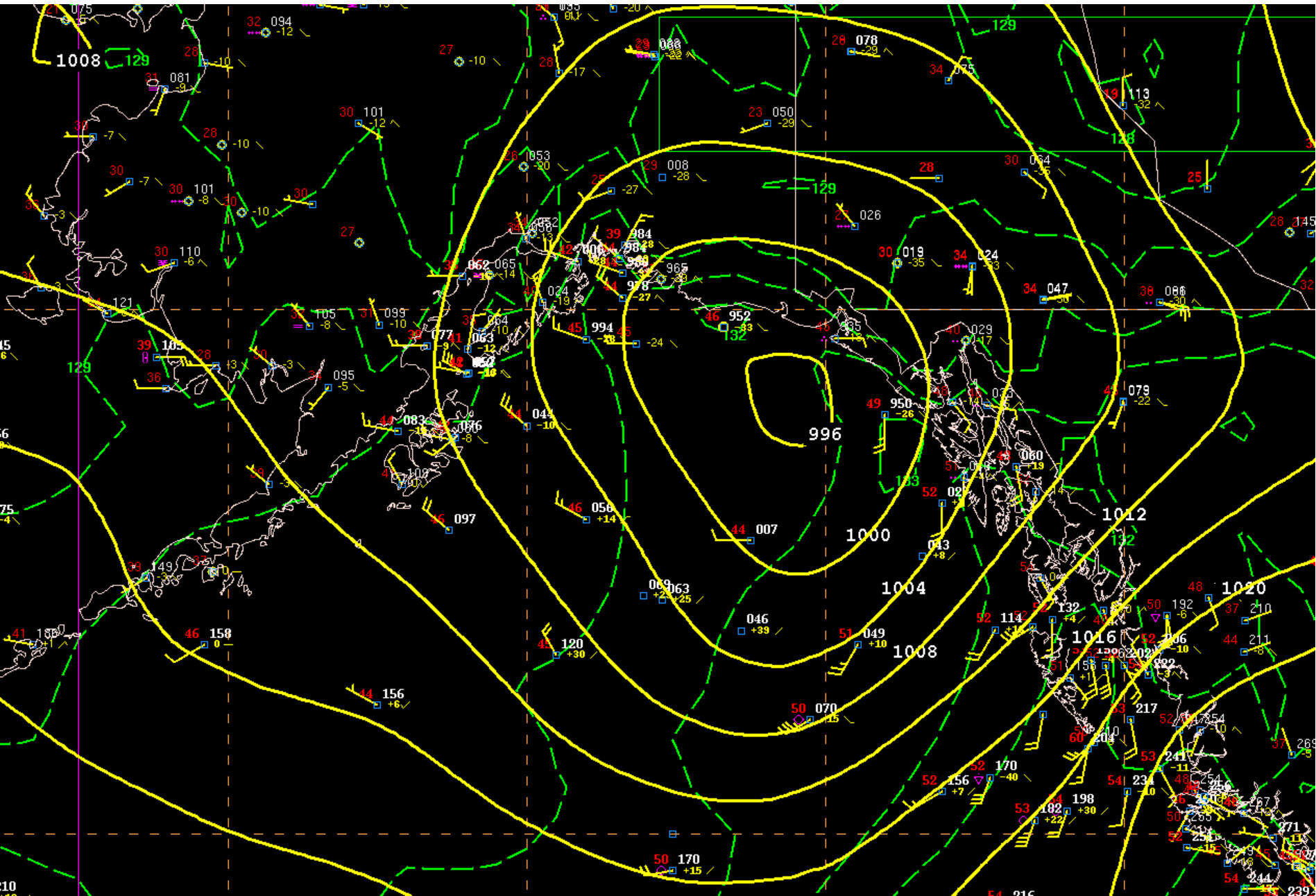
Convection has broken out  
near center.  
10 mb deepening past 12 hrs.

Convection has merged with  
comma tail.  
4 mb deepening past 12 hrs.  
**Cyclone max intensity.**

System begins to shear.  
4 mb filling past 12 hrs.



# GFS Objective Analysis



## National Data Buoy Center

**Center of Excellence in Marine Technology**

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## Organization

## Station ID Search

## Station List

## Observations

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MMS ADCP

## Obs Search

## Ship Obs Report

## Gliders

**APEX**

TAO

DODS

## HF Radar

OSMC

## Dial-A-Buoy

**RSS Feeds** 

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### Station Status

## NDBC Maintenance

## NDBC Platforms

## Partner Platforms

## Program Info



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## About NDBC

Met/Ocean

### Moored Buoy

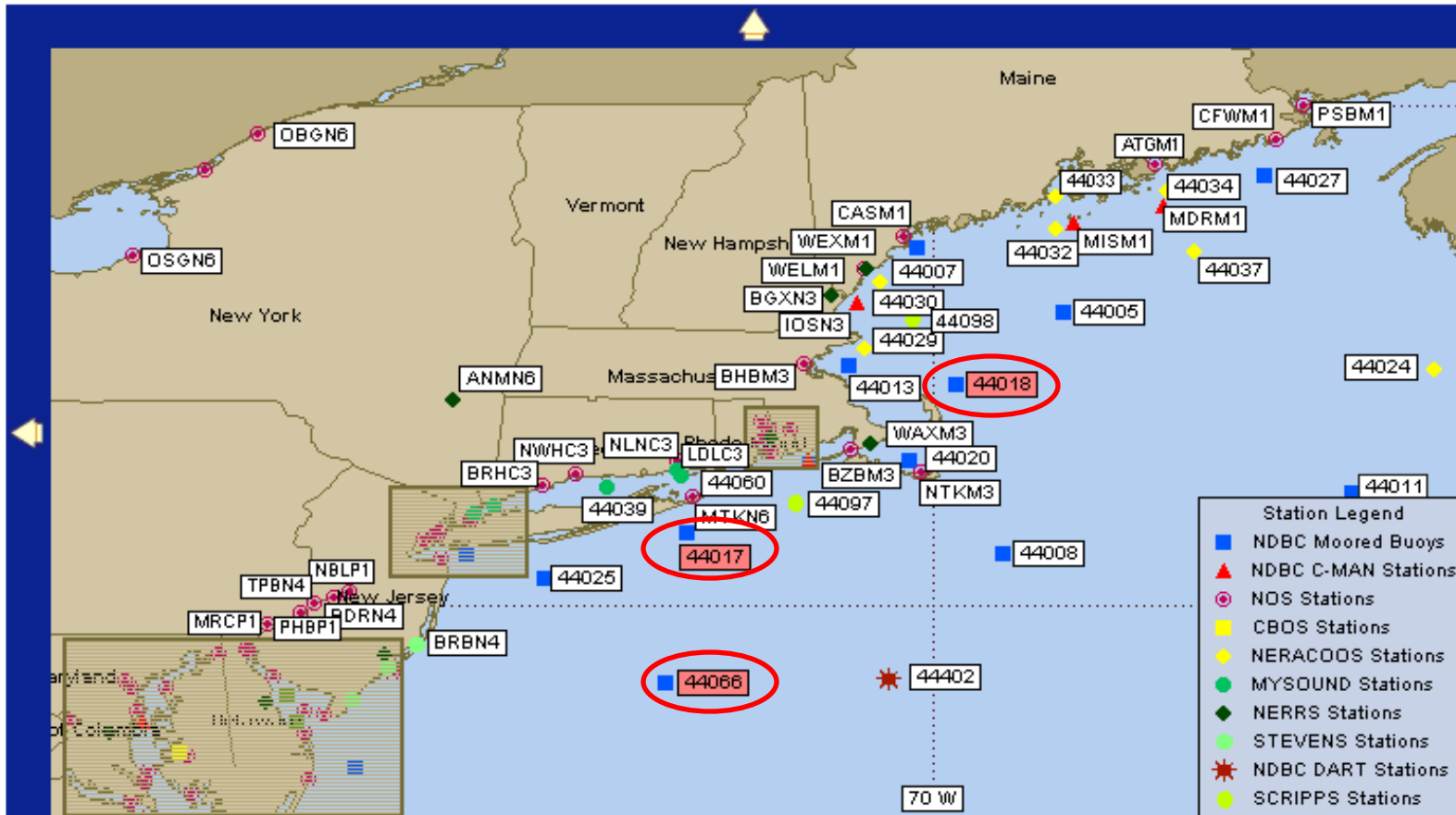
## C-MAN

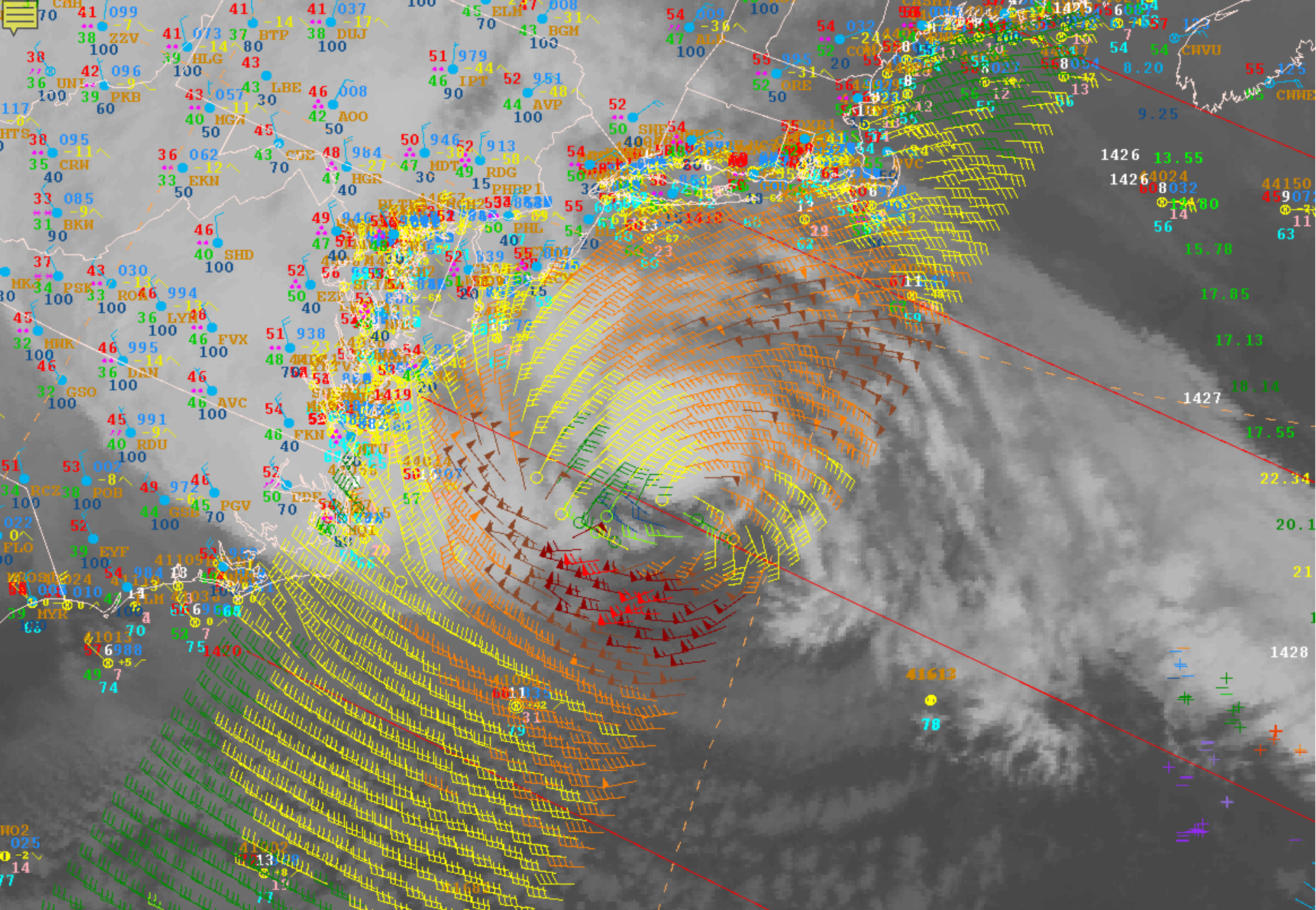
**Storm Special!** View the latest observations near [Atlantic HURRICANE LESLIE as of ADVISORY NUMBER 29 @ 1100 AM AST THU SEP 06 2012](#) and [Atlantic HURRICANE MICHAEL as of ADVISORY NUMBER 14 @ 1100 AM AST THU SEP 06 2012](#).

### Northeast USA Recent Marine Data

**Not All Stations Depicted are Operated by the National Data Buoy Center.**

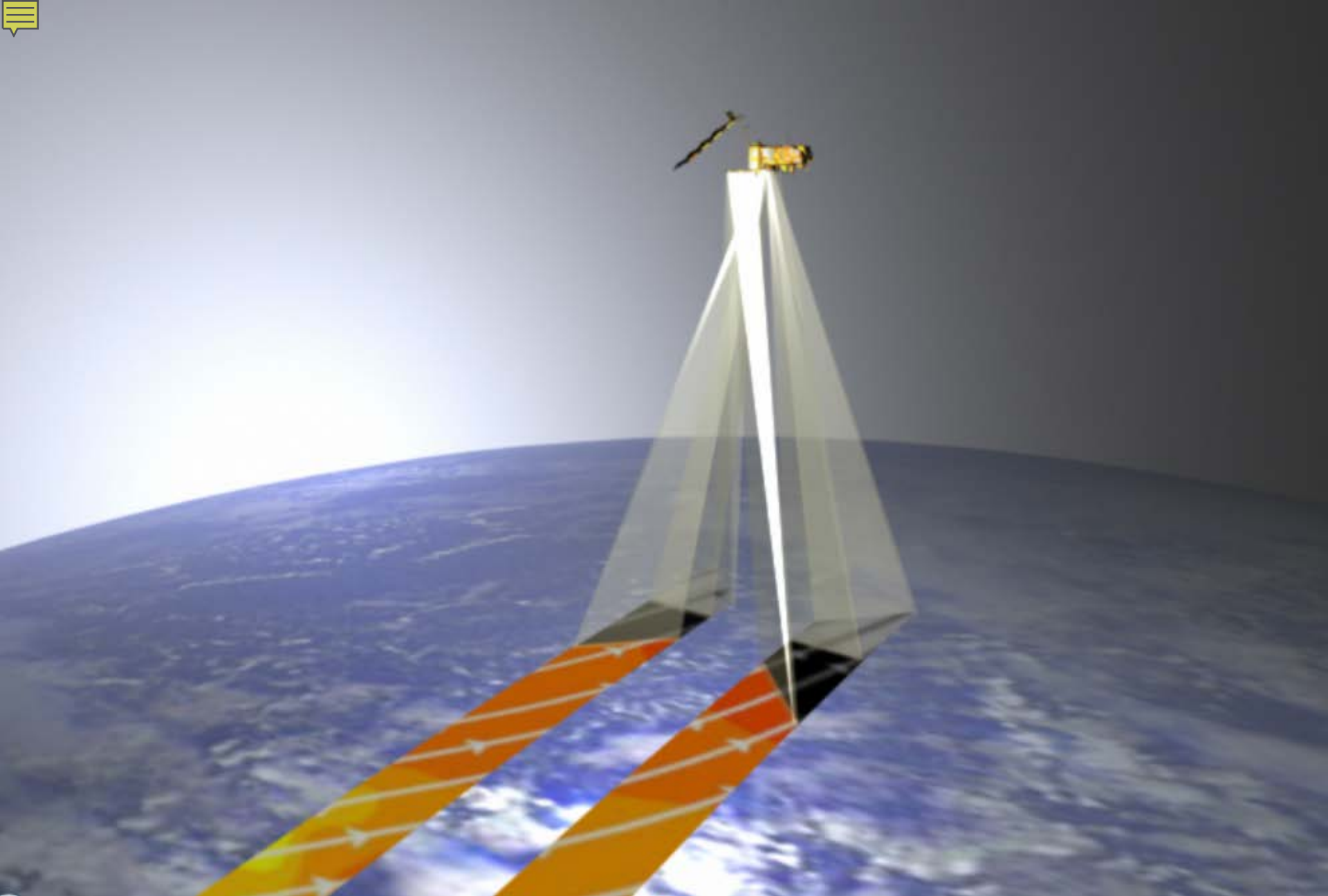
To view marine data, click a station on the map below:





**12.5 KM ASCAT Hurricane Sandy 29 Oct 2012**

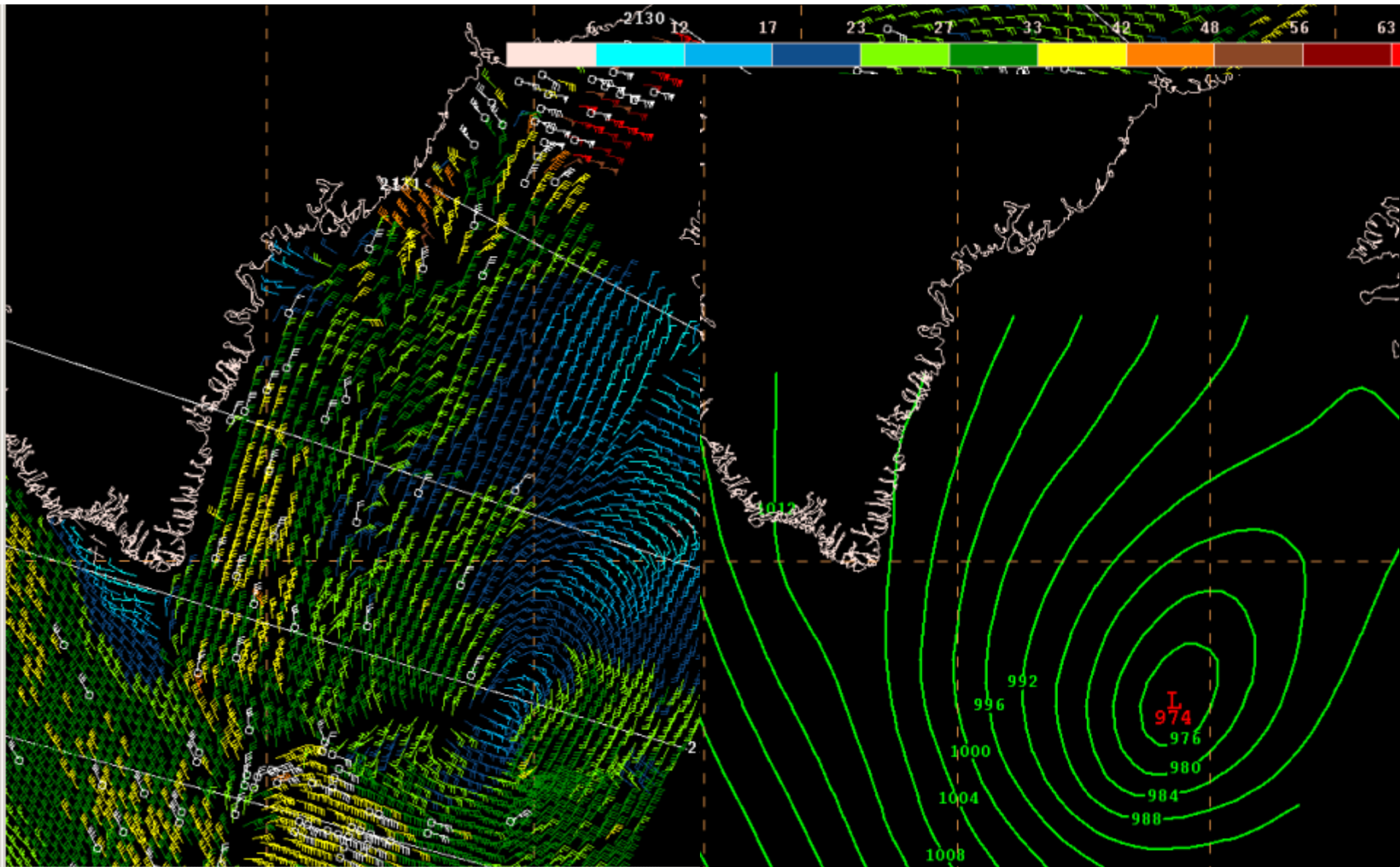




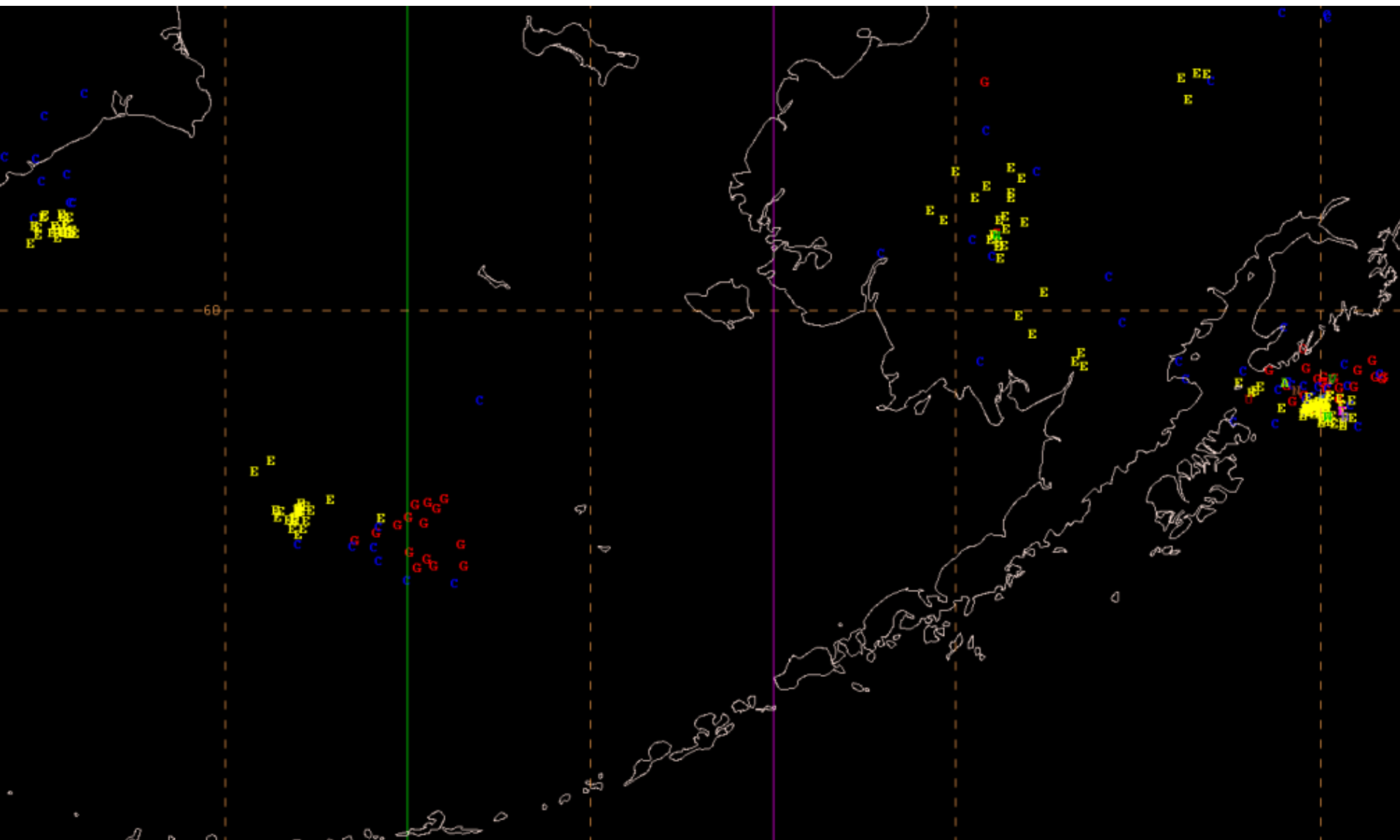
**ASCAT Scatterometer**



# University of Washington Planetary Boundary Layer Model



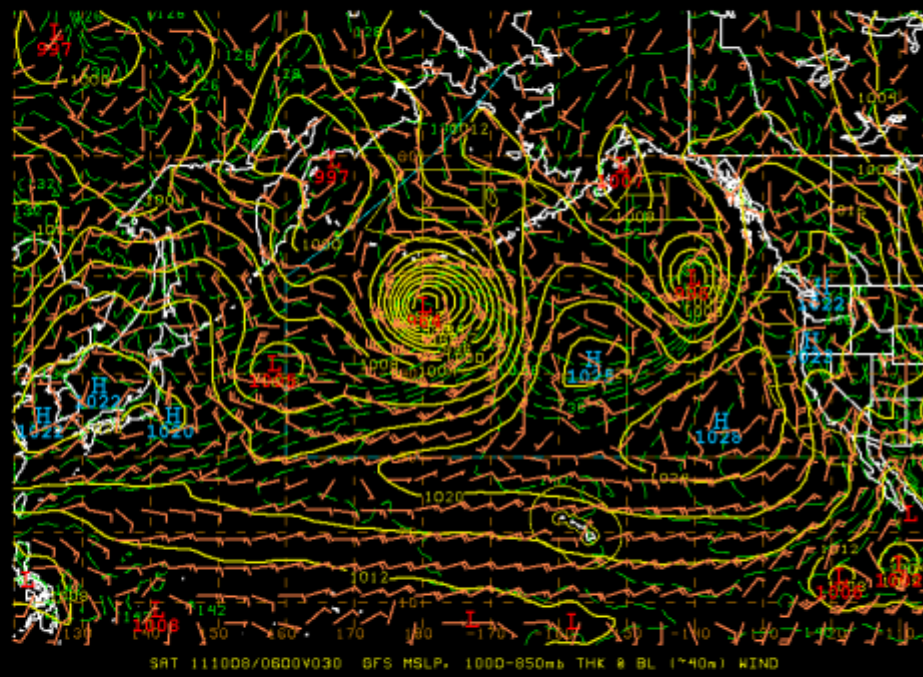
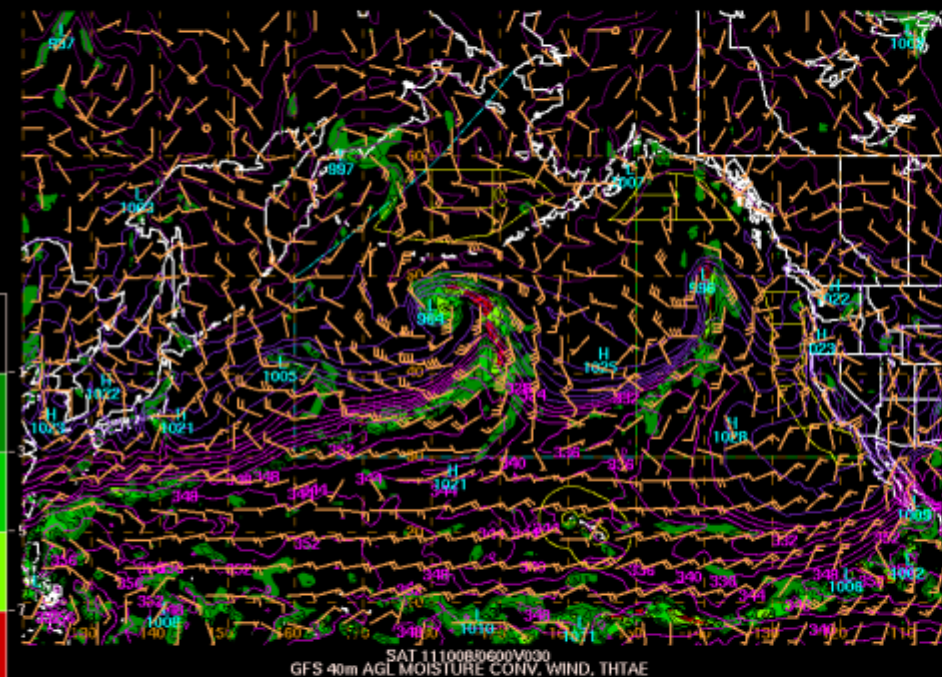
# GEFS/GEM/ECMWF Ensemble Members





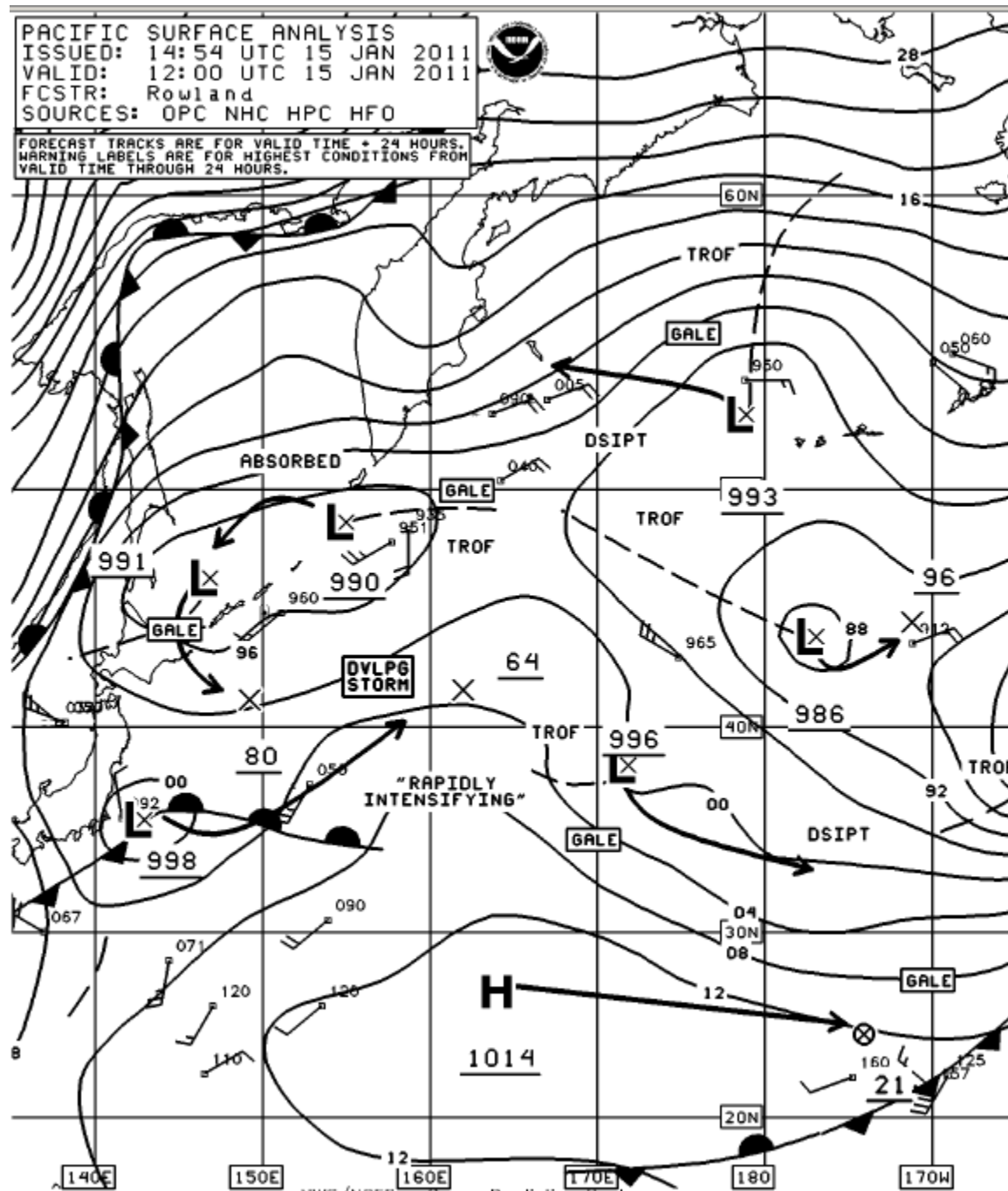
GFS 40M Moisture Convergence/Winds/Thetae

GFS1000/850 MB Thickness



PACIFIC SURFACE ANALYSIS  
ISSUED: 14:54 UTC 15 JAN 2011  
VALID: 12:00 UTC 15 JAN 2011  
FCSTR: Rowland  
SOURCES: OPC NHC HPC HFO

FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.

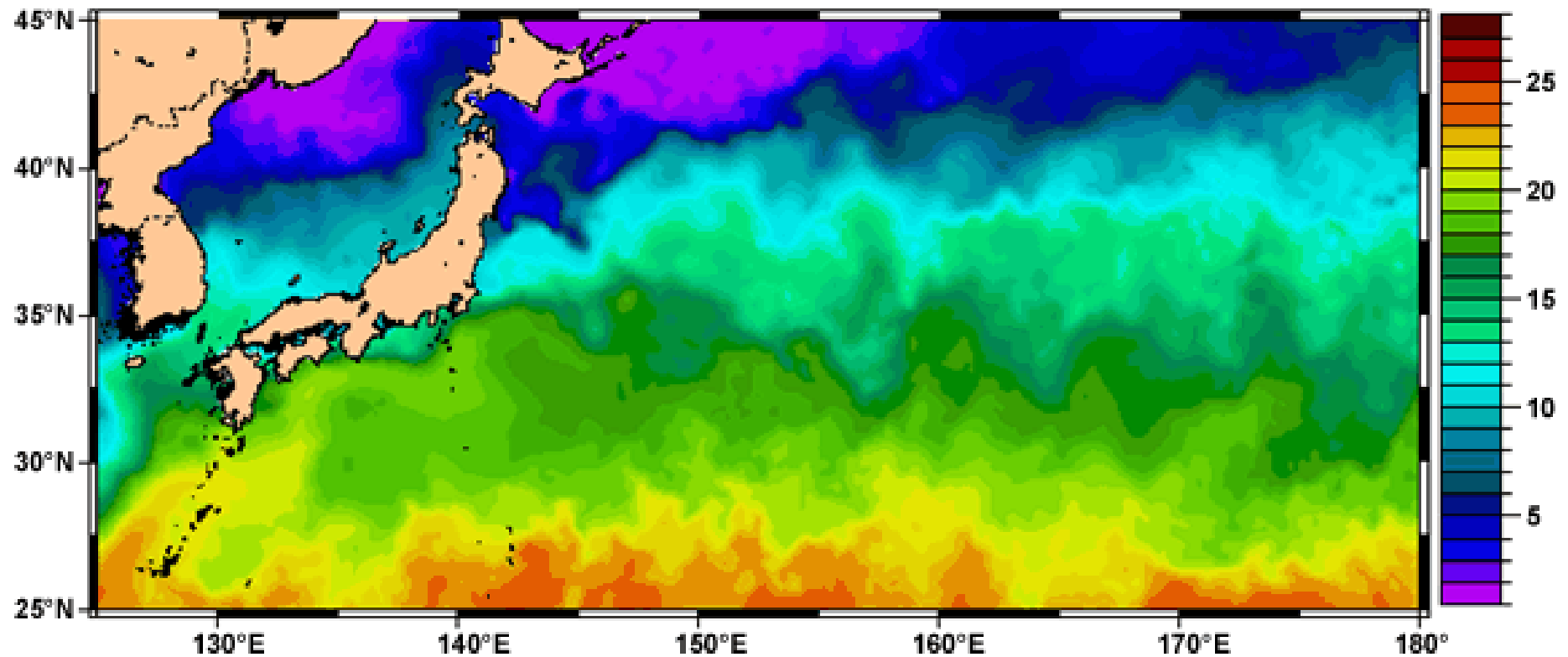


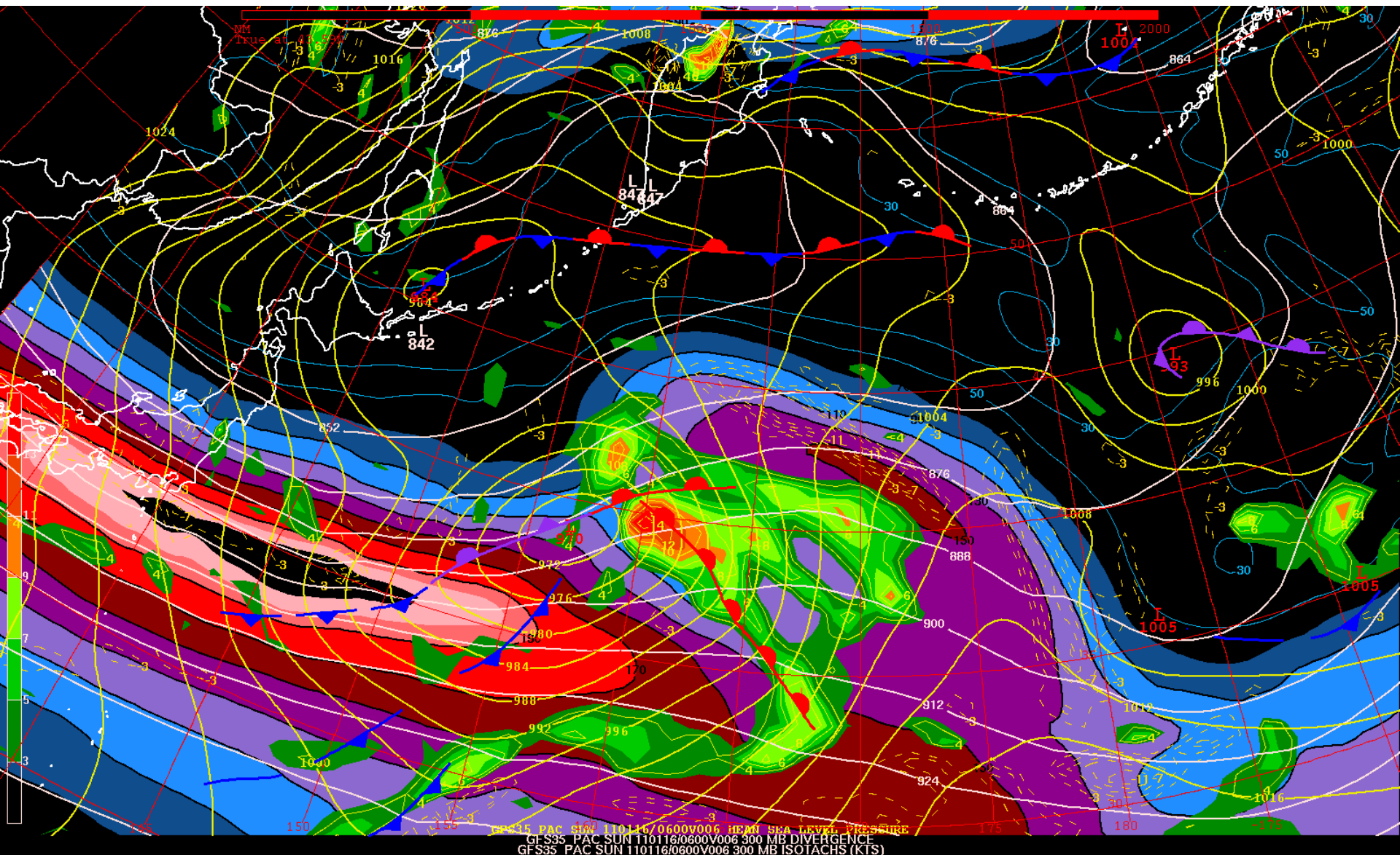




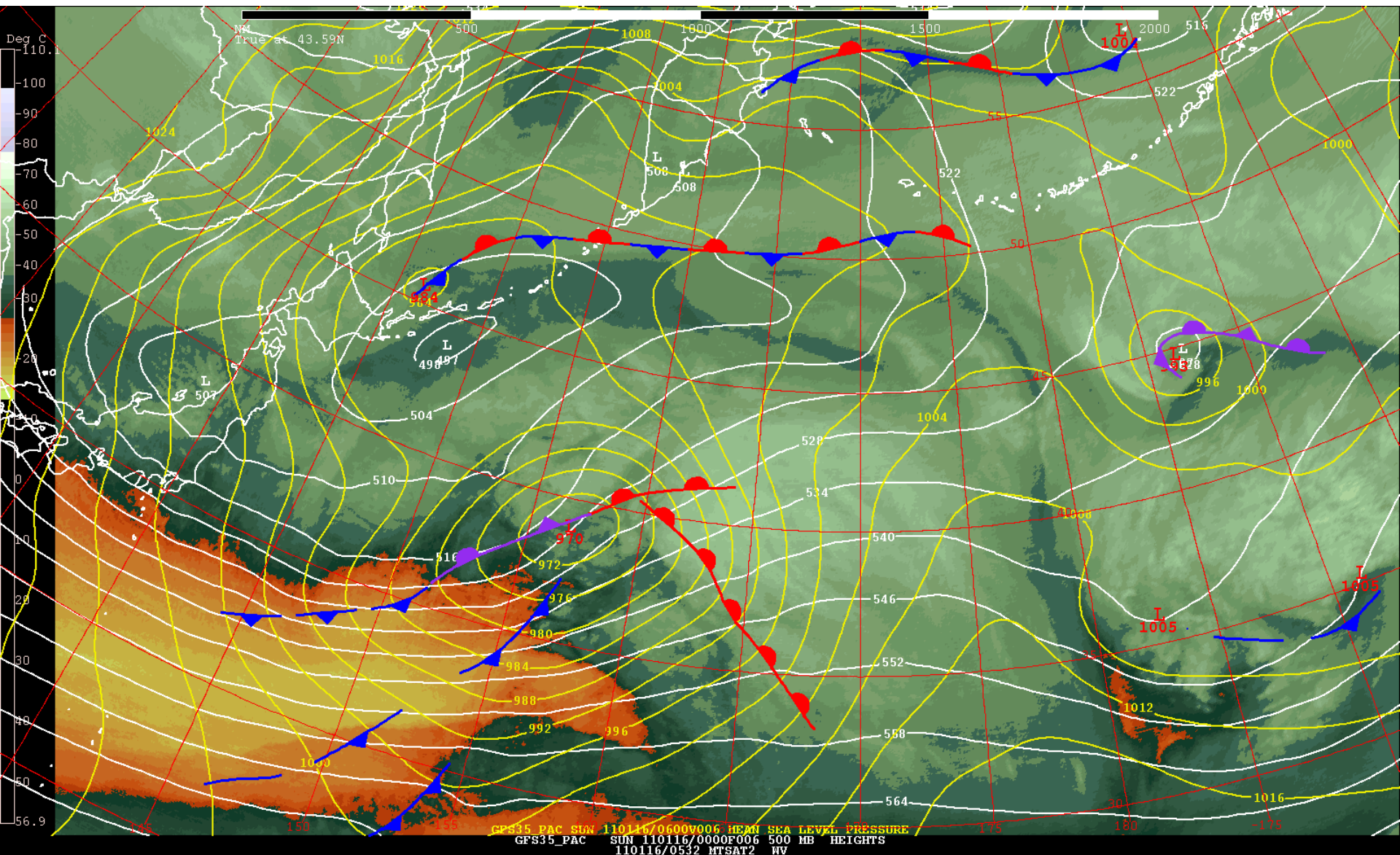
# Kuroshio Current

Sea Surface Temperature (°C) MODAS Analysis 01 Mar 2006



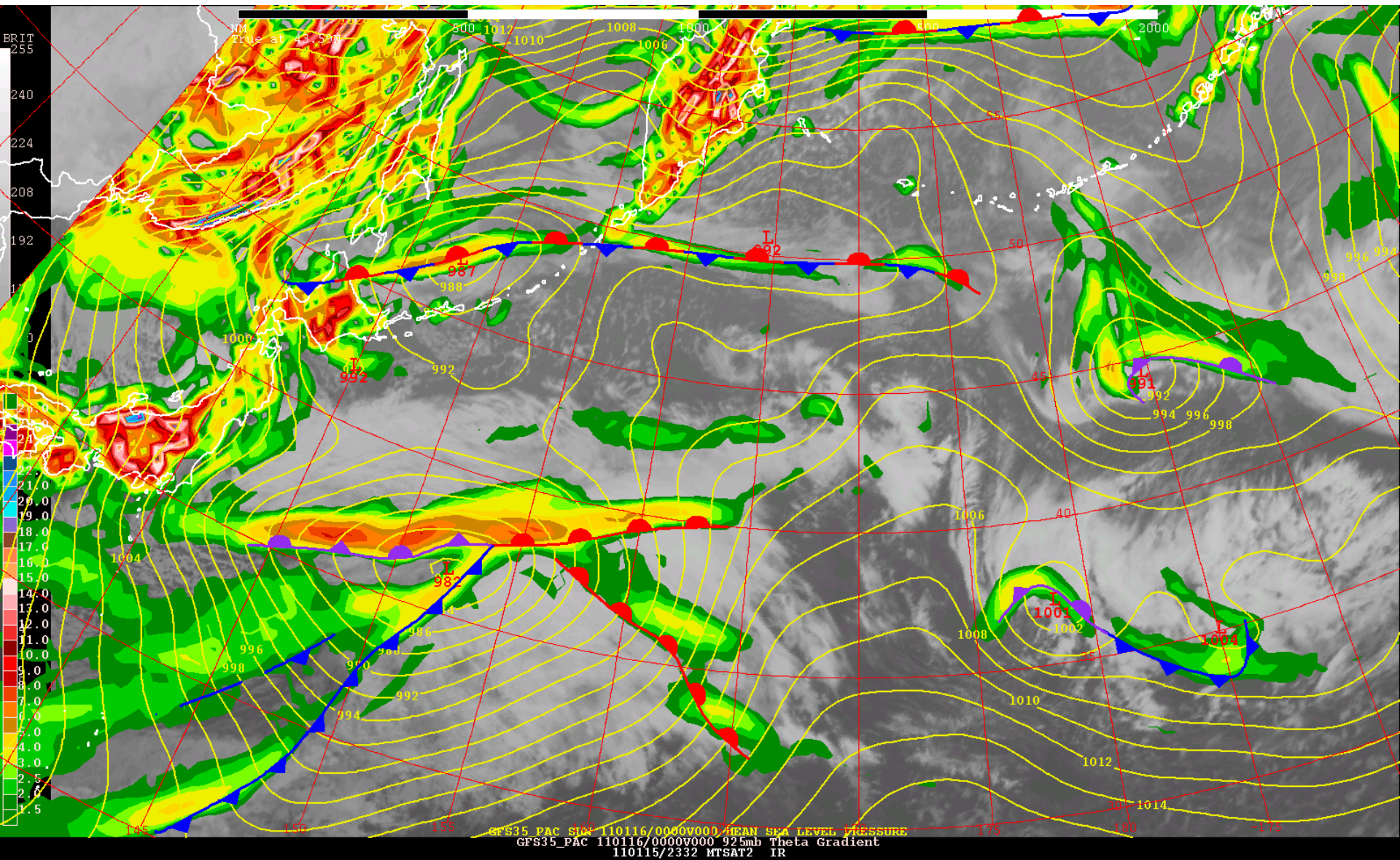


# 0600 UTC Jan 16, 2011

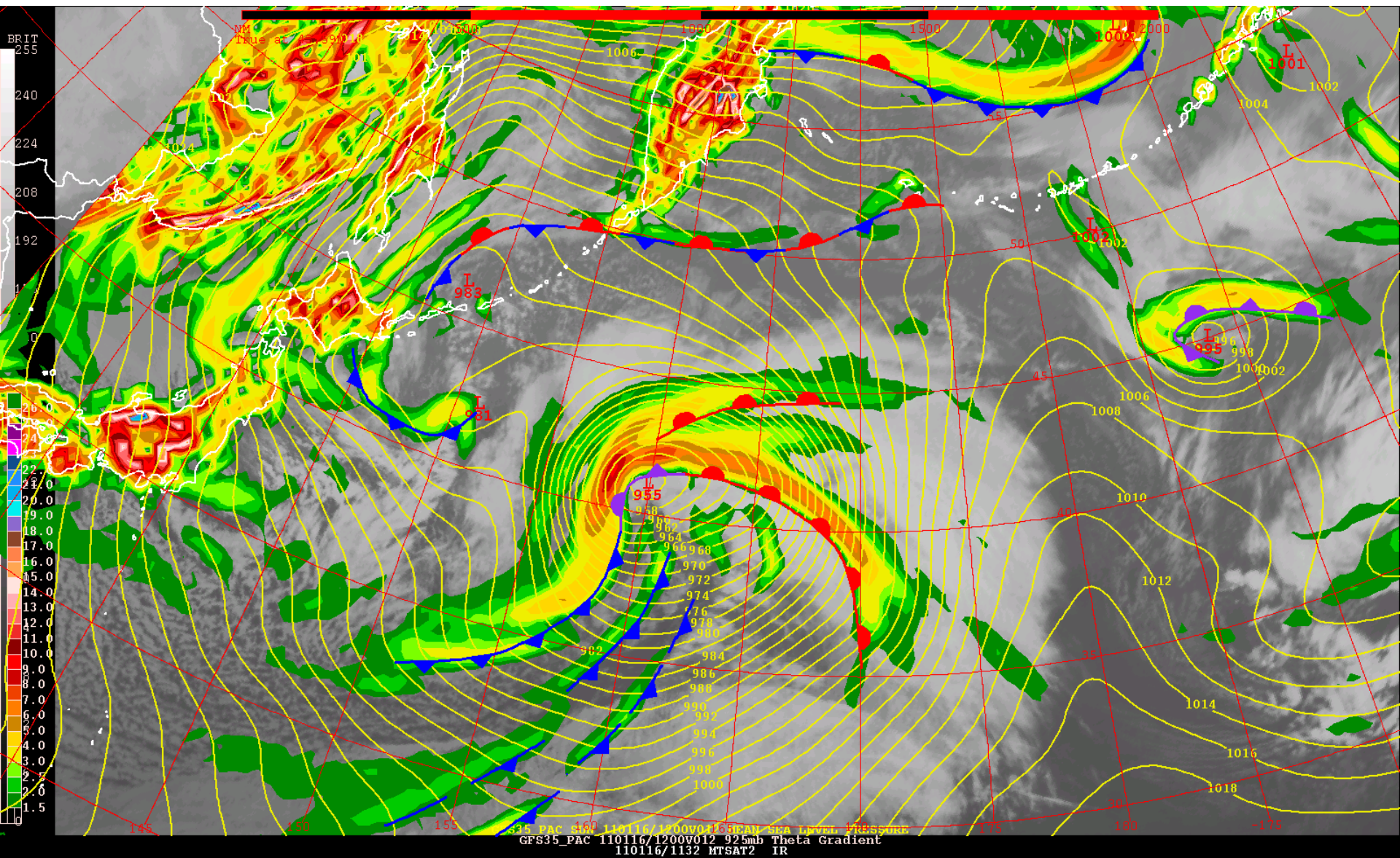




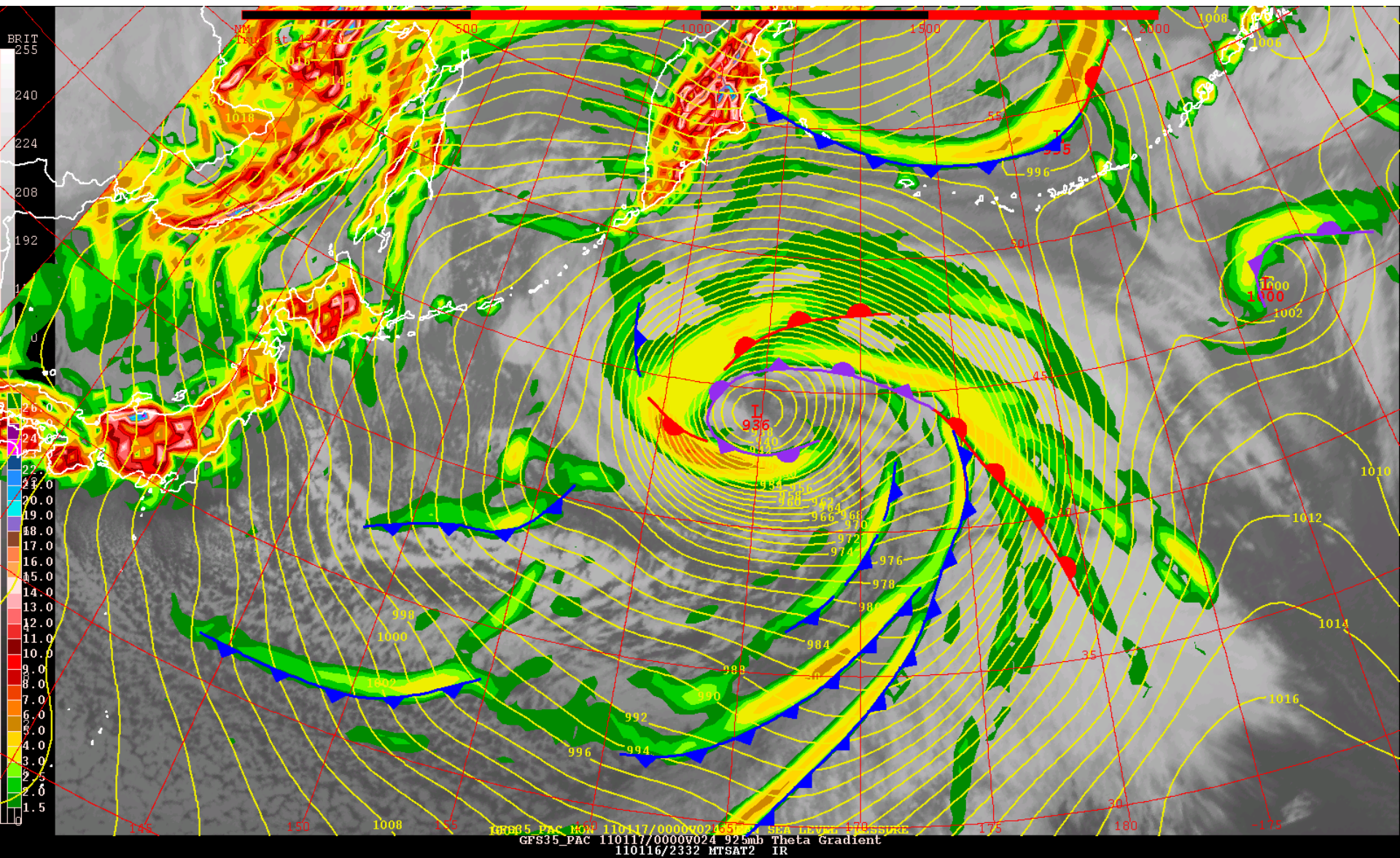
0000 UTC Jan 16, 2011



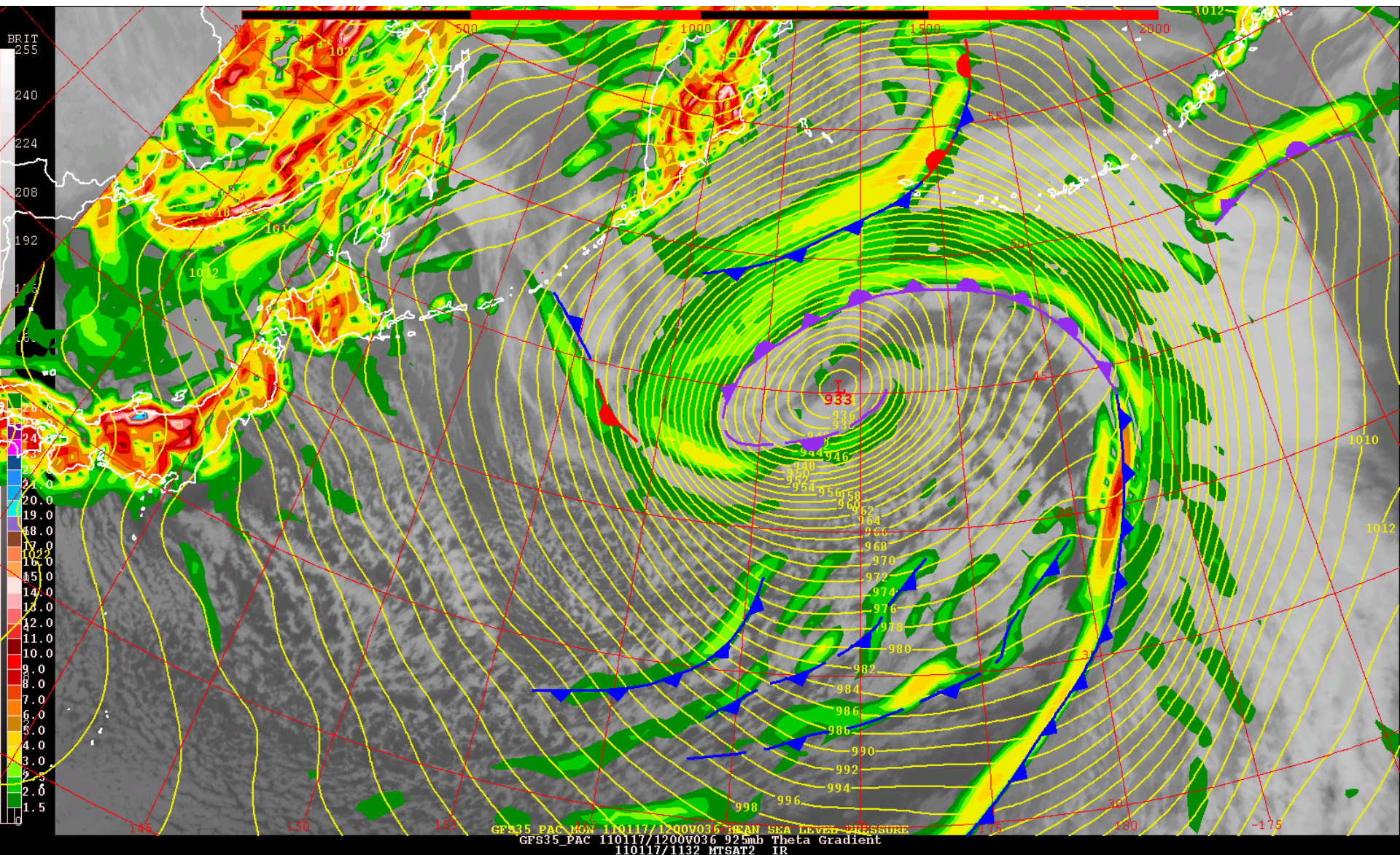






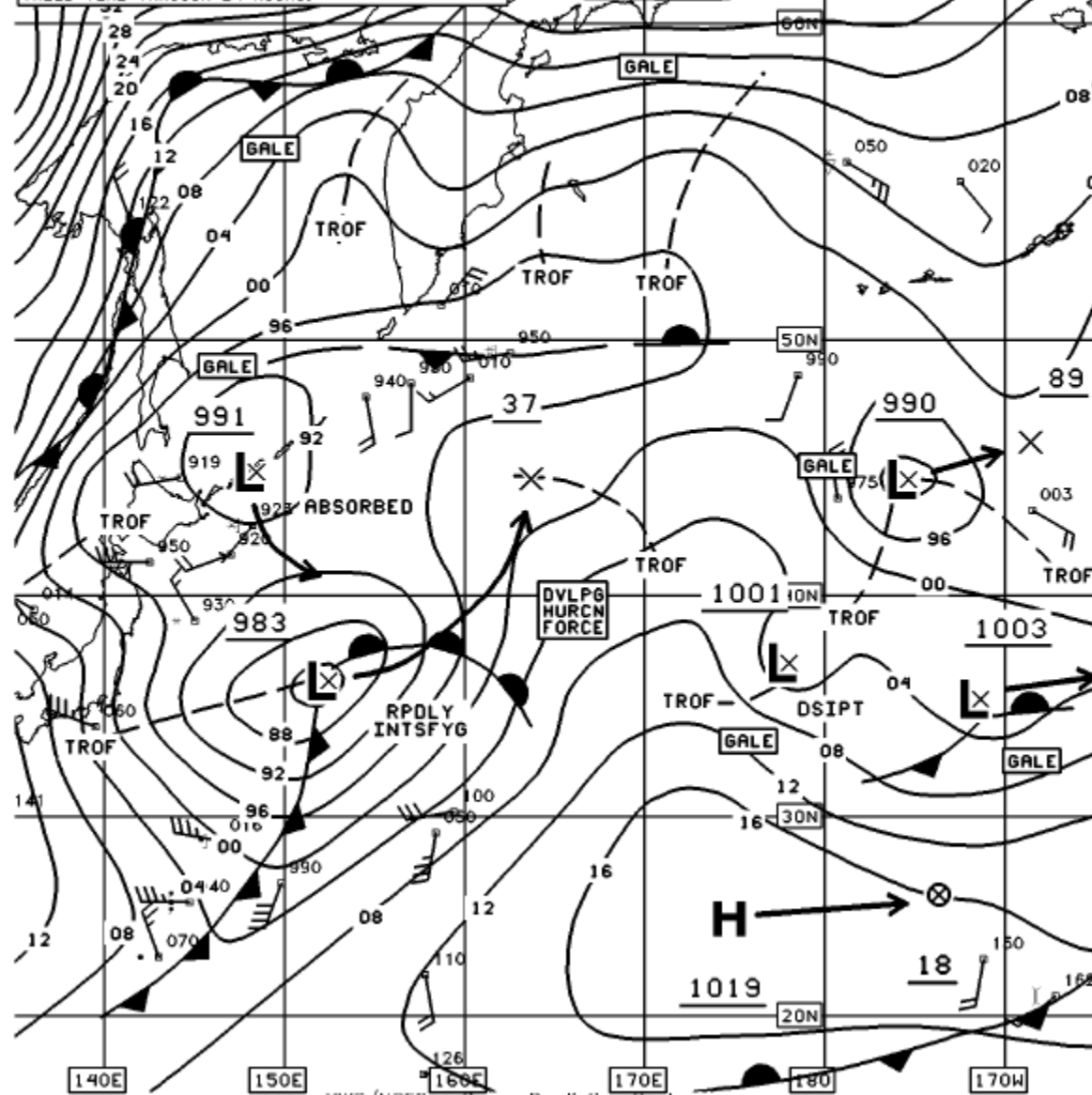






PACIFIC SURFACE ANALYSIS  
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FCSTR: LEE  
SOURCES: OPC NHC HPC HFO

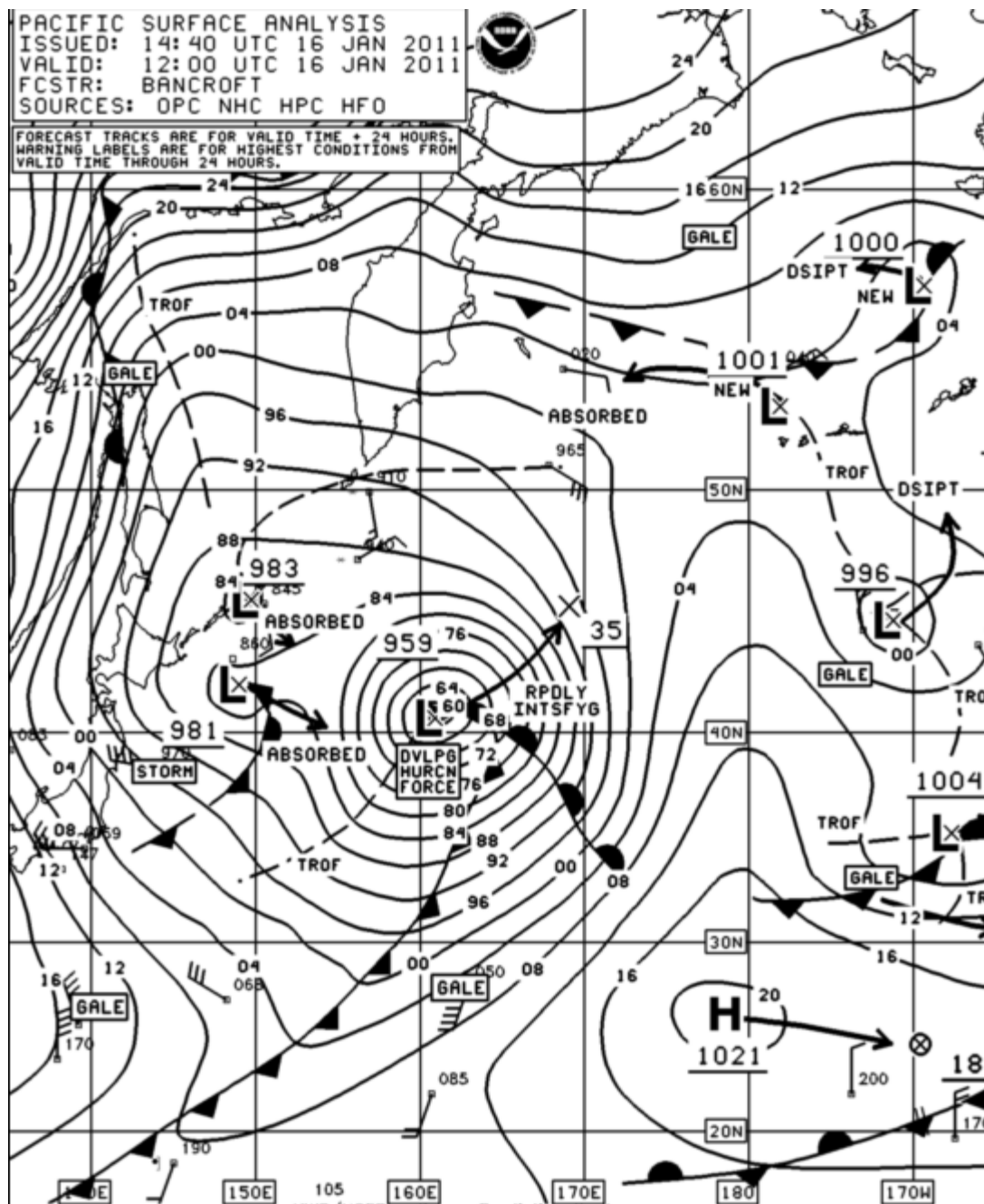
FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.





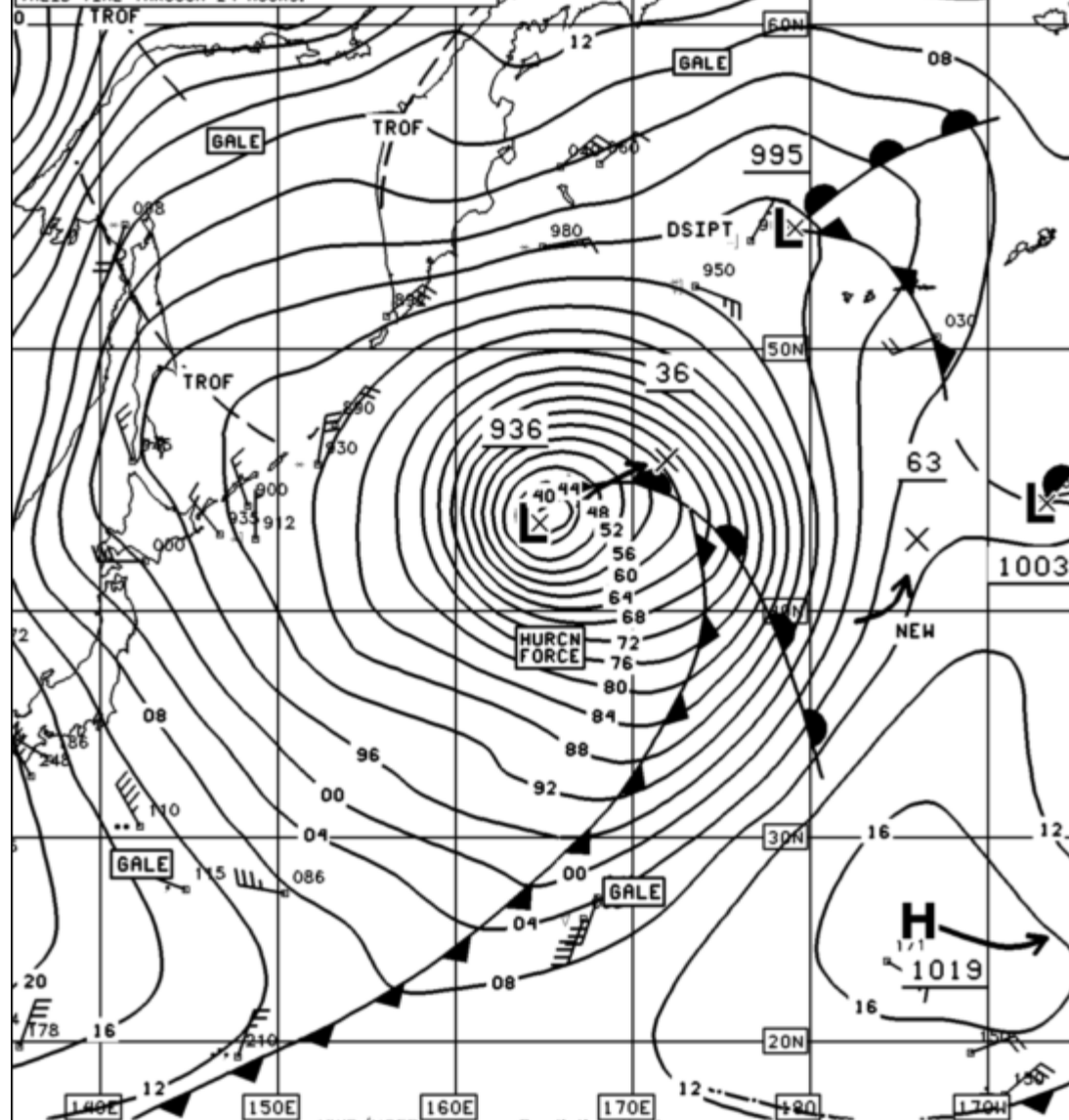
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VALID: 12:00 UTC 16 JAN 2011  
FCSTR: BANCROFT  
SOURCES: OPC NHC HPC HFO

FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.



PACIFIC SURFACE ANALYSIS  
ISSUED: 02:46 UTC 17 JAN 2011  
VALID: 00:00 UTC 17 JAN 2011  
FCSTR: MUSONDA  
SOURCES: OPC NHC HPC HFO

FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.

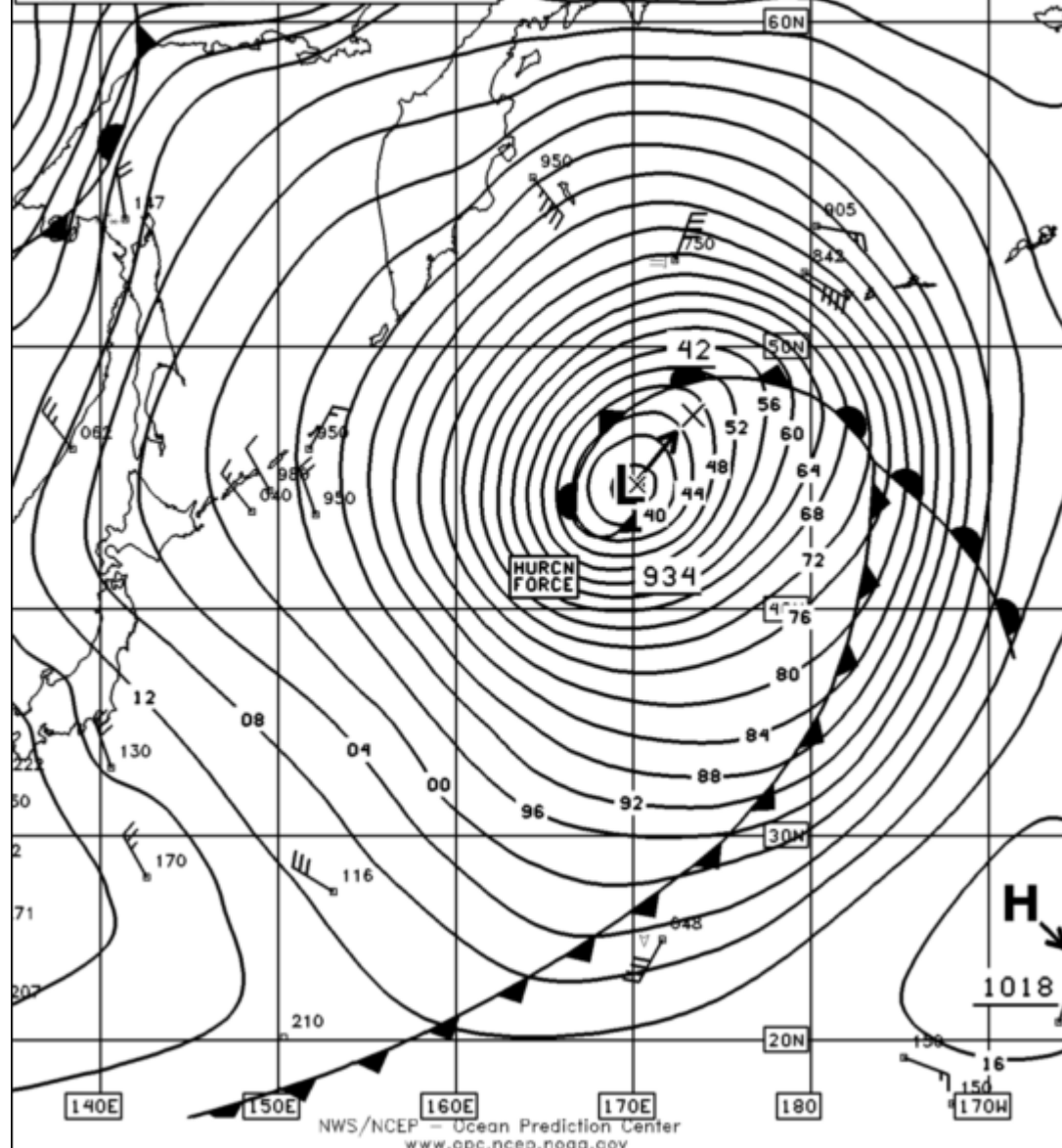




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VALID: 12:00 UTC 17 JAN 2011  
FCSTR: COLLINS  
SOURCES: OPC NHC HPC HFO

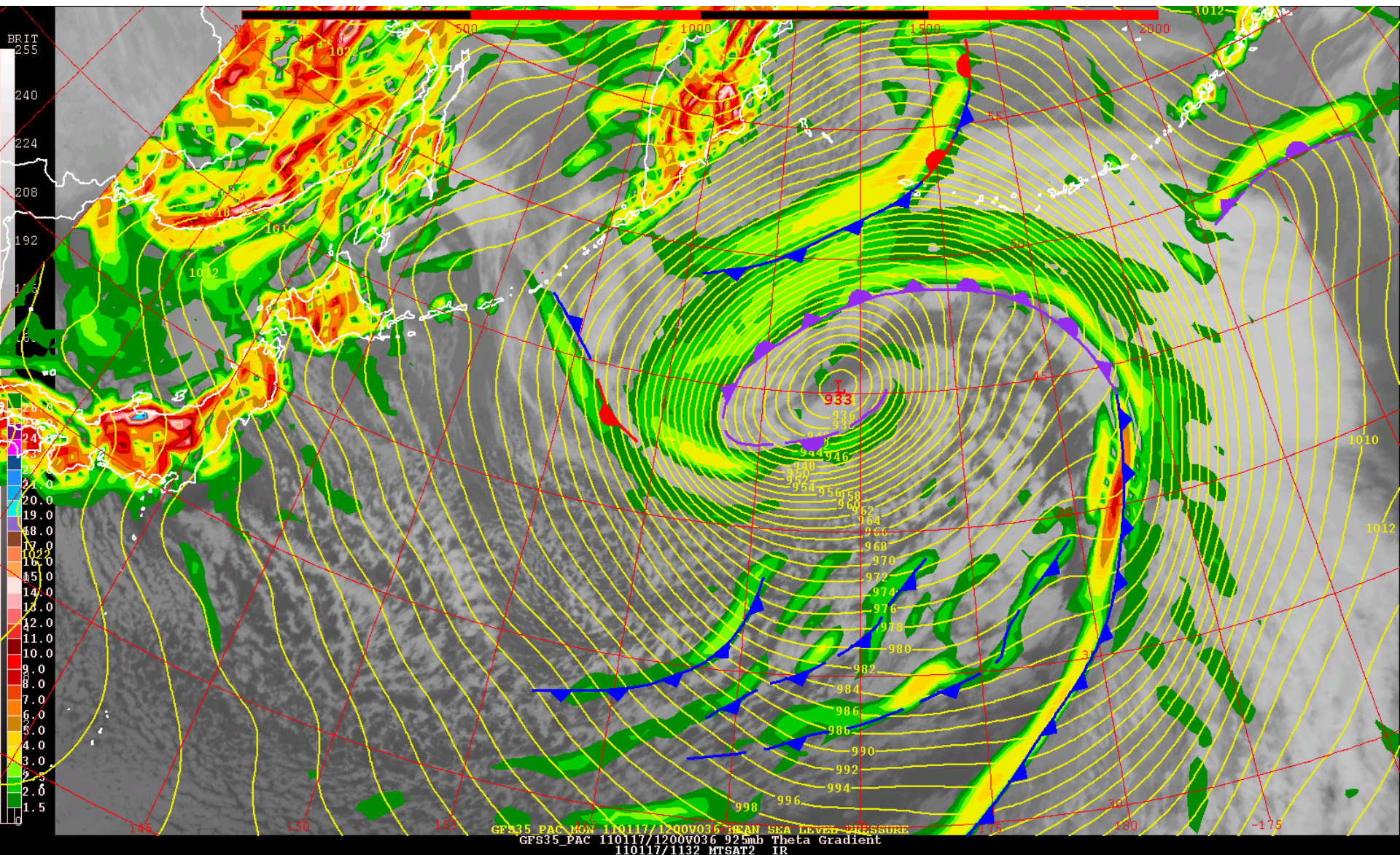


FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.





# 1200 UTC Jan 17, 2011





# Unified Surface Analysis



National Weather Service

## Ocean Prediction Center

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### Top News – Last updated August 30, 2011

- [Buoy 41002 will be relocated on or about November 1, 2011](#)
- [Feedback requested on proposed NDBC buoy 44018 relocation](#)
- [The 2010 OPC Accomplishments report is now available \(pdf\)](#)

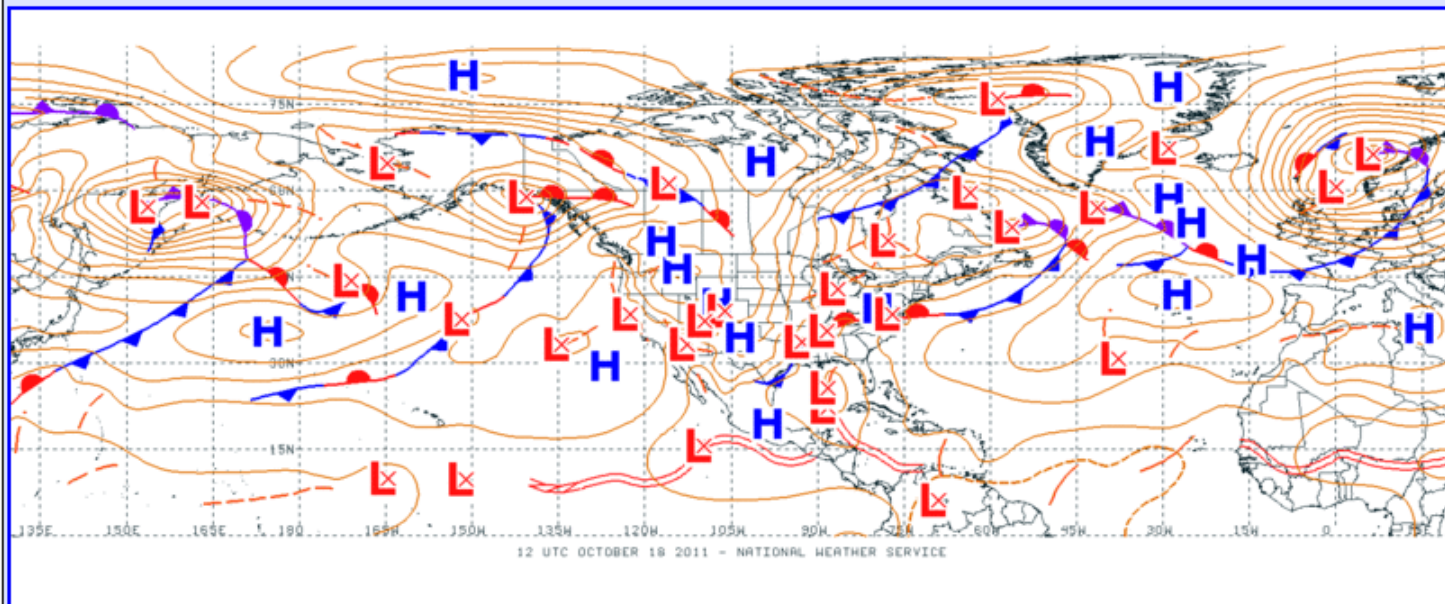
[NOAA](#)>[NWS](#)>[NCEP](#)> [OPC](#)>Unified Analysis

Unified Analysis

Atlantic Marine

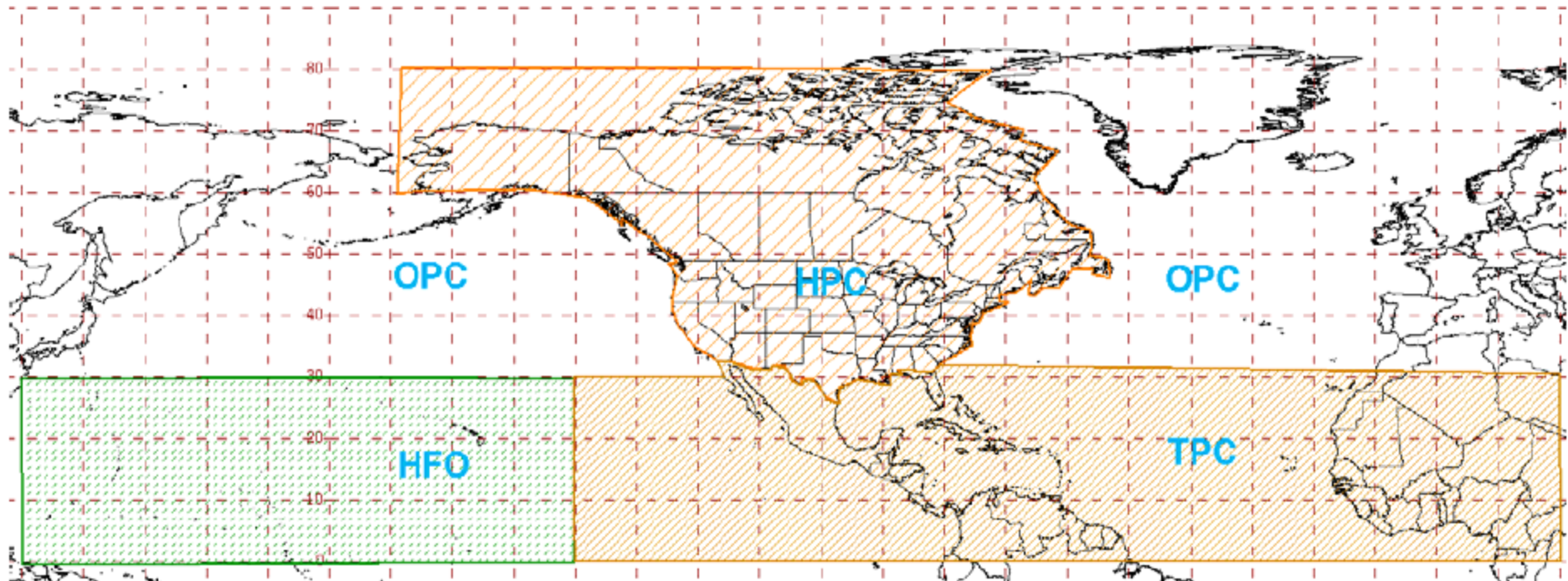
Pacific Marine

Ocean Products



Last Update: Tuesday, 18-Oct-2011 16:09:19 UTC

# Unified Analysis AORs



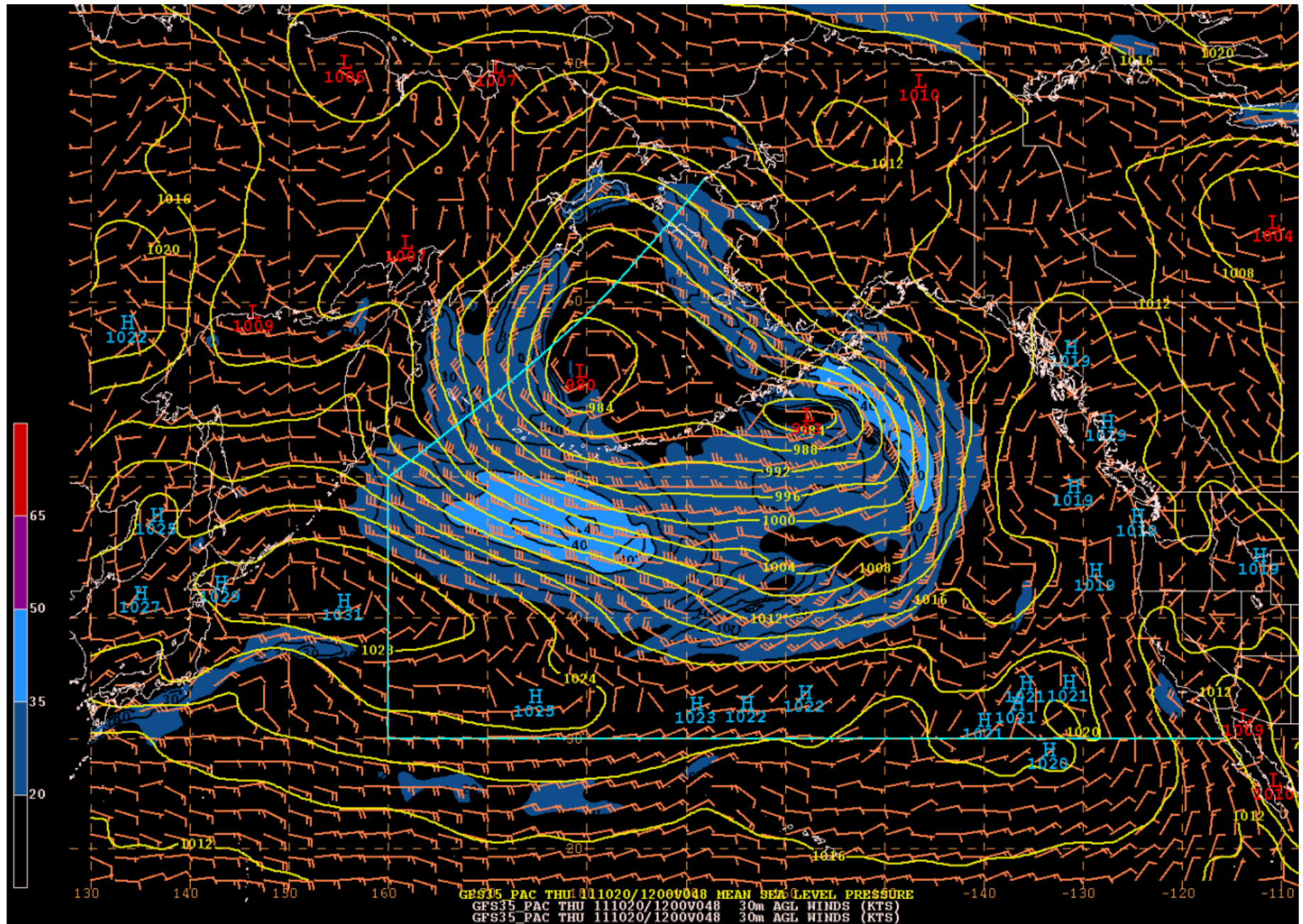
# The OPC Forecast Process



***Man Machine Mix***

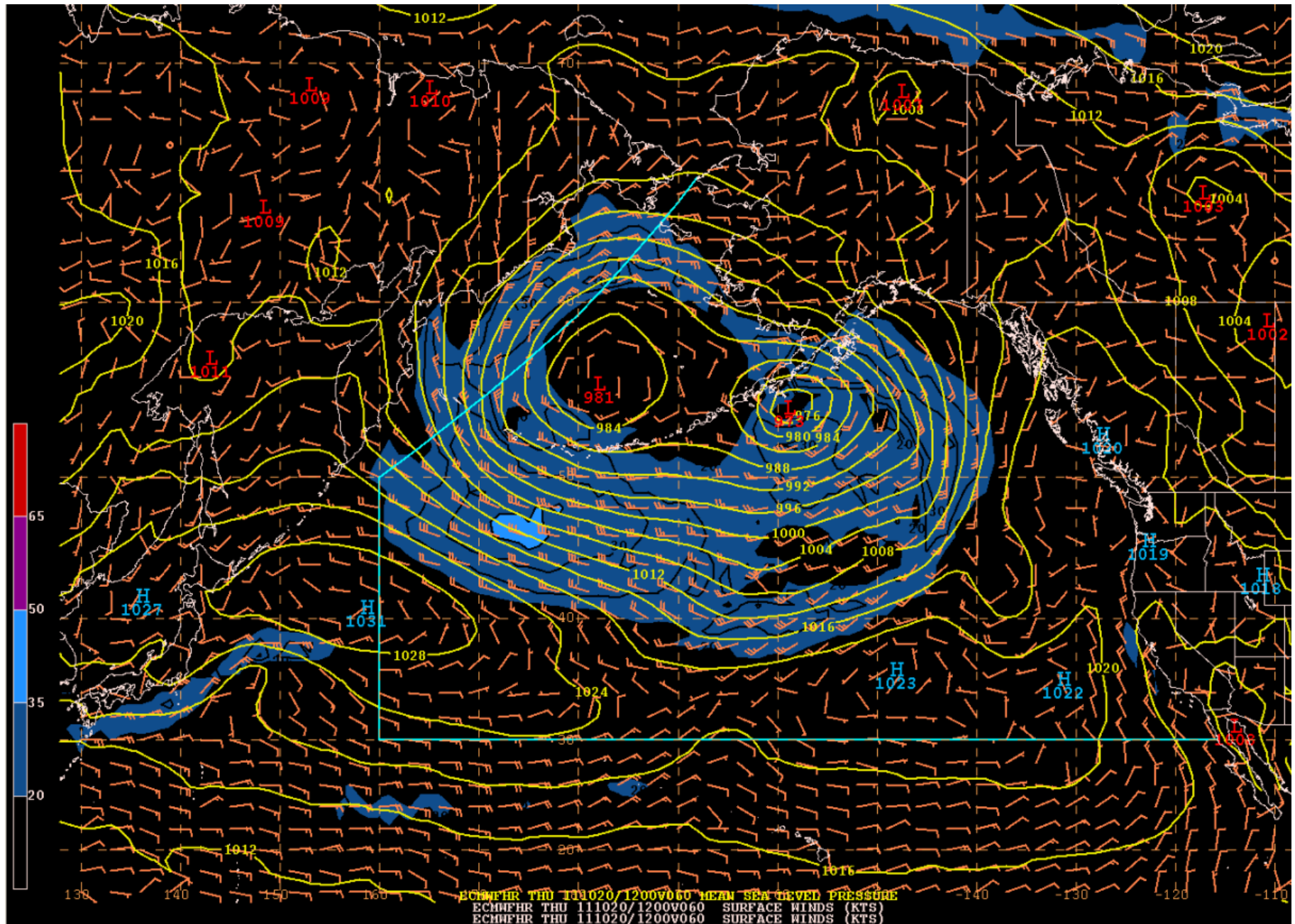


# 35 KM GFS Surface Pressure/30M Winds



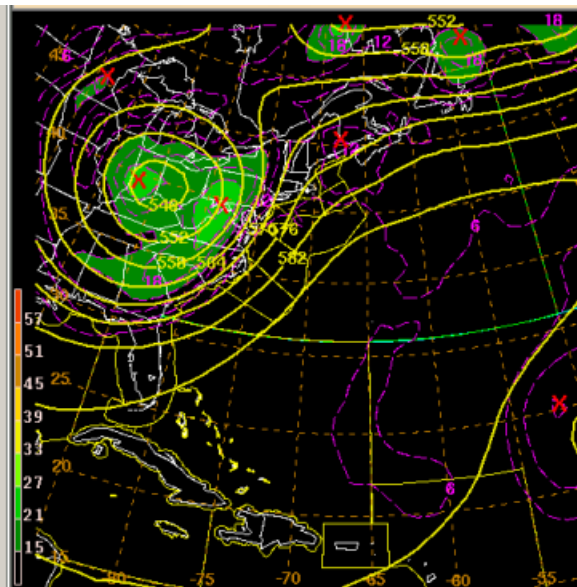


# Hi-Res ECMWF Surface Pressure/10M Winds

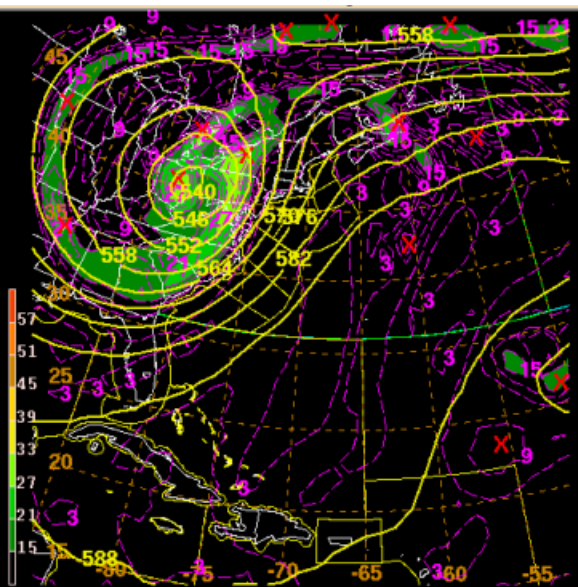




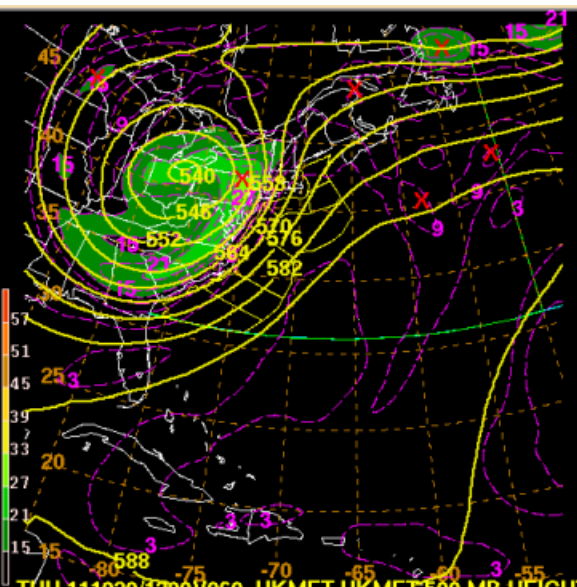
# NOGAPS/GEM/UKMET Comparison



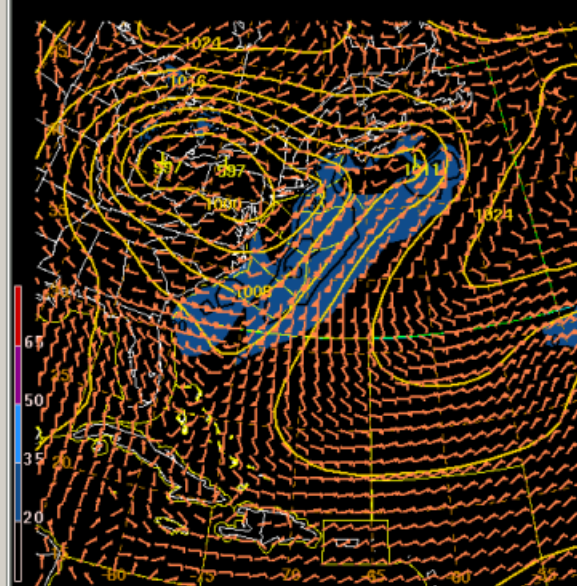
111020/1200V060 NOGAPS 500 MB HEIGHTS AND VORTICITY



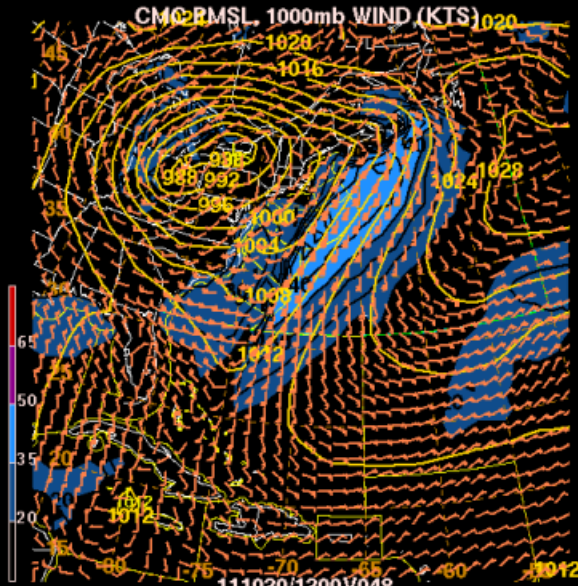
CMC 111020/1200V048 500 MB HEIGHTS AND ABS VORTICITY



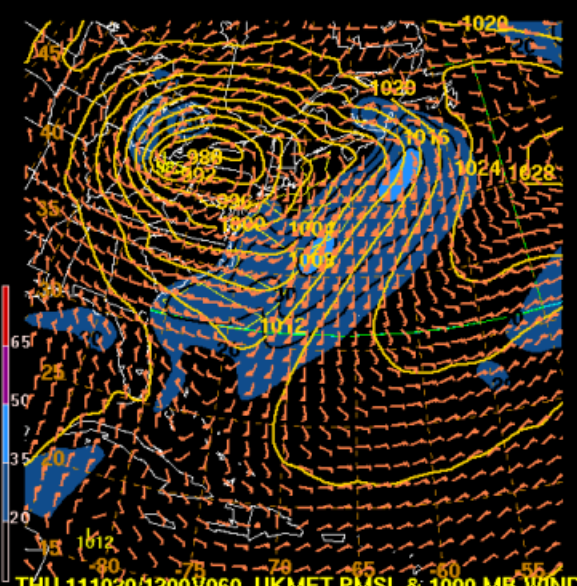
THU 111020/1200V060 UKMET UKMET 500 MB HEIGHTS



111020/1200V060 NOGAPS PMSL & BL WIND (10m AGL; KTS)



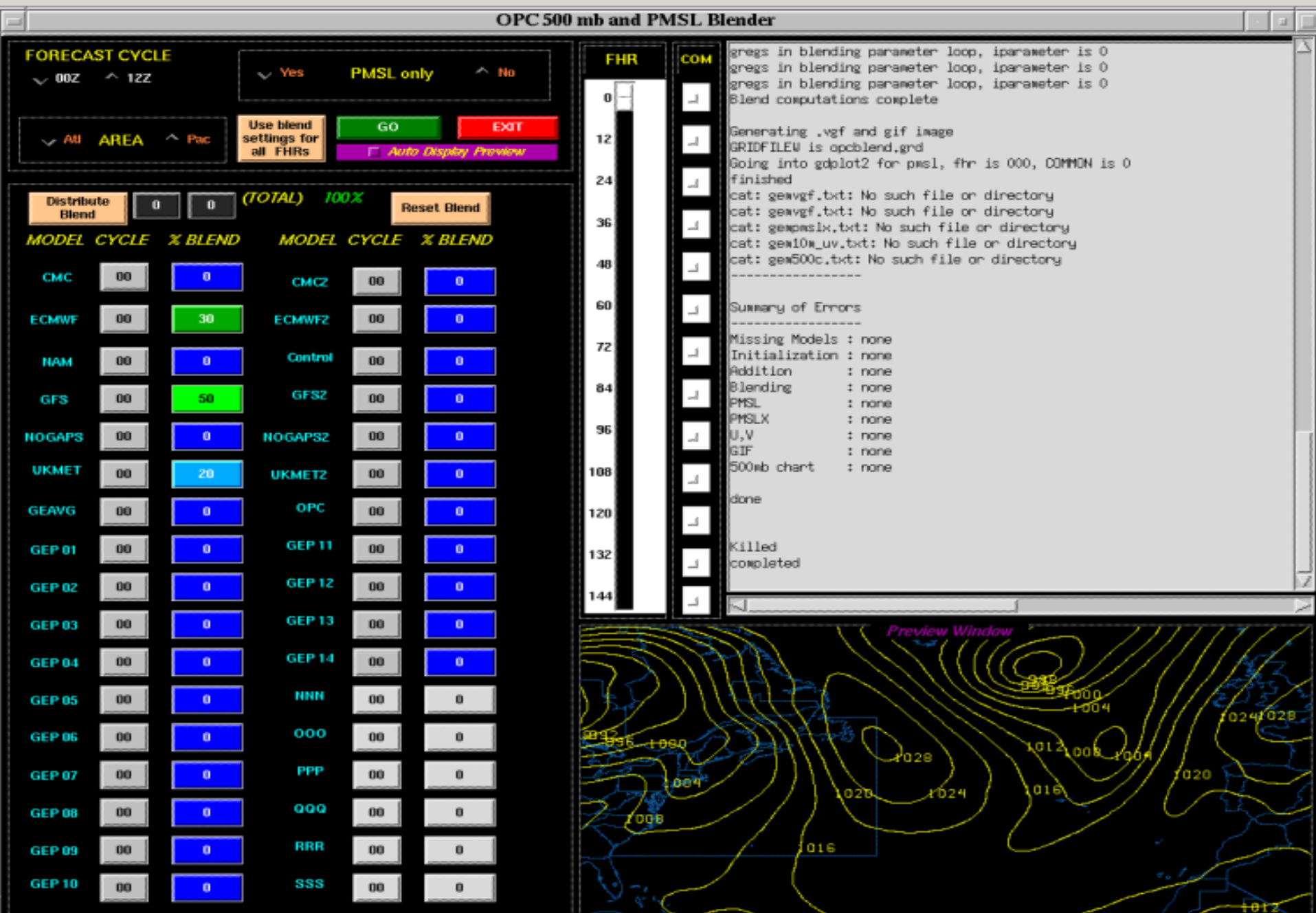
CMC 111020/1200V048 PMSL & 1000mb WIND (KTS)



THU 111020/1200V060 UKMET PMSL & 1000 MB WIND

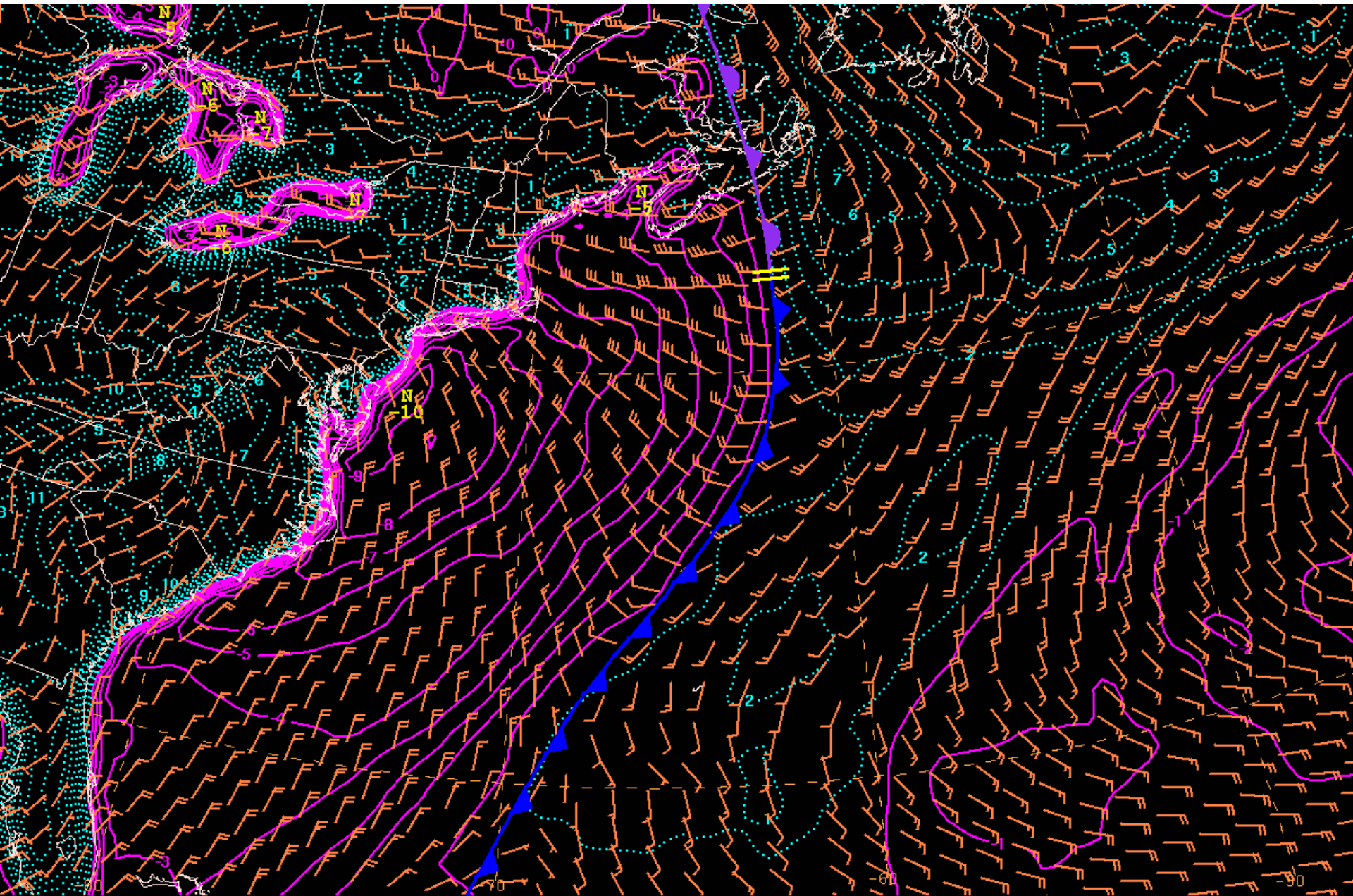
Colors: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

# OPC Model Blender





# GFS Static Stability/30M/10M Winds

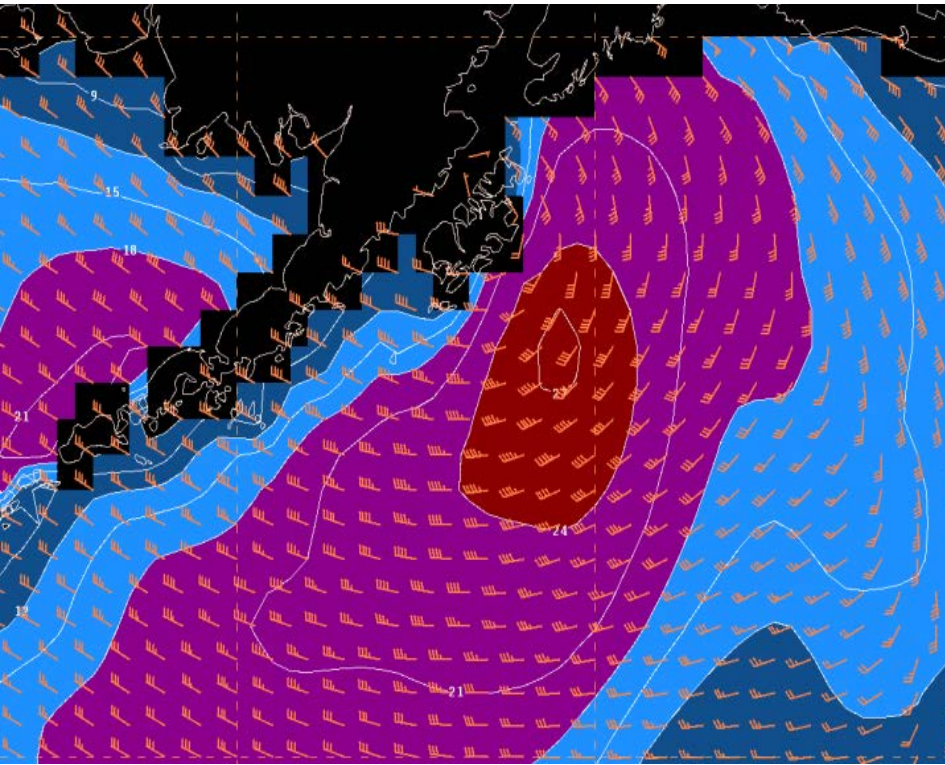


GFS35\_ATL THU 121011/1200V024 Winds, Lapse Rate (925-SFC) [Unstable < 0 - 30m winds, stable > 0 - 10m winds]



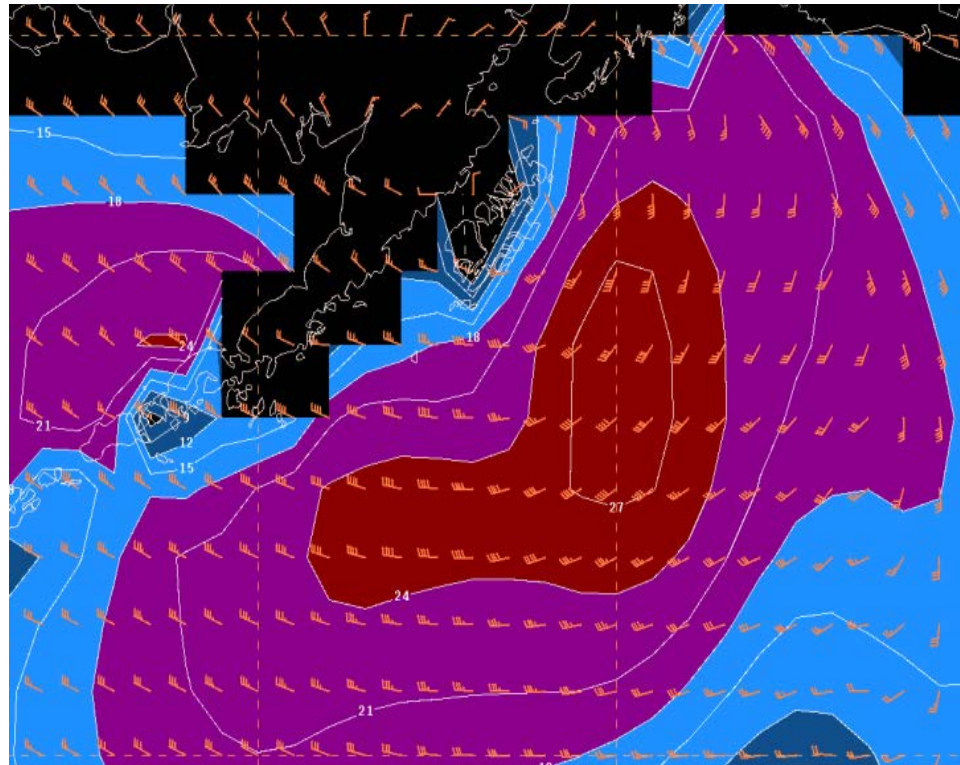


## Multigrid WaveWatch III



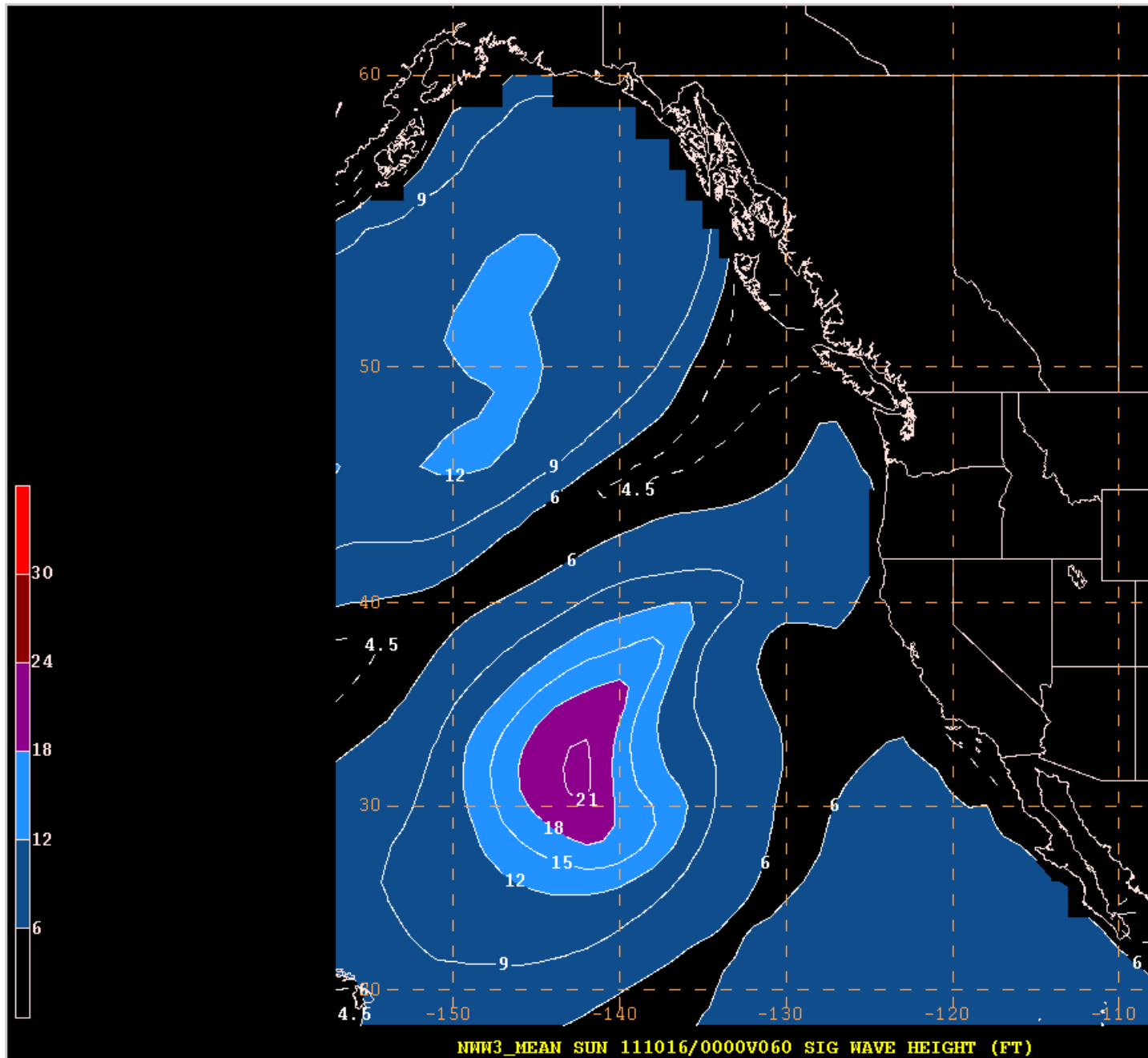
**VT 1800 UTC 25 Oct 2011**

## ECWMF WAM

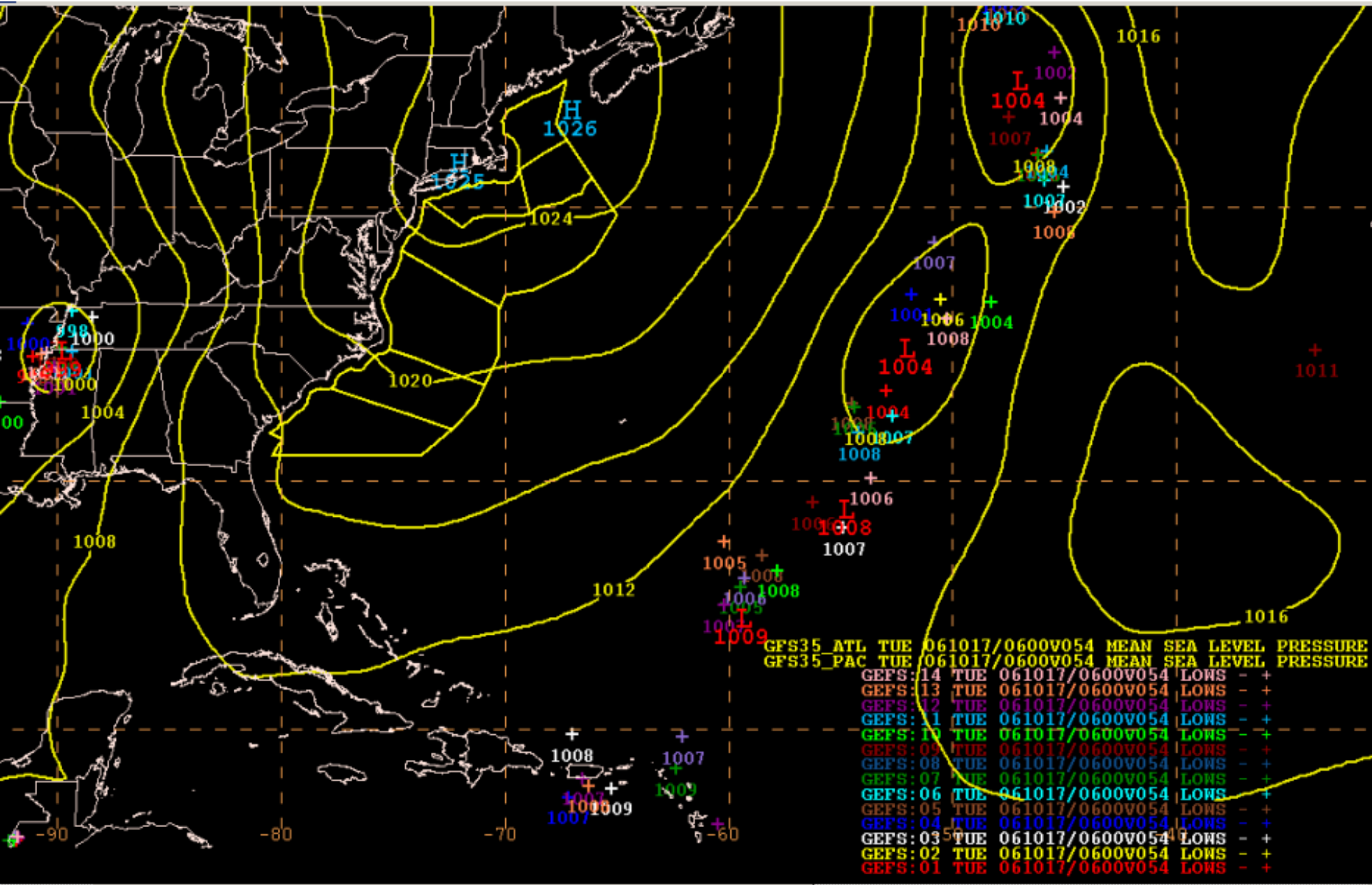


**VT 1800 UTC 25 Oct 2011**

# WaveWatch III Ensemble Mean

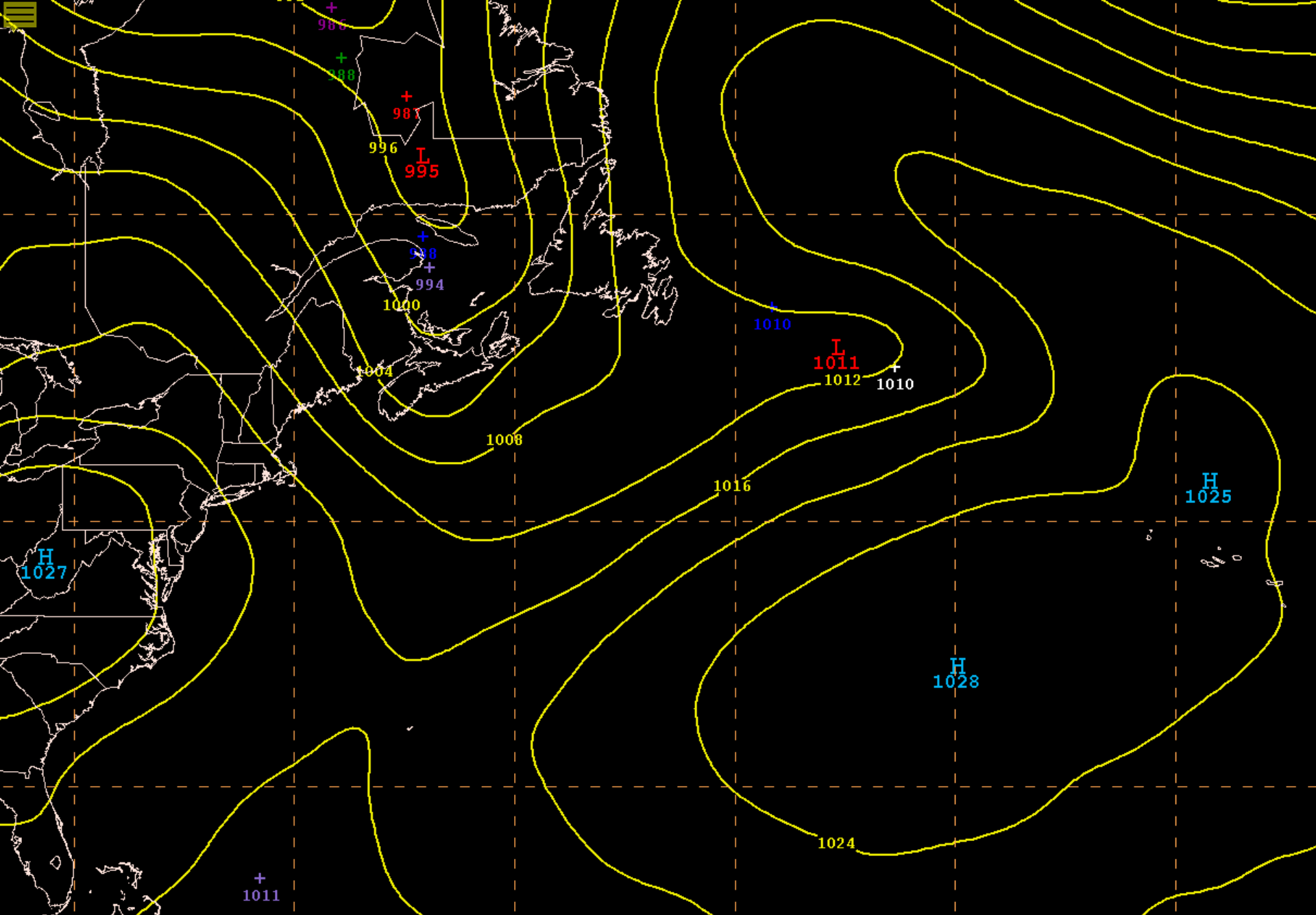


# Global Ensemble Forecast System





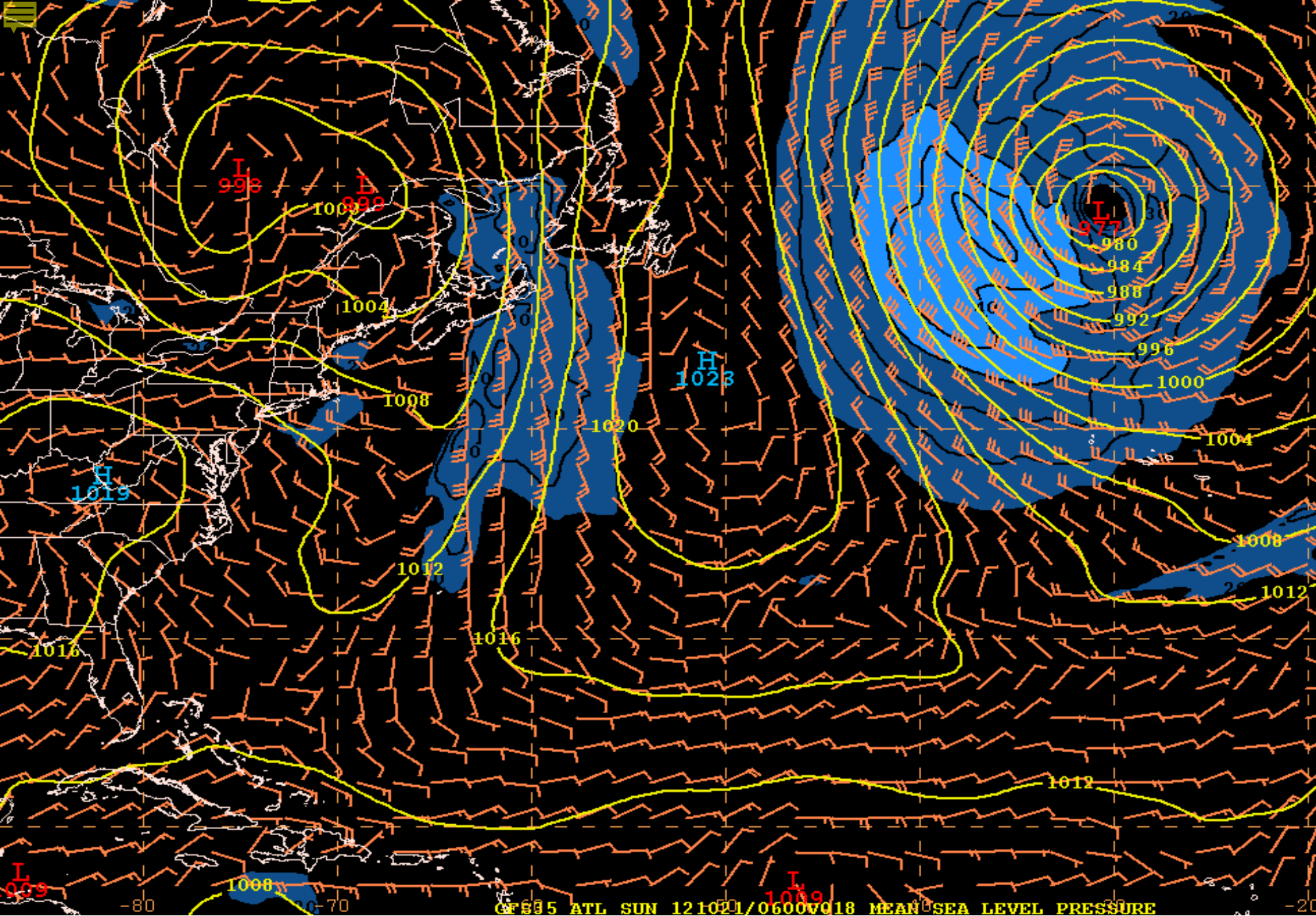




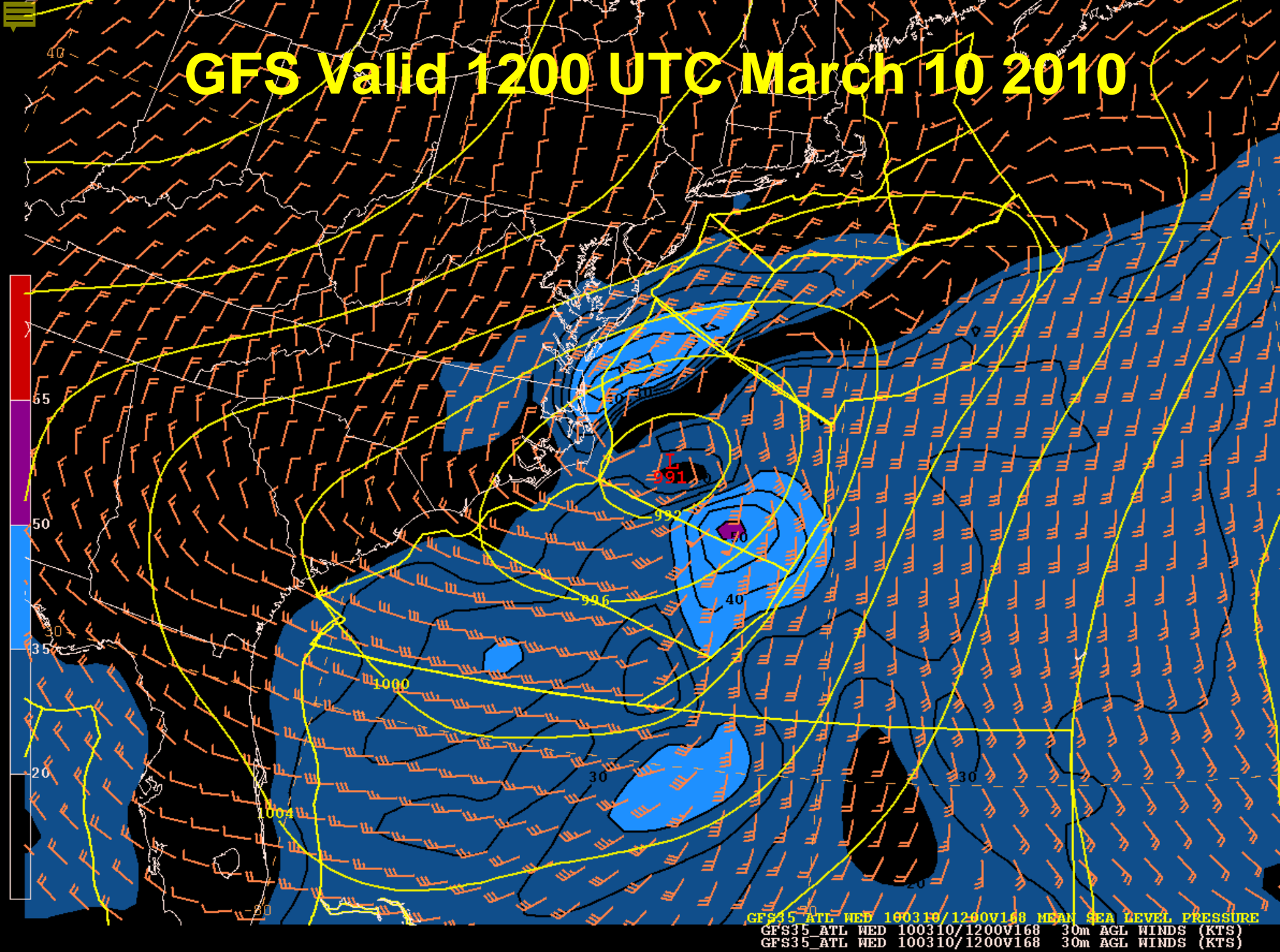
**GEFS Valid 1200 UTC 11 October 2012**



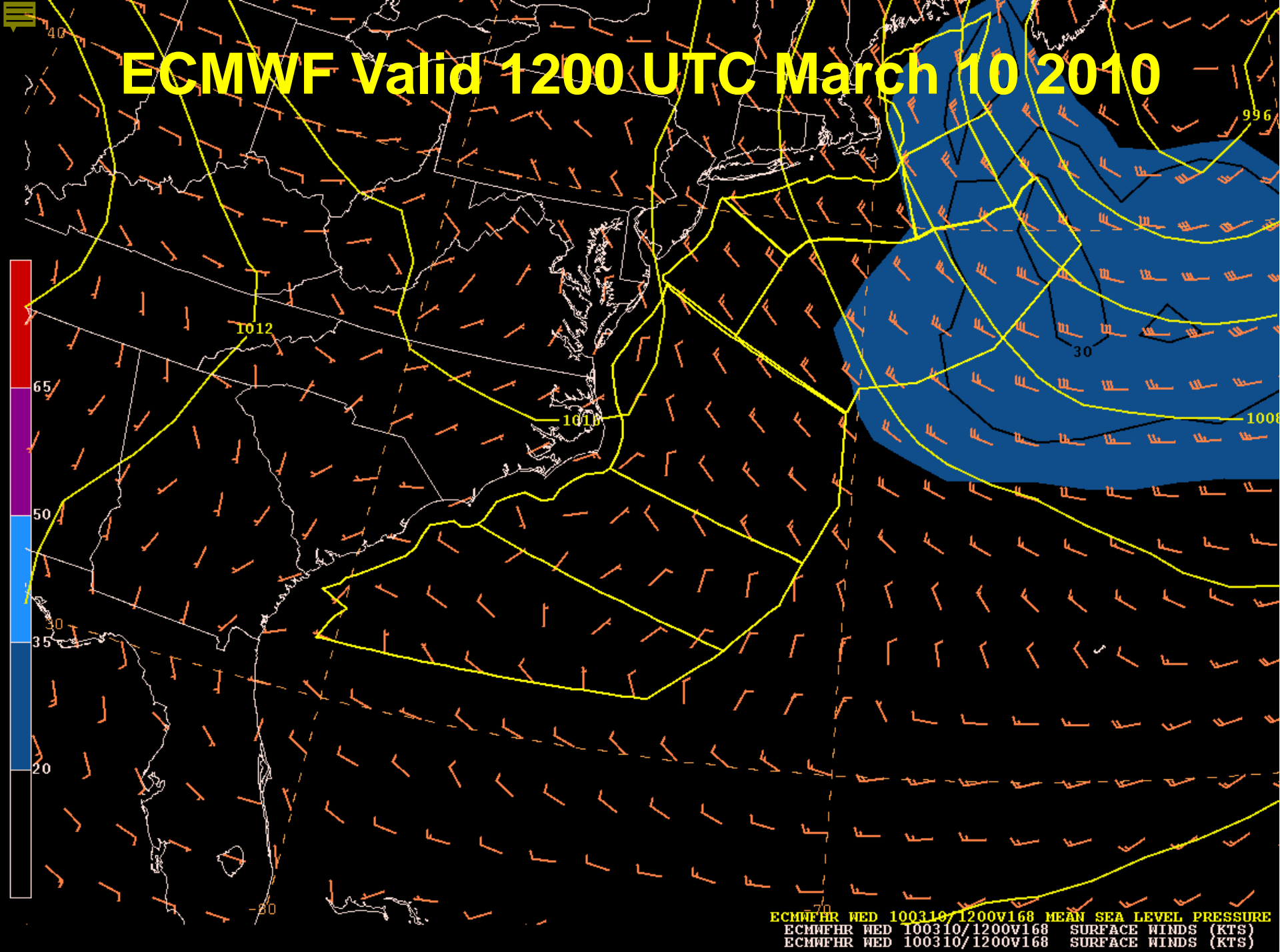




# GFS Valid 1200 UTC March 10 2010

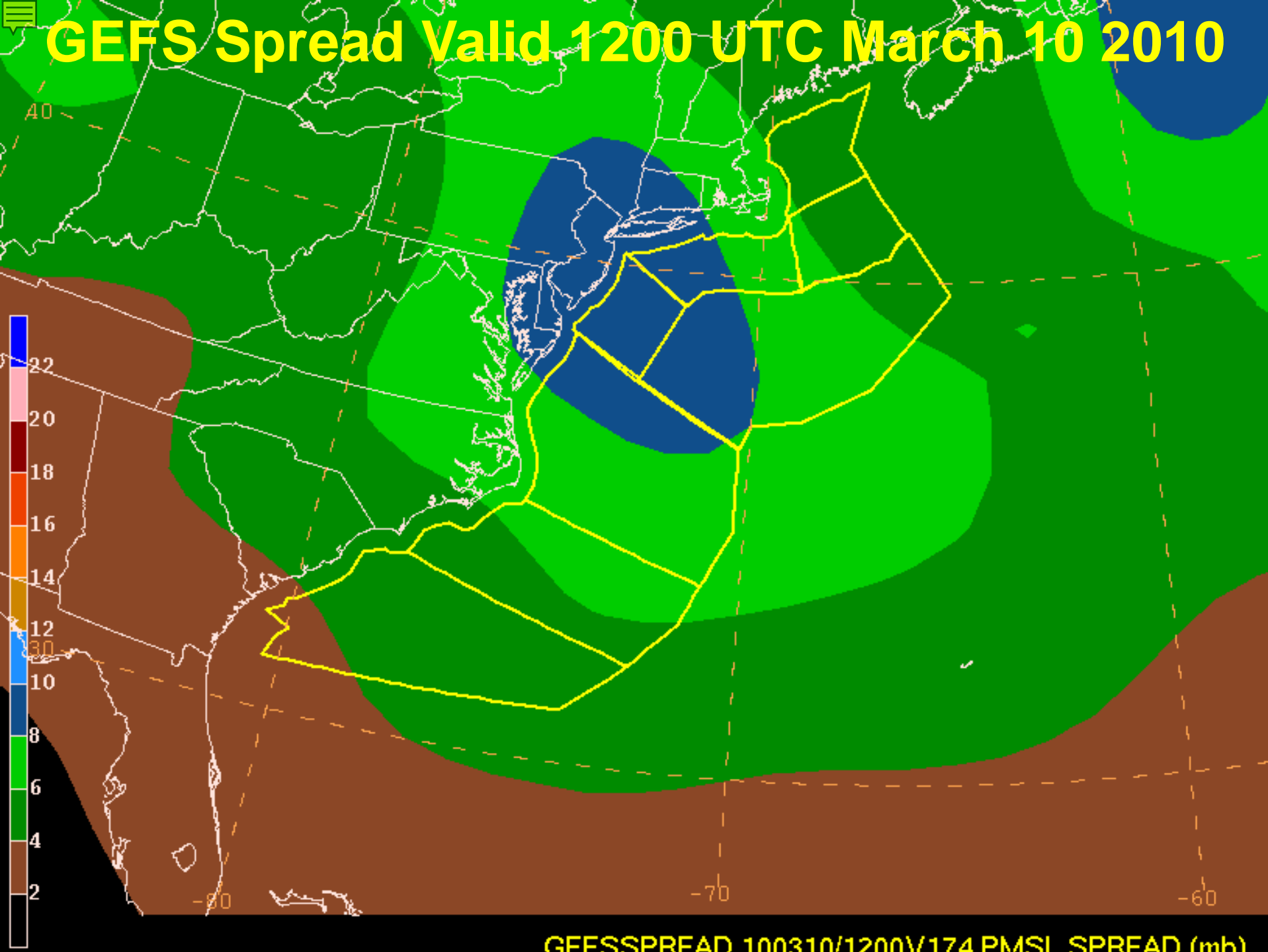


# ECMWF Valid 1200 UTC March 10 2010



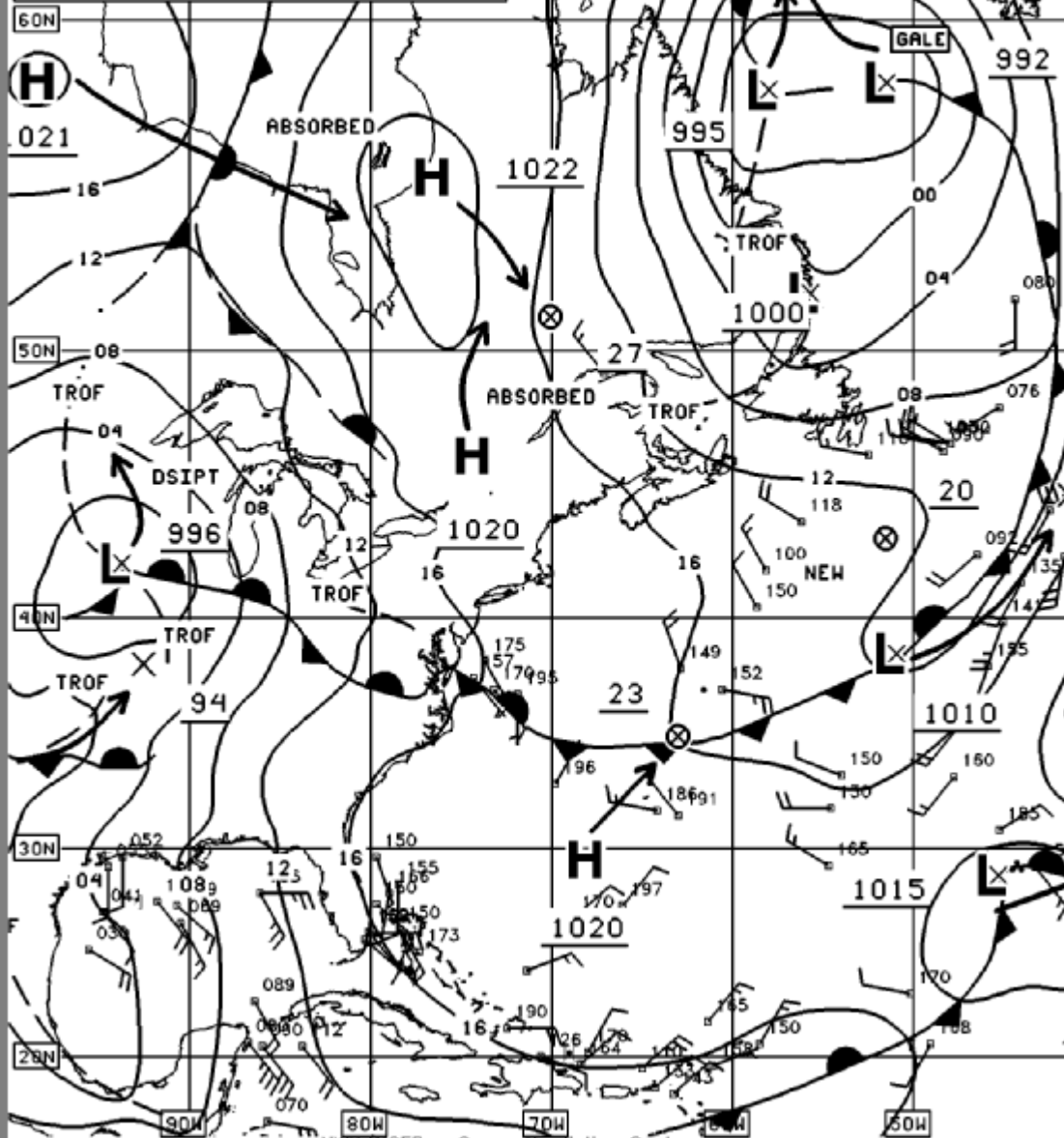






ATLANTIC SURFACE ANALYSIS  
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VALID: 12:00 UTC 10 MAR 2010  
FCSTR: LEE  
SOURCES: OPC TPC HPC

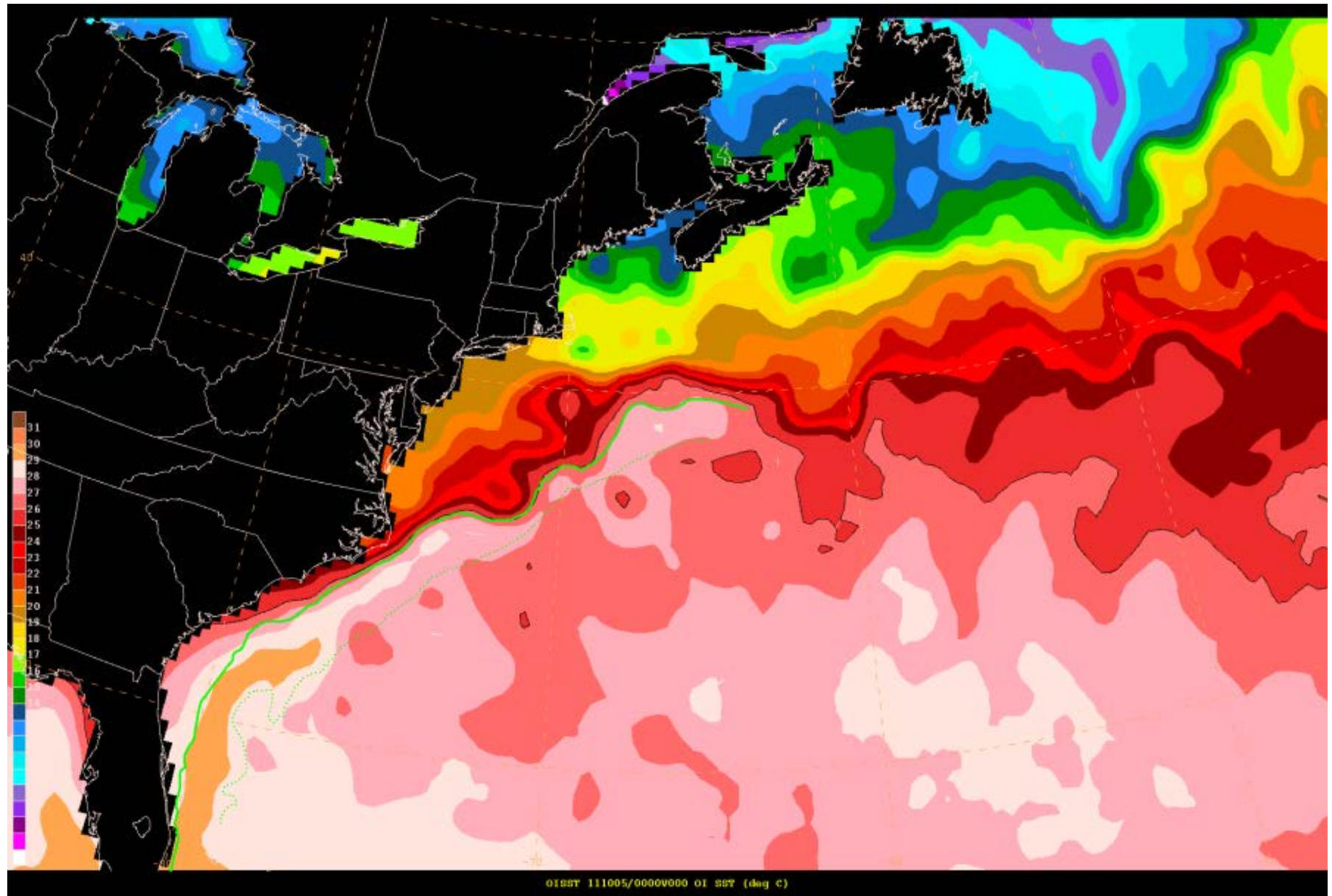
FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.

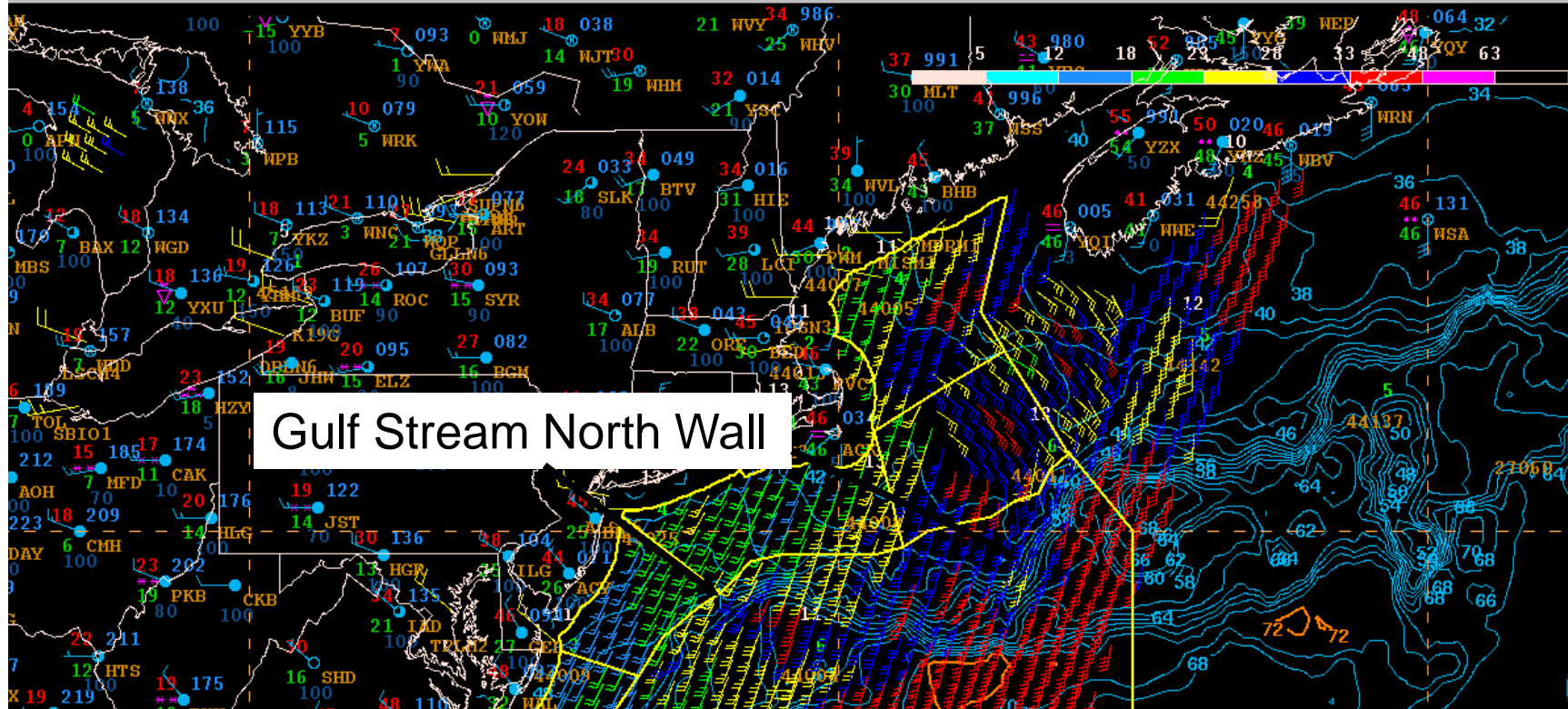




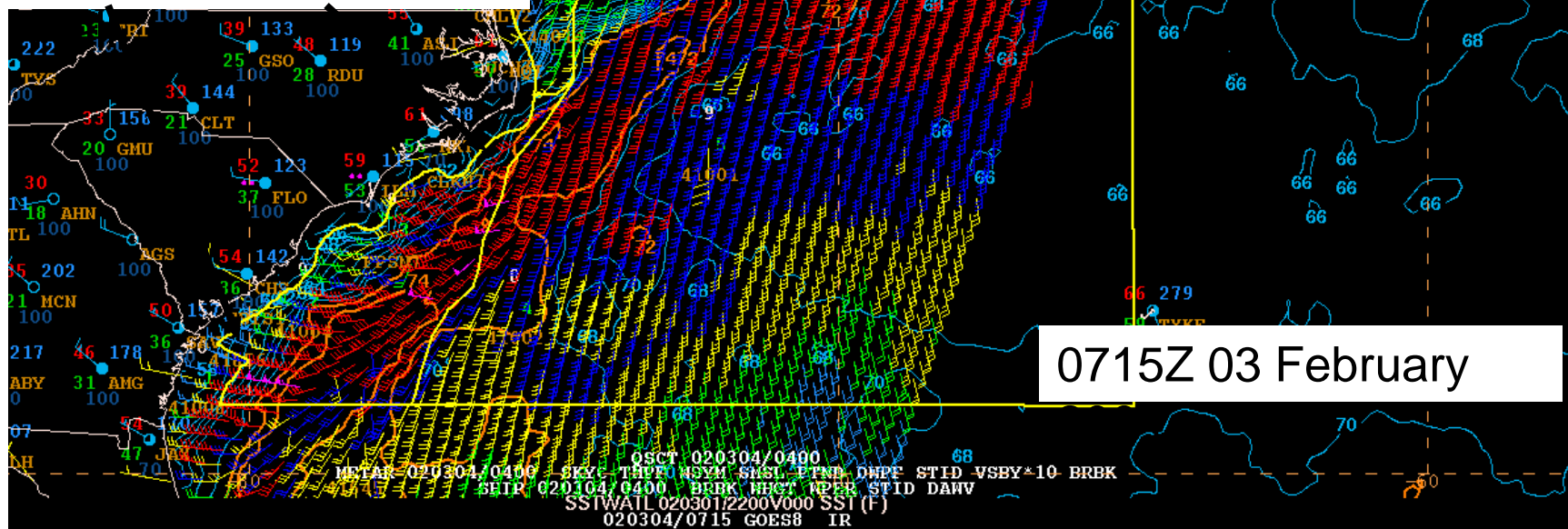
# Optimum Interpolation SST

## Gulf Stream



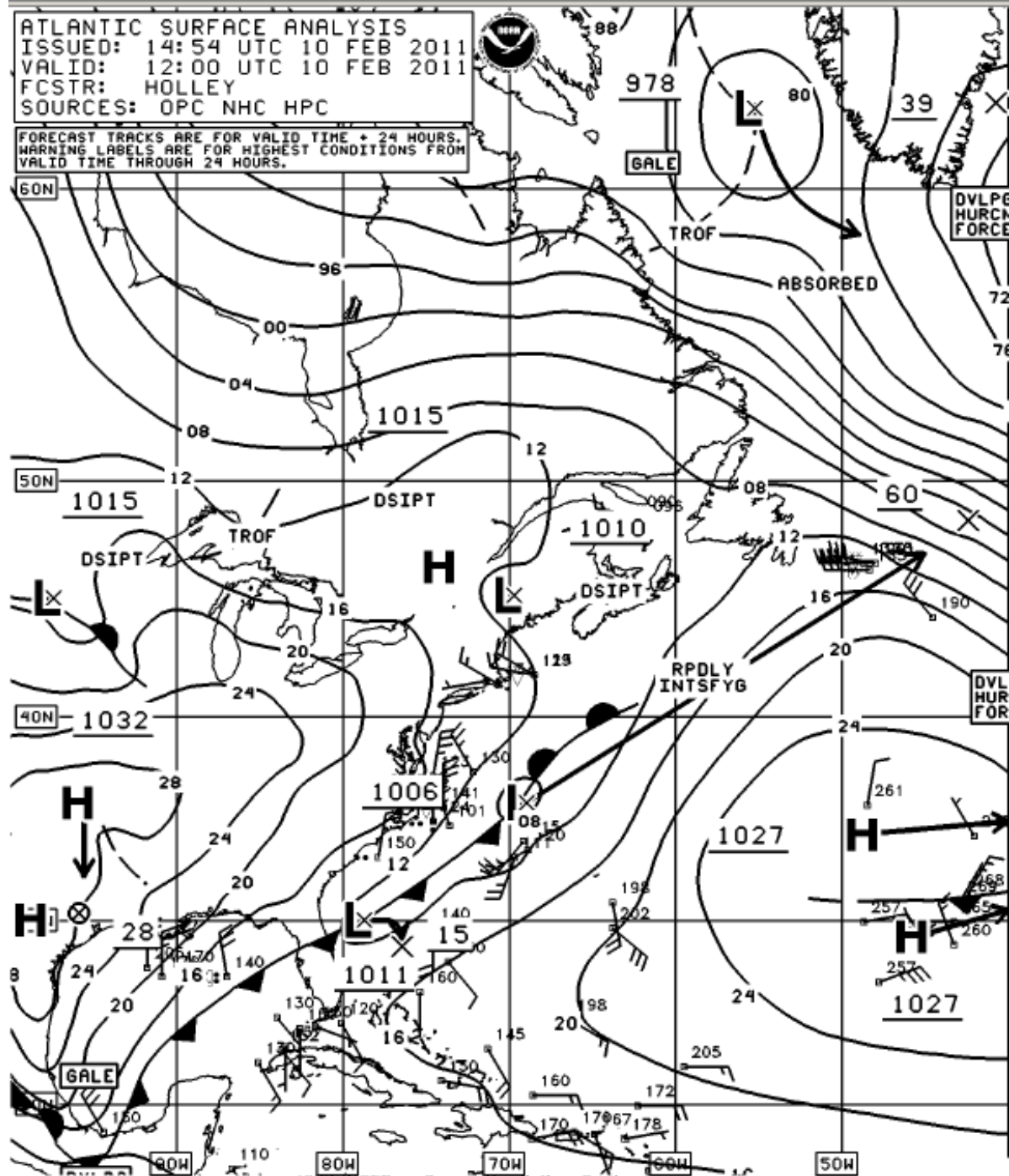


Gulf Stream North



ATLANTIC SURFACE ANALYSIS  
 ISSUED: 14:54 UTC 10 FEB 2011  
 VALID: 12:00 UTC 10 FEB 2011  
 FCSTR: HOLLEY  
 SOURCES: OPC NHC HPC

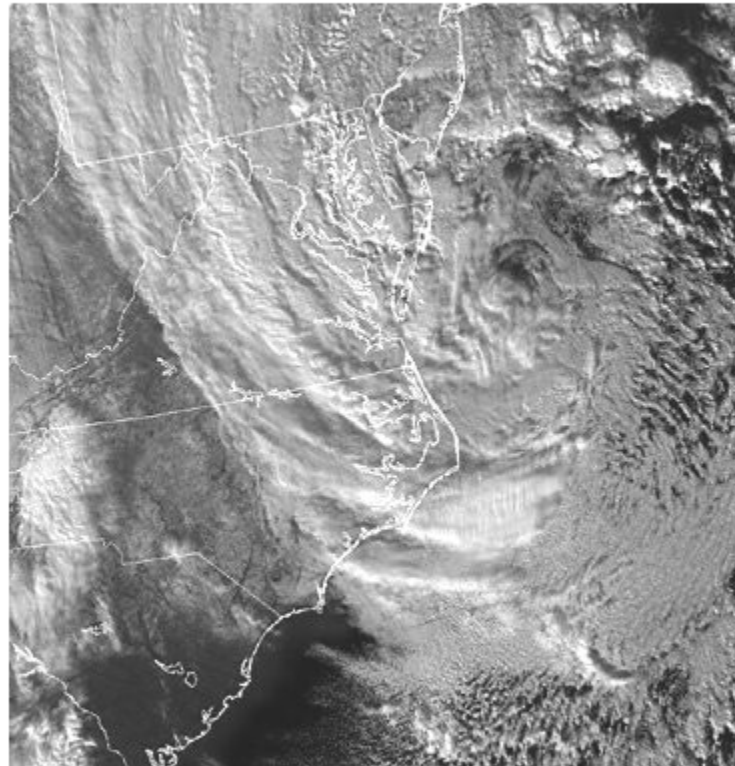
FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
 WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
 VALID TIME THROUGH 24 HOURS.





# Atlantic Surface Cyclone Intensification Index (ASCI<sup>II</sup>)

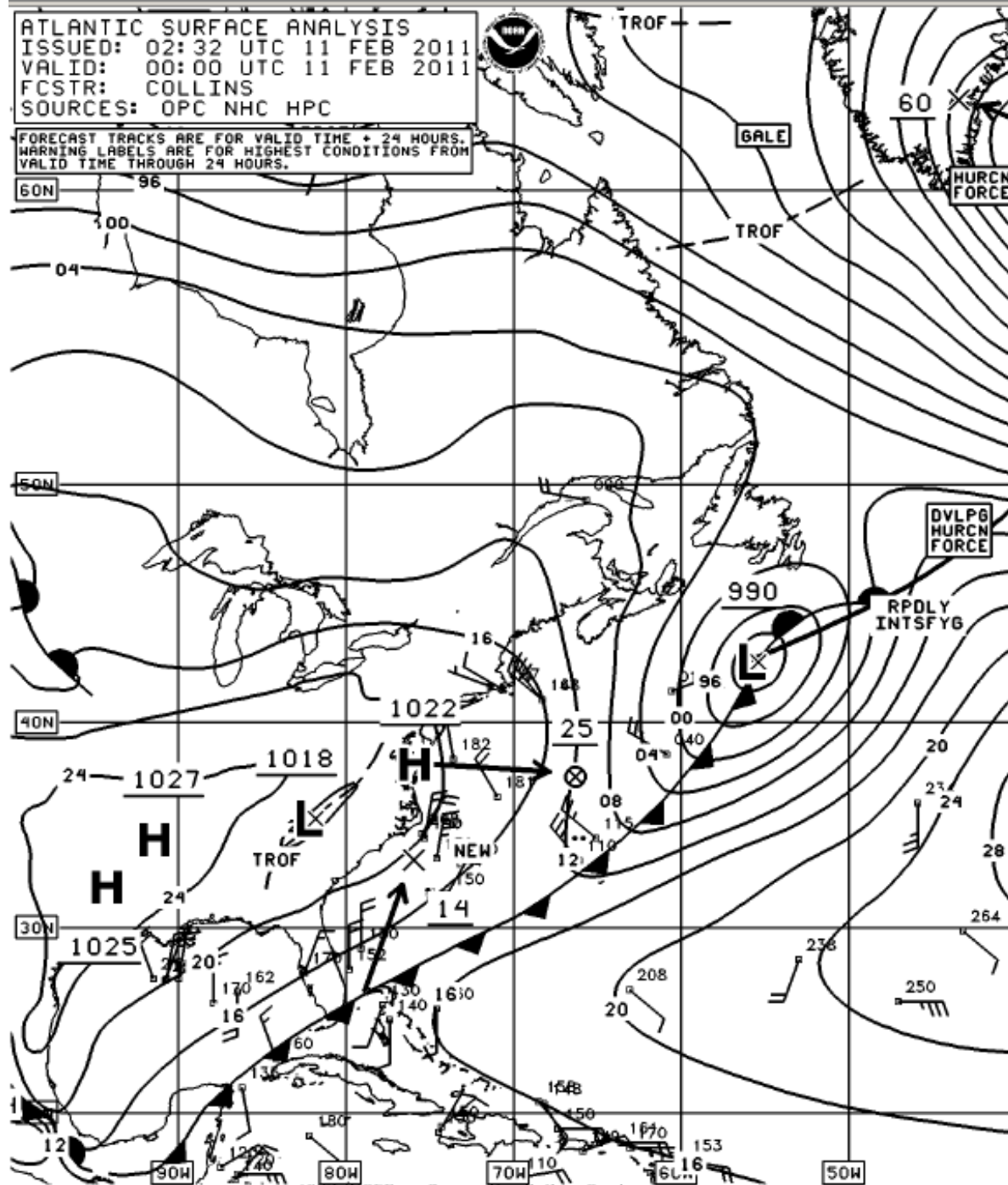
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Intense area of low pressure as it exits the ASCI<sup>II</sup> study domain on January 25, 2000. Thirty-six hours prior to the storm's effects on the Carolinas, the ASCI<sup>II</sup> "bomb" index indicated that a storm in the domain was likely to "bomb."

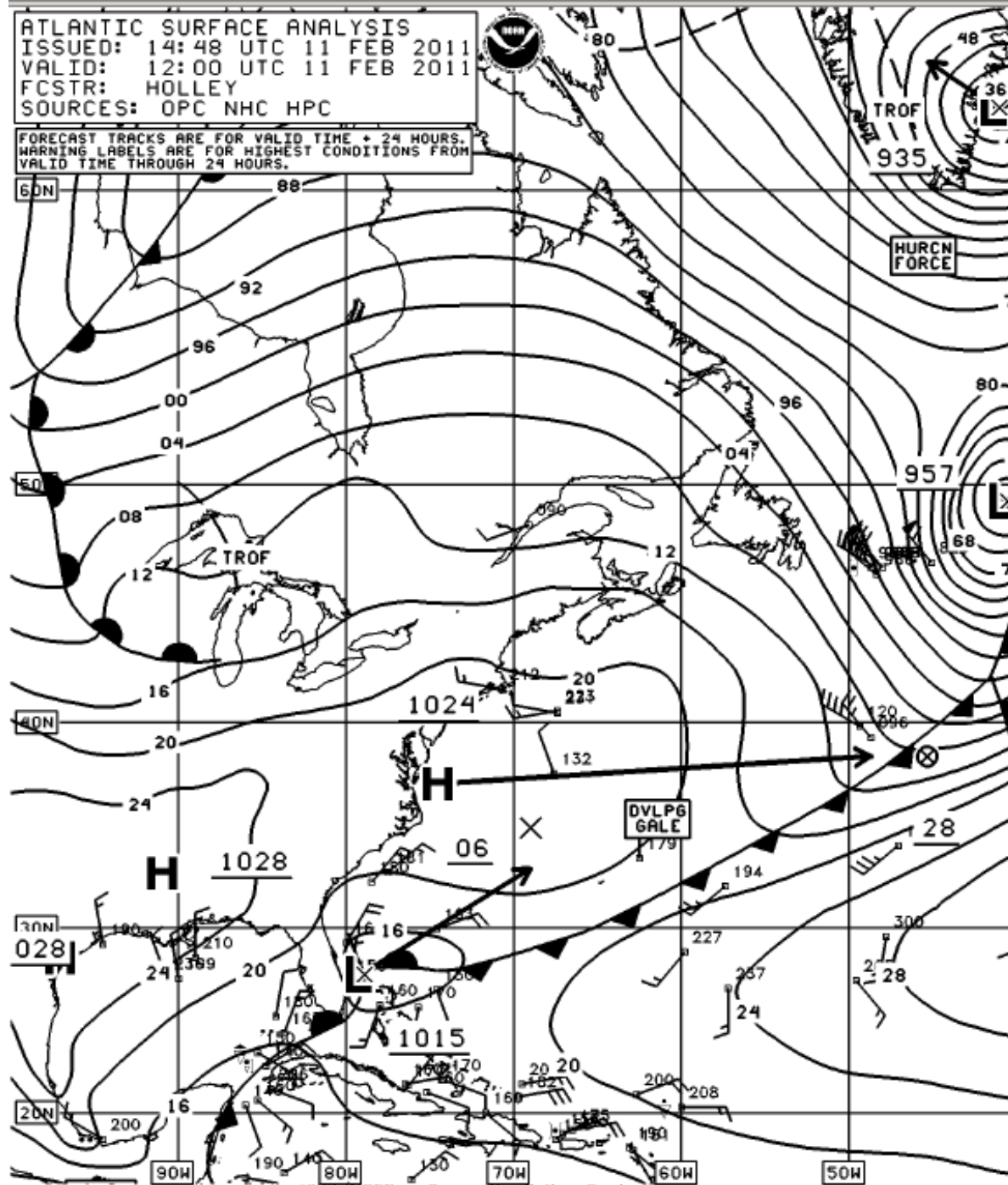
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VALID: 00:00 UTC 11 FEB 2011  
FCSTR: COLLINS  
SOURCES: OPC NHC HPC

FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.

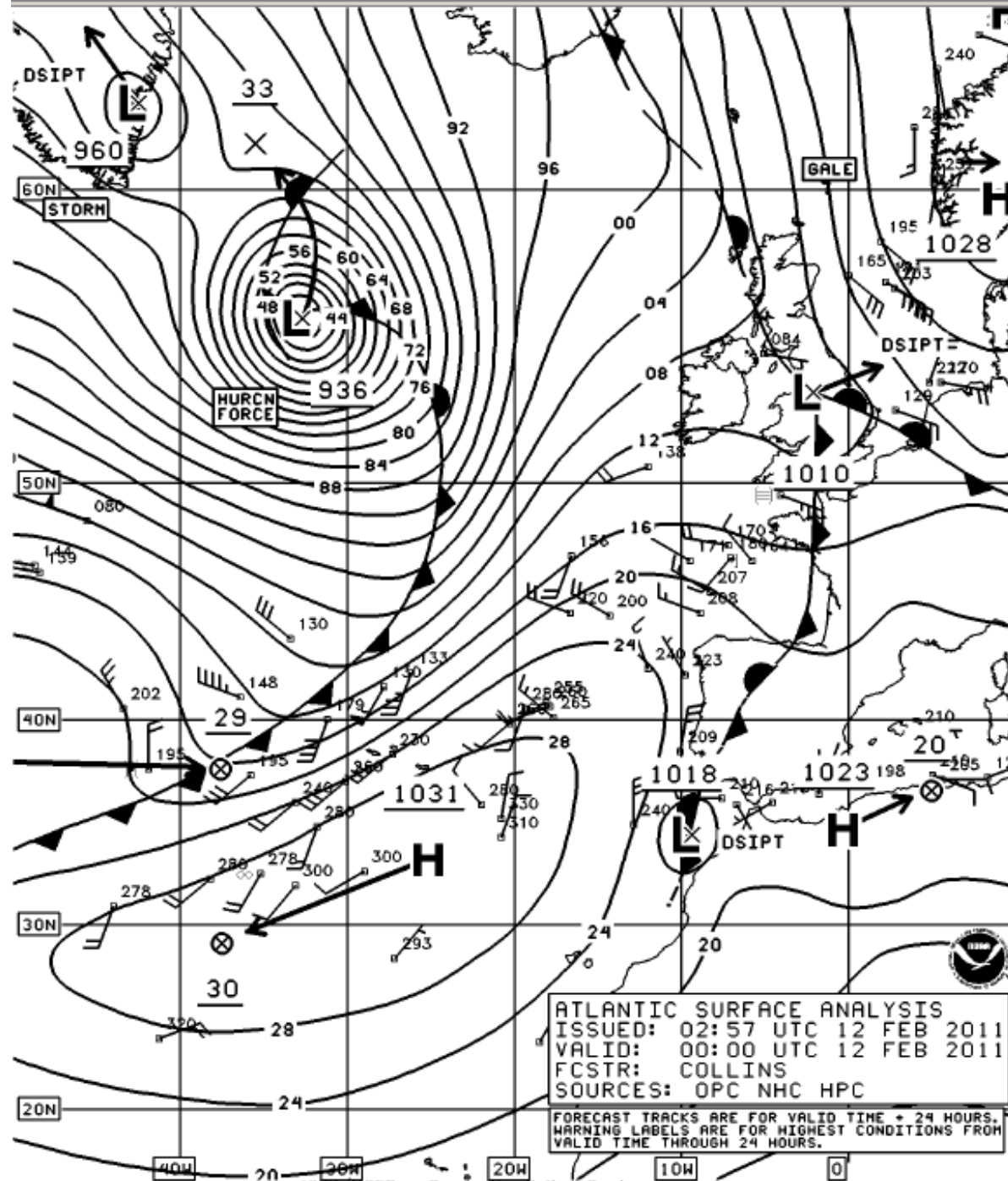


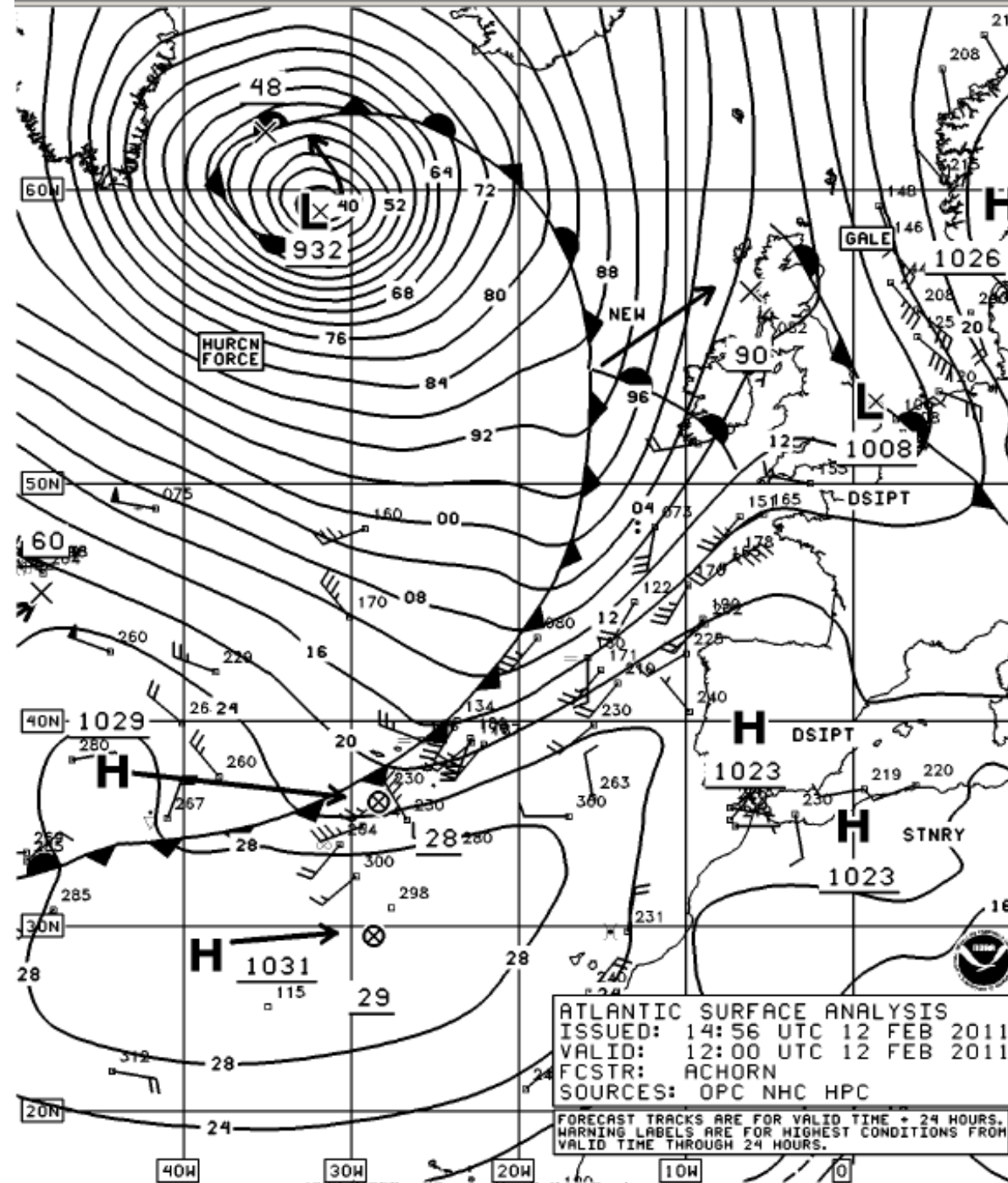
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VALID: 12:00 UTC 11 FEB 2011  
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SOURCES: OPC NHC HPC

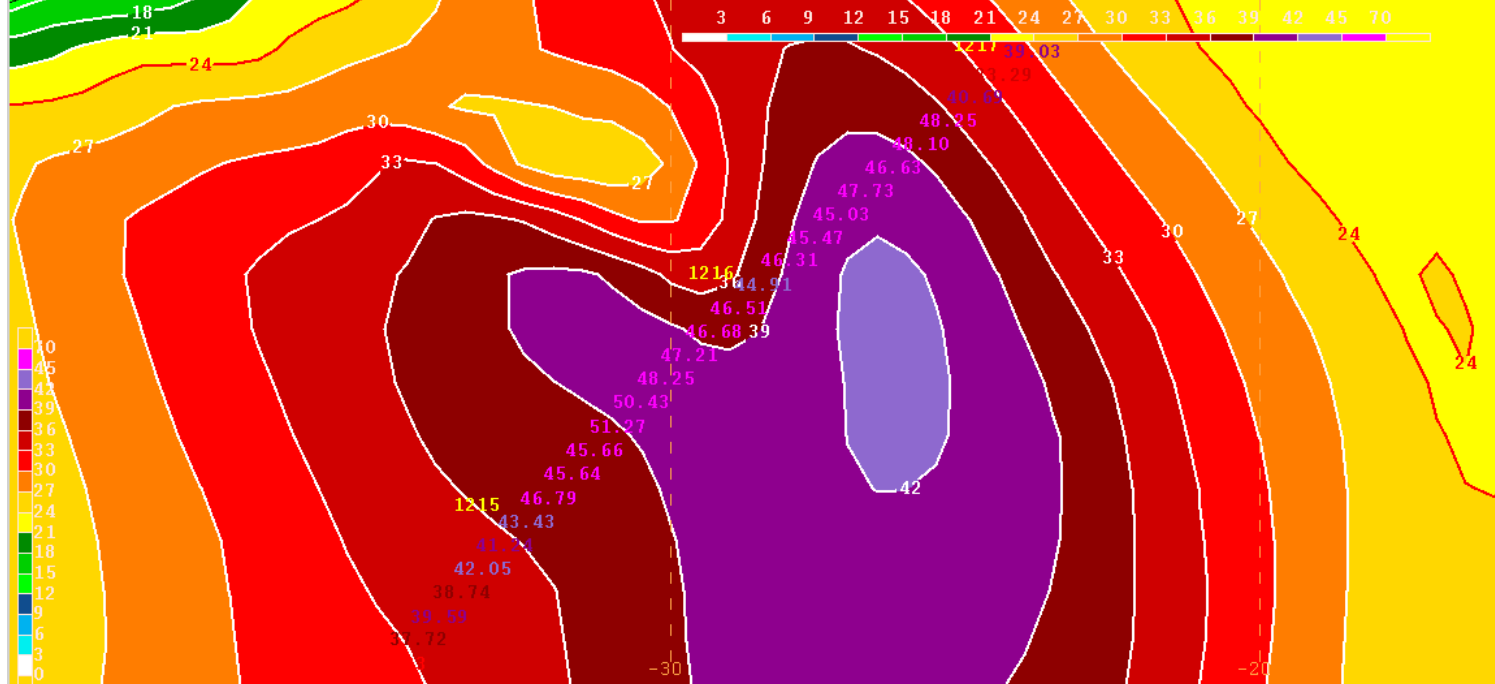
FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.



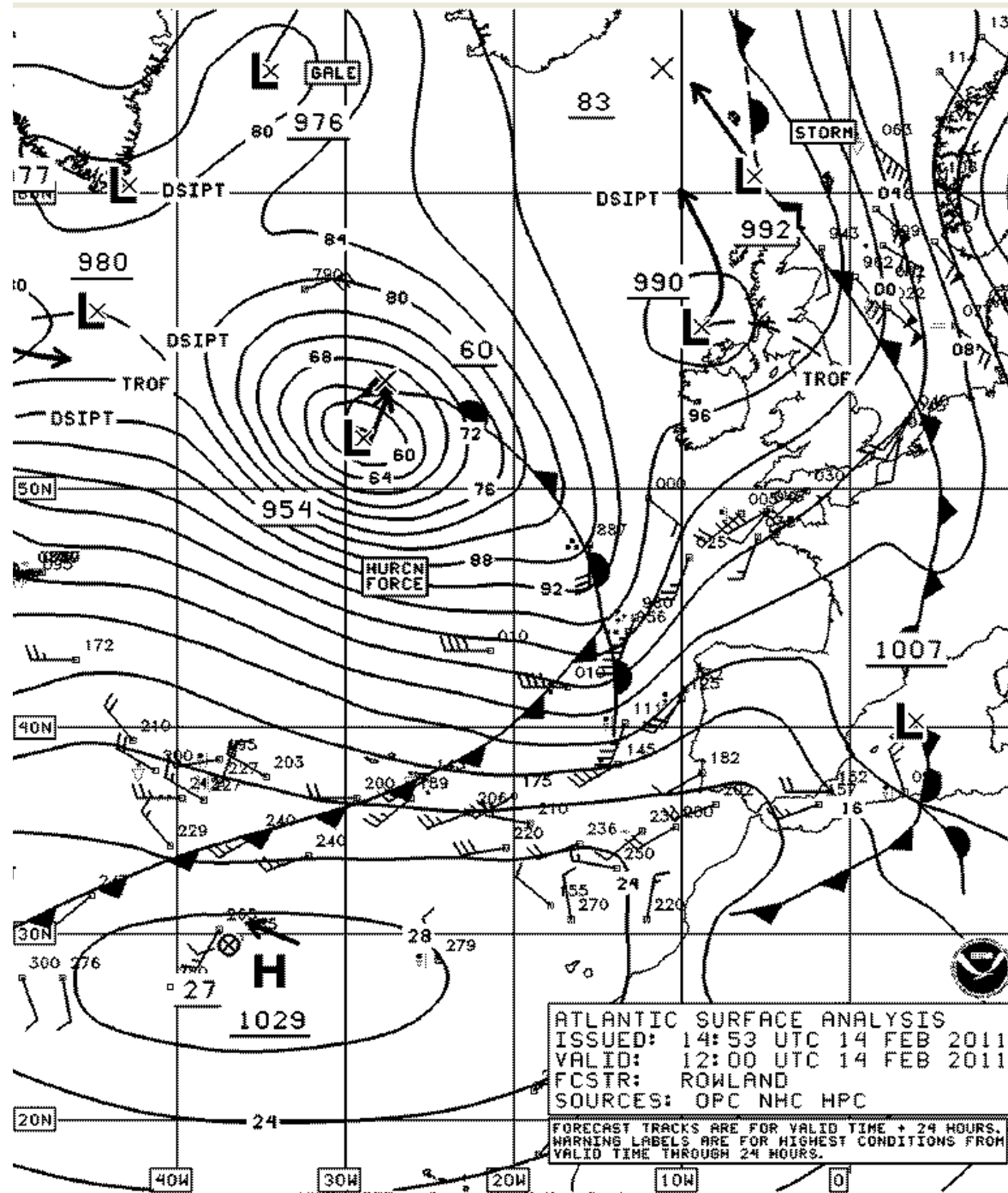






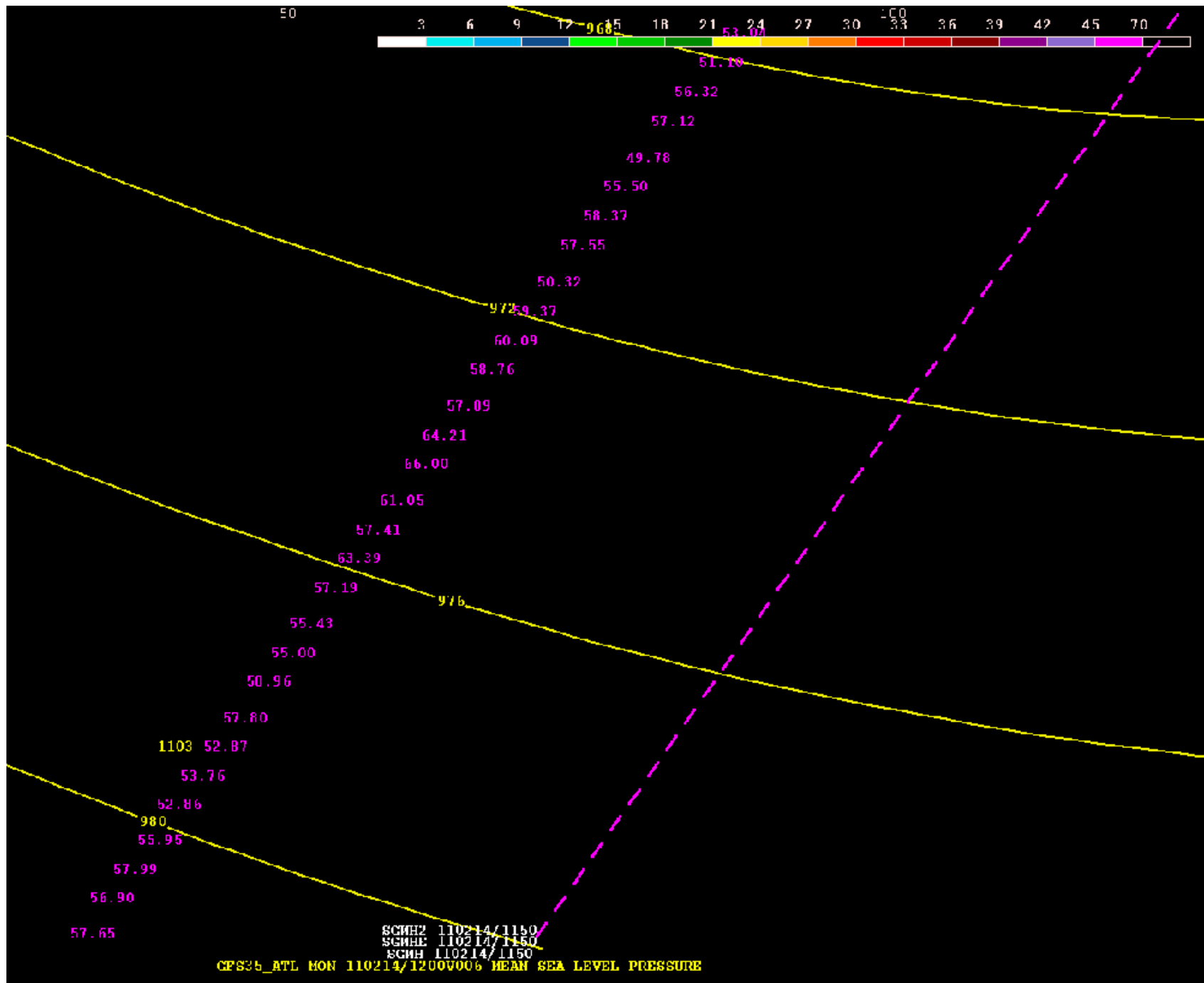






ATLANTIC SURFACE ANALYSIS  
ISSUED: 14:53 UTC 14 FEB 2011  
VALID: 12:00 UTC 14 FEB 2011  
FCSTR: ROWLAND  
SOURCES: OPC NMC HPC

FORECAST TRACKS ARE FOR VALID TIME + 24 HOURS.  
WARNING LABELS ARE FOR HIGHEST CONDITIONS FROM  
VALID TIME THROUGH 24 HOURS.





A Final Thought...





# **Conclusions**

## **Surface Analysis**

- Unique forecast model sources
  - BL Moisture Convergence, Theta, Thetae, etc...
  - Ensemble members
- Non-standard observational sources
  - GOES-14 Super Rapid Scan Imagery
  - ASCAT/OSCAT Scatterometer Winds
    - University of Washington PBL Model
  - Jason Altimeter Wave Heights

## **Forecasting**

- Model biases in Winter
- Explosive cyclogenesis scenarios
  - Strong CAA over Kuroshio and Gulf Stream Currents
- Non-standard model guidance
  - Model Blender
  - Ensemble guidance
  - In-House Model Displays
    - Static Stability