NOAA HURRICANE FORECAST IMPROVEMENT PROJECT

Introductory Comments

Bob Gall

November 8, 2011

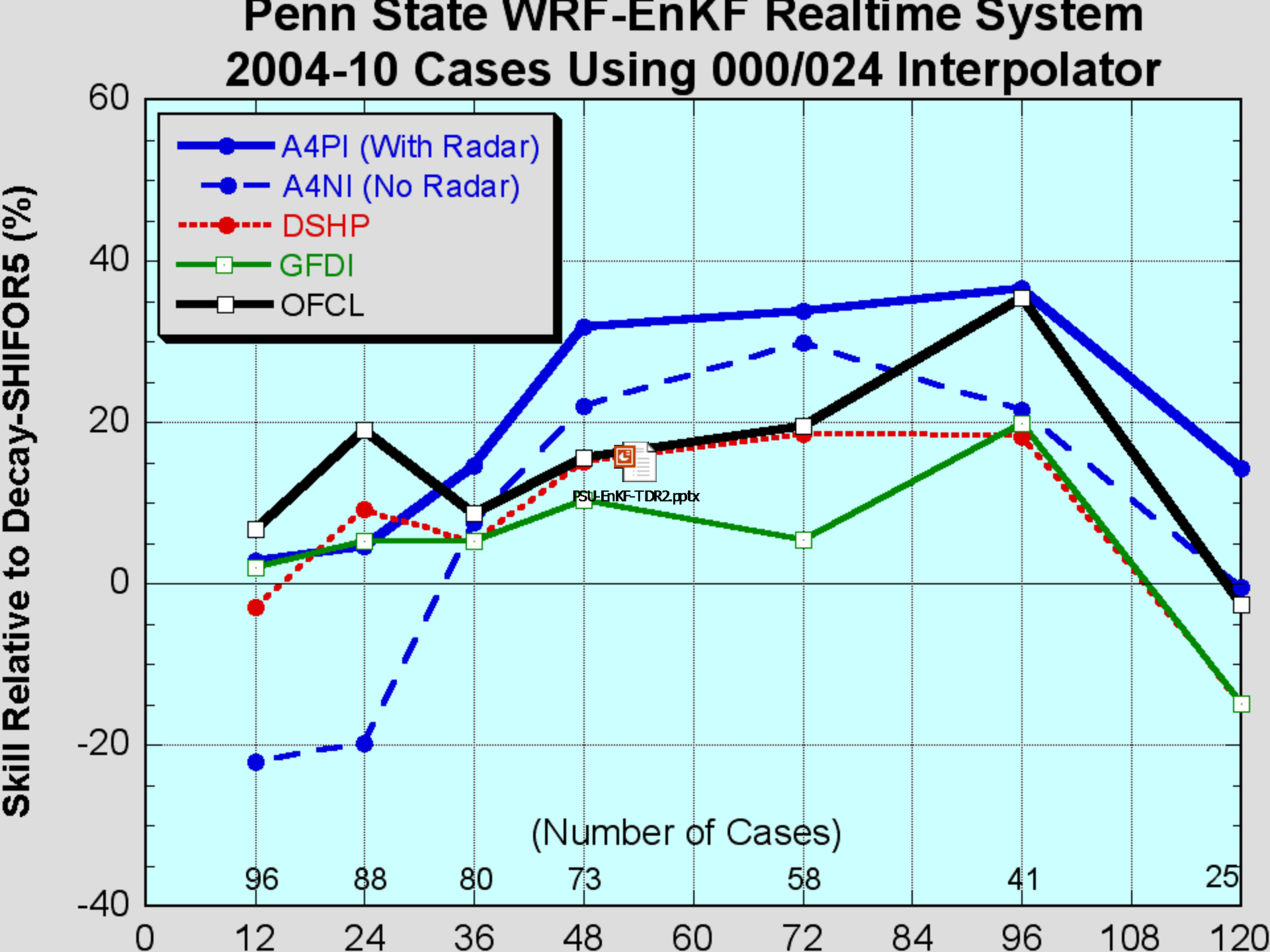
Miami, FL

HFIP Schedule

- Nov 2011 – Start annual report
- Dec 2011 – Start the milestone process and publications
- Jan 2012 – Begin retro testing for Stream 1.5 candidates
- Feb 2012 – Final annual report and publication manuscripts
- March 2012 – Finish milestone document (by teams)
- March 2012 – Develop organization milestones
- March – June 2012 – Funding letters to organizations
- April 15 – Stream 1.5 retro tests complete and submitted to TCMT
- May 31 – NHC decision on Stream 1.5 candidates
- June 1 – Begin prep. For 2012 hurricane season real-time runs
- July 7 – Begin setting up real-time reservations on t-jet, u-jet
- July 15 – 22 – Full up test of real-time system (using retro runs?)
- Aug 1 – Real time system officially running

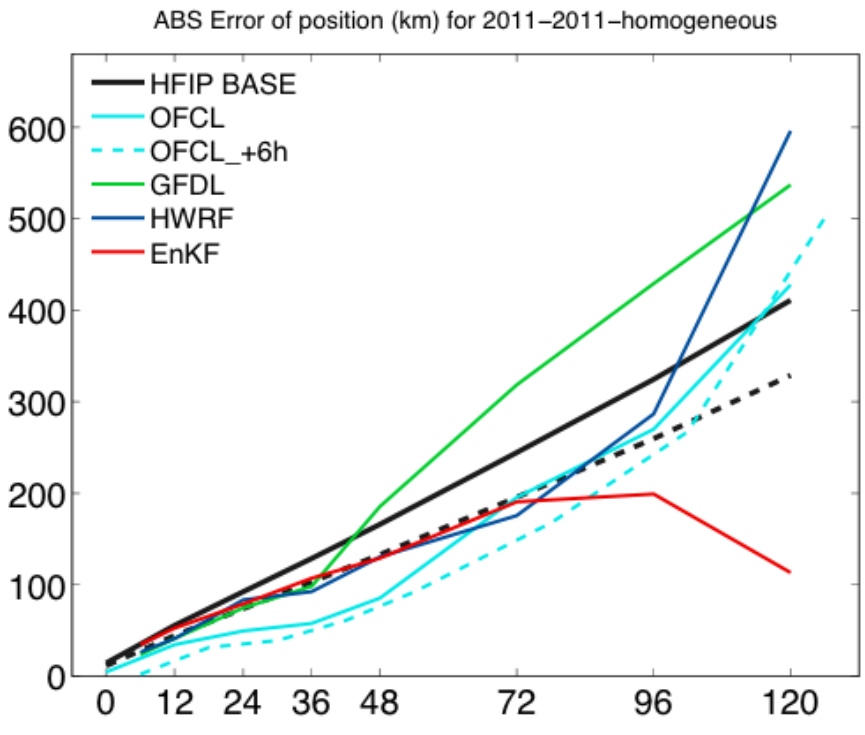
2012 HFIP Priorities

- Computing
  - Continued development of the Experimental Numerical Forecast System (Real-Time) during hurricane season on T-jet
    - New paradigm for NWS transitioning research to operations
- Operational Commitments
  - Work with NCEP to make the global hybrid DA operational
  - Continue the coordinated community effort to improve HWRF
- Development
  - Development of the hybrid system (the NCEP system) for regional models
    - Develop methods to include more satellite data near hurricane core
  - Develop a physics package suitable for 3 KM models

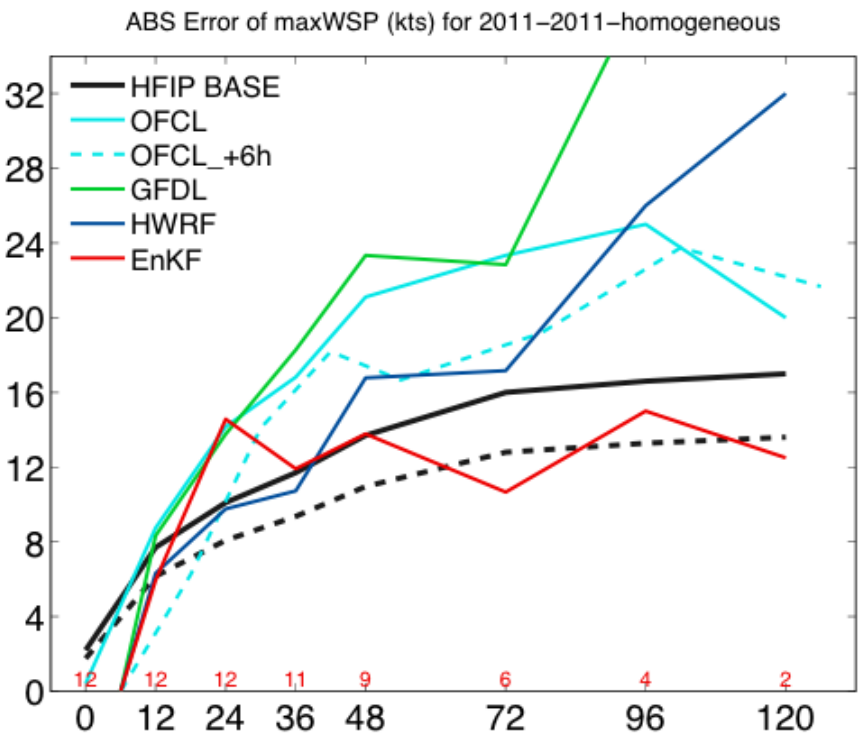

Penn State WRF-EnKF Realtime System
2004-10 Cases Using 000/024 Interpolator
A4PI (With Radar)
A4NI (No Radar)
DSHP
GFDI
OFCL
Skill Relative to Decay-SHIFOR5 (%)
60
40
20
0
-20
-40
(Number of Cases)
96
88
80
73
58
41
25
0
12
24
36
48
60
72
84
96
108
120
PSU-EnKF-TDR2.pptx

Performance of the 2011 PSU WRF-EnKF Real-time Forecasts with assimilation of P3 airborne radar (Irene 7 + Rina 5)

Position Error (km)

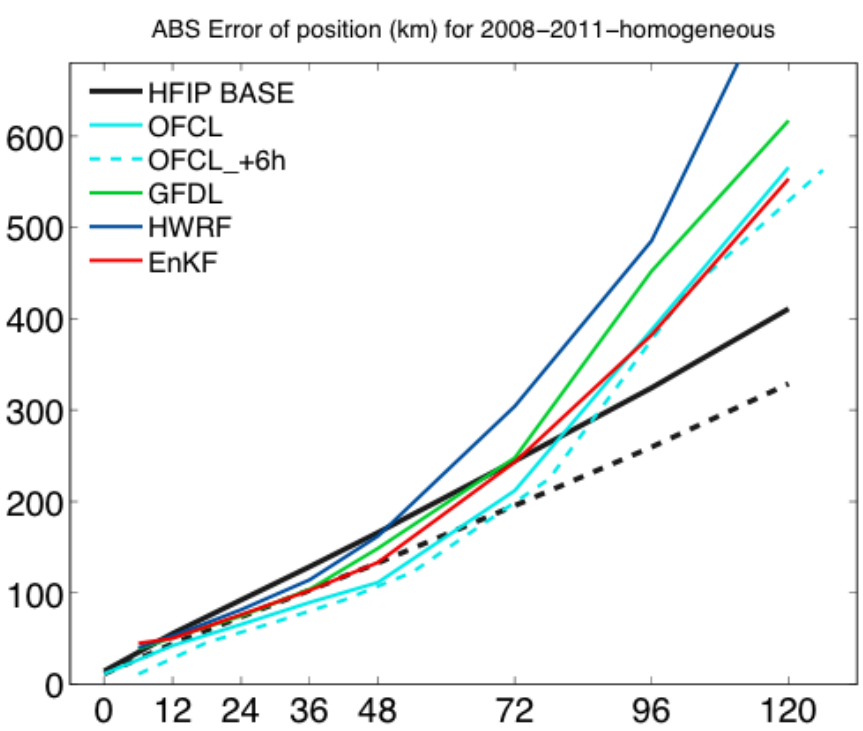


Intensity Error (kt)

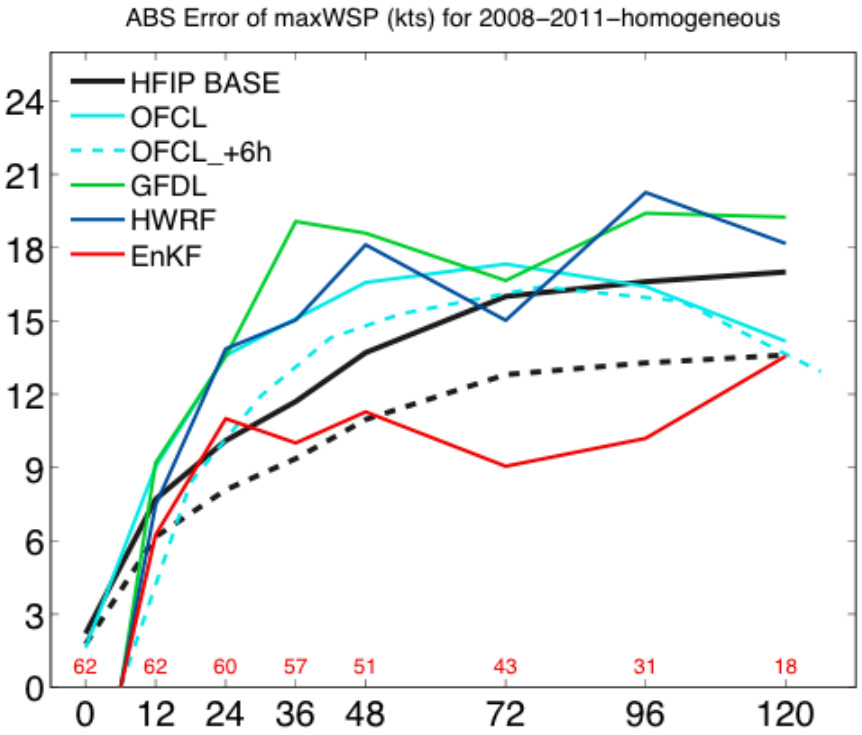


Updated Performance of the PSU WRF-EnKF during 2008-2011 with assimilation of P3 airborne radar

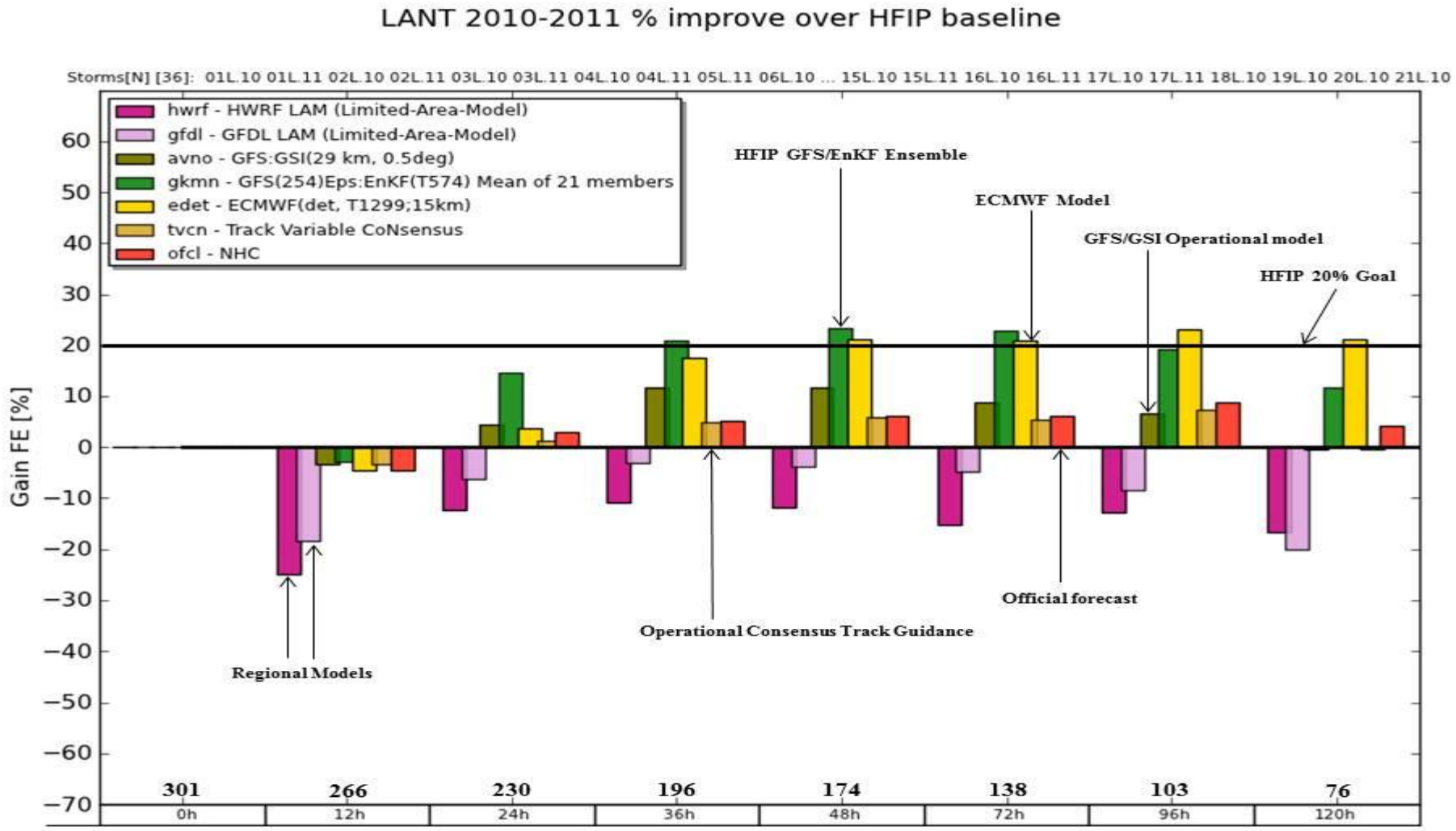
Position Error (km)



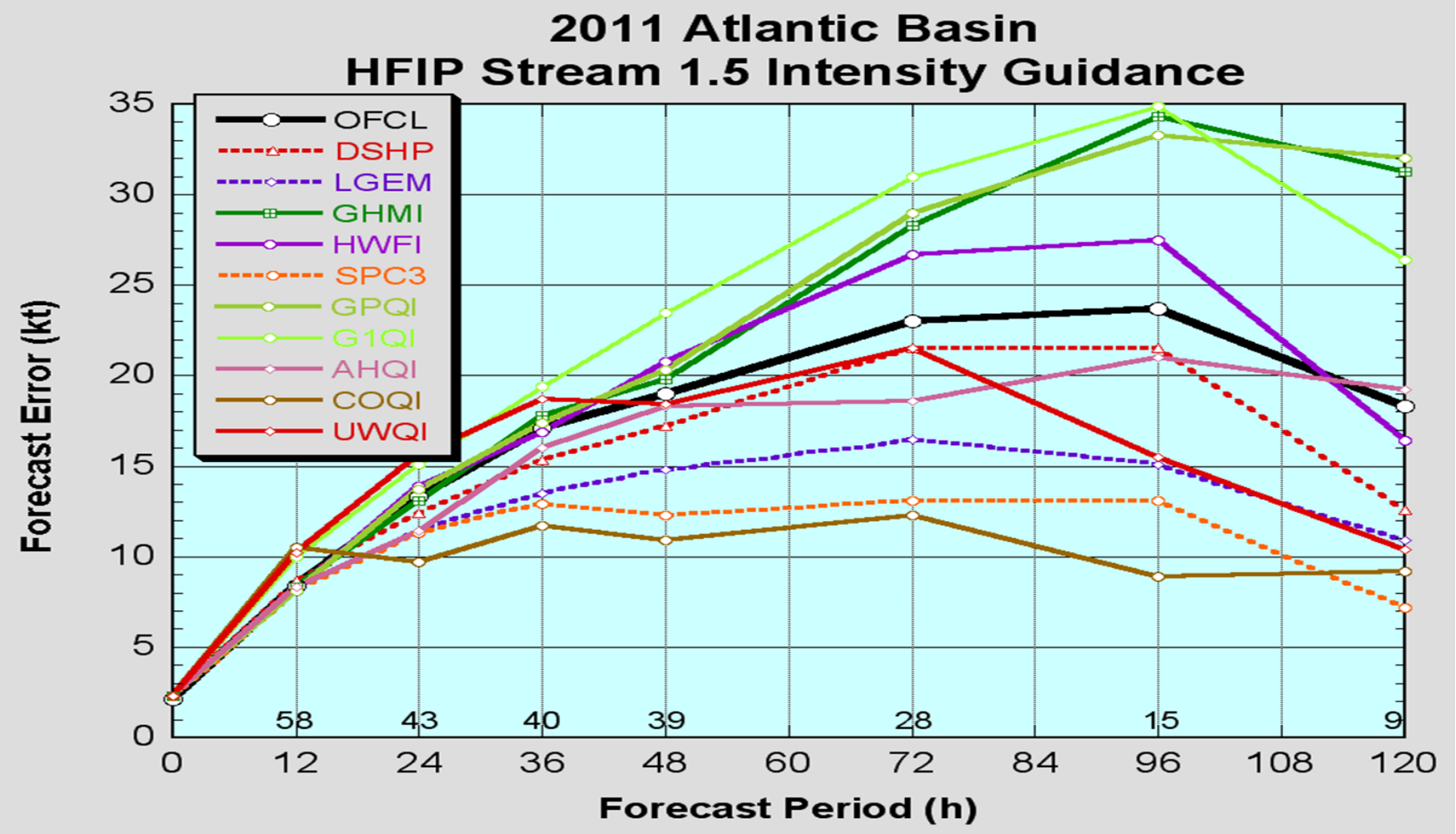
Intensity Error (kt)



Track Error of Models
(% Improvement over HFIP Baseline)

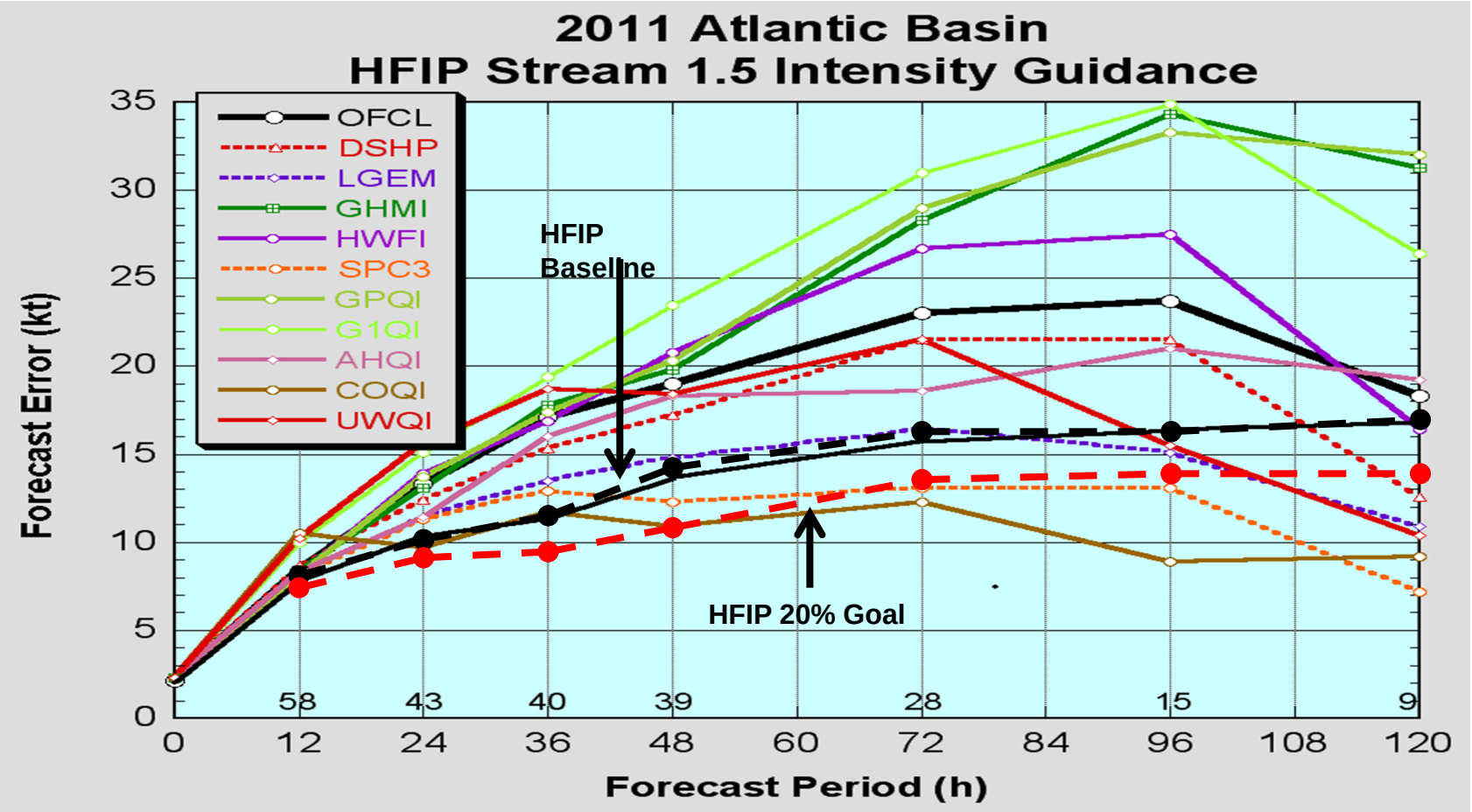


HFIP Promising Early Results



Some Stream 1.5 models (COQI and SPC3) significantly outperformed the operational models and NHC for the 2011 season through mid September (includes Irene)

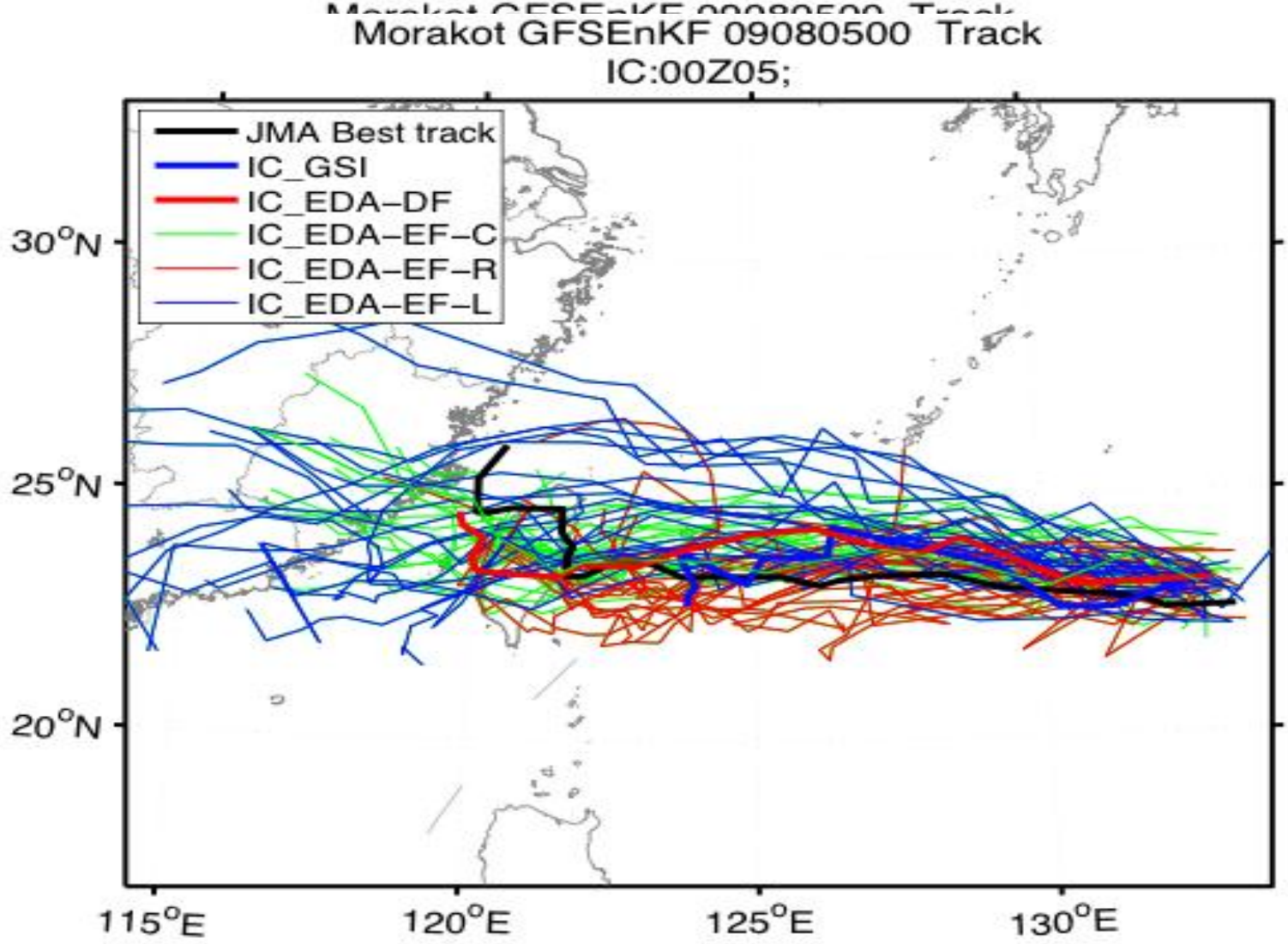
HFIP Promising Early Results



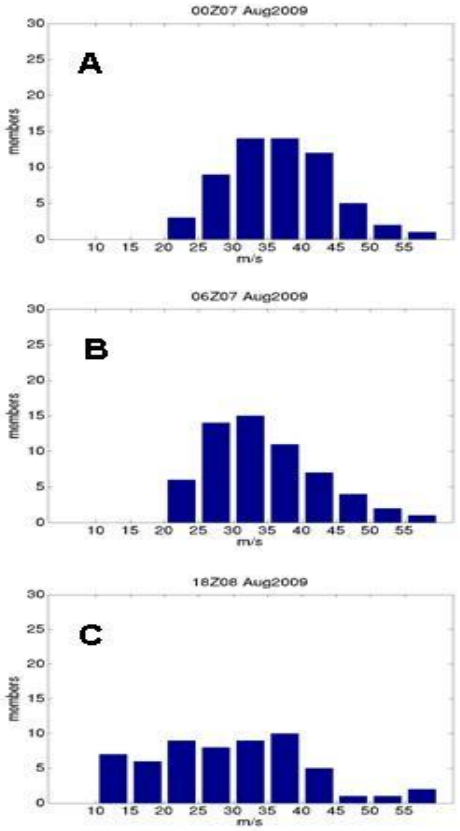
Some Stream 1.5 models (COQI and SPC3) significantly outperformed the operational models and NHC for the 2011 season through mid September (includes Irene)

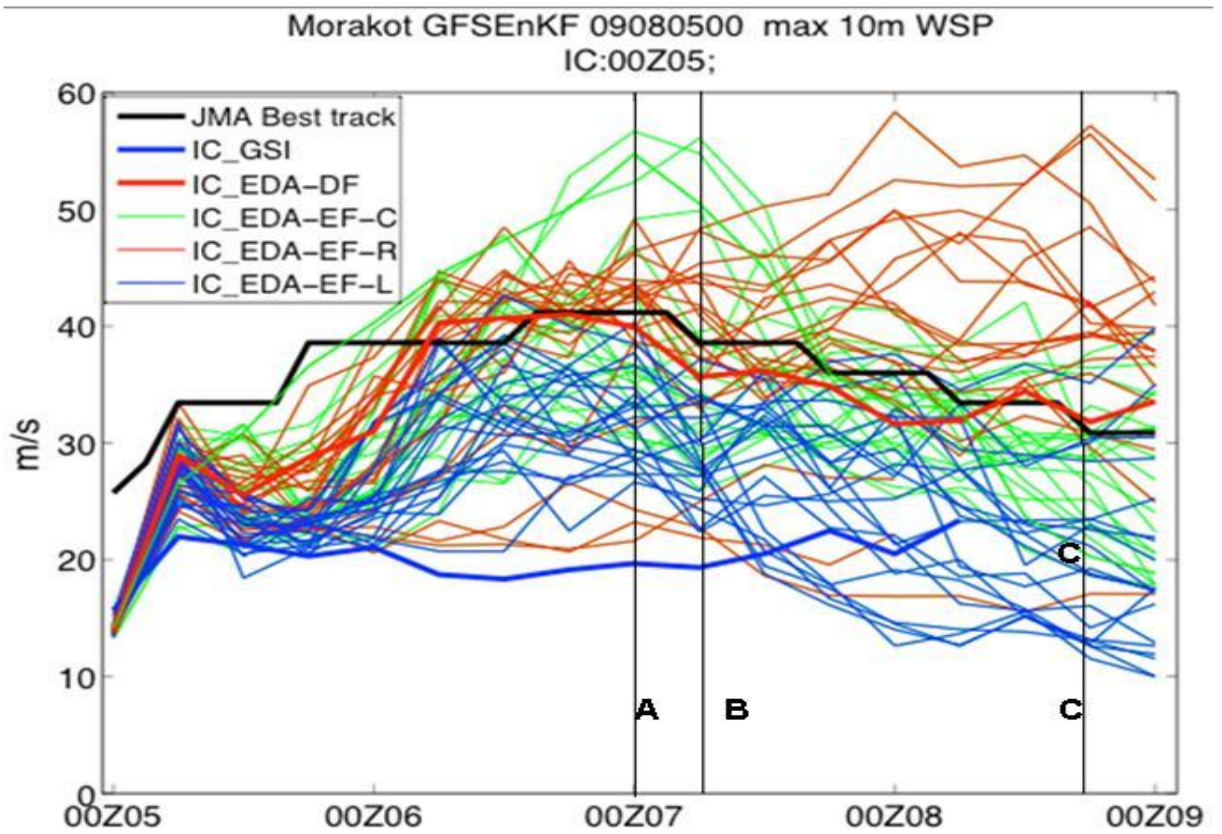
Examples of products from HFIP models

Example of an Ensemble Forecast

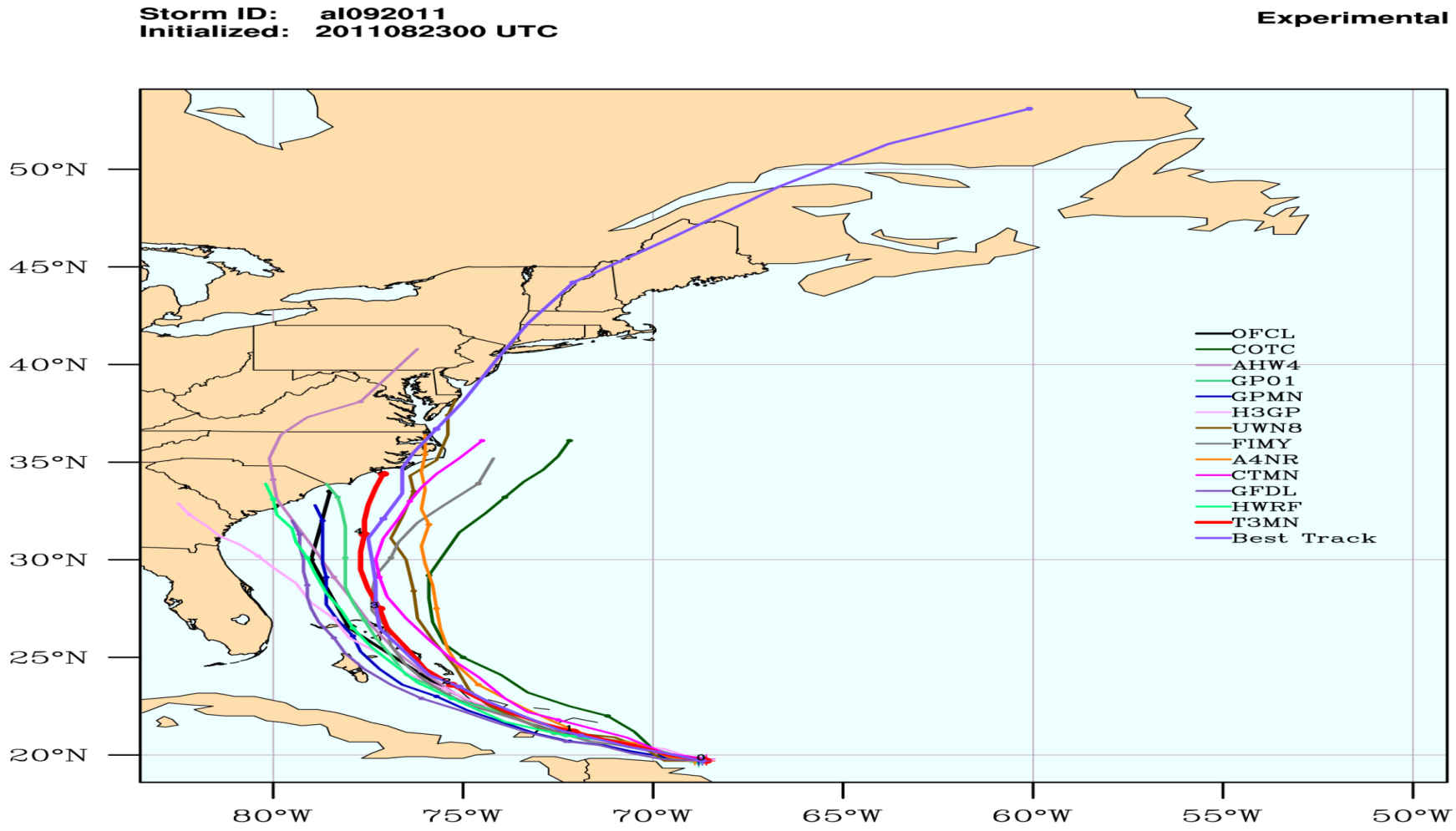


Example of an Ensemble Forecast



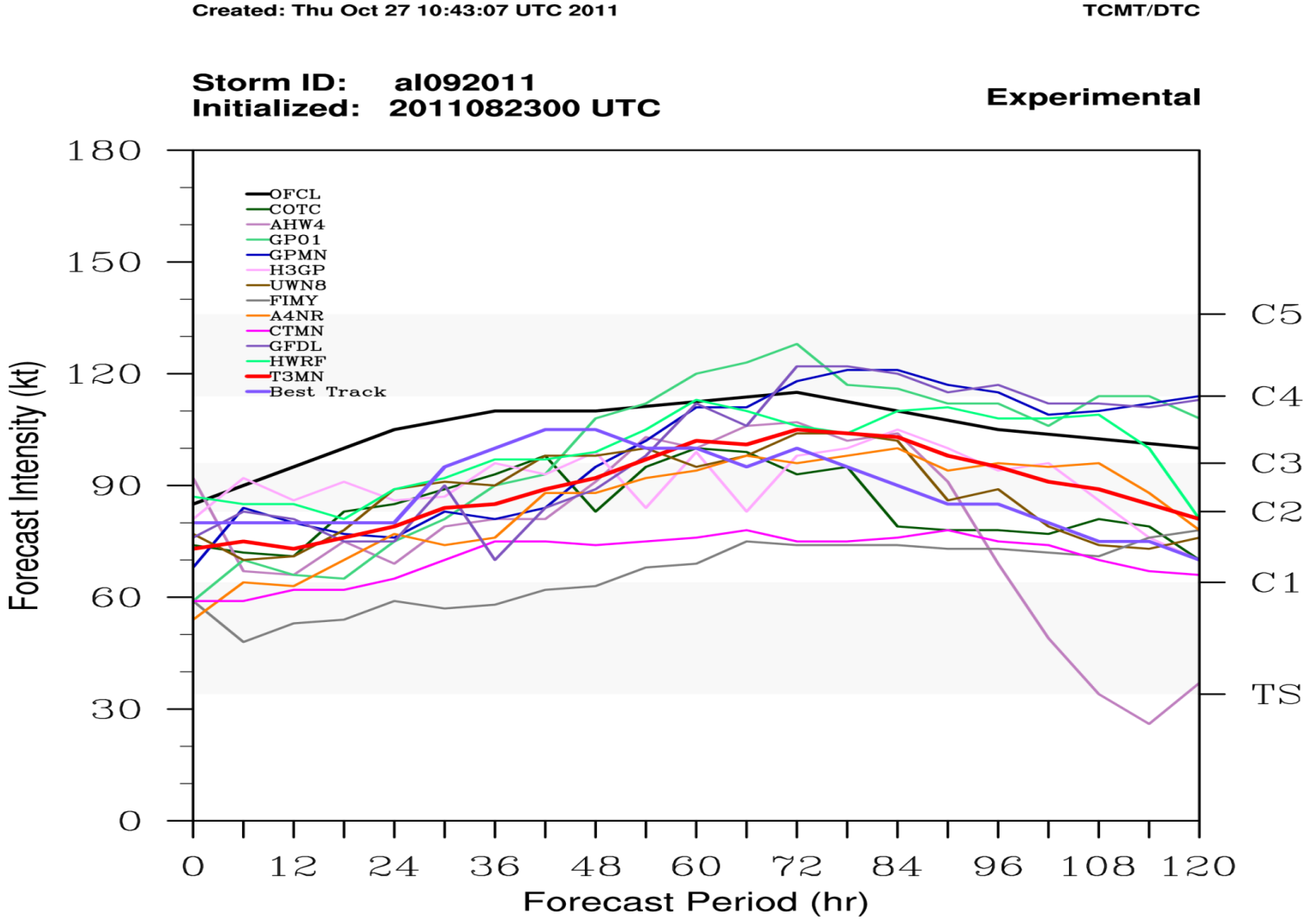


Irene 000Z August 23, 2011

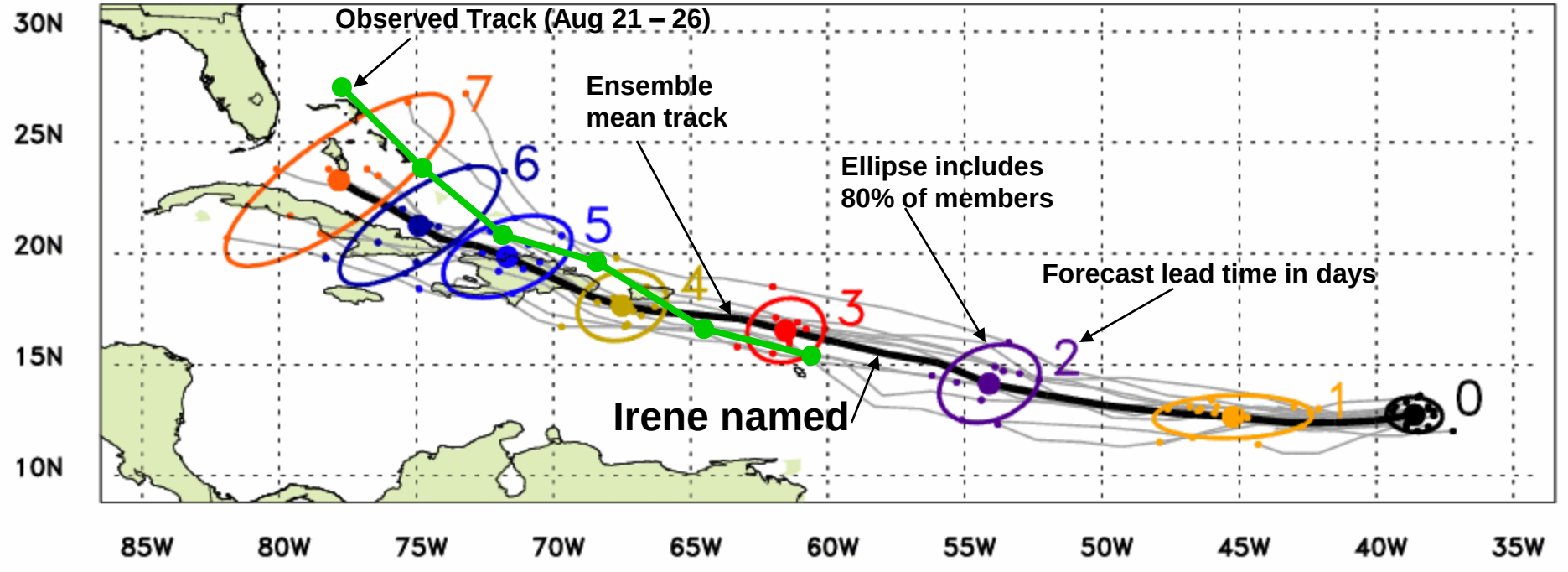


TCMT/DTC

Irene 000Z August 23, 2011

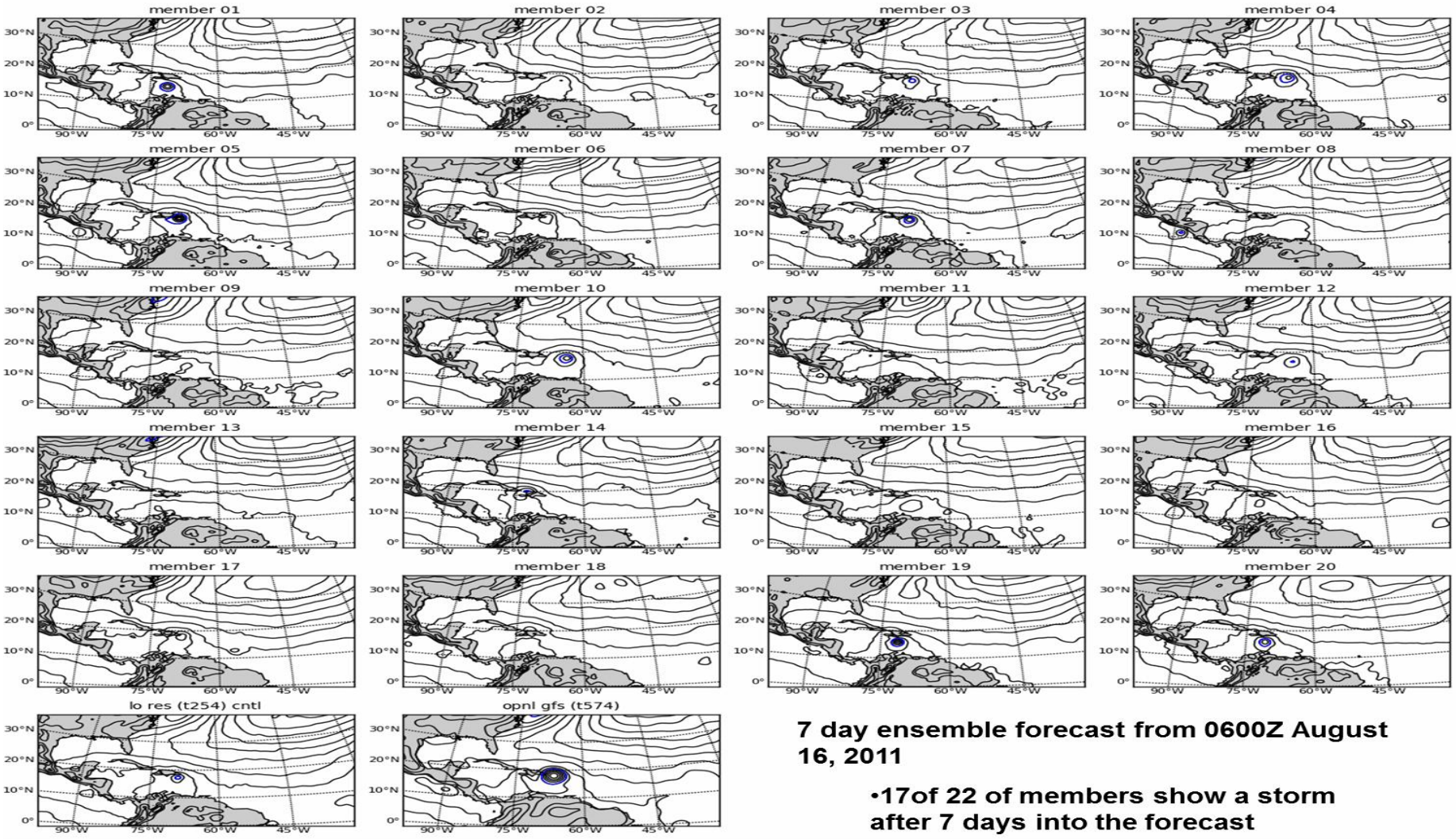


HFIP Global Ensemble Forecast for Irene Starting at 1200Z **August 18, 2011**



- Irene declared an investigation area at 1200Z on August 18, 2011
- Irene named at 0000Z August 21, 2011
- Initial indication of the formation of Irene from ensemble at **00Z August 16, 2011**
  - 2 days before it was declared an investigation area
  - 5 days before it was named

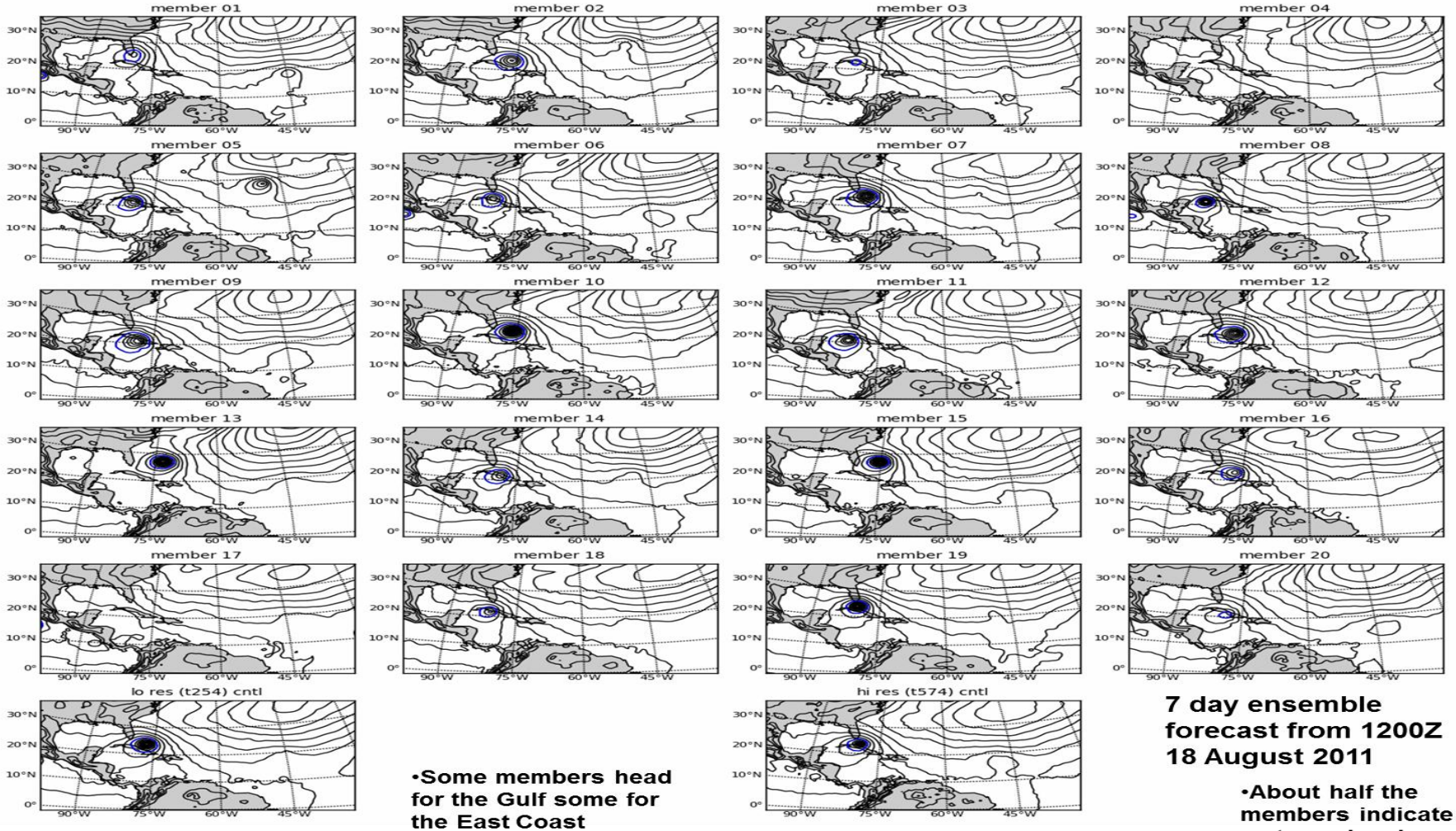
7 Day Ensemble Forecast
(Irene August 16, 2011)



7 day ensemble forecast from 0600Z August 16, 2011

- **17of 22 of members show a storm after 7 days into the forecast**

7 Day Ensemble Forecast
(Irene August 18, 2011)

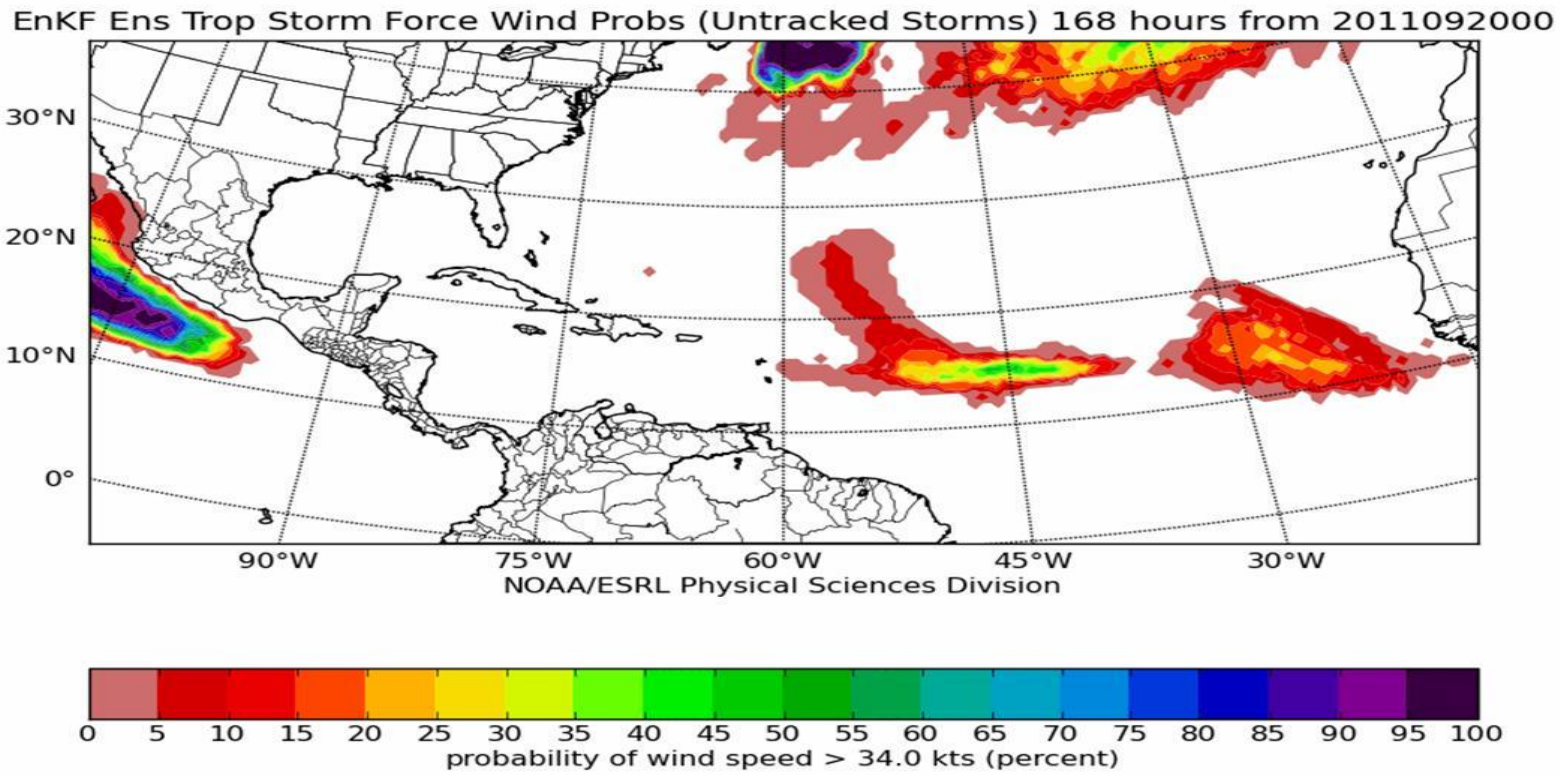


•Some members head for the Gulf some for the East Coast

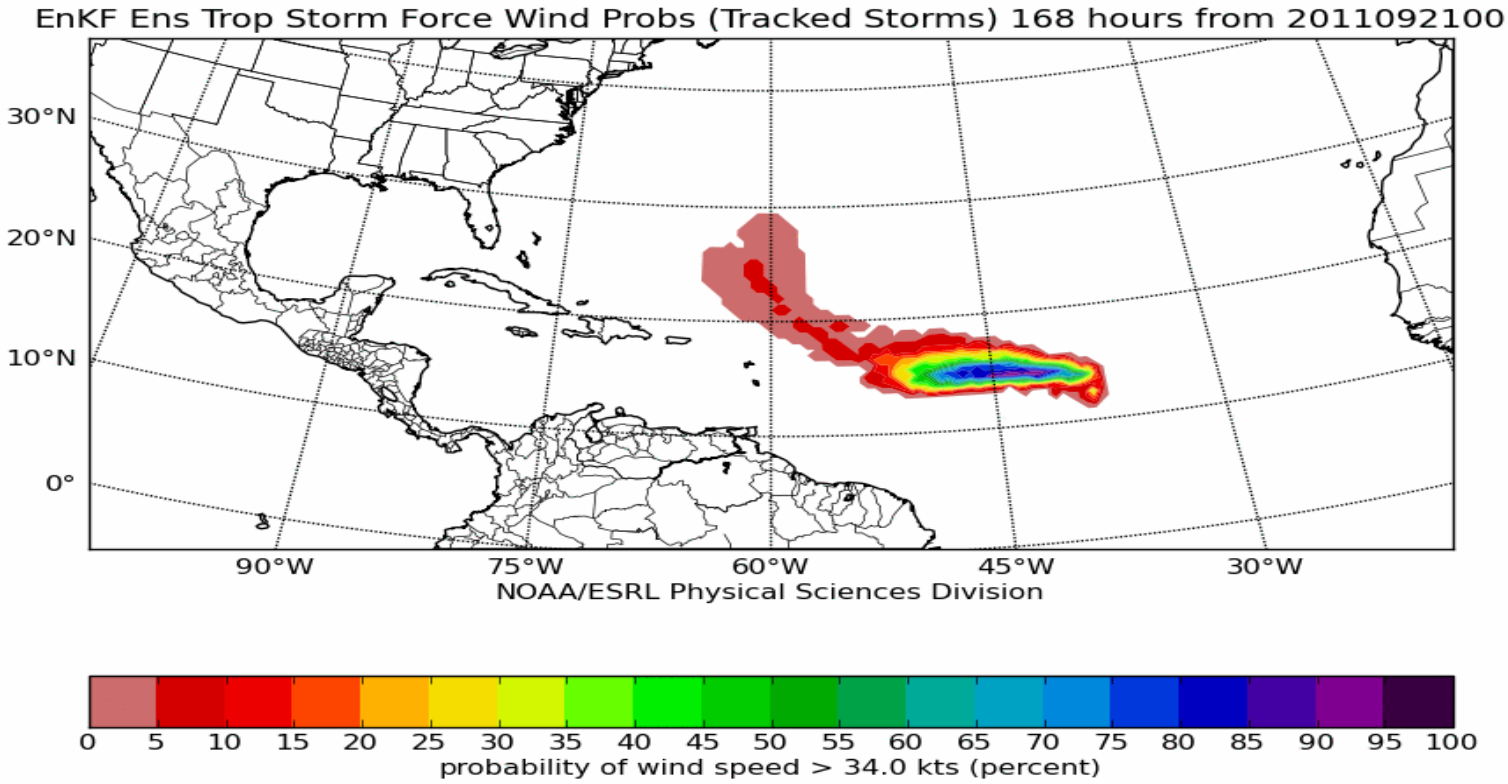
7 day ensemble forecast from 1200Z 18 August 2011

•About half the members indicate a strong hurricane

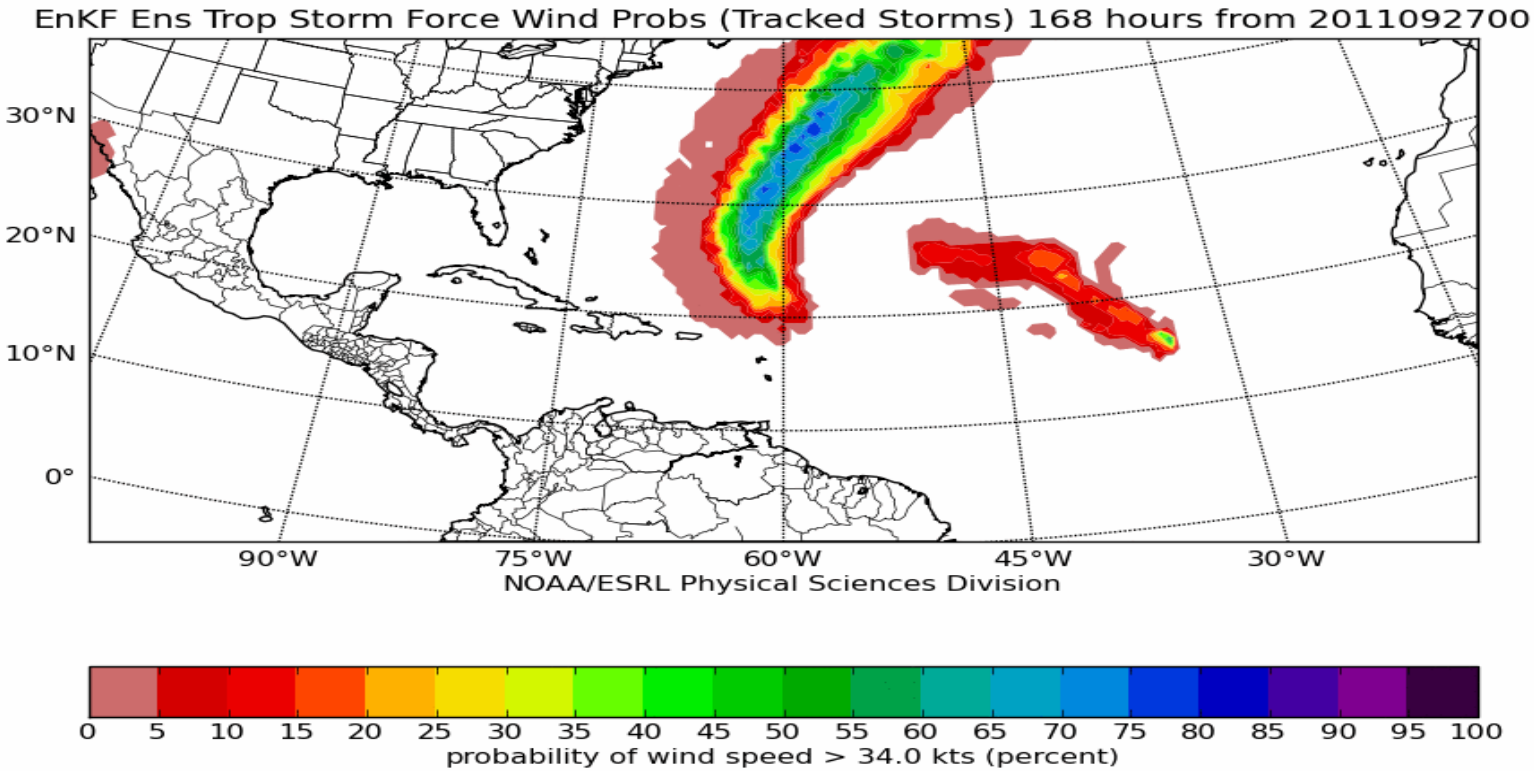
EnKF Ensemble
(Untracked Storms)



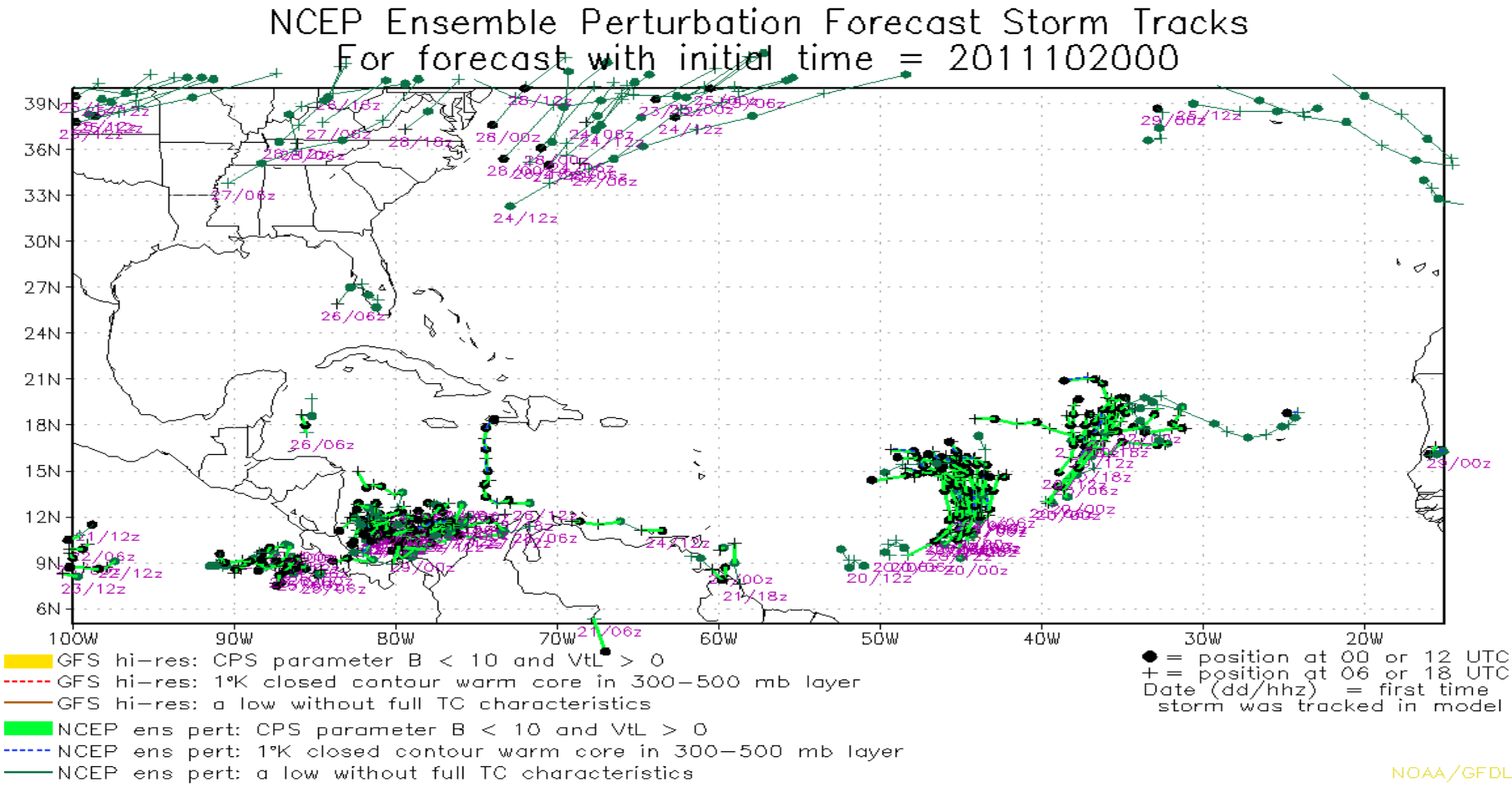
EnKF Ensemble
(Tracked Storms)



EnKF Ensemble
(Tracked Storms)

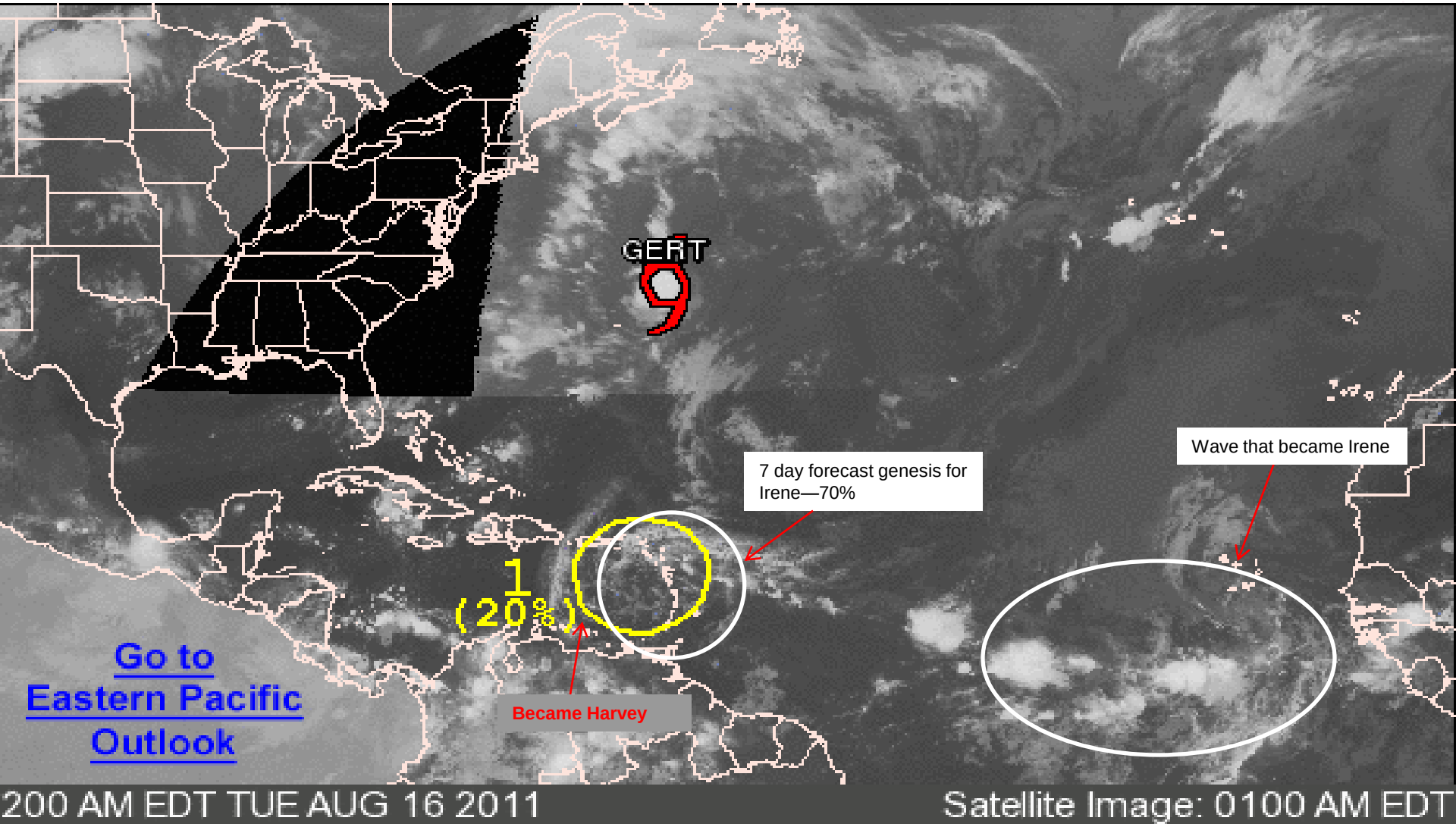


NCEP Ensemble



Graphical Tropical Weather Outlook

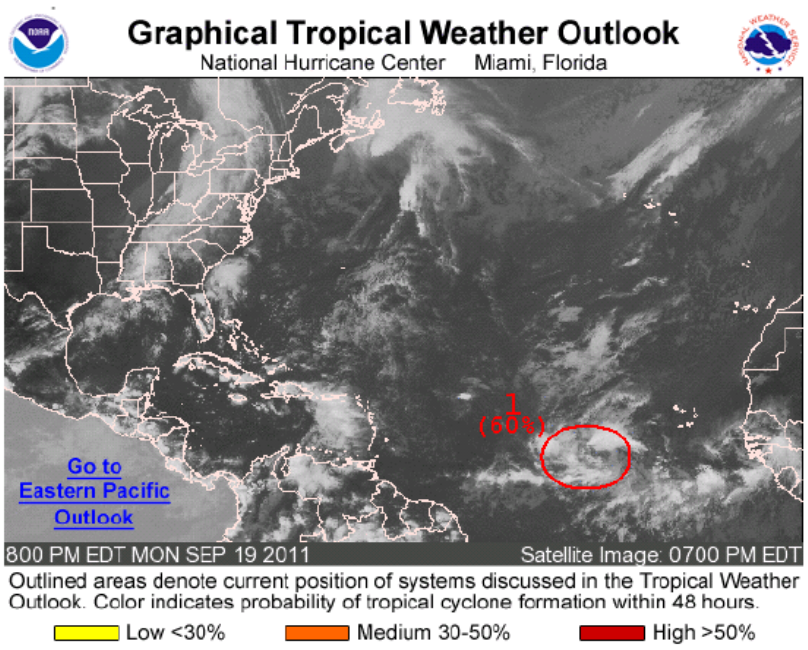
National Hurricane Center Miami, Florida

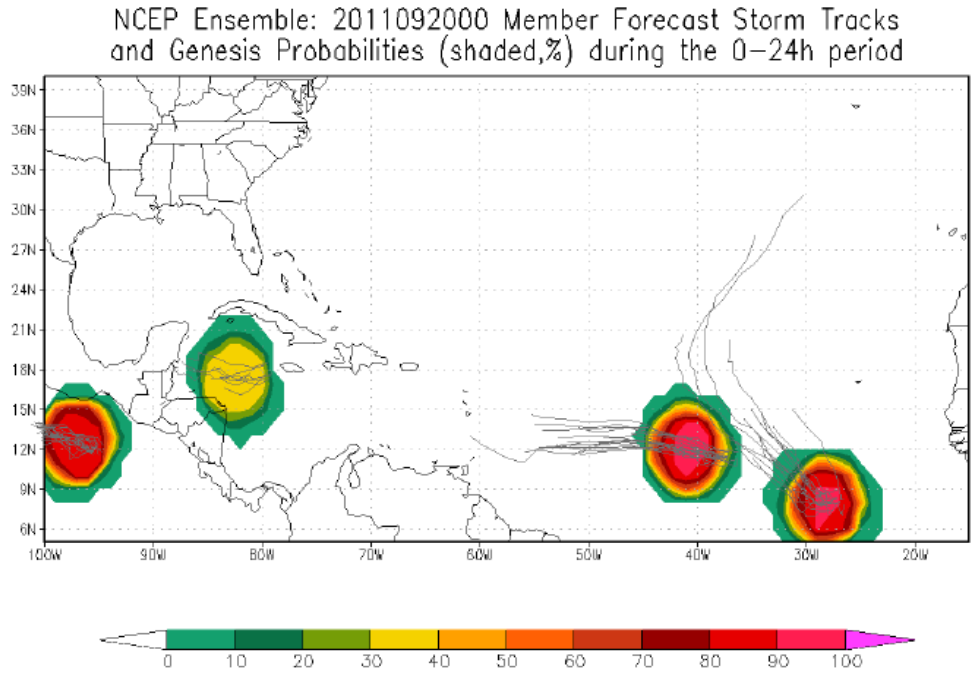


Outlined areas denote current position of systems discussed in the Tropical Weather Outlook. Color indicates probability of tropical cyclone formation within 48 hours.

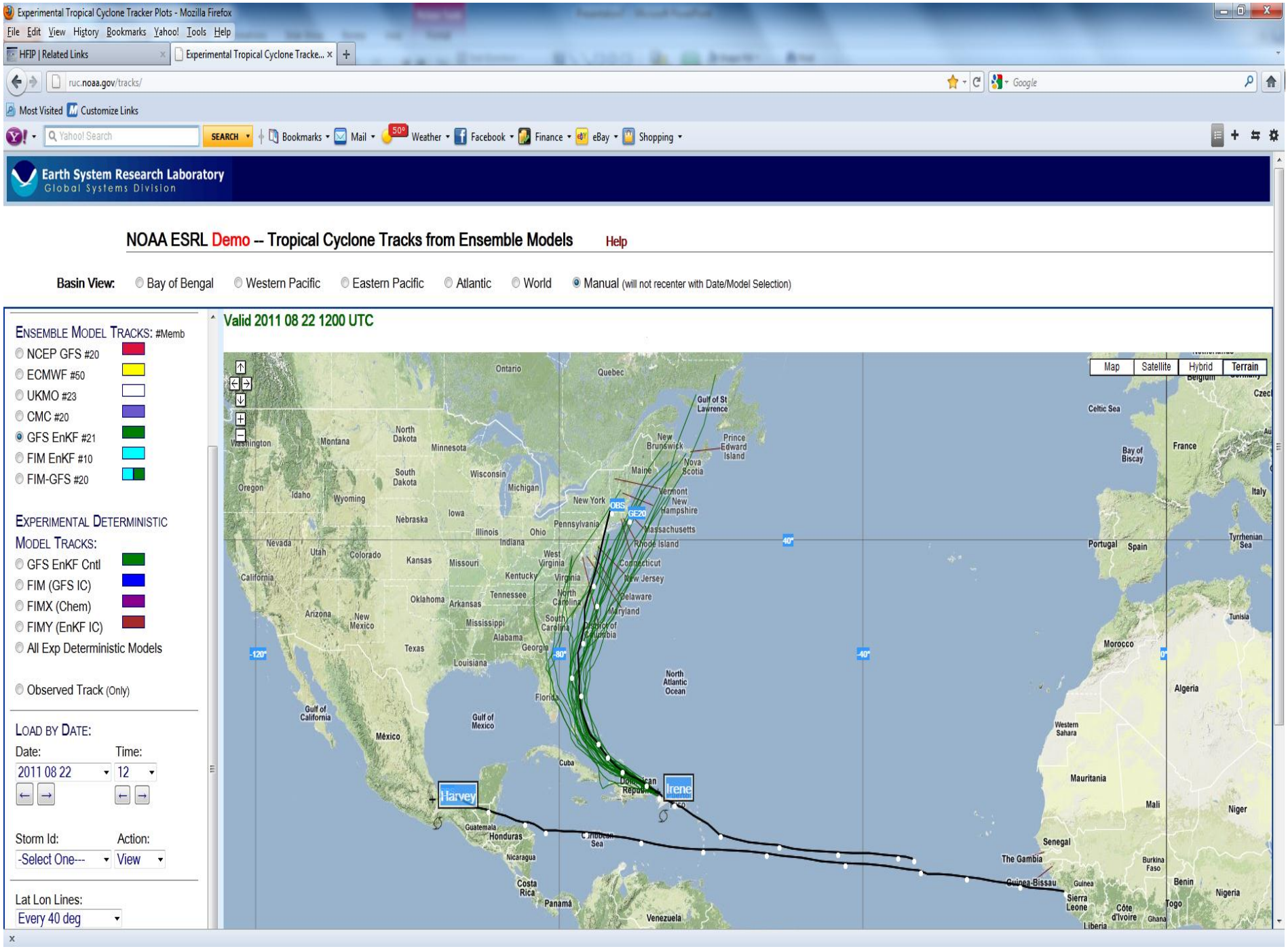
Low <30% Medium 30-50% High >50%

Ensemble track-based probabilistic genesis guidance





Probability is simply the percentage of members indicating genesis in a given lead time window (here, 0-24h).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Western Pacific
Eastern Pacific
Atlantic
World
Manual (will not recenter with Date/Model Selection)
Ensemble Model Tracks: #Memb
NCEP GFS #20
ECMWF #50
UKMO #23
CMC #20
GFS EnKF #21
FIM EnKF #10
FIM-GFS #20
Experimental Deterministic Model Tracks:
GFS EnKF Cntl
FIM (GFS IC)
FIMX (Chem)
FIMY (EnKF IC)
All Exp Deterministic Models
Observed Track (Only)
Load by Date:
Date:
Time:
2011 08 22
12
Storm Id:
Action:
-Select One---
View
Lat Lon Lines:
Every 40 deg
Valid 2011 08 22 1200 UTC
Map
Satellite
Hybrid
Terrain
Harvey
Irene
OBS
GE20
Ontario
Quebec
Gulf of St Lawrence
New Brunswick
Prince Edward Island
Nova Scotia
Maine
Vermont
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Tennessee
Georgia
Alabama
Mississippi
Louisiana
Florida
Texas
Arkansas
Oklahoma
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South Dakota
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Wyoming
Montana
Idaho
Oregon
Washington
Nevada
Utah
California
Arizona
New Mexico
Gulf of California
Gulf of Mexico
México
Cuba
Guatemala
Honduras
Nicaragua
Costa Rica
Panamá
Venezuela
Caribbean Sea
North Atlantic Ocean
Celtic Sea
Bay of Biscay
France
Portugal
Spain
Italy
Tyrrhenian Sea
Tunisia
Morocco
Western Sahara
Algeria
Mauritania
Mali
Niger
Senegal
The Gambia
Guinea-Bissau
Guinea
Sierra Leone
Liberia
Côte d'Ivoire
Ghana
Togo
Benin
Burkina Faso
Nigeria
-120°
-80°
-40°
40°

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NOAA ESRL Demo -- Tropical Cyclone Tracks from Ensemble Models

Help

Basin View: Bay of Bengal | Western Pacific | Eastern Pacific | Atlantic | World | Manual (will not recenter with Date/Model Selection)

Valid 2011 08 22 1200 UTC

ENSEMBLE MODEL TRACKS: #Memb

- NCEP GFS #20
- ECMWF #50
- UKMO #23
- CMC #20
- GFS EnKF #21
- FIM EnKF #10
- FIM-GFS #20

EXPERIMENTAL DETERMINISTIC MODEL TRACKS:

- GFS EnKF Cntl
- FIM (GFS IC)
- FIMX (Chem)
- FIMY (EnKF IC)
- All Exp Deterministic Models

- Observed Track (Only)

LOAD BY DATE:

Date: 2011 08 22 Time: 12

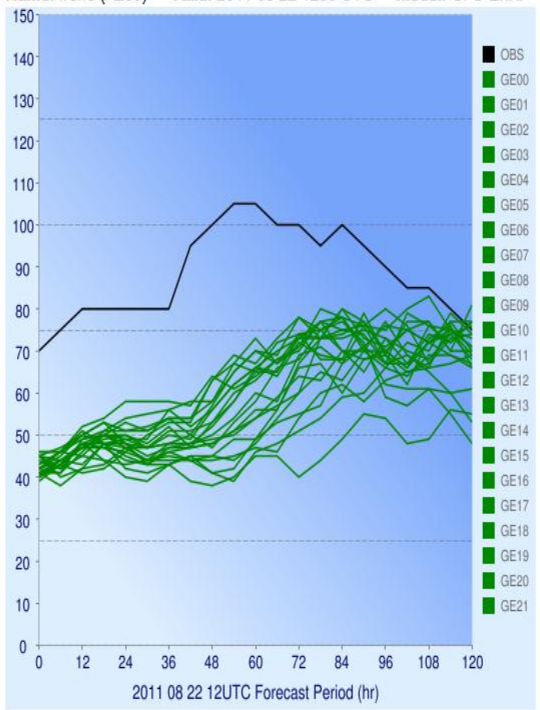
Storm Id: -Select One--- Action: View

Lat Lon Lines: Every 40 deg

Wind Speed | Pressure

Wind Speed Intensity (kts)

Name: Irene (AL09) **Valid:** 2011 08 22 1200 UTC **Model:** GFS-EnKF



Map | Satellite | Hybrid | Terrain

Canada Alberta Manitoba Saskatchewan Washington Montana North Dakota Minnesota Oregon Idaho Wyoming South Dakota Nebraska Iowa Nevada Utah Colorado Kansas Missouri California Arizona New Mexico Oklahoma Arkansas Texas Louisiana Gulf of California México Gulf of Mexico Cuba

North Sea Denmark United Kingdom Ireland Netherlands Belgium Germany Celtic Sea Bay of Biscay France Portugal Spain Italy Tyrrhenian Sea Tunisia Morocco Algeria Western Sahara

- http://www.esrl.noaa.gov/psd/forecasts/gfsenkf/
- http://www.ral.ucar.edu/projects/hfip/d2011/
- http://ruc.noaa.gov/tracks/
- http://www.emc.ncep.noaa.gov/gmb/tpm/emchurr/tcgen/
- http://www.hfip.org/ (go to related links)

- http://www.emc.ncep.noaa.gov/gmb/tpm/emchurr/gfs_gen/ (change gfs gen to tcgen)