



A graphic element consisting of several concentric, horizontal, white elliptical lines that create a sense of depth and movement. A large, solid red shape, resembling a stylized comma or a curved arrow, is positioned in the center of these lines, pointing towards the right.

NOAA
HURRICANE FORECAST IMPROVEMENT PROJECT

Welcome

HFIP Annual Meeting
February 19-20, 2014



The HFIP Project Vision/Goals

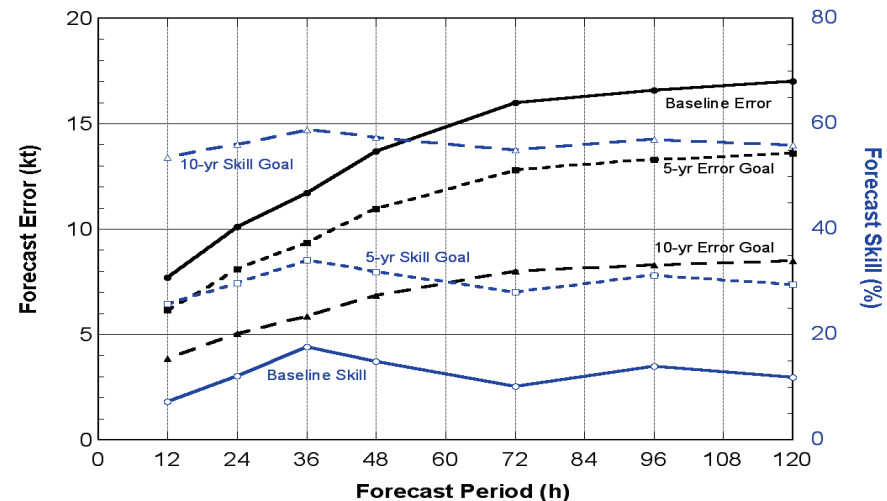
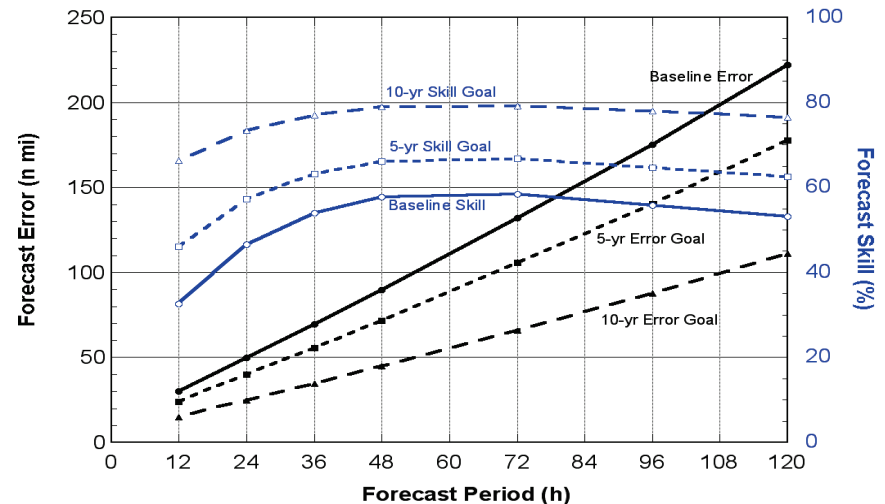


Vision

Organize the hurricane community to dramatically improve numerical forecast guidance to NHC in 5-10 years

Goals

- Reduce numerical forecast errors in track and intensity by 20% in 5 years, 50% in 10 years
- Extend forecast guidance to 7 days with skill comparable to 5 days at project inception
- Increase probability of predicting rapid intensification at day 1 to 90% and 60% at day 5





HFIP Progress and Accomplishments After 5 years (2009 – 2013)



- 5-year Performance Goals Exceeded or Within Reach
 - Operational GFS among the best dynamical model for hurricane track prediction
 - New GSI-Hybrid DA Systems went operational in the GFS in May 2012
 - Track forecasts exceeded the 5-yr goal for Days 1 through Day 4.
 - Beating ECMWF most lead times.
 - However, little progress in reducing 5 to 7 day track error in numerical guidance
 - A third nest was added to operational HWRF allowing an inner core resolution of 3 km. This and other changes led to another 20% improvement in both HWRF track and intensity forecasts over previous year.
 - Improvements in Numerical Guidance appear to be showing up in operational guidance

Where will we stand at the end of the 2014 Hurricane Season?

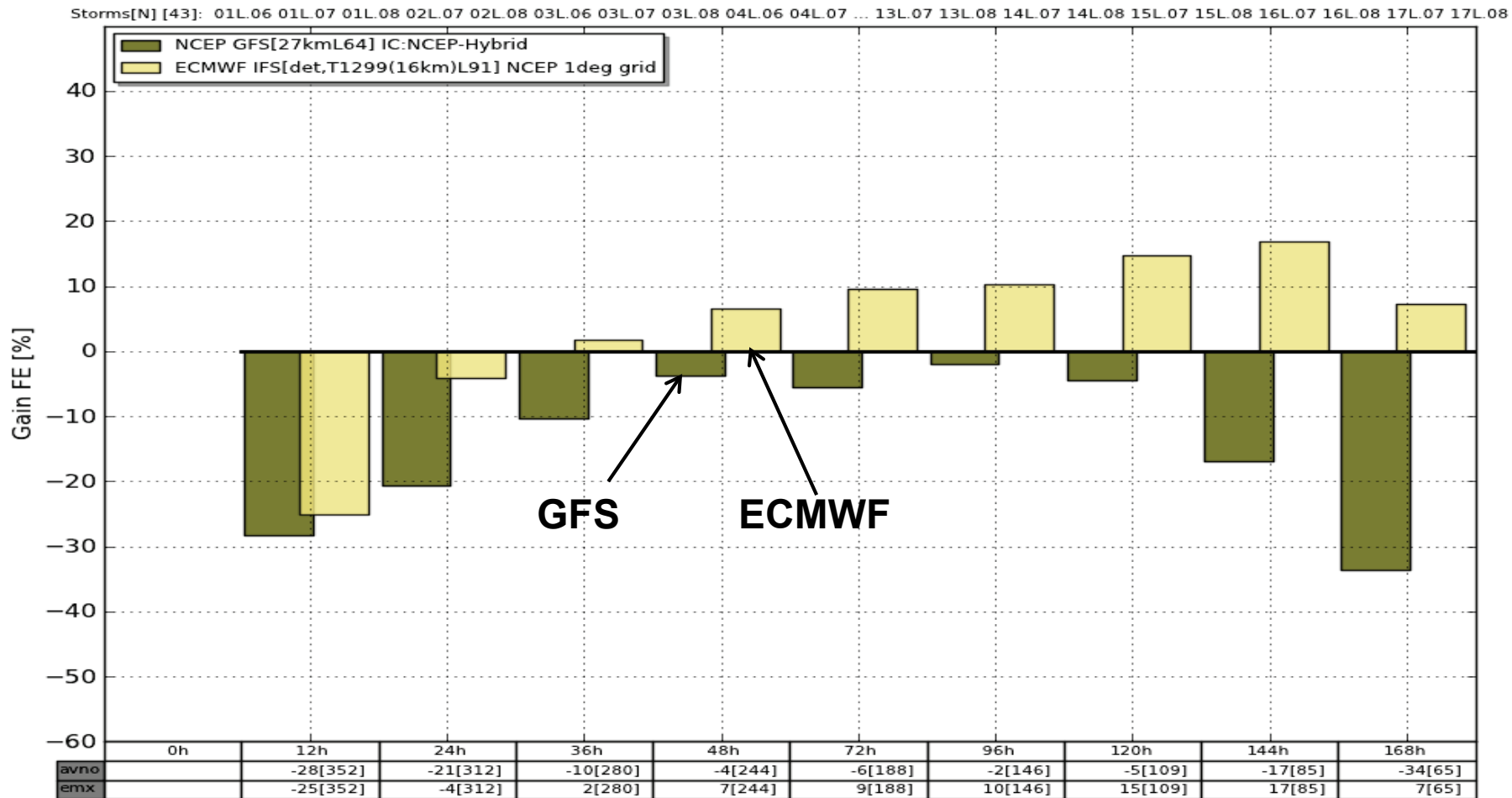


NCEP vs ECMWF for Atlantic 2006-2008



% gain over HFIP baseline (track)

LANT GFS v ECMWF %improve over HFIP baseline d+7 track error
pre-HFIP period 2006-2008



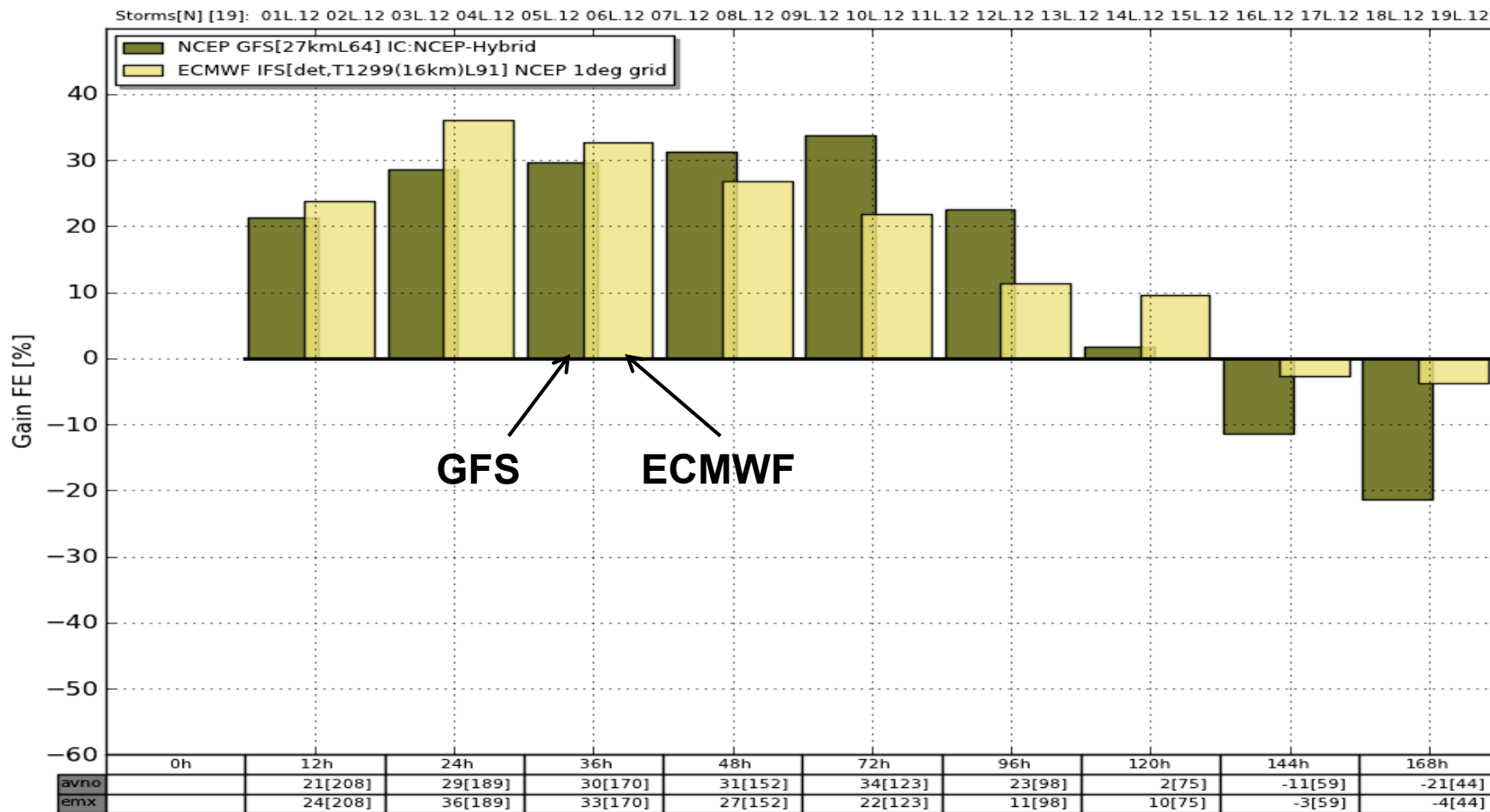


NCEP vs ECMWF for Atlantic 2012



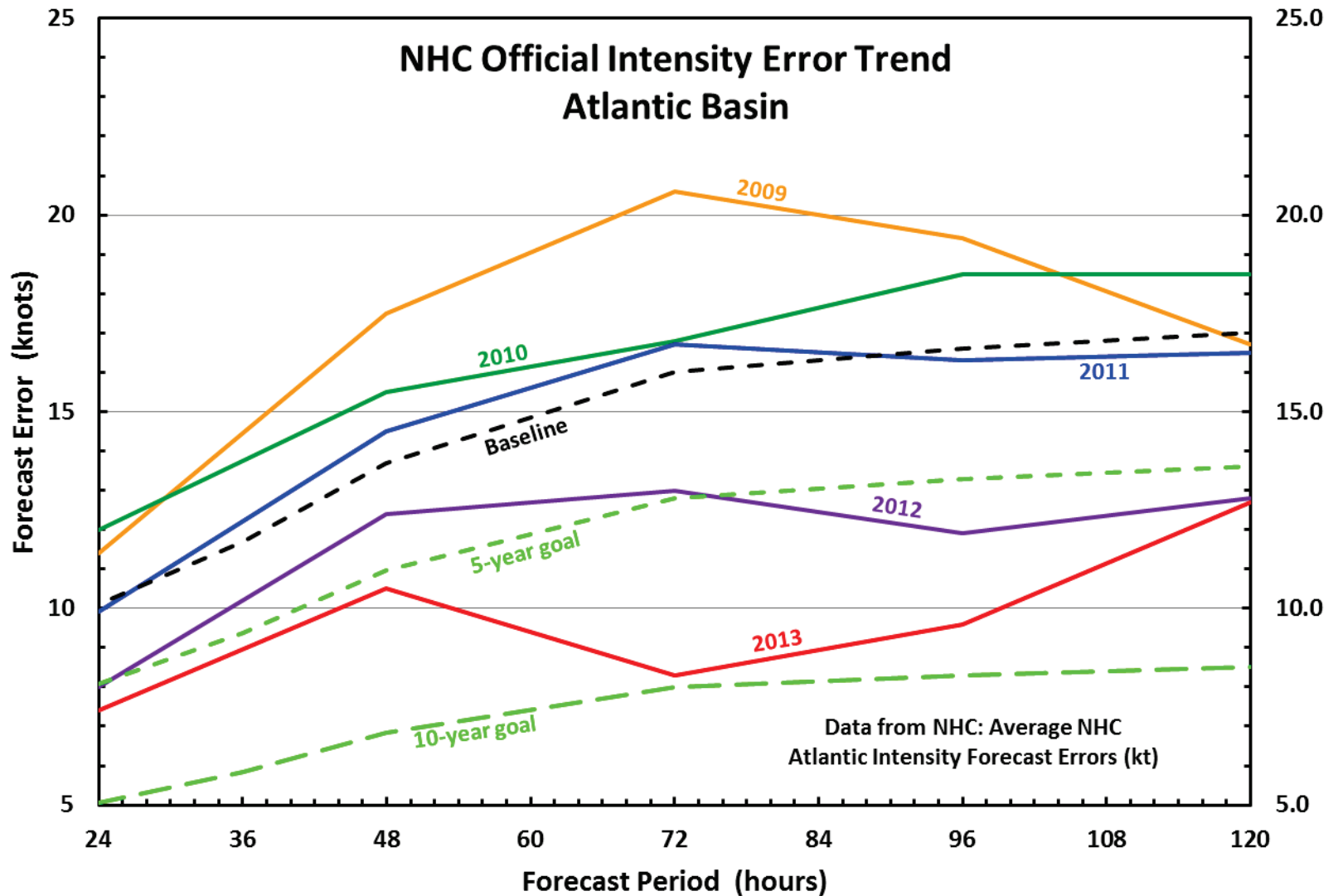
% gain over HFIP baseline (track)

LANT GFS v ECMWF %improve over HFIP baseline d+7 track error
HFIP year 4 2012





Recent (2009-2013) Trend in Operational Intensity Forecast





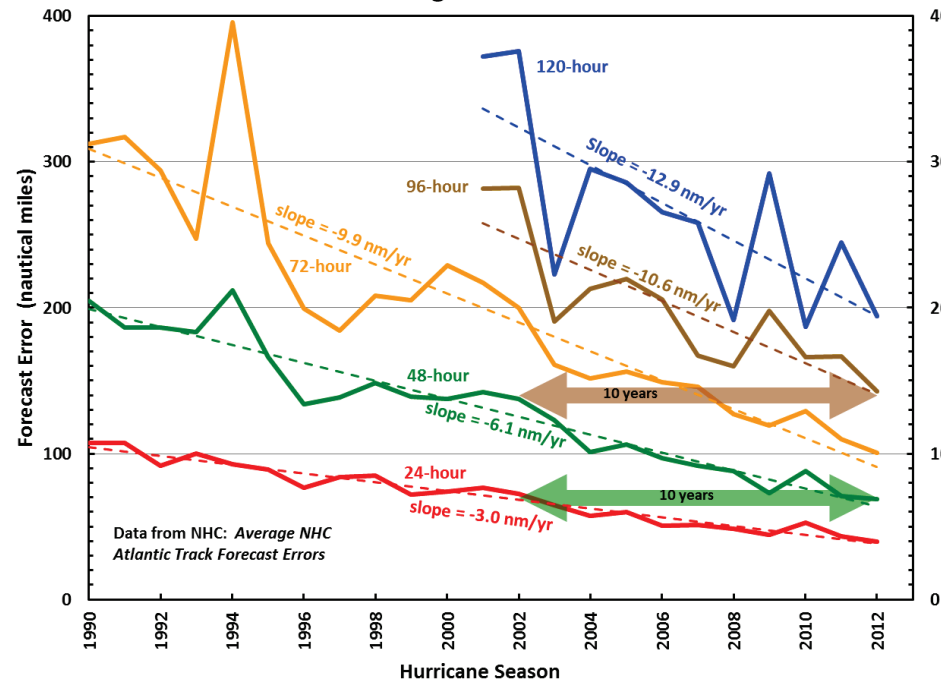
Operational Forecast Performance



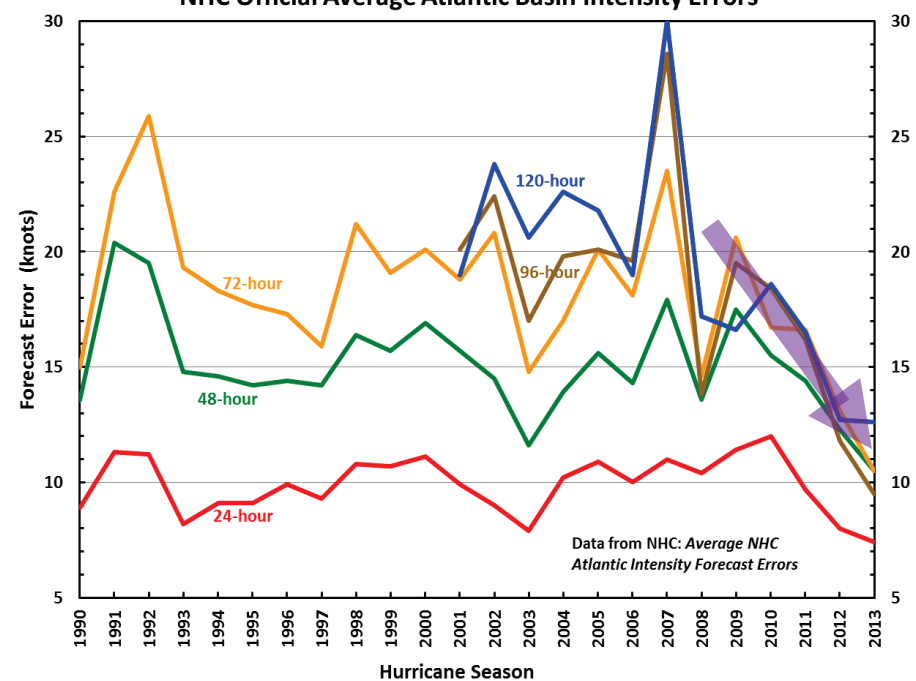
Good – track forecast improvements

Not so Good – however, recent trend hopefully persists

NHC Official Average Atlantic Basin Track Errors



NHC Official Average Atlantic Basin Intensity Errors



- Errors cut in half over past 15 yrs
- 10-yr improvement - As accurate at 48 hrs as we were at 24 hrs in 2000

- 24-48h intensity forecast historically off by 1 category (2 categories perhaps 5-10% of time)



HFIP Progress and Accomplishments

Other Development Areas



- A prototype real-time product for potential genesis using the HFIP global ensembles was demonstrated.
- Next generation hurricane storm surge model demonstrated. A forecast for hurricane Sandy made 36 hours before landfall showed surprising skill in forecasting the surge in New York City and along the New Jersey coast.
- Demonstration of the expected performance gain of increased operational resolution in operational Hybrid DA underway
- Grants to Academia
- Operational HWRF Development Process initiated
- Scientific Review Committee meeting
- JTWC evaluating HWRF operational guidance suite – HWRF demonstrated superior results in 2013



Outreach and Community Participation



- **31st Conference on Hurricanes and Tropical Meteorology**
 - 4 HFIP focused sessions
 - 41 papers (7) NCAR,(5)EMC,(4)HRD,(1)GFDL,(1)ESRL,(1)NRL,(1)IIT,(10)Univ.
- **International Partnerships (6)**
- **Providing JTWC forecast guidance from HWRF**
- **Grants to US Universities (12) 1st round, (~10) 2nd round**



Appropriation History (2009-2014)



	FY09	FY10	FY11	FY12	FY13	FY14 (PB)
WCOSS PAC (HFIP)	6.000M	3.000M	3.000M	4.000M	2.000M	4.000M
*24.044M	13.040M	13.040M	13.044M	*14.044M *8.540M Due to NWS reprogramming	14.044M 1.999 M Due to NWS reprogramming	13.000M
Sandy Supplement					9.338M	3.600M for Carryover R2O enhancement
OAR ORF	6.100M	6.100M	6.100M	6.000M	5.800M	5.800M
TOTAL	\$26.140M	\$22.140M	\$23.144M	\$18.540M	\$22.737M	\$27.400

*Includes \$1,040K in NCEP Base allocation for HWRF and SLOSH O&M





NOAA
HURRICANE FORECAST IMPROVEMENT PROJECT

The HFIP logo features a stylized red hurricane symbol in the center, surrounded by several concentric, overlapping white and grey lines that suggest a storm's path or forecast area.

Future HFIP Priorities

HFIP Annual Meeting
February 19-20, 2014



NHC priorities: next 3-5 years



- Program drivers:
 1. rapid intensity forecast accuracy
 2. track forecast accuracy
 3. overall intensity forecast accuracy
- HFIP Program Components in Priority order
 1. Evaluation of impact of aircraft inner core data
 2. Minimize intensity and structure initialization problem
 3. Maximize use of satellite data that improve model initialization.
 4. Accurate extended (3-5 day) forecasts of disturbances.
 5. Post-processing of products for users (limited effort within HFIP).
 6. Quantify importance of ocean forecasts (adjust program if necessary)
 7. Develop applications for use of model guidance by forecasters (limited).
 8. Global model work



HFIP Priorities 2014 - 2016



Operational Impact

- Continued development and demonstration of the Experimental Numerical Forecast System (real-time) during hurricane season on HFIP Boulder Jet System
- Determine the benefit from standard reconnaissance data (flight level, dropsondes, SFMR) and the addition of Doppler Radar
- Demonstrate impact of multi- and single-model ensembles for Track and Intensity

Research and Development

- Best use of limited TDR flights operationally
- Improve use of Satellite data in hurricane DA
- Develop HWRF GSI hybrid DA -- Focus on high resolution inner domains
- Tune Global Physics for higher resolution
- Continue to improve HWRF Physics

Technical Advancements

- Convert HWRF to NMM (under NEMS) and optimize code so new model technology can fit in operational windows



Questions?





HFIP Scope



- Improve hurricane forecast system/global forecast system to reduce error in intensity and track
- Make better use of existing observing systems; define requirements for future systems to enhance research and operations capabilities and impacts
 - Does not include acquisition or operation of operational observing systems
- Expand and improve forecaster tools and applications to add value to model guidance