Reflections on 2011 Stream 1.5 from the TCMT perspective

Louisa Nance

NCAR/RAL/JNT

TCMT members:
Karen Arp, Barb Brown, Laurie Carson, Tressa Fowler, Eric Gilleland, Paul Kucera, Kathryn Newman, Tricia Slovacek, Christopher Williams, Chunhua Zhou

Stream 1.5 Time Line

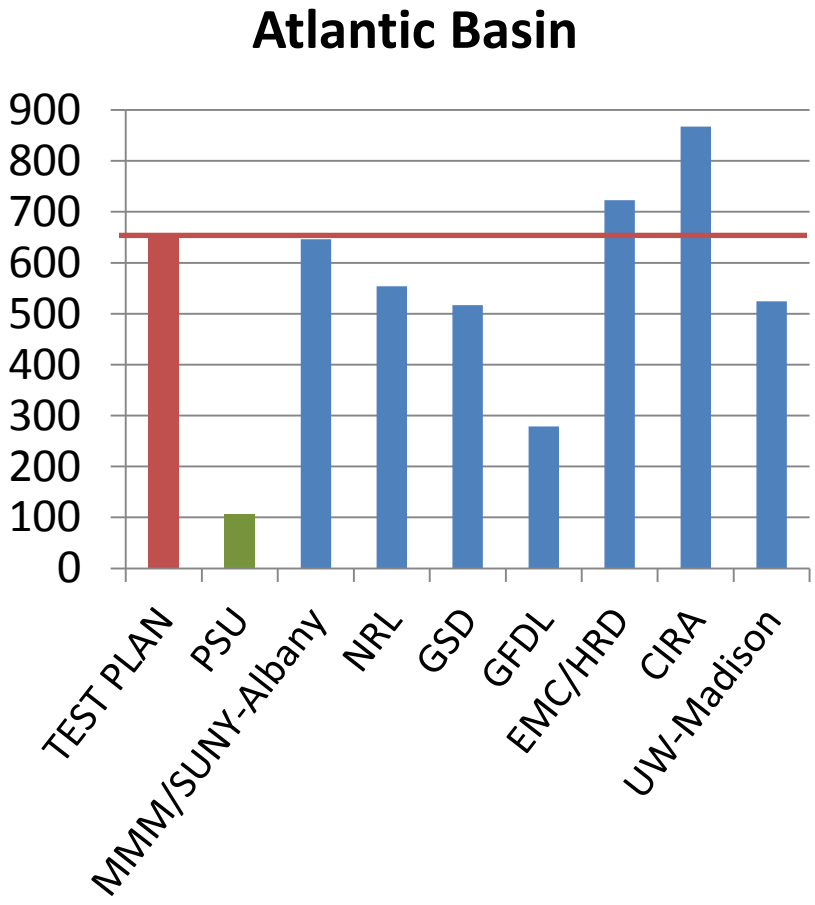
Time Line		
Task	Proposed	Actual
Test plan distributed	Dec 15	Initial Dec 15 Updated Jan 21
Retrospective runs complete & Tier 1 data delivered to TCMT	May 1	May 1 – June 16
Initial (additional) analysis completed	Jun 1 (15)	July 5 - 27
Decision regarding which models qualify for Stream 1.5	Jun 15	July 28

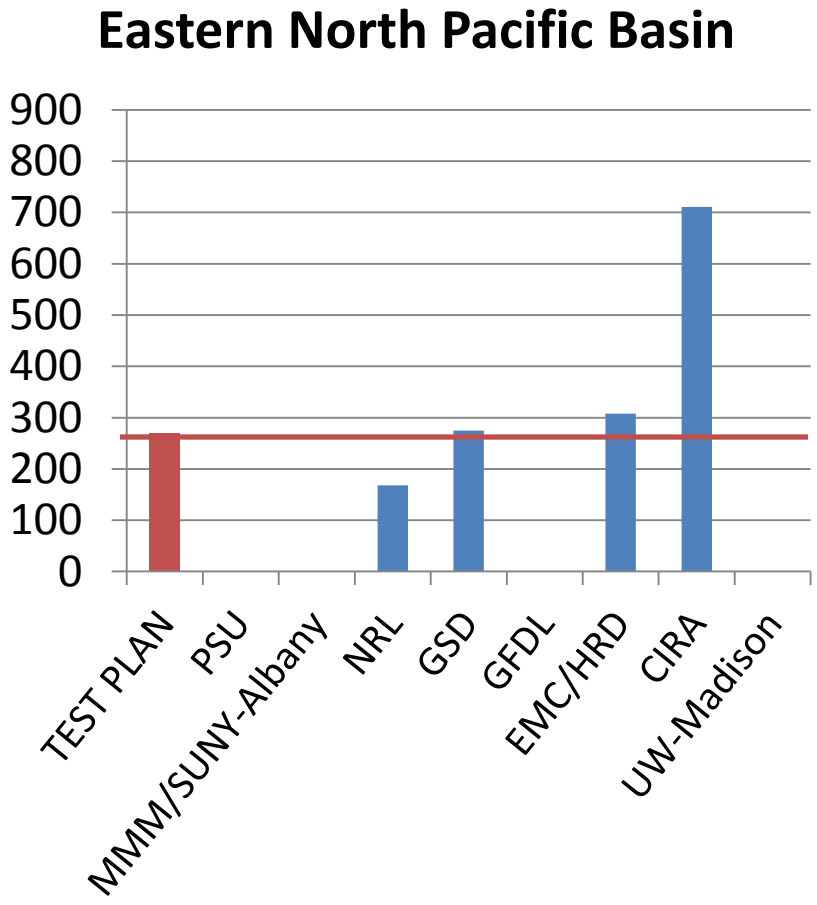
Stream 1.5 Participants

Organization	Model	Type	Config
MMM/SUNY-Albany	AHW	Regional-dynamic-deterministic	1
UW – Madison	UW-NMS	Regional-dynamic-deterministic	1
EMC/HRD	HWRF	Regional-dynamic-deterministic	1
NRL	COAMPS-TC	Regional-dynamic-deterministic	1
PSU	ARW	Regional-dynamic-deterministic & ensemble	4
GFDL	GFDL	Regional-dynamic-ensemble	18
GSD	FIM	Global-dynamic-deterministic	1
CIRA	SPICE	Statistical-dynamic-consensus	9

Only early model guidance

Data Inventory



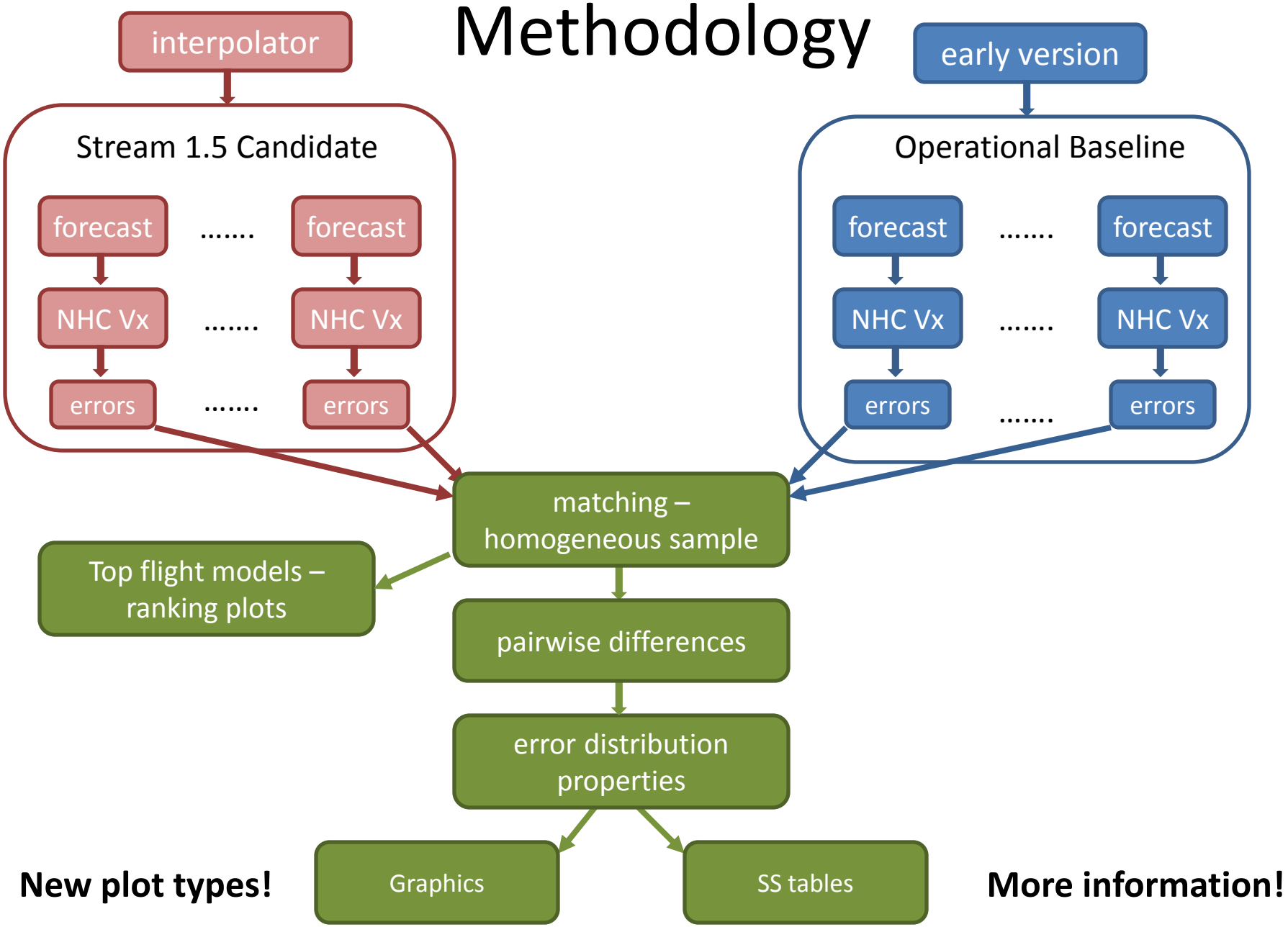


3 to 15% of delivered cases were excluded from the analysis

Baseline Comparisons

Operational Baselines	Stream 1.5 configuration
Individual: Track – GFSI, GHMI, HWFI (HWRF only) Intensity – LGEM, GHMI, HWFI (HWRF only)	Stream 1.5
Variable Consensus - Track AL: GFSI, EGRI, GHMI, HWFI, GFNI EP: GFSI, EGRI, GHMI, HWFI, GFNI,NGPI Intensity AL & EP: DSHP, LGEM, GHMI, HWFI	ARW, UM-NMS, COAMPS-TC, FIM: Consensus + Stream 1.5 HWRF, GFDL, SPICE: Consensus w/ Stream 1.5 equivalent replacement
Average error of previous year's top flight models Track: GFSI, EGRI, GHMI Intensity: GHMI, DSHP, LGEM	Stream 1.5

Methodology

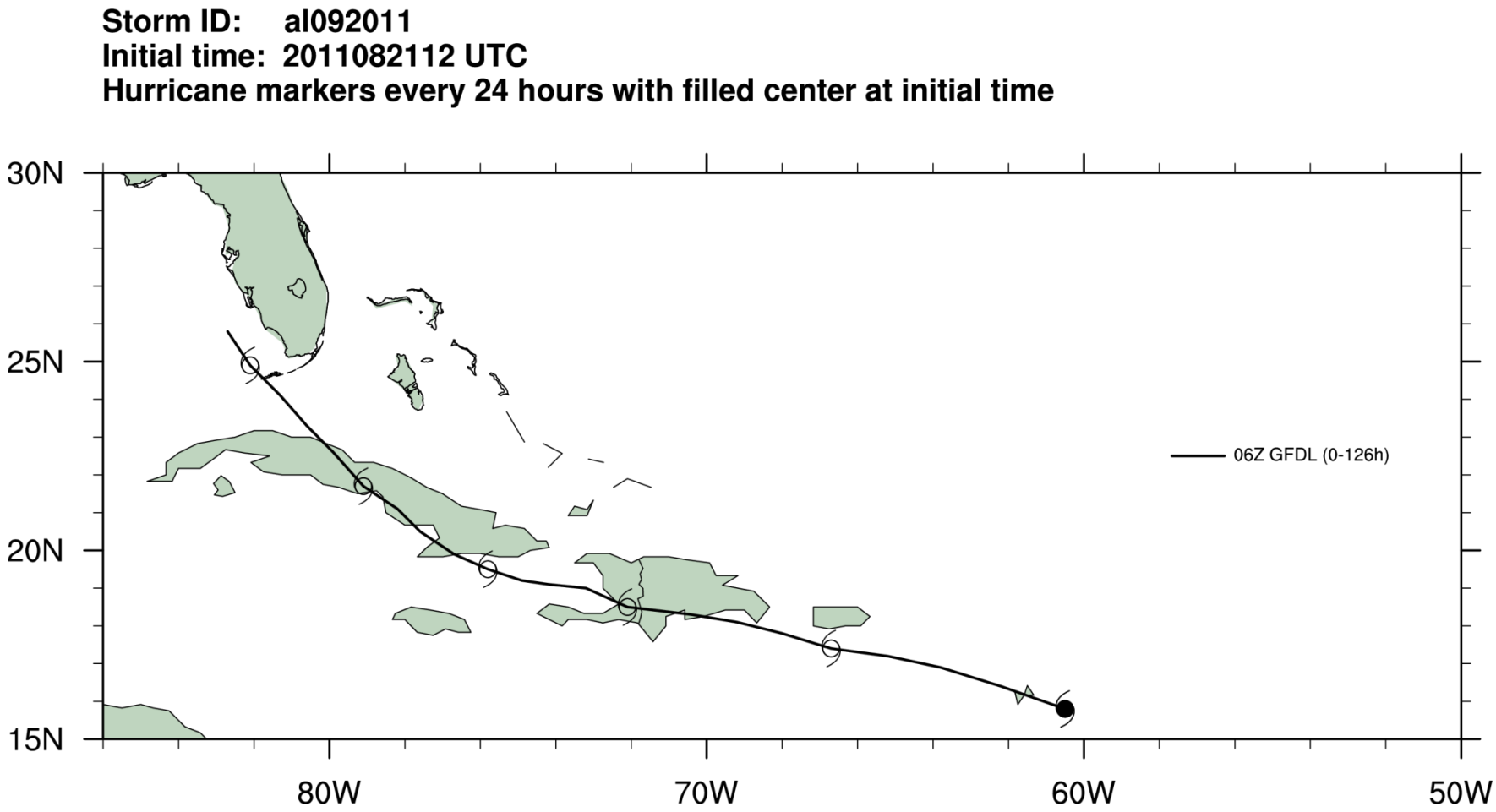


New plot types!

More information!

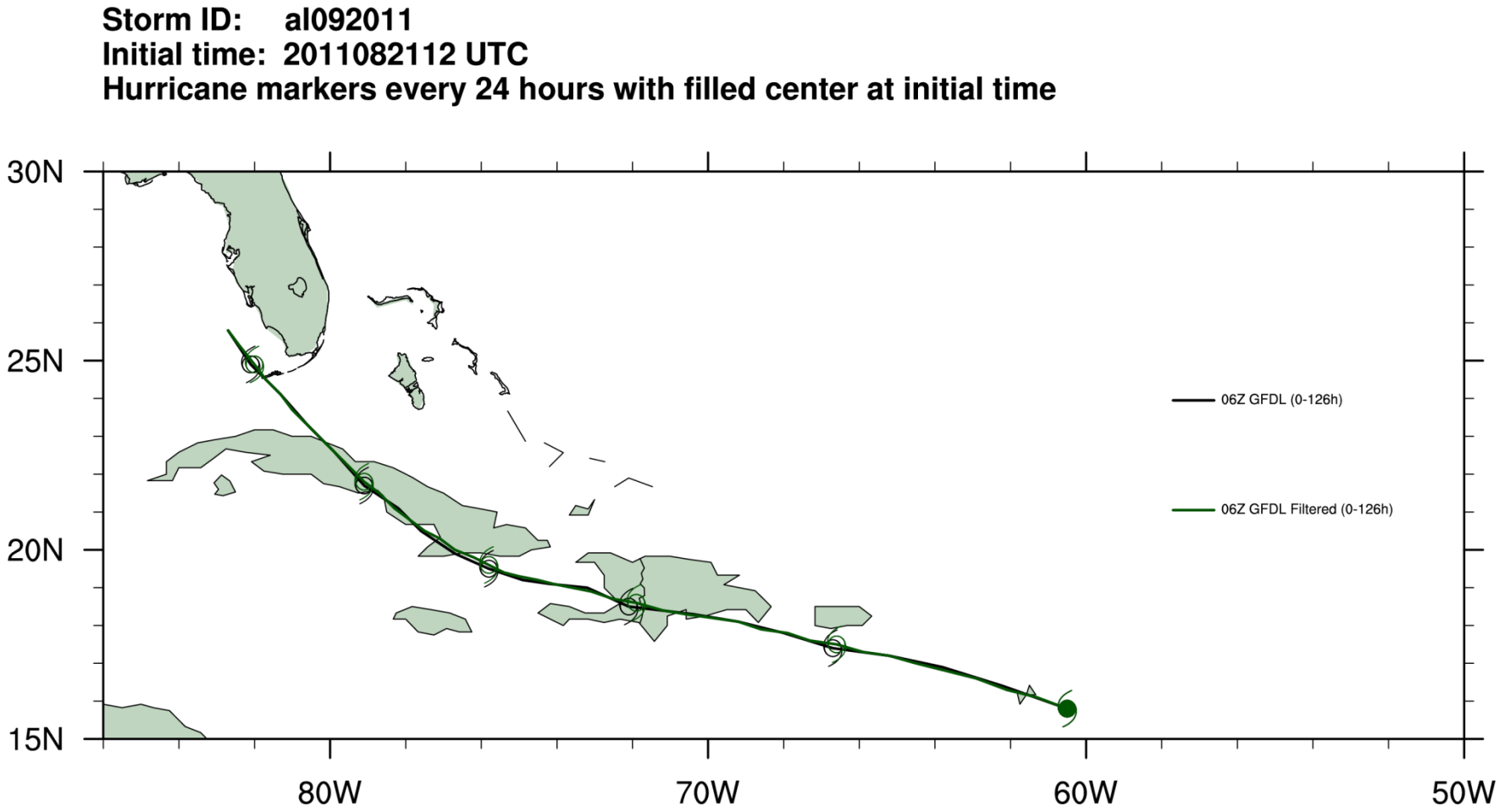
Late Model Conversion

Raw Track Forecast



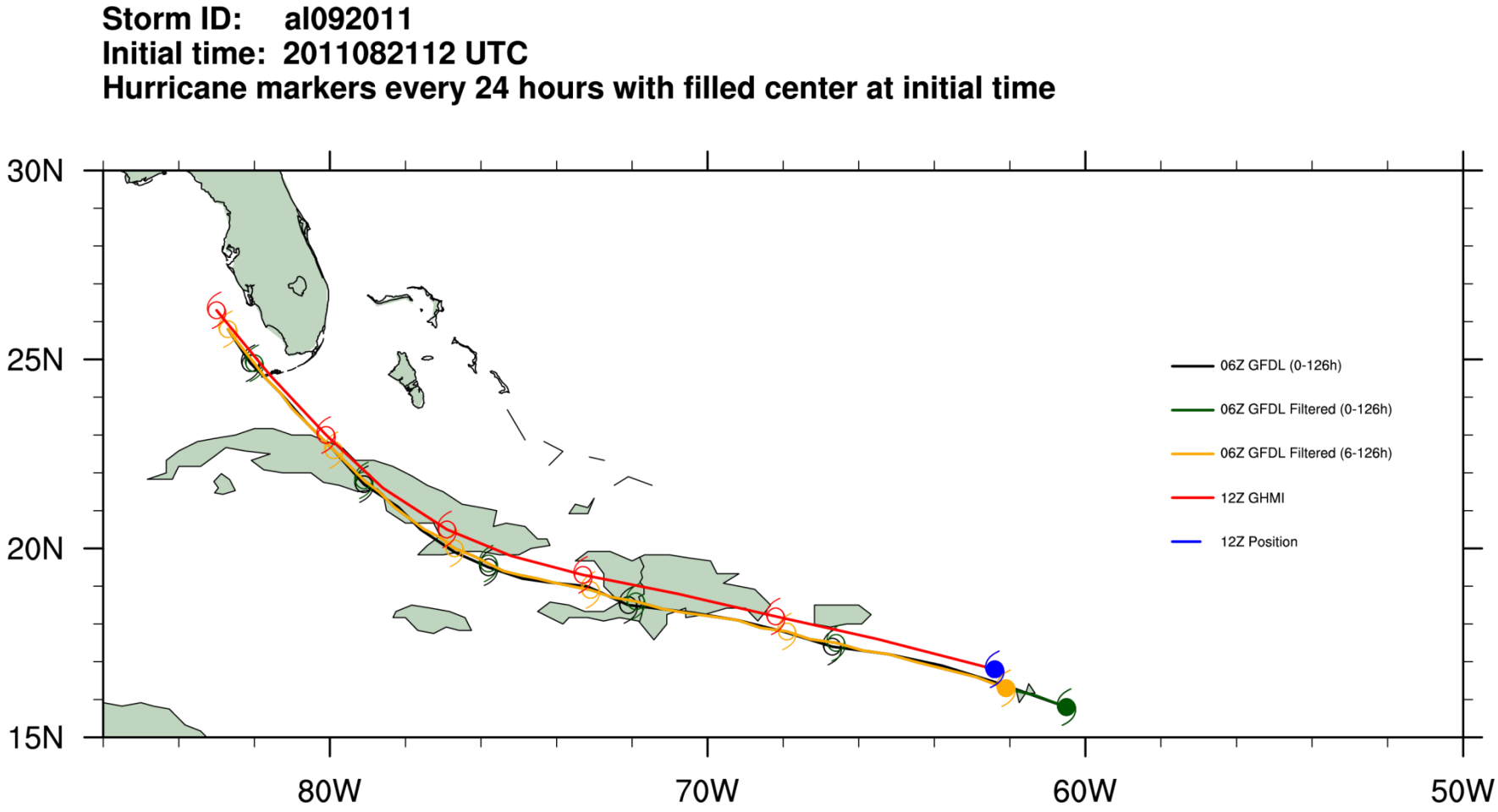
Late Model Conversion

Filtered Track Forecast



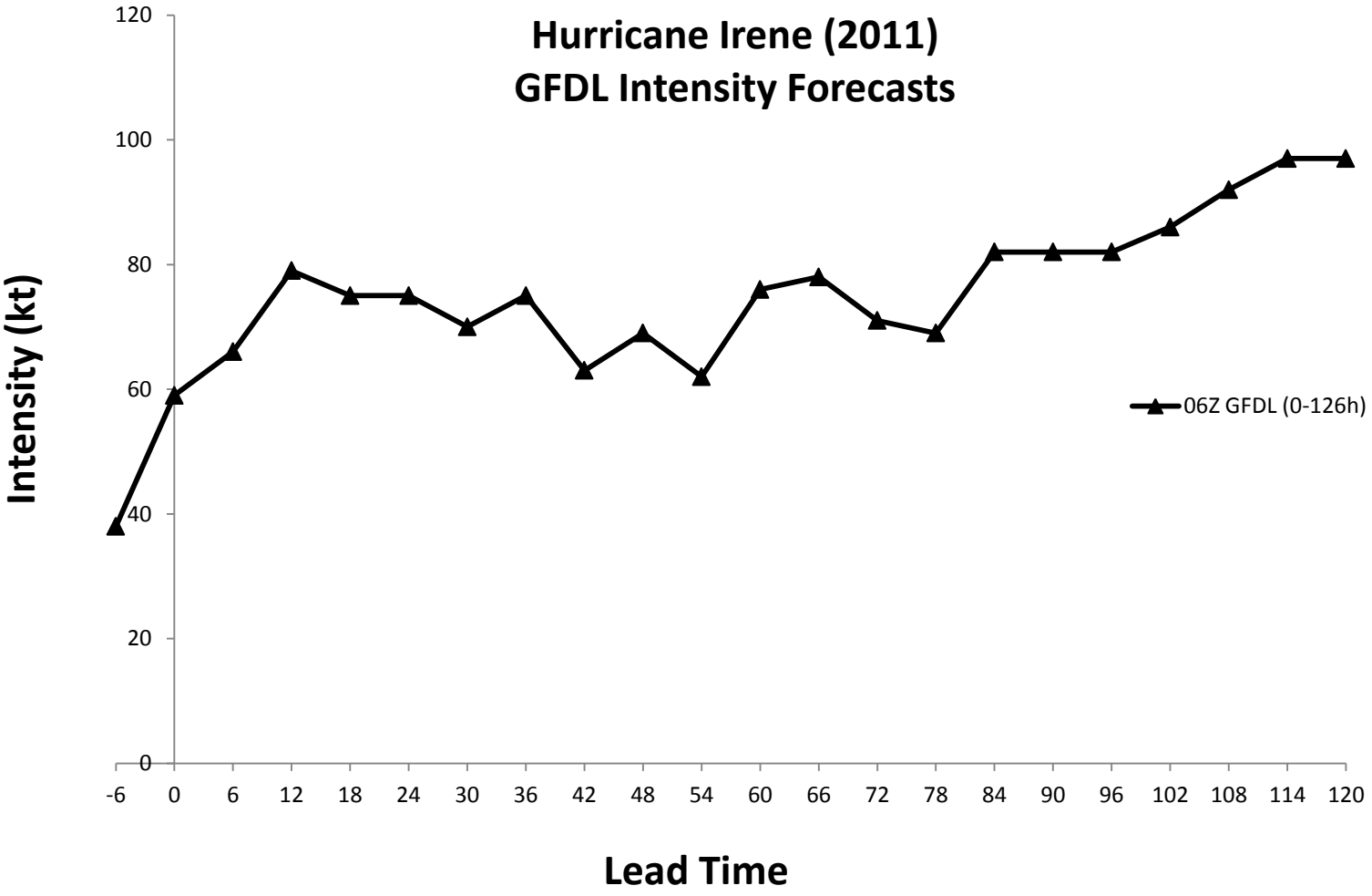
Late Model Conversion

Time-lagged & Adjusted Track Forecast



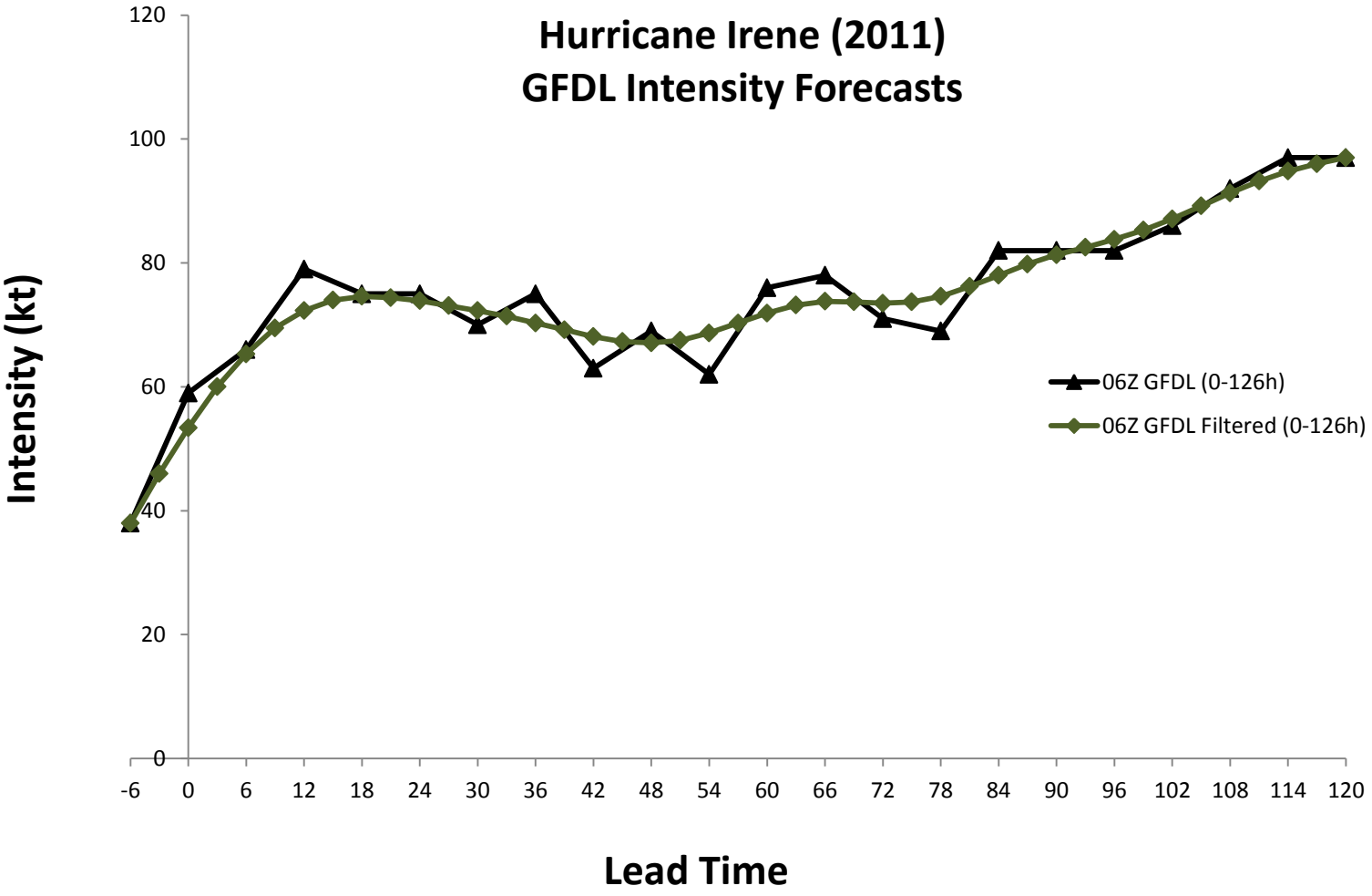
Late Model Conversion

Raw Intensity Forecast



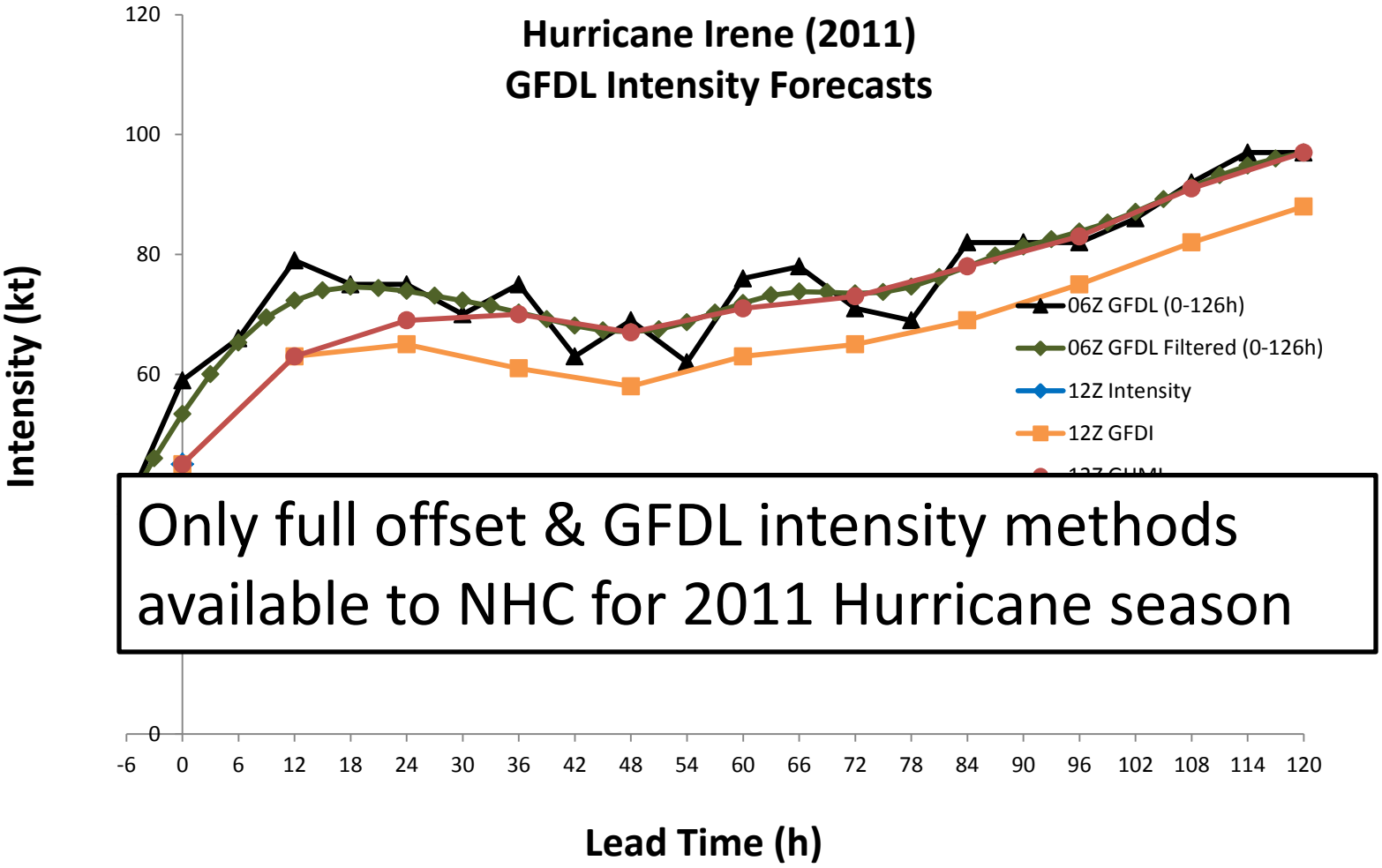
Late Model Conversion

Filtered Intensity Forecast



Late Model Conversion

Time-lagged & Adjusted Intensity Forecast

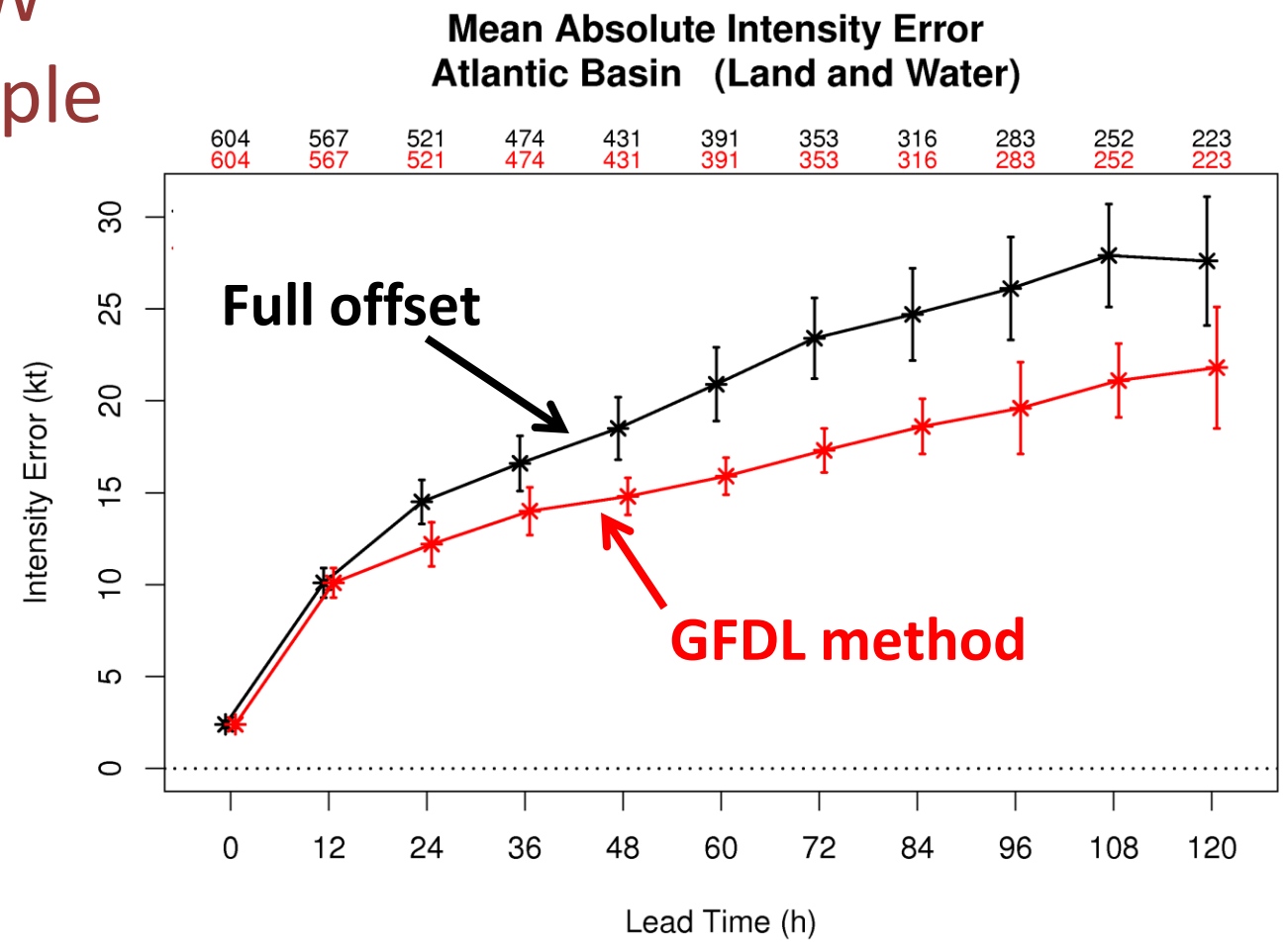


Only full offset & GFDL intensity methods available to NHC for 2011 Hurricane season

Late Model Conversion

Selection of Intensity Adjustment Method

AHW Example

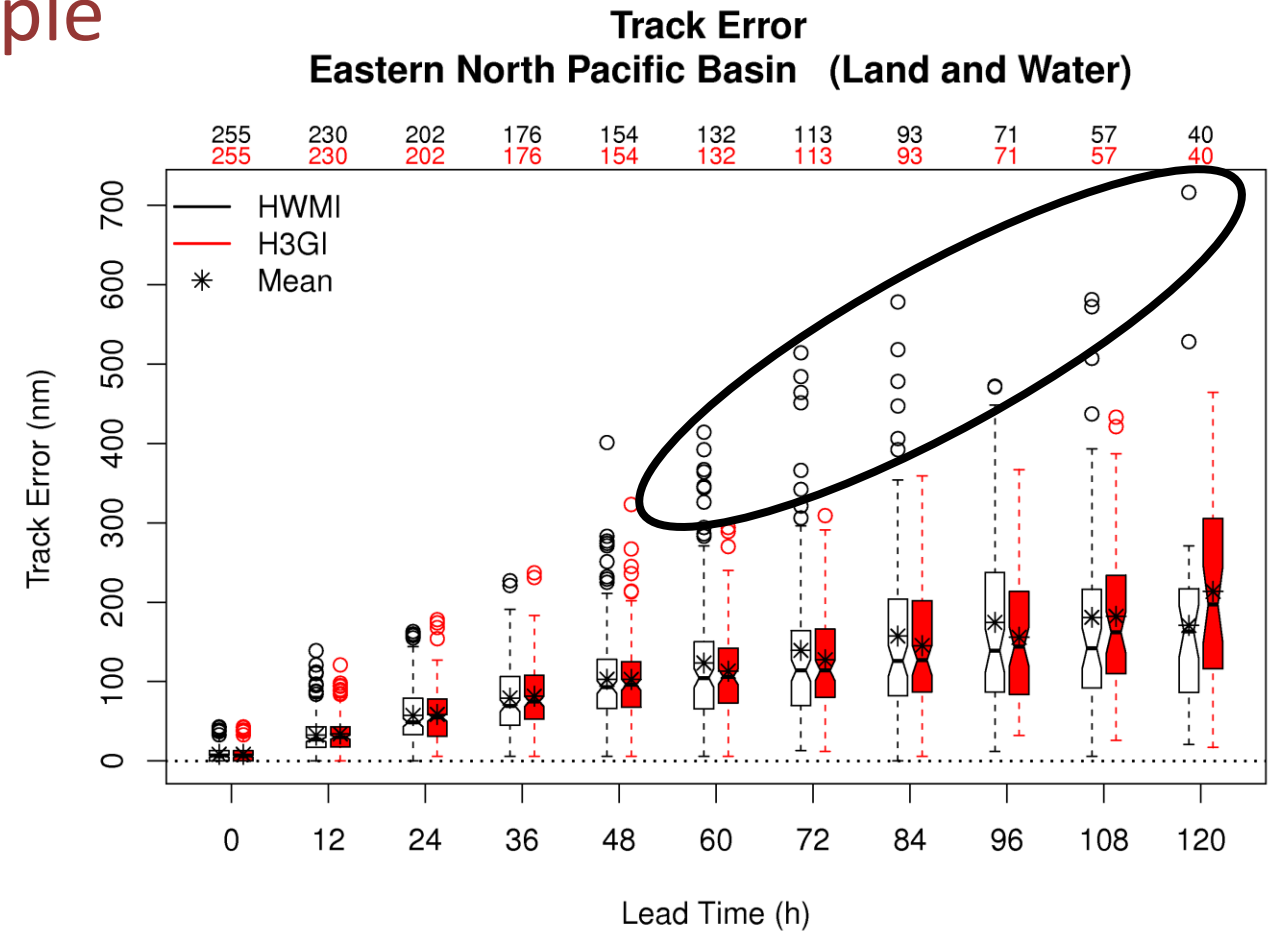


Sample results/display

Error Distributions

Box Plots

HWRF Example

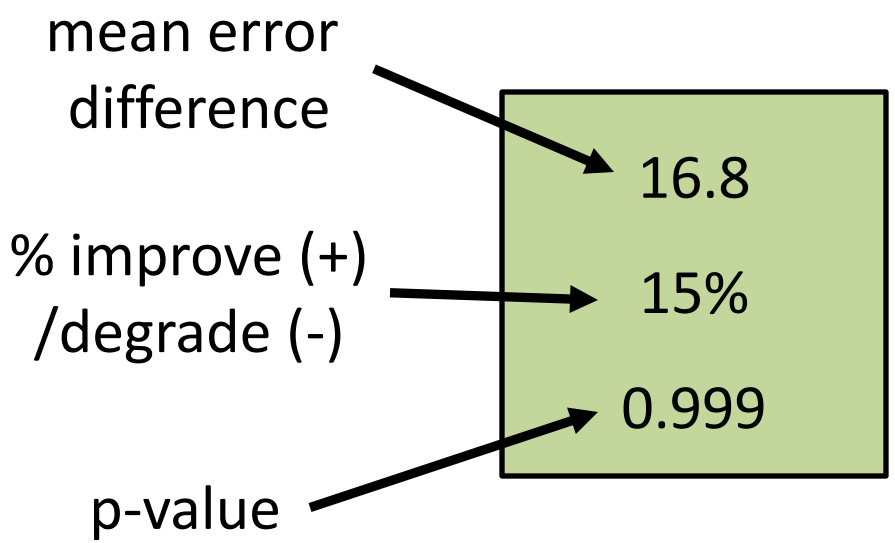


Stream 1.5 reduced # of cases w/ large track errors

Statistical Significance

Summary Tables

FIM Example



Practical Significance

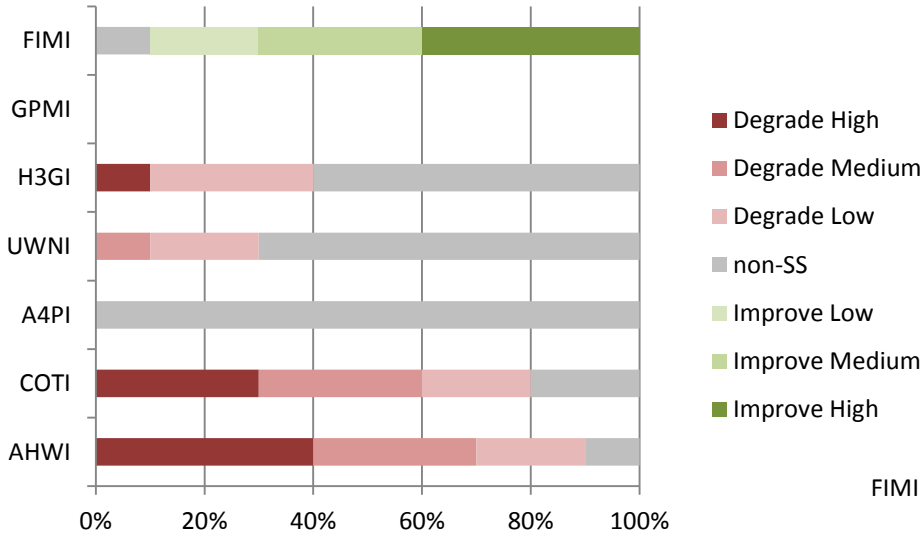
		Track	Intensity
SS differences		$\Delta < -20$	$\Delta < -2$
		$-20 < \Delta < -10$	$-2 < \Delta < -1$
		$-10 < \Delta < 0$	$-1 < \Delta < 0$
		$0 < \Delta < 10$	$0 < \Delta < 1$
		$10 < \Delta < 20$	$1 < \Delta < 2$
		$\Delta > 20$	$\Delta > 2$
Not SS		$\Delta < 0$	$\Delta < 0$
		$\Delta > 0$	$\Delta > 0$

Forecast hour	0	12	24	36	48	60	72	84	96	108	120
GFSI Track	0.0 0% -	4.5 13% 0.999	8.2 15% 0.999	11.1 15% 0.999	13.4 14% 0.998	16.8 15% 0.999	21.3 16% 0.999	24.0 15% 0.999	25.9 14% 0.998	28.7 14% 0.989	34.9 14% 0.897
LGEM Intensity	0.0 0% -	-0.6 -7% 0.865	-1.4 -12% 0.994	-2.0 -14% 0.995	-3.6 -25% 0.999	-4.9 -32% 0.999	-6.3 -40% 0.999	-6.7 -42% 0.999	-8.5 -53% 0.999	-10.0 -61% 0.999	-10.4 -60% 0.999

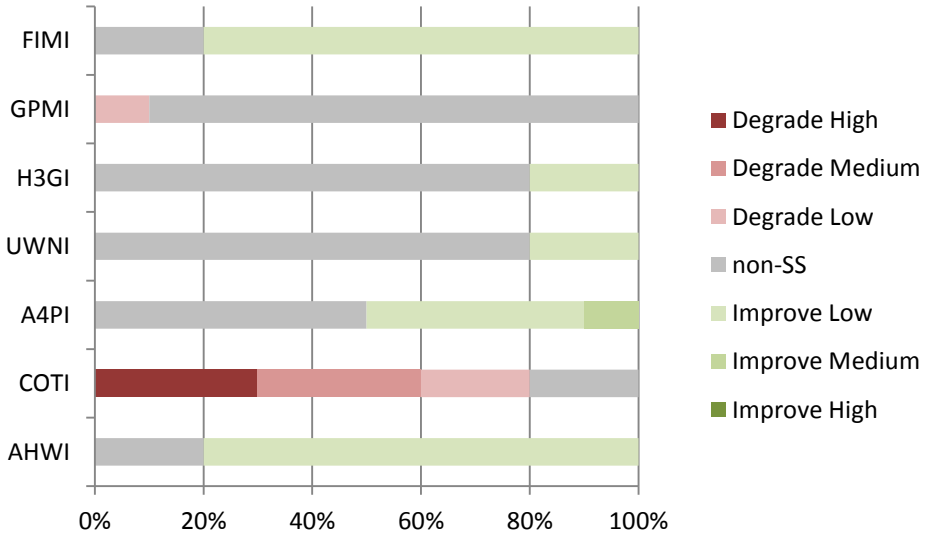
Statistically Significant Differences

Track Summary

GFS Baseline

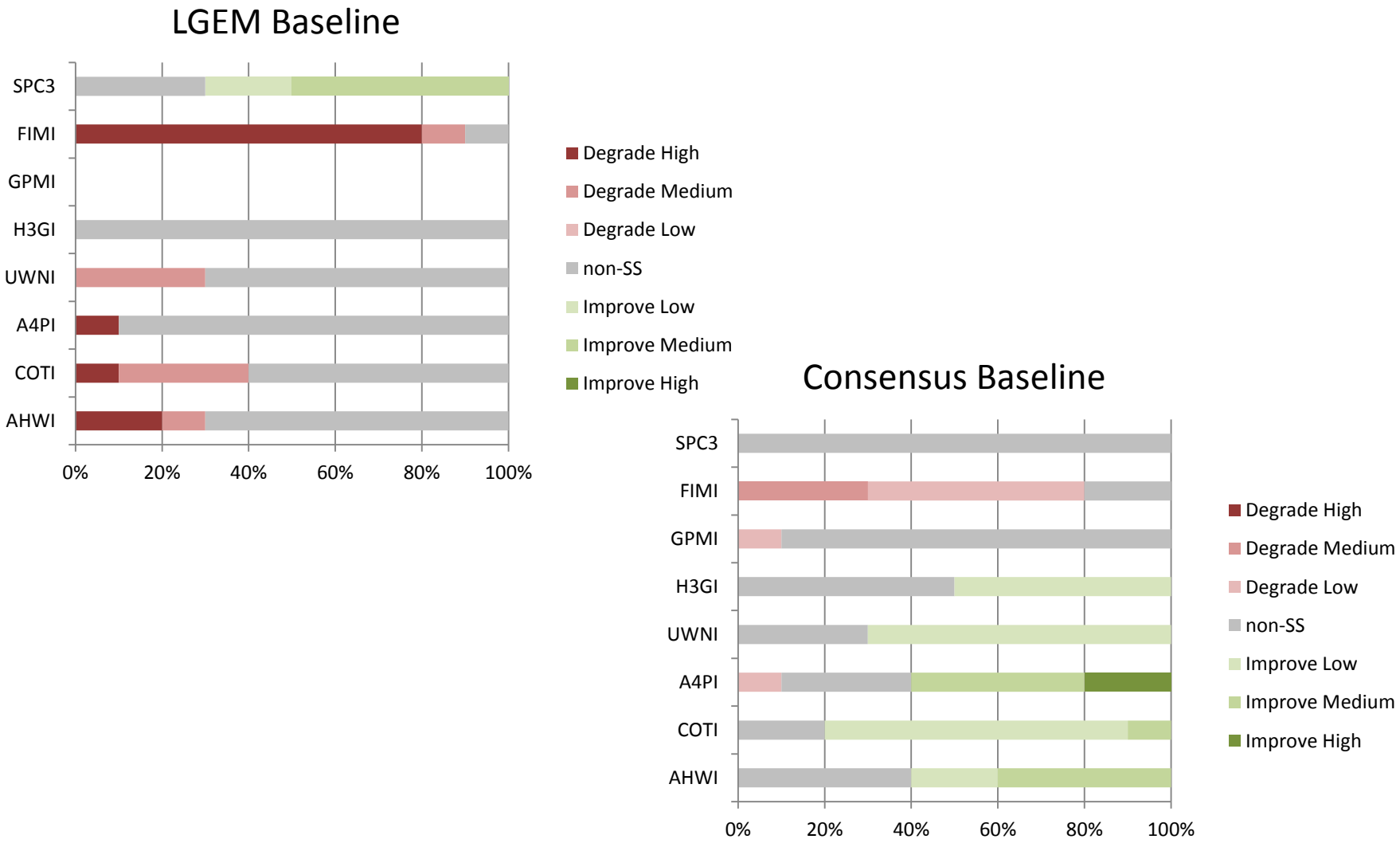


Consensus Baseline



Statistically Significant Differences

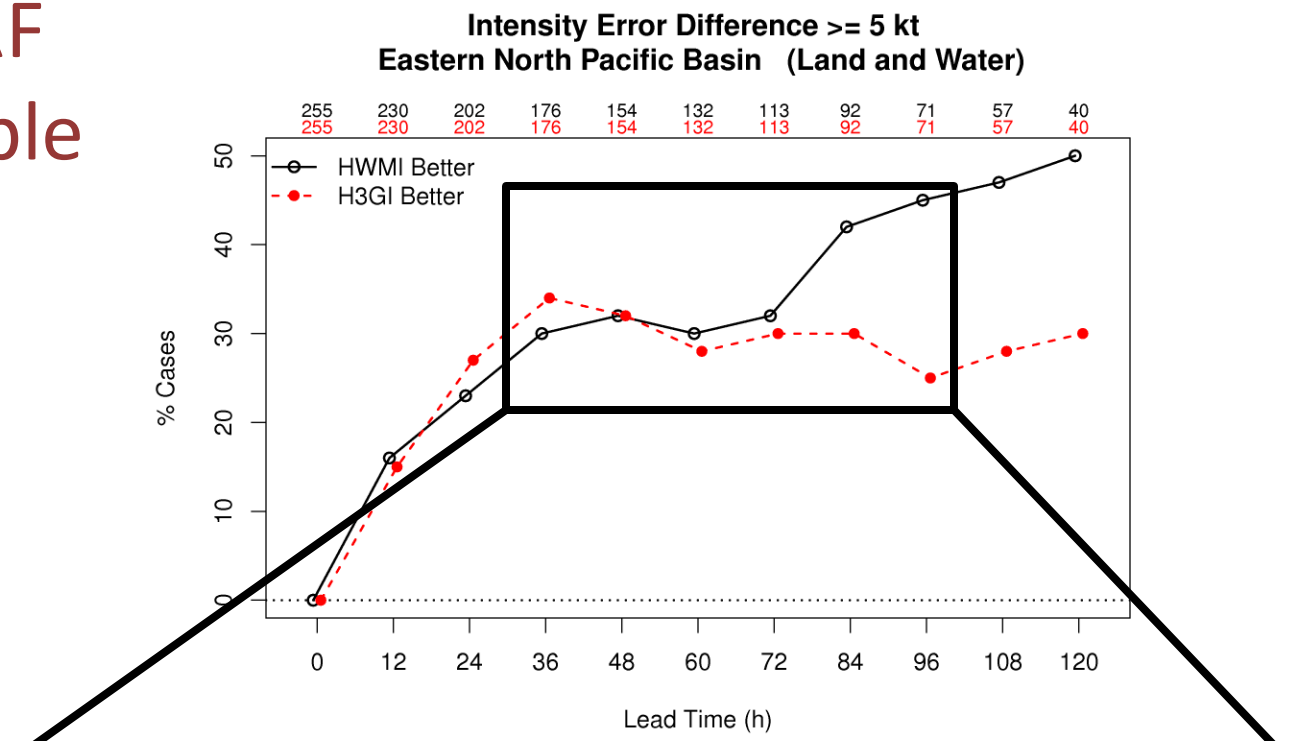
Intensity Summary



Tails of Error Distributions

% cases exceeding threshold

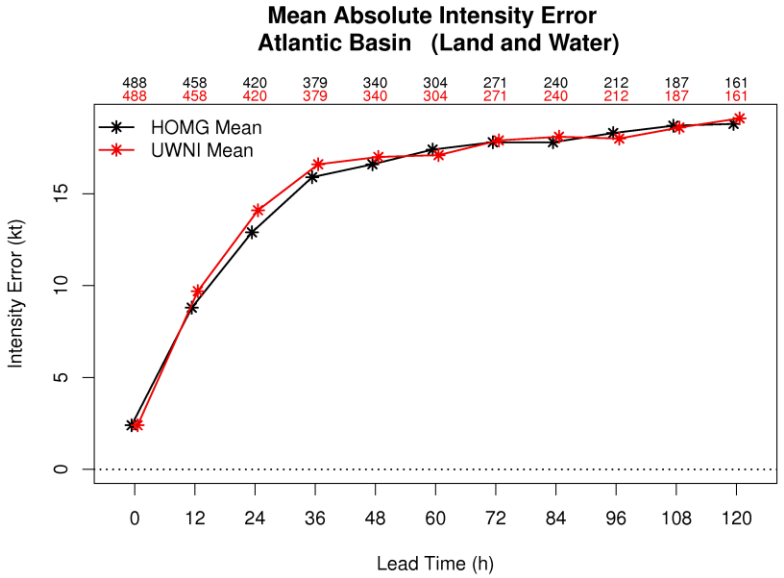
HWRF Example



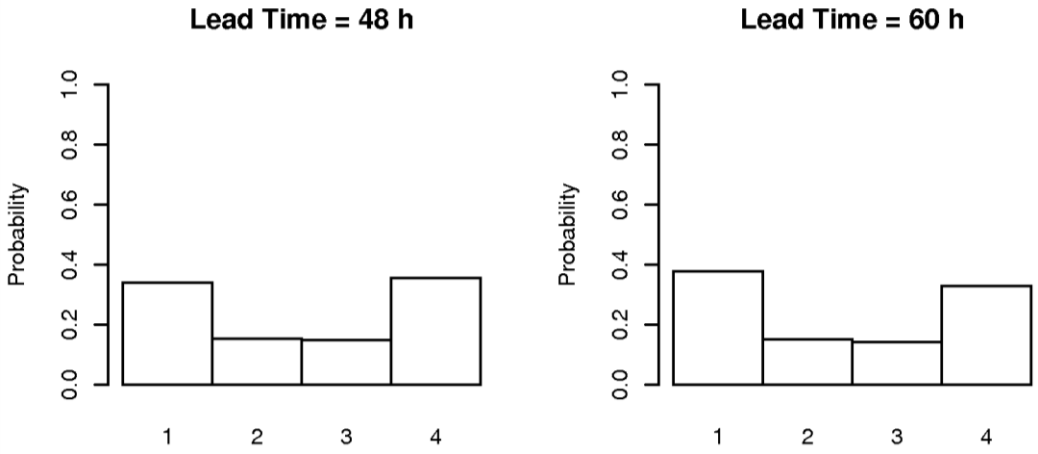
36	48	60	72	84	96
1.1	0.4	1.1	2.4	1.7	-1.0
6%	2%	5%	10%	7%	-4%
0.601	0.225	0.458	0.506	0.336	0.230

Top Flight Model Comparison

UW-NMS Example



Average Errors



Rank

Limitations/Missing Components

- TCMT tools for consensus do not mirror NHC types
  - Fixed – totally missing
  - Variable – does not strictly match
- Access to ECMWF data – impacts consensus and top-flight analysis
- Impact of multiple stream 1.5 models on consensus
- Intensity options available in NHC's interpolator / determination of optimal configuration for stream 1.5 candidates
- Ensemble metrics beyond looking at ensemble mean as deterministic forecast

Stream 1.5 timeline
2012 Hurricane Season

- 1 Dec 11: Disseminate test plan – detailed retrospective case info
- 15 Dec 11: Final list of Stream 1.5 participants & model characteristics
  - Dec-Apr: NHC, Vx team and TCMT discuss evaluation metrics for range of participants – key to quickly turning around analysis
- 2 Apr 12: Retrospective runs completed & data submitted to TCMT
- 9 Apr 12: Clean retrospective data sets finalized by candidates
  - 16-20 Apr: AMS Conference on Hurricanes & Tropical Meteorology
- 15 May 12: TCMT assessment of retrospective tests completed
- 15-31 May 12: Additional requested analysis
  - 29 May – 1 Jun: AMS NWP/WAF Conference
- 31 May 12: NHC decision on prospective projects
- 15 Jul 12: Shake down for real-time activities
- 1 Aug 12: Official start of 2012 Demo