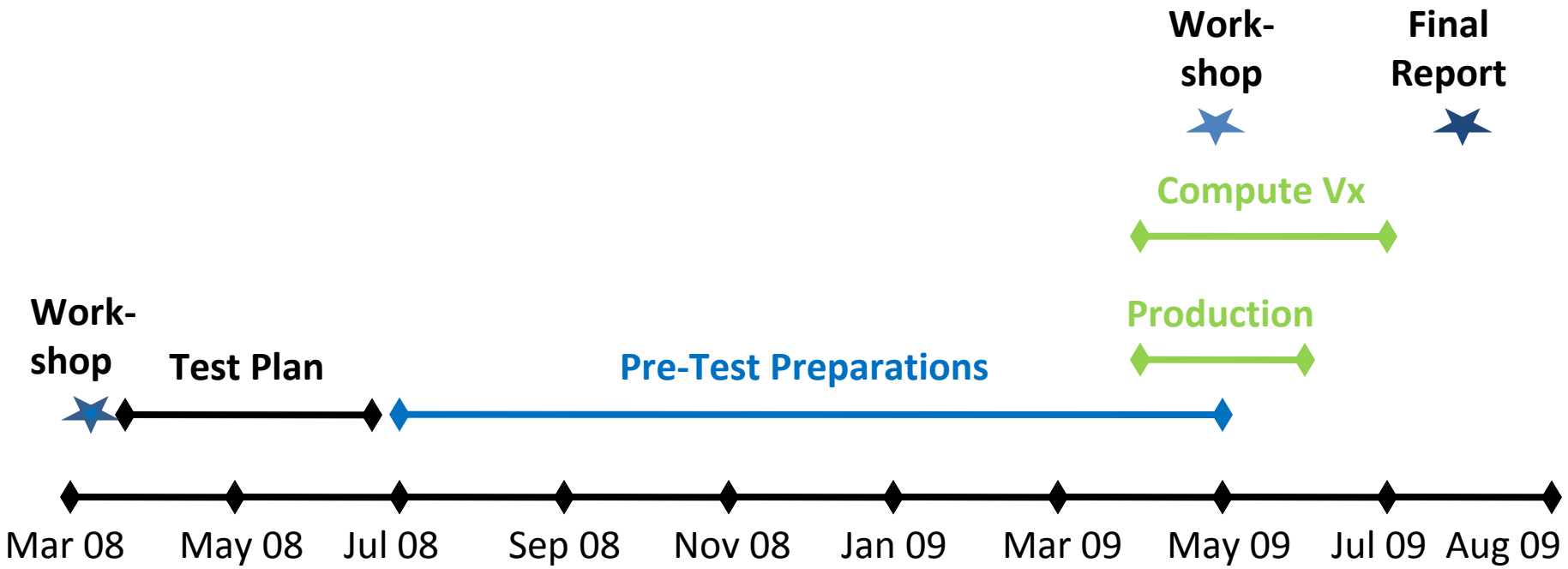
NOAA Hurricane Forecast Improvement Proj

High Resolution Hurricane Forecast Test

Goals:

- Evaluate the effect of increasing horizontal resolution within a given model configuration on hurricane intensity forecasts
- Provide a data set that can be used to explore the potential value of a multi-model ensemble for improving hurricane forecasts



DTC Evaluation Team

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Case Selection Team

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Modeling Groups

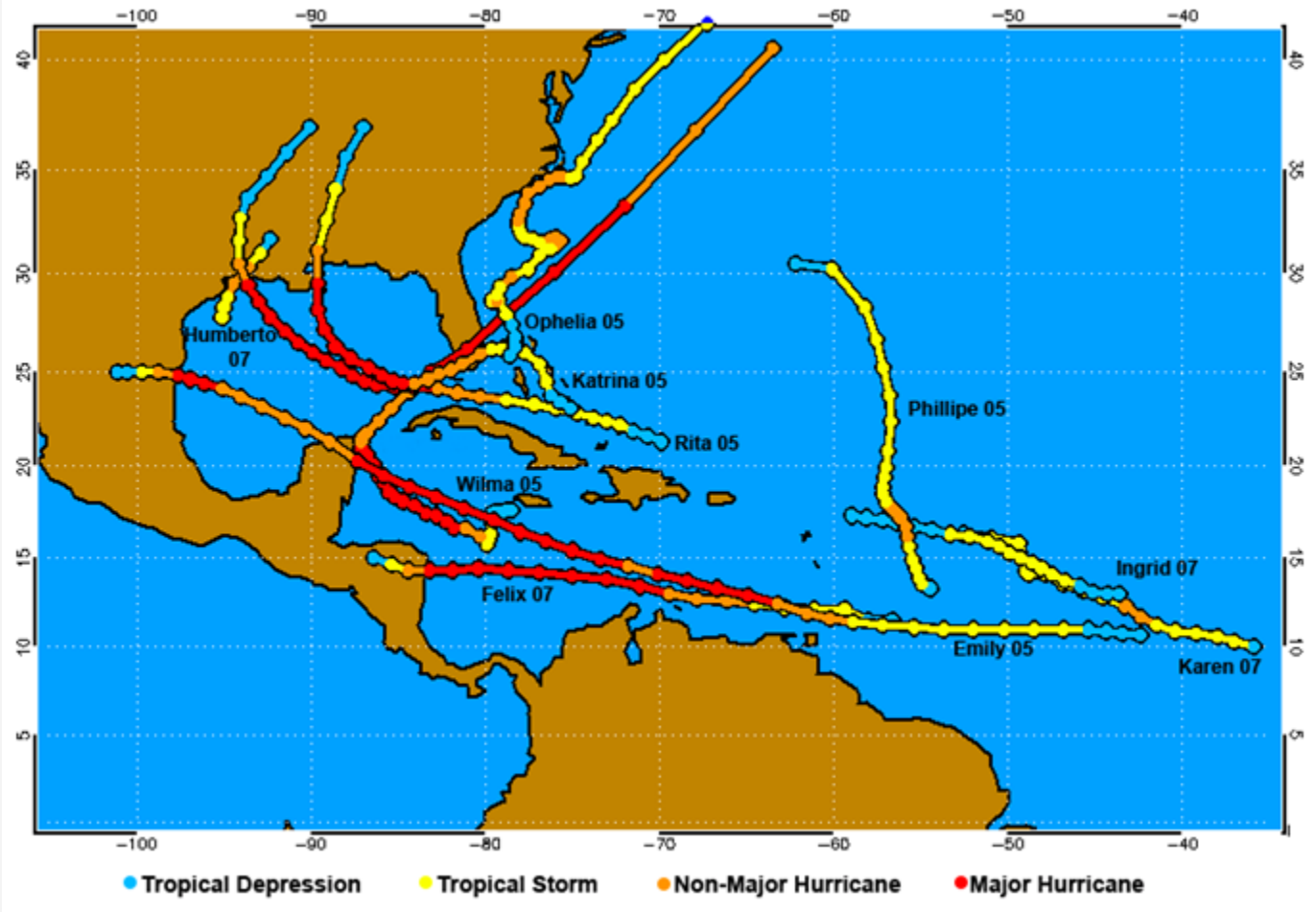
Institution	Model	Grid Spacing (km)			# of cases
		low	mid	high	
AOML	WRF-NMM	9	3	-	69
NCAR/MMM	Advanced Hurricane WRF (ARW)	12	-	1.3	69
NRL	COAMPS	9	3	-	57
PSU	WRF-ARW	13.5	4.5	1.5	9
University of Rhode Island	GFDL	9	6	-	69
U of Wisconsin – Madison	UW Non-hydrostatic Modeling System	12	3	-	15

HRH Test Cases

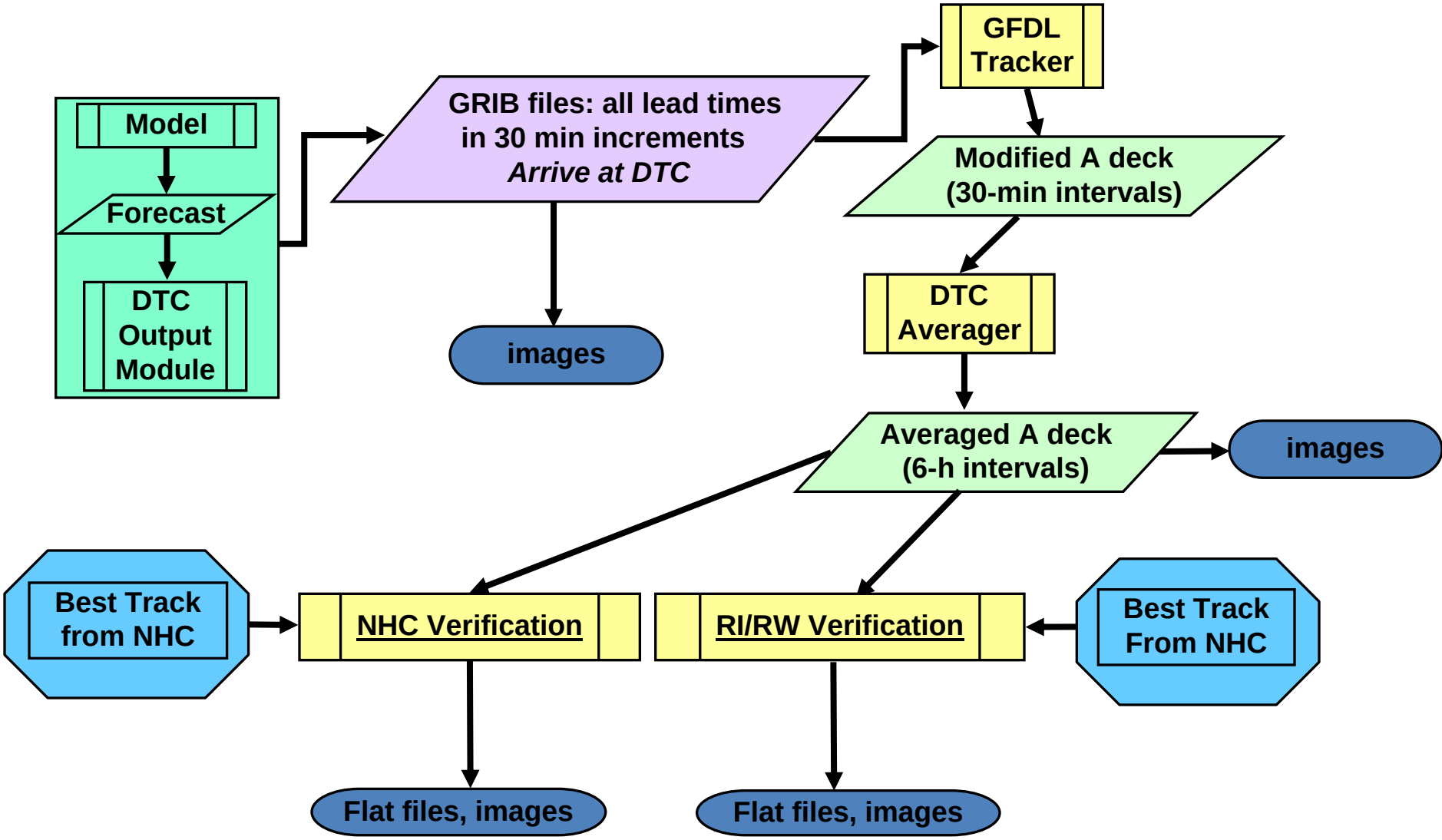
Criteria: diverse set of storms, as well as time periods for each storm

Ten storms from the 2005 & 2007 hurricane seasons

Number of cases: 69



DTC Evaluation System for HRH



Averager

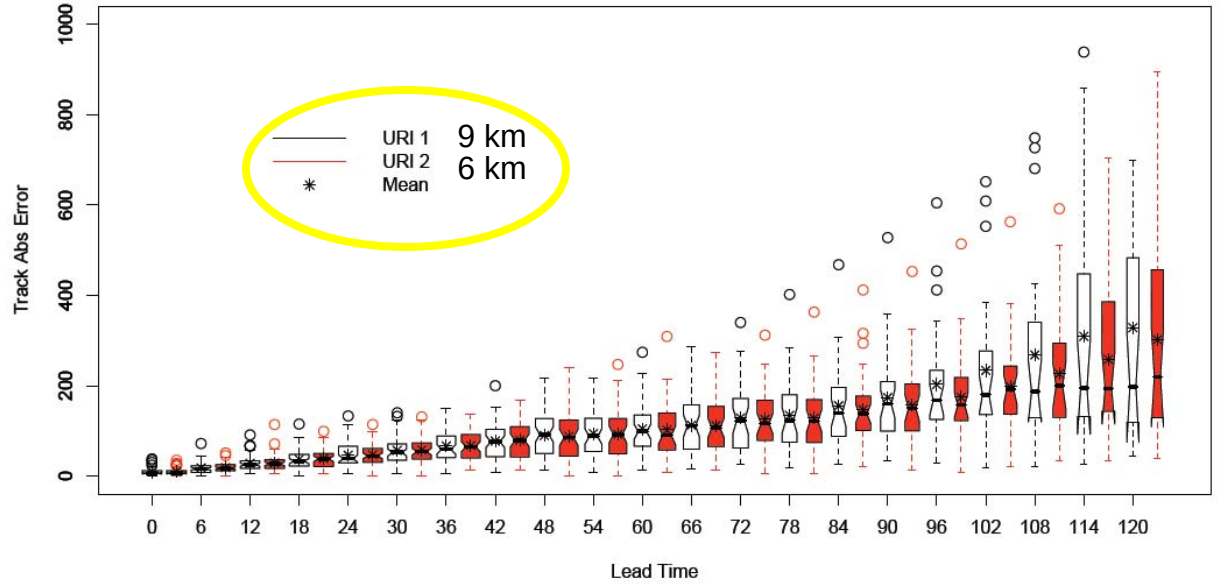
Issue: verify representative maximum wind (not instantaneous)

After discussions in entire HRH group, it was decided to:

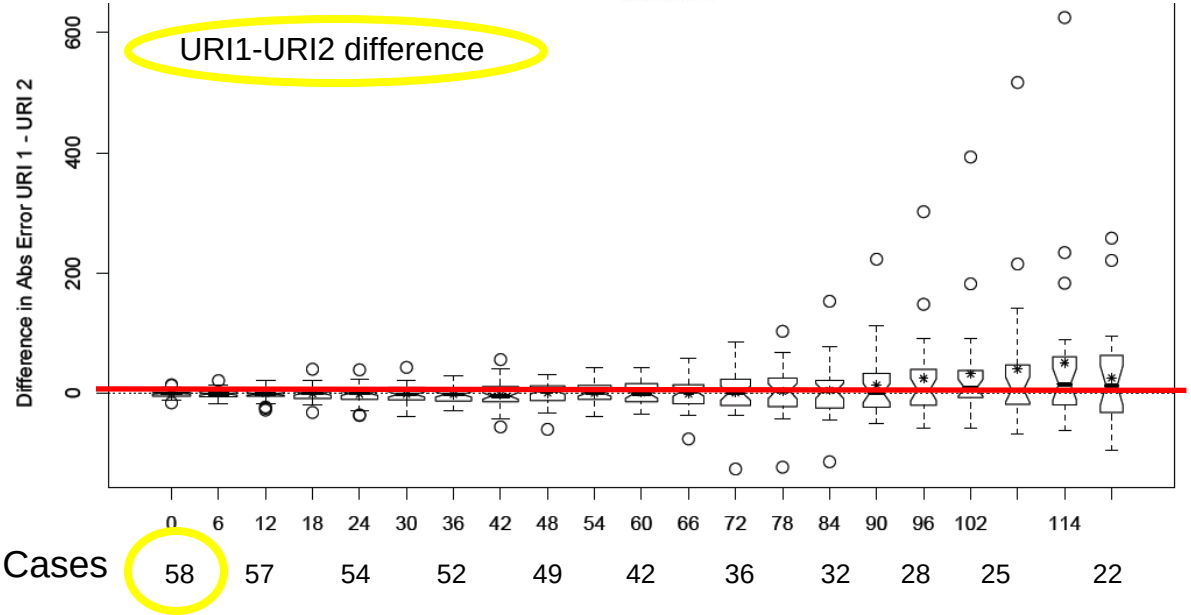
- Output forecasts every 30 minutes
- Run tracker every 30 minutes
- Compute a running mean of the max wind over a 2h window:

  $\mathbf{V_{mean}(t) = [V(t+60) + V(t-30) + V(t) + V(t+30) + V(t+60)] / 5}$
- Use $\mathbf{V_{mean}}$ for verification of maximum wind

GFDL model: Track error



Errors grow
Outliers present



No differences

Boxplot Description

Median: bold waist

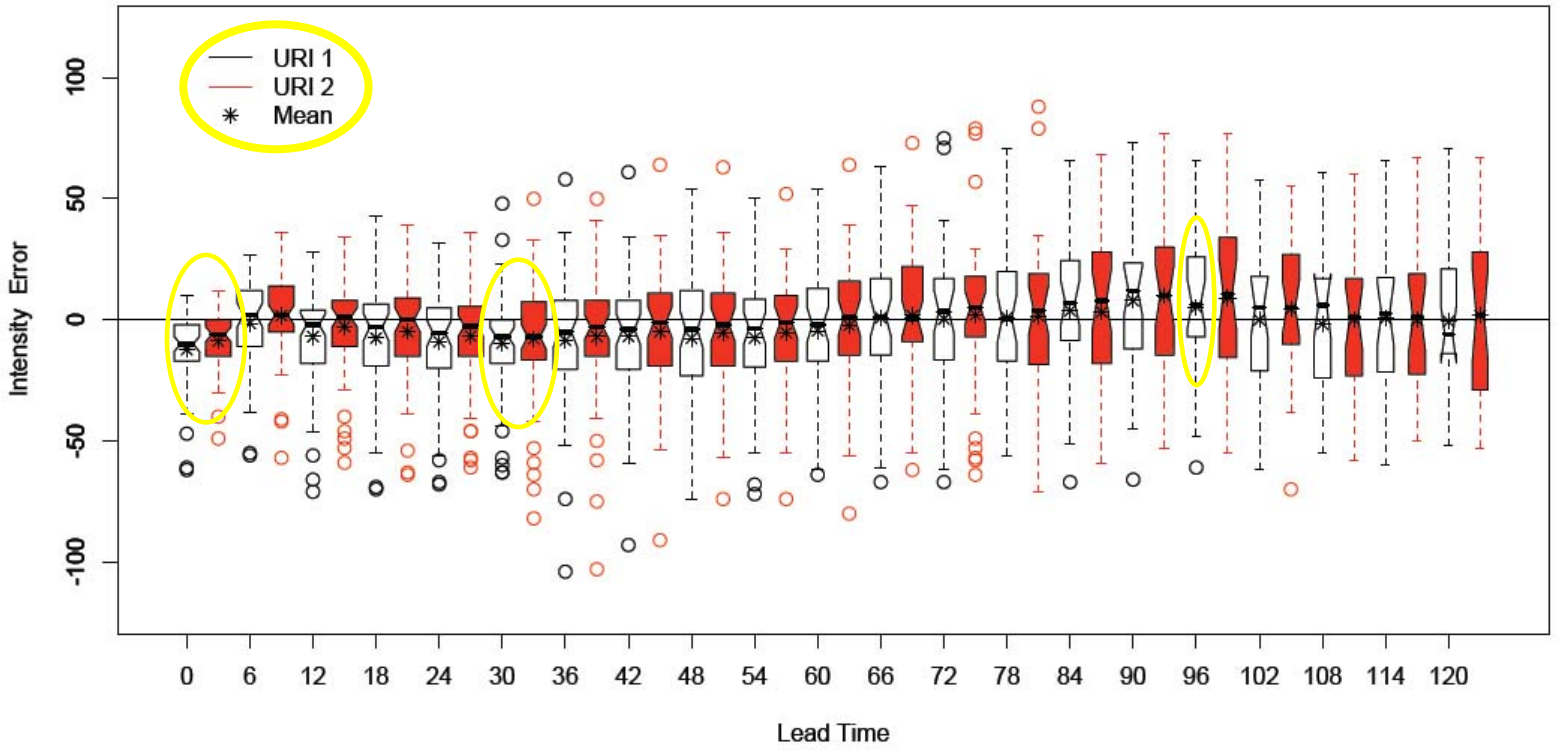
Mean: star

95% CI on median: notch

Sample size: width of box

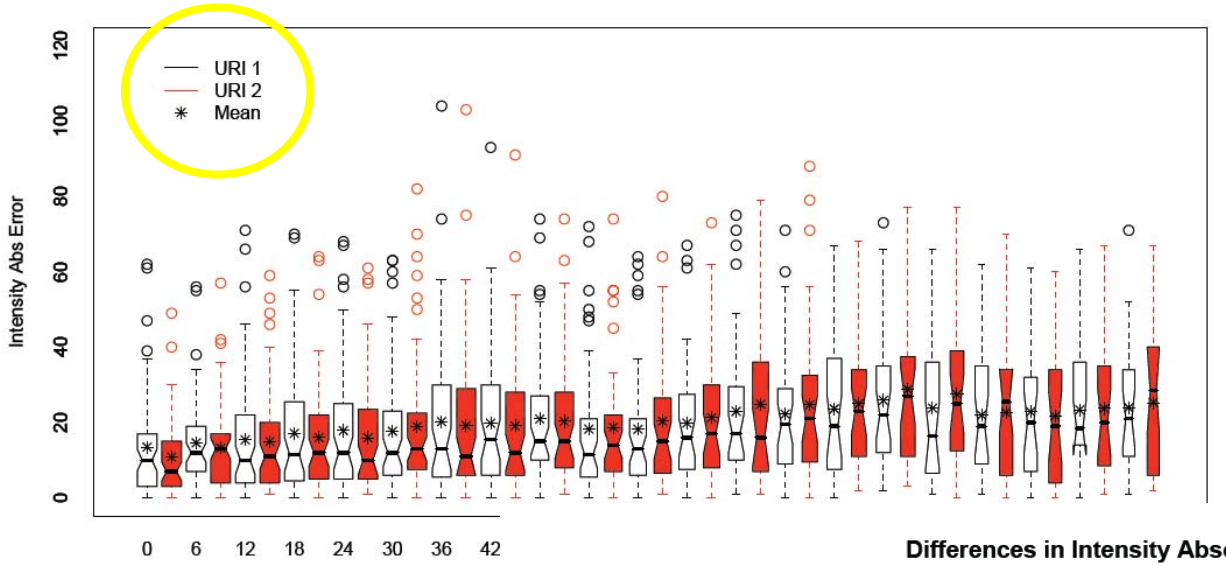
25% and 75% quartiles: bottom and top of box

GFDL model: Intensity error



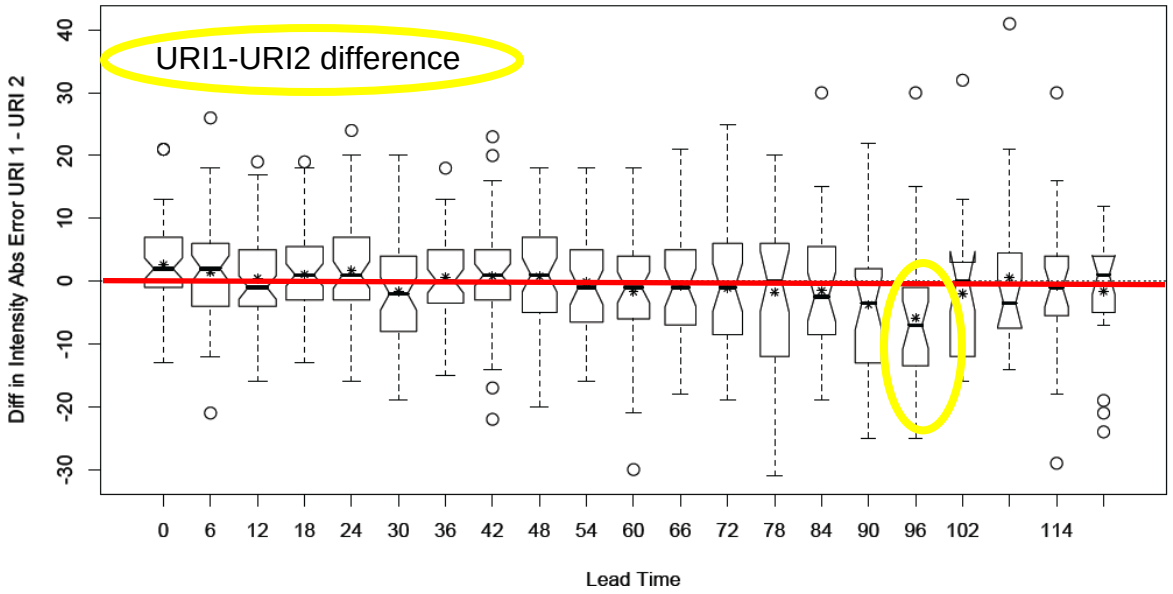
Systematic underprediction at lead times 0 and 30 h
Systematicoverpredictionat lead time 96 h

GFDL: Intensity absolute error



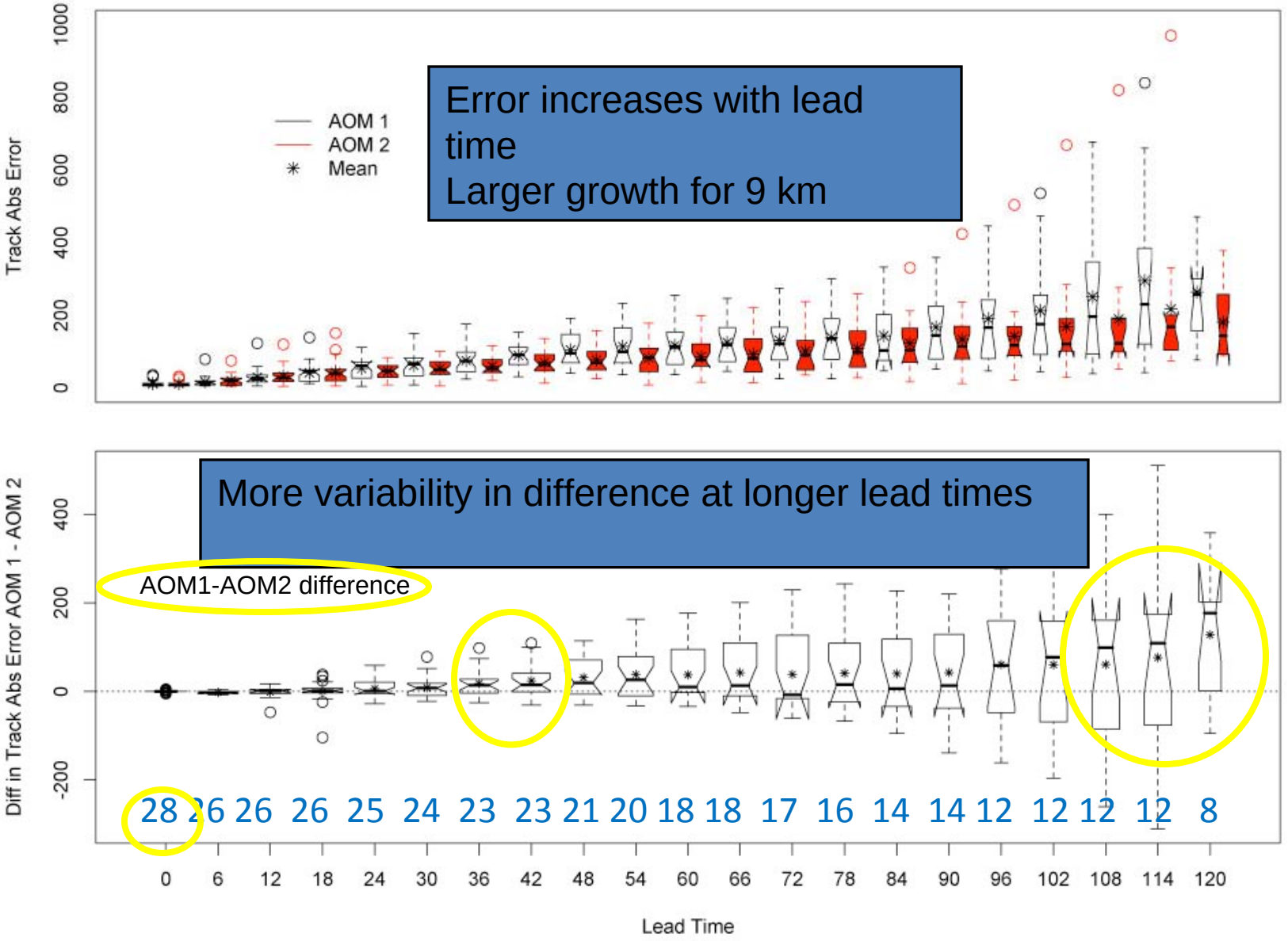
Small growth in time

More outliers at early lead times

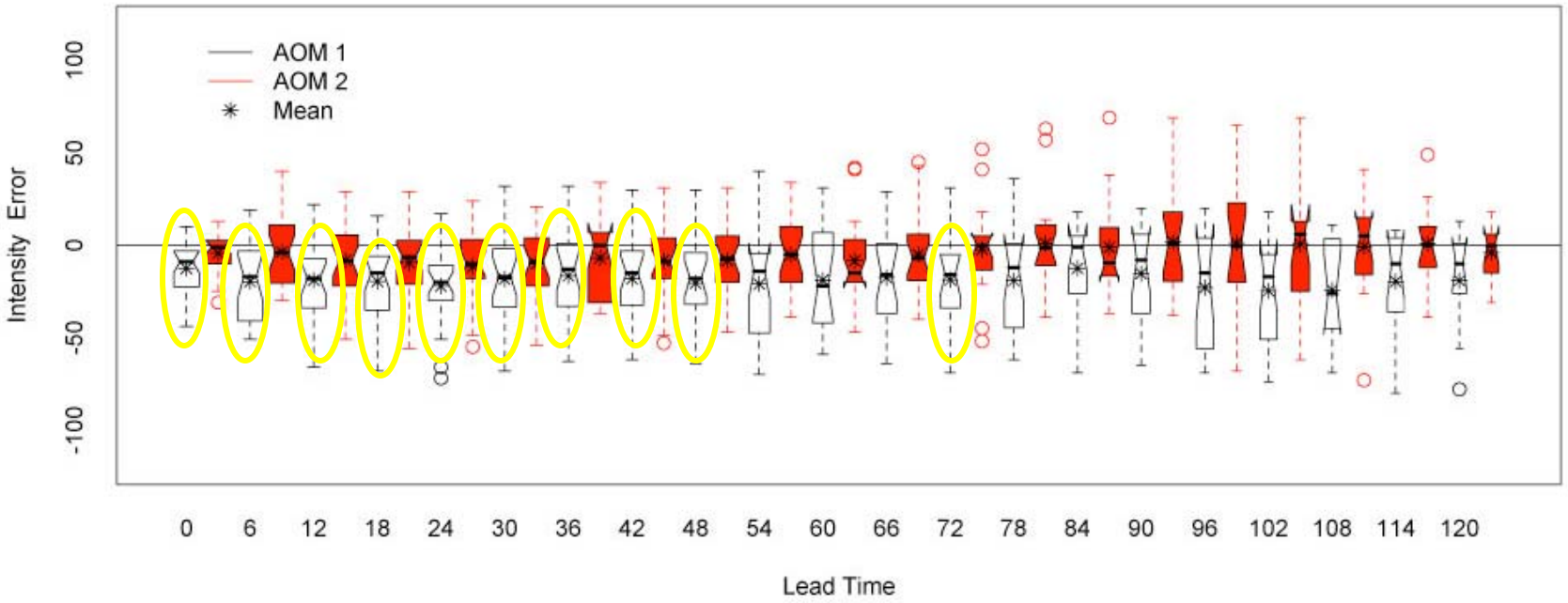


Only 1 SS difference
96 h low res better

Track Absolute Error - AOML

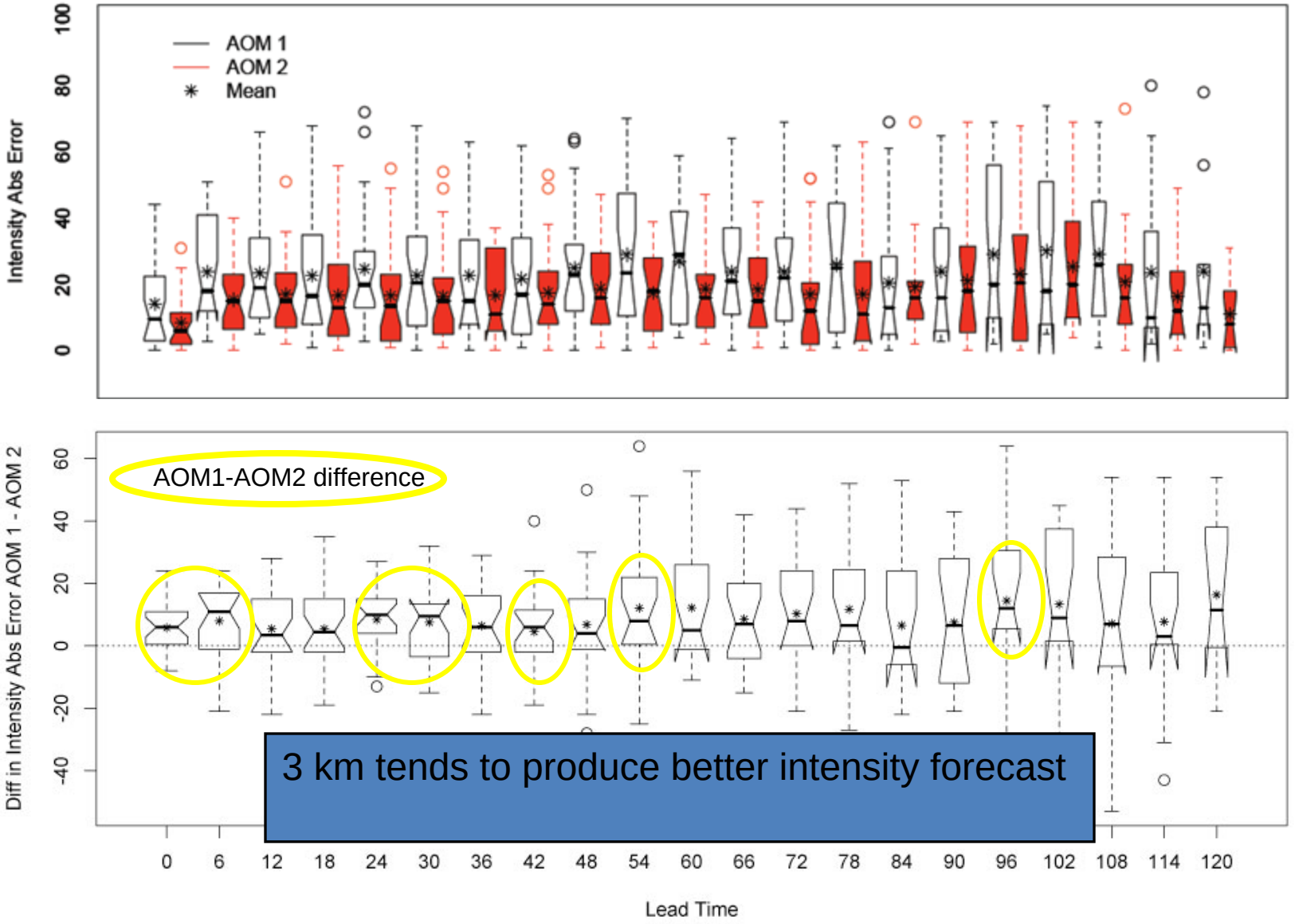


Intensity Error - AOML



9 km tends to under predict intensity
3 km exhibits less systematic error

Intensity Absolute Error - AOML



Overall Summary

Group	AOML	MMM	GFDL	PSU – not significant
Track Error	Improved	Slight degradation	No change	Improved / degraded
Intensity Error	Reduced systematic under prediction	Reduced systematic under prediction	No change	Reduced systematic under prediction
Absolute Intensity Error	Improved	No change	No change	Improved (1-3 days)
RI	Improved	Improved	No change	No change/ Improved
RW	No change	No change	Degradation	No change/ No change

Follow-up: extend analysis to all cases and compute additional verification measures