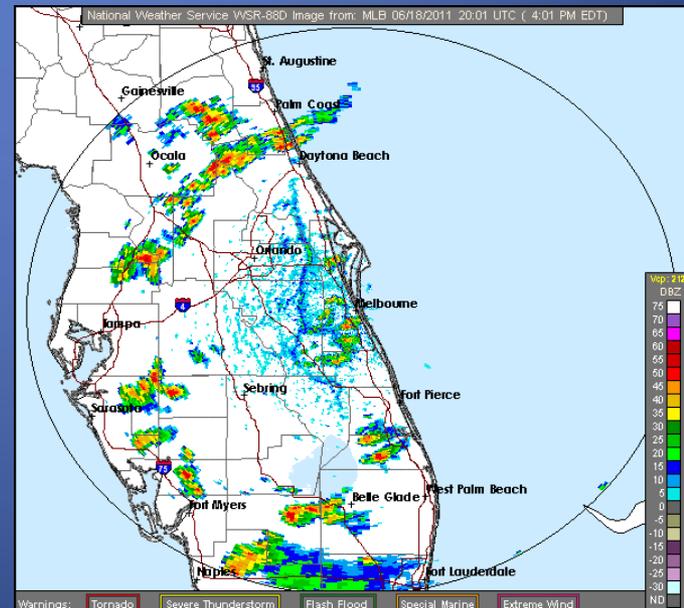
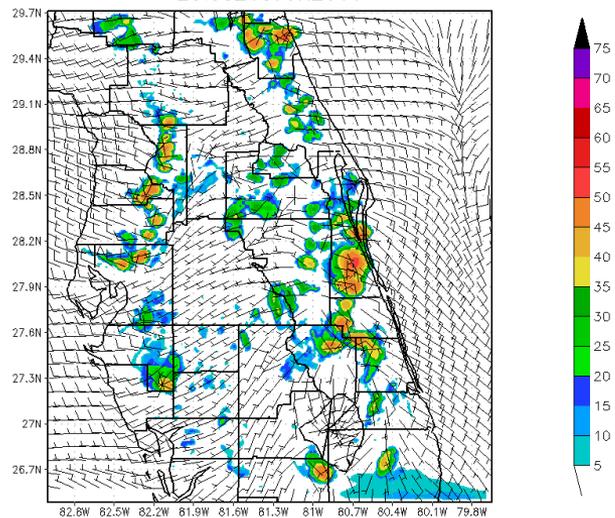


Forecasting Convection over East Central Florida Using Near-Storm Scale Numerical Models within a Frequent Cycling Strategy

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National Weather Service, Melbourne FL

Matthew Mahalik
The Pennsylvania State University, State College PA

1 km WRF-NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
20:05Z 18JUN2011



Constant forecast challenge during FL wet season:

Location, timing, and evolution of convection

along sea breezes and other boundaries in the short term (1-3 hours)

NCEP models better than ever, at increasingly higher resolutions and improved data assimilation:

12km NAM, 13km RUC, RR (~NOV 2011-NCEP), 3km HRRR (already available via ESRL, some fields through SRH)

QUESTION:

Could a locally configured near-storm scale model (~1km), configured with frequent cycling (refresh every hour), and 5 minute temporal depictions, assist short term forecasts and decision support activities?

Forecast programs relying on detailed short term information: *both spatially and temporally*

Short term forecasts; NOWcast, graphiccasts, blogs.

Aviation; TAFs, Airport Weather Warning (AWW).

Digital Forecast database (NDFD) maintenance.

Decision support services, EM community responsible for people in harms way.

Incident / Fire (Spot) forecast input.

Input for dispersion models (HySPLIT).

Trend towards “warn on forecast” methods.

Marine forecasts; warnings, potential input to wave models.

Experimental warning services/products; Lightning watch/warning, TRACON forecasts for climb/descent at area airports/spaceports

Local Model Configurations using the WRF-EMS

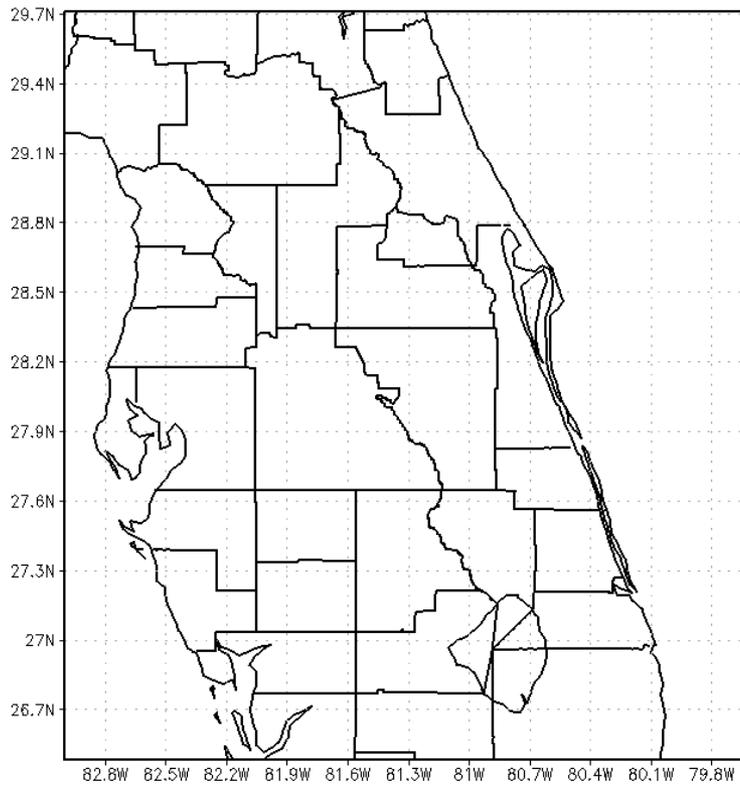
Core	NMM	ARW
Resolution	1km (1.4km diagonal)	1.4km
Levels	45	45
Domain	170 x 360 (61,200)	220 x 220 (48,400)
Initial conditions	RUCPtile SSTSPoRT	RUCPtile SSTSPoRT
recently using	SPoRT GVF	SPoRT GVF
Boundary conditions	RUCPtile	RUCPtile
Microphysics	Ferrier	Ferrier
PBL	Mellor-Yamada-Janjic	Yonsei
Radiation	GFDL short/long	Dudhia
History interval	5 minutes	5 minutes
Timestep	Auto_S (~3 seconds)	Auto_S (~7.5 seconds)

NASA SPoRT products can benefit local models; MODIS SST, LIS, GVF.....

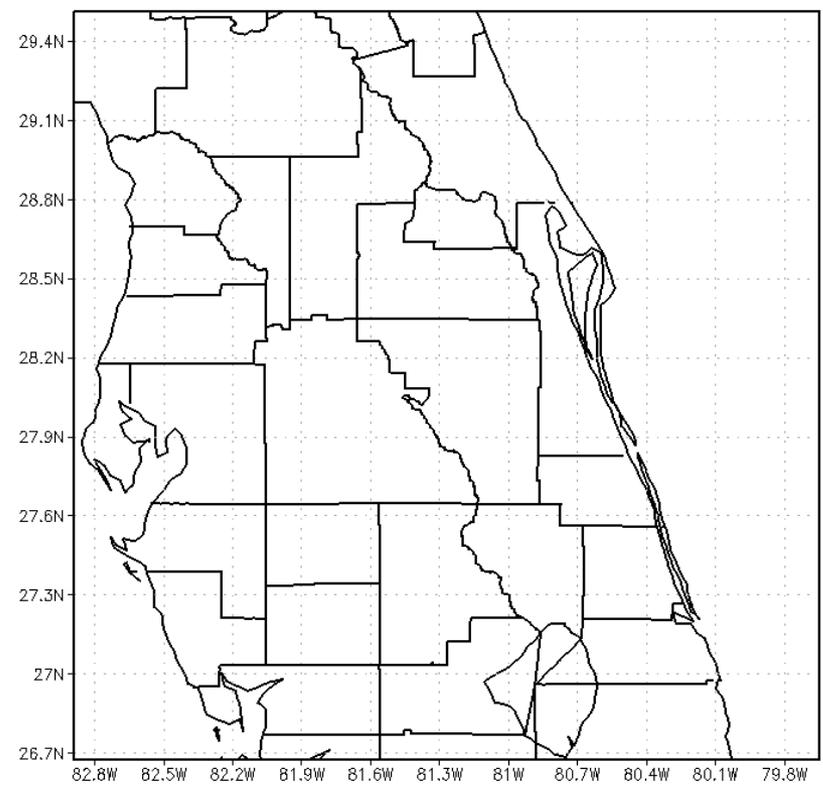
EMS domains

Center 28.1 N, 81.265 W

NMM



ARW



A model refresh strategy was created to provide hourly updates with simulations depicting near-storm scale structure and evolution....

Hour 1 of the RUC was used for IC/BC, EMS config: INITFH = 01

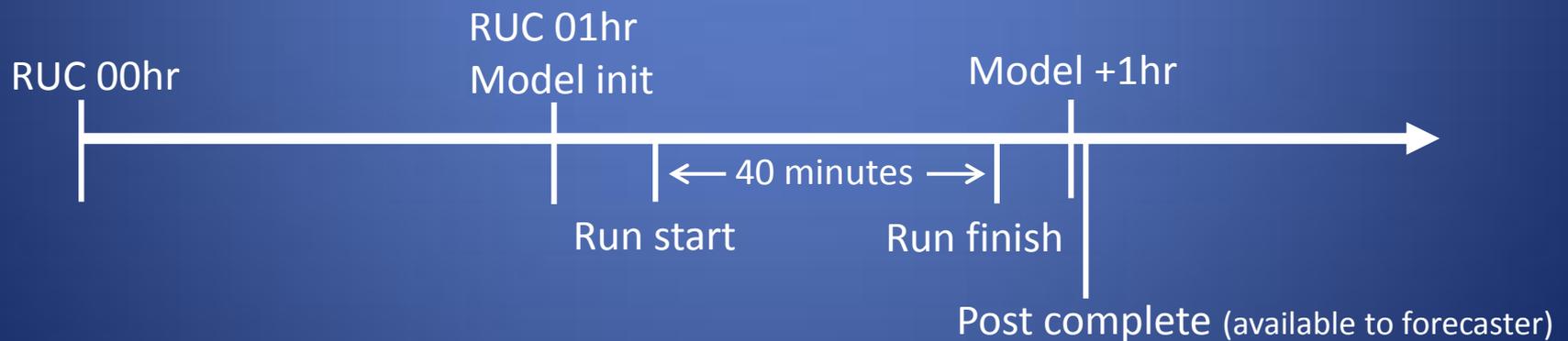
RUC BC every hour, EMS config: BCFREQ = 01

Model simulation out through 4 hours, EMS config: LENGTH = 04

Cycle starts 12 minutes past hour, allows time for availability of RUC

Graphics generation from model simulation hour 1 through hour 4 (3 hours)
Skipping 1st hour of graphics presentation is 'past cast' and gives time for model to spin-up convection

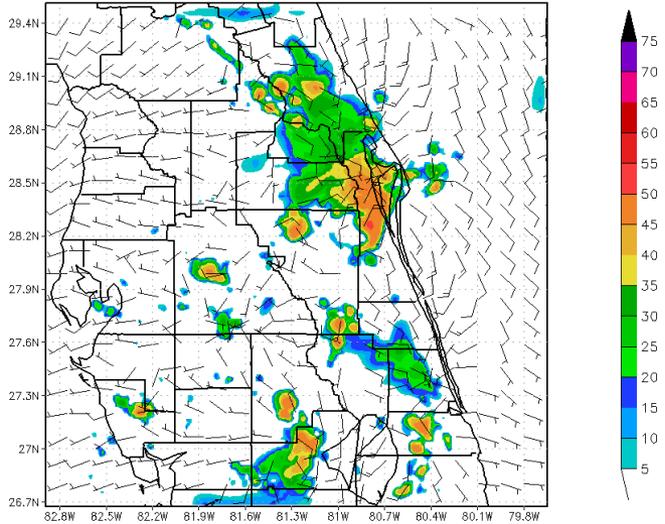
Digital Filter Initialization (DFI) proved to be too computationally taxing. The unseen 1st hour of the model run mitigated some convective spin-up issues.



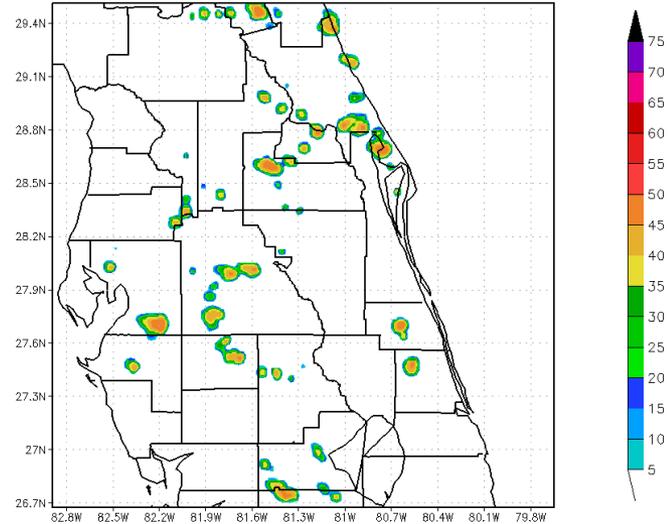
Over 900 model runs since mid June, over 160,000 individual images

Graphic production (GrADS)

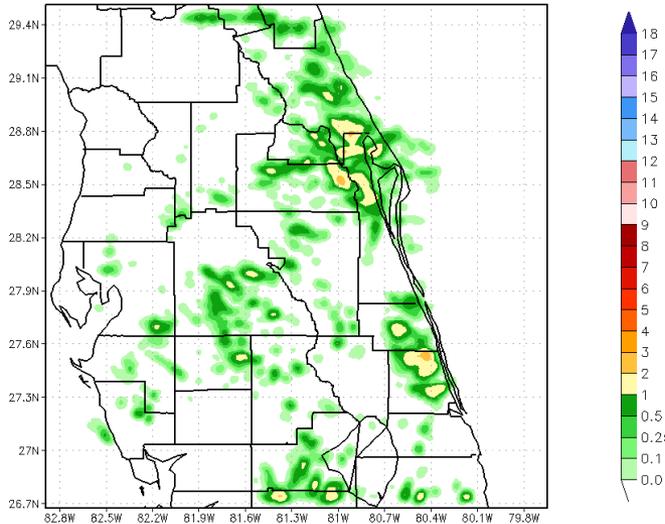
1.4 km WRF-ARW Composite Radar Reflectivity and 10 Meter Winds (knots)
21:45Z 14JUL2011



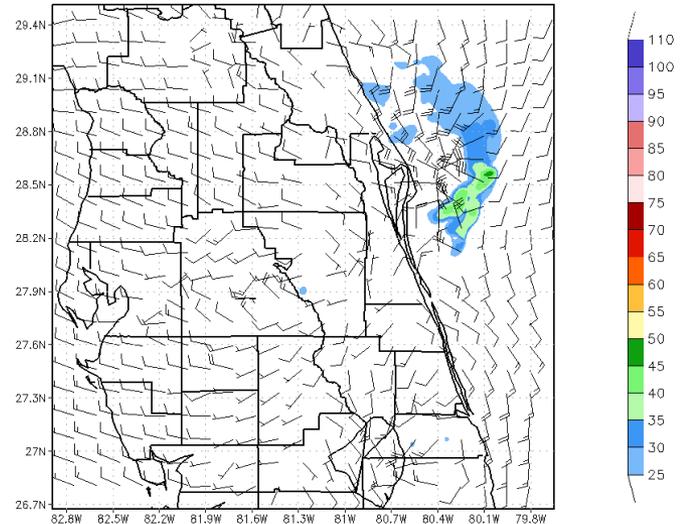
1.4 km WRF-ARW Reflectivity at -10C (~500mb)
19:05Z 14JUL2011



1.4 km WRF-ARW Accumulated Precipitation
21:45Z 14JUL2011



1.4 km WRF-ARW Max 10m Wind Speed and 10 Meter Winds (knots)
21:30Z 15AUG2011

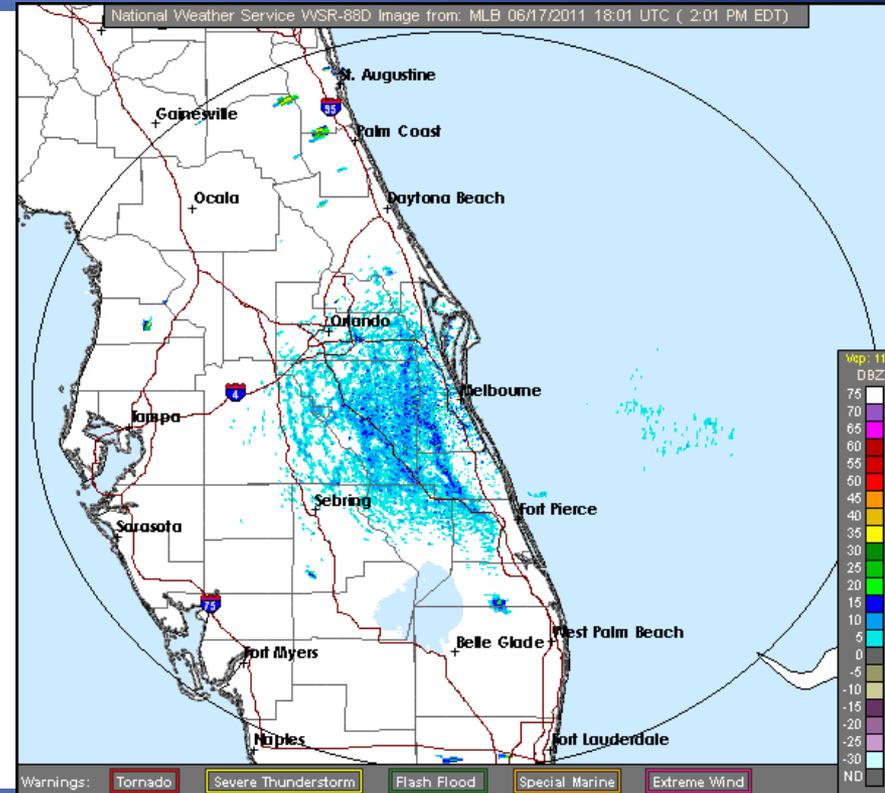
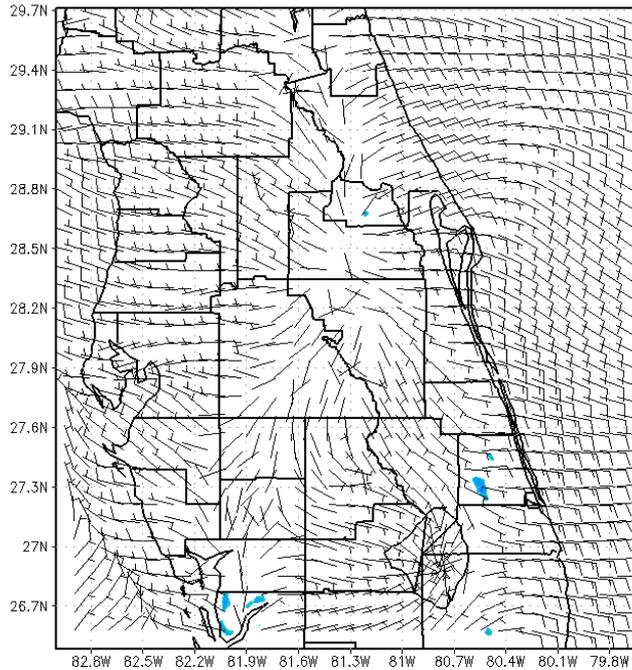


Example NMM run:

17z Run, 1 (0) hour fcst
18z

Verification 1801z

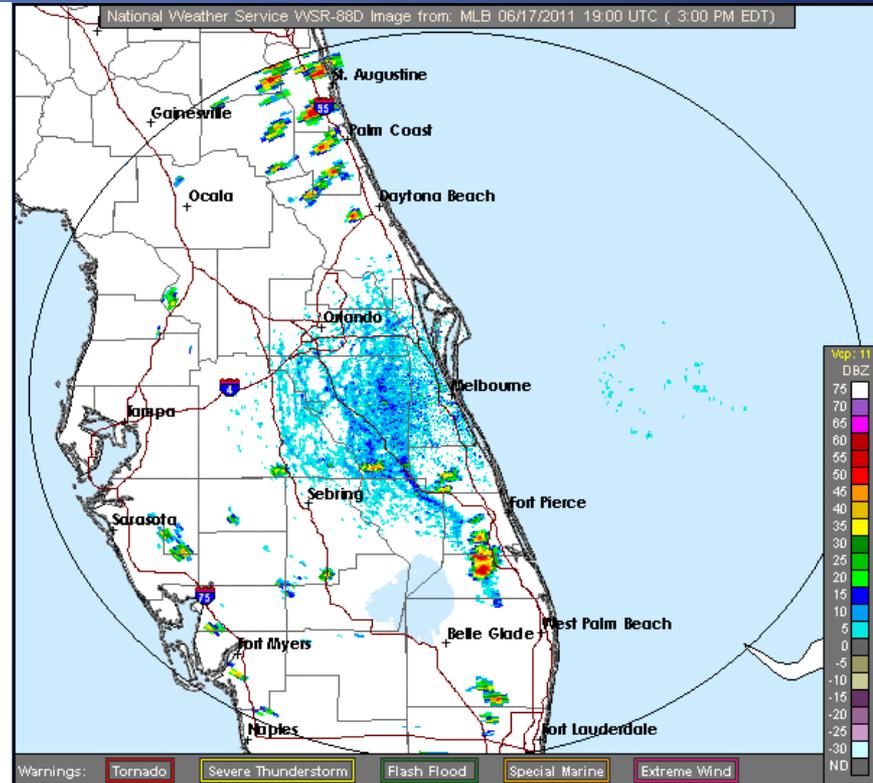
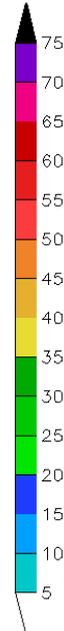
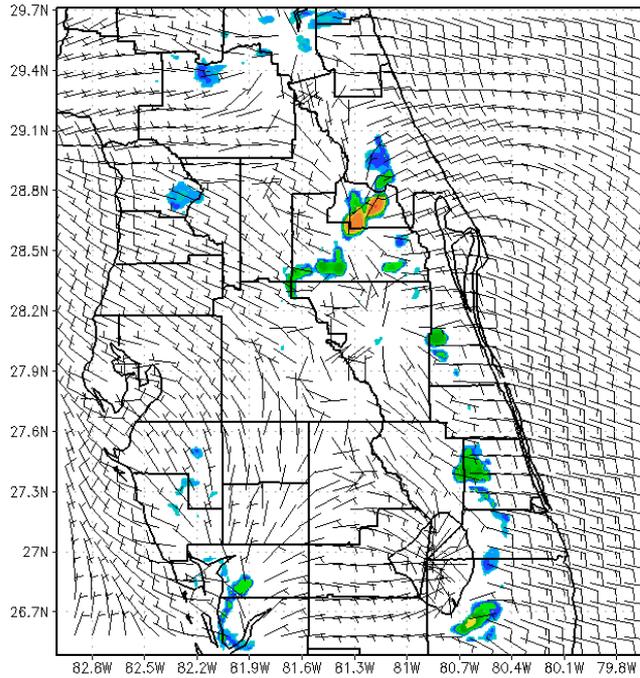
1 km WRF-NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
18Z17JUN2011



17z Run, 2 (1) hour fcst
19z

Verification 19z

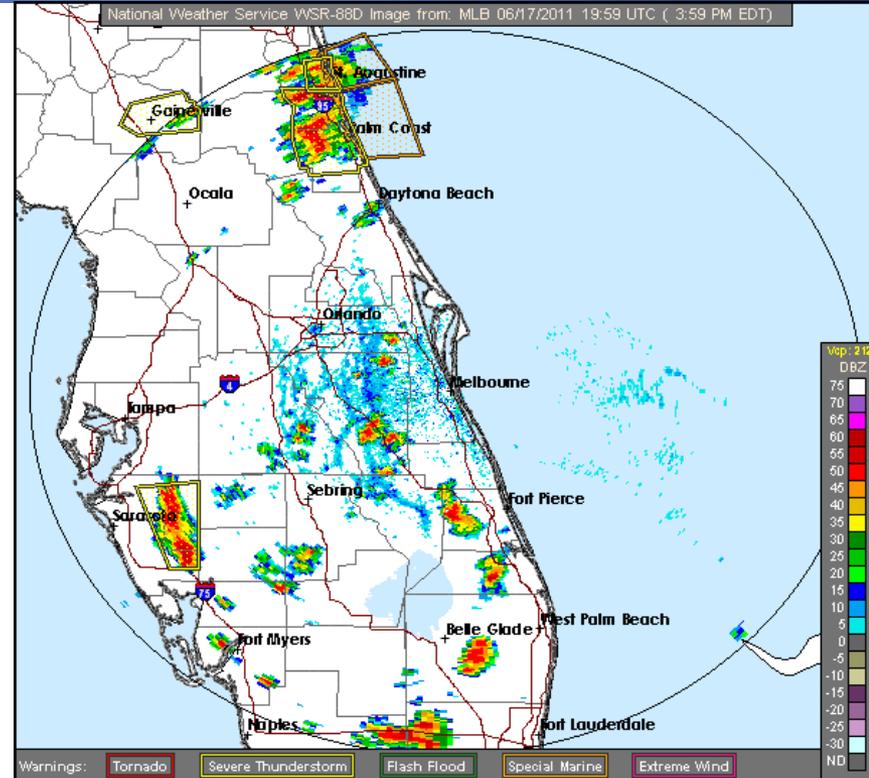
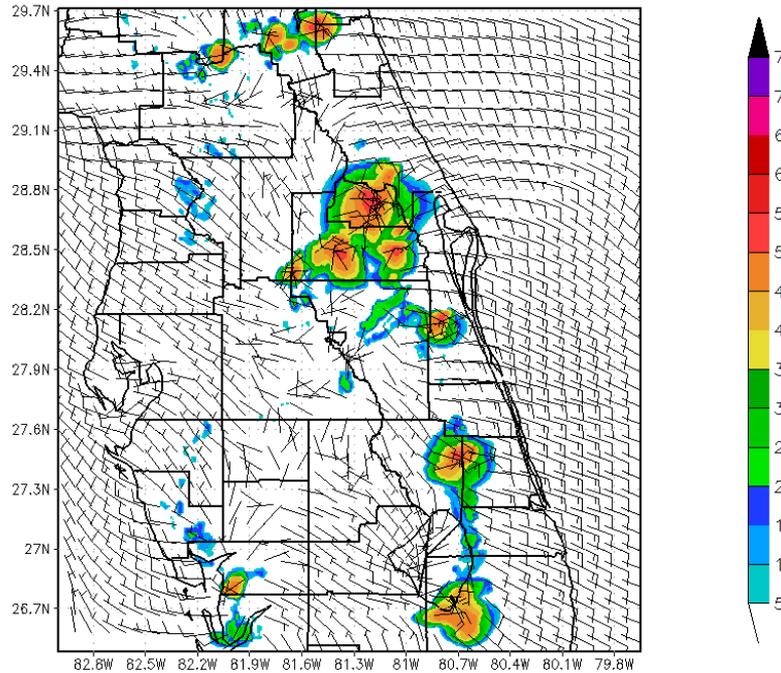
1 km WRF-NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
19Z17JUN2011



17z Run, 3 (2) hour fcst
20z

Verification 1959z

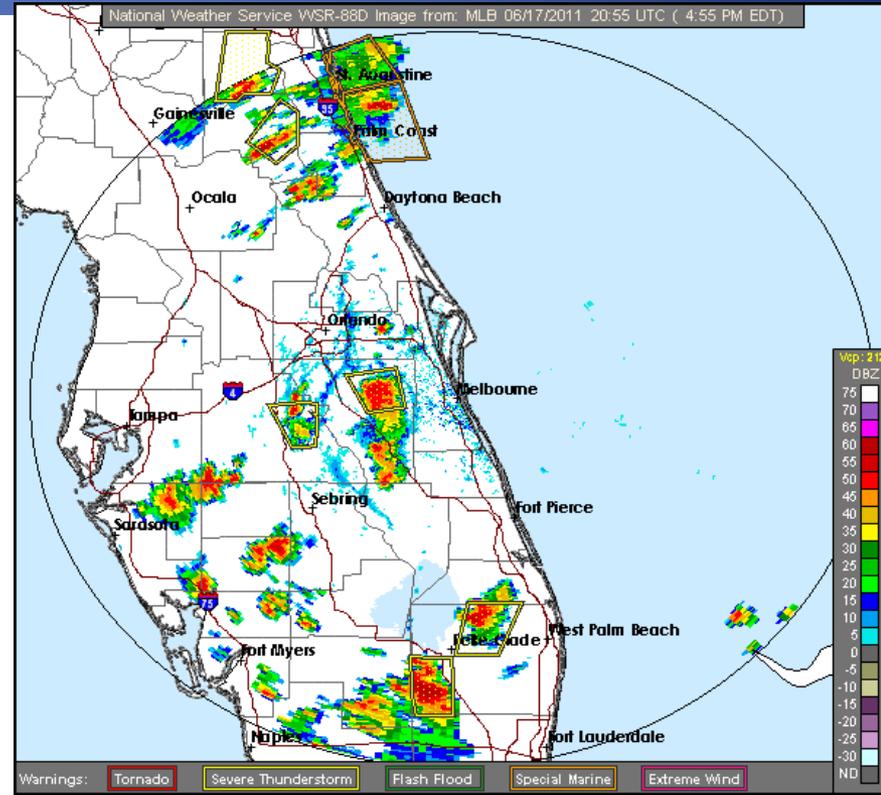
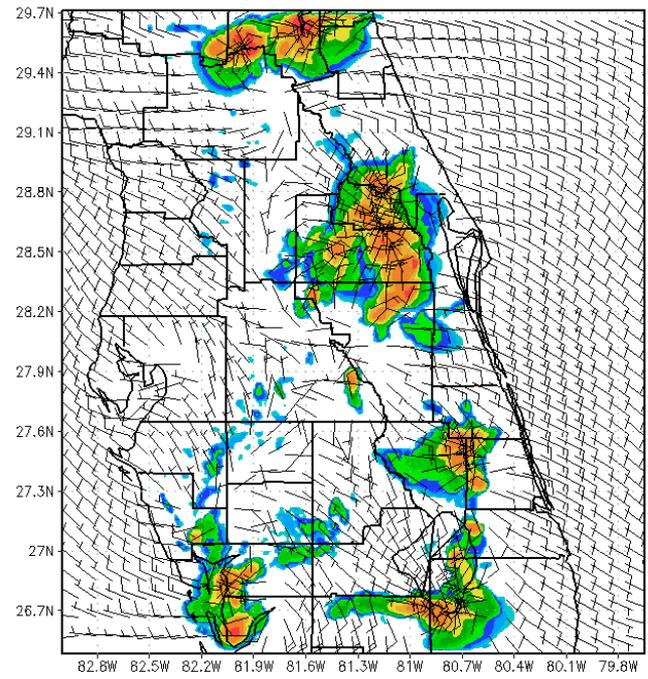
1 km WRF-NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
20Z17JUN2011



17z Run, 4 (3) hour fcst
2055z

Verification 2055z

1 km WRF-NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
20:55Z17JUN2011

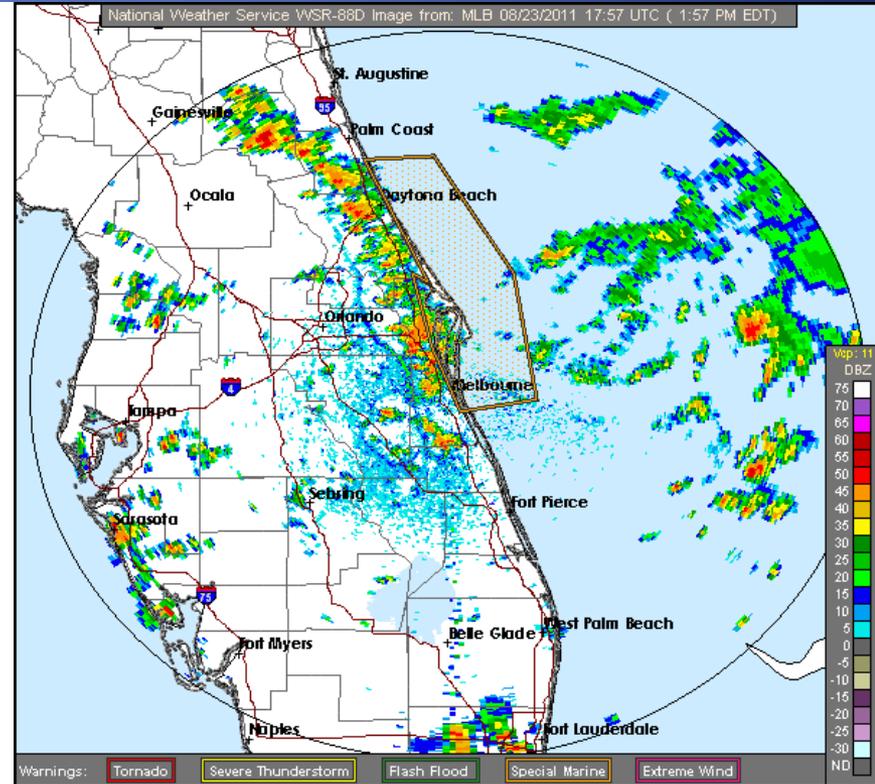
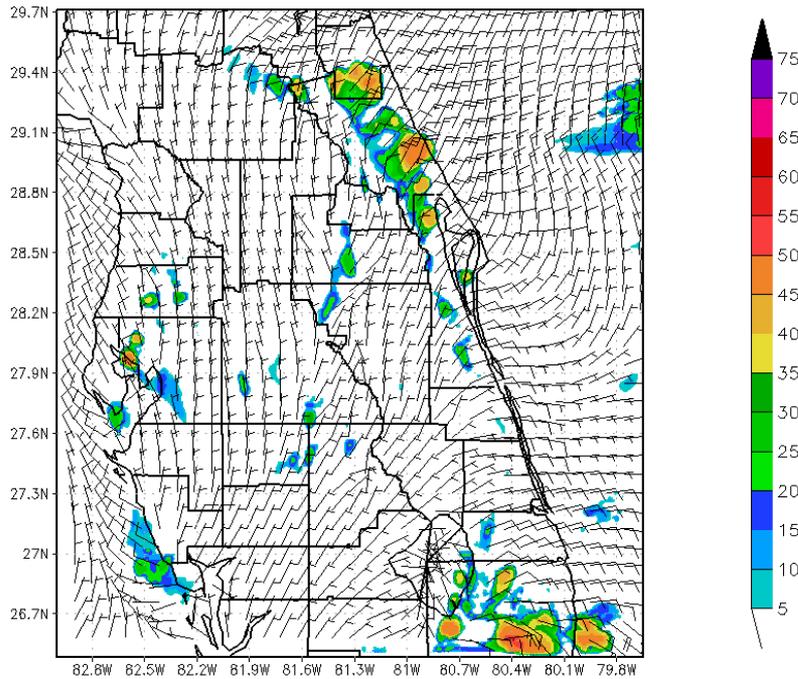


MCS outflow example:

23 Aug 15z Run
3 (2) hour fcst
18z

Verification 17:57z

1 km WRF-NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
18Z23AUG2011



Preliminary findings...

Hardware improvements, and WRF model efficiencies are realized now:

We're good to go for high resolution simulations!

5 minute depictions assist in understanding what the model is trying to tell the Forecaster:

Smooth evolution representing mesoscale and near-storm scales (a lot can happen in 15 to 30 minutes)

WRF can simulate features would not originally expect it to be able to:

Reflectivity associated with outflow boundaries

Models are typically delayed in development of convection:

NMM more so than ARW

DFI may help

Both NMM and ARW often overdo convection, more so with ARW.

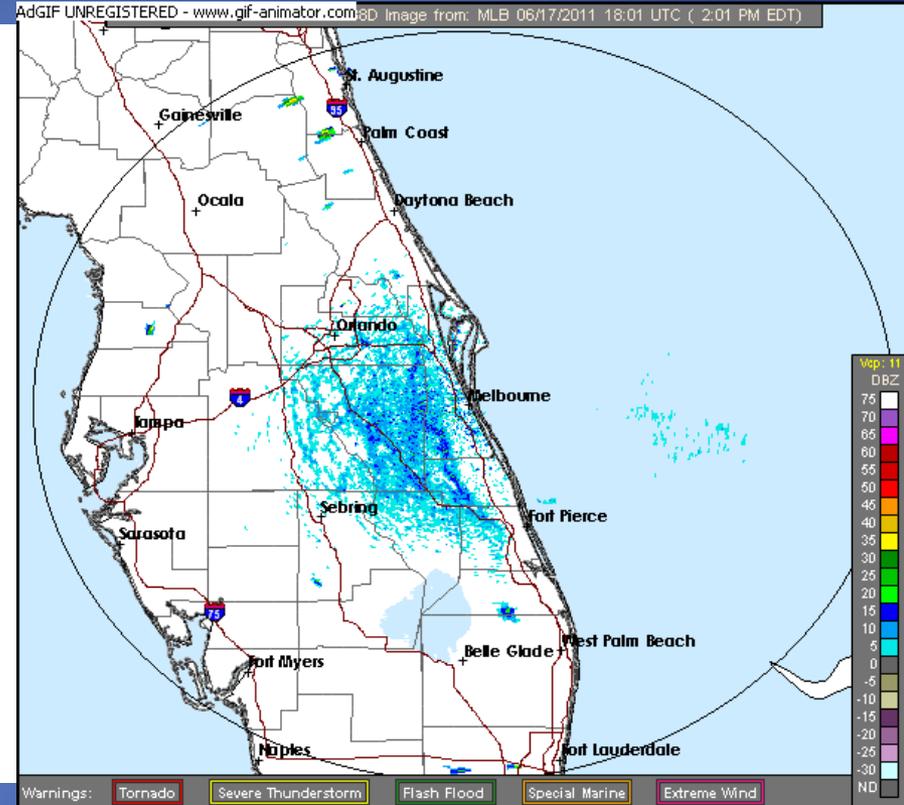
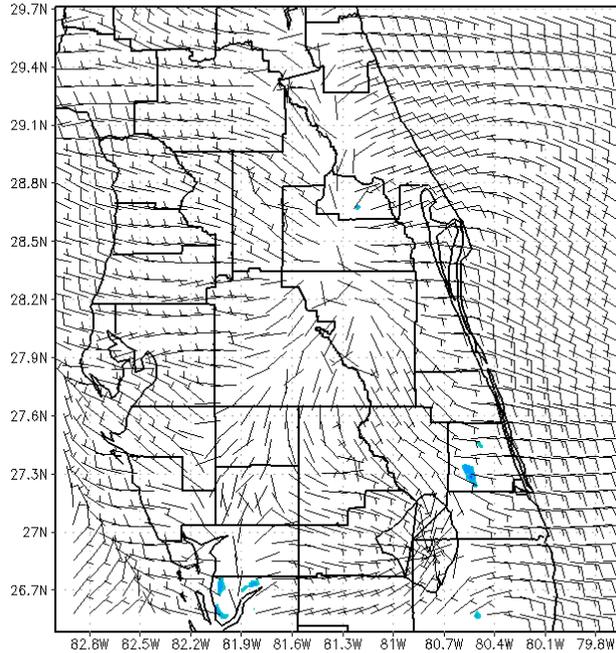
Very subjective results thus far, need objective verification:

Must be feature / phenomenological based

Need sensitivity studies of different model configurations, and with/without SPoRT data.

17 Jun 2011, 17z run (loop 18z – 21z)

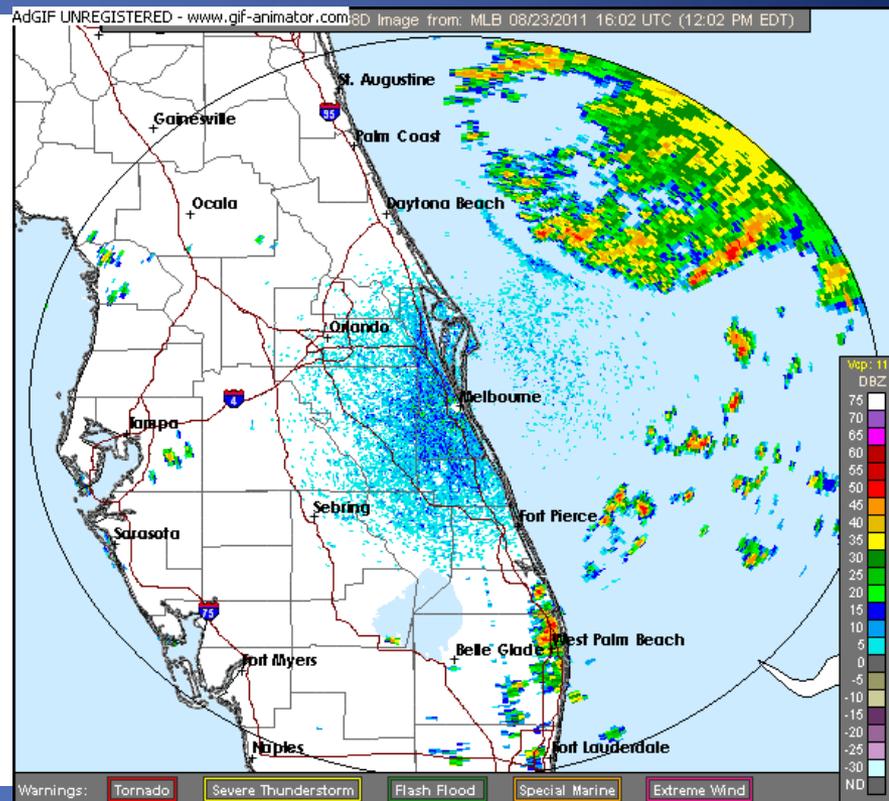
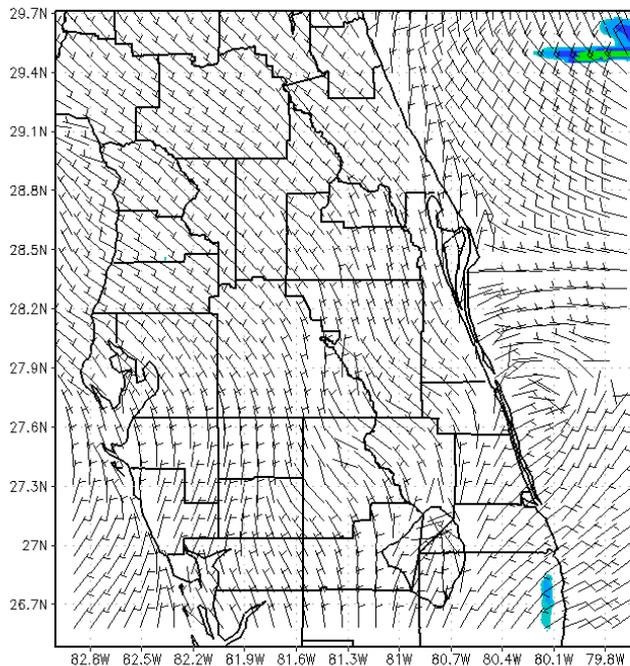
1 km WRF-NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
18Z17JUN2011



<http://www.srh.noaa.gov/media/mlb/presentations/jun17loop.pptx>

23 Aug 2011, 15z run (loop 16z – 19z)

AdGIF UNREGISTERED - www.gif-animator.com
1 km Wkr - NMM Composite Radar Reflectivity and 10 Meter Winds (knots)
16Z23AUG2011



<http://www.srh.noaa.gov/media/mlb/presentations/aug23loop.pptx>