

Localized Aviation Model Output Statistics Program (LAMP): Improvements to convective forecasts in response to user feedback

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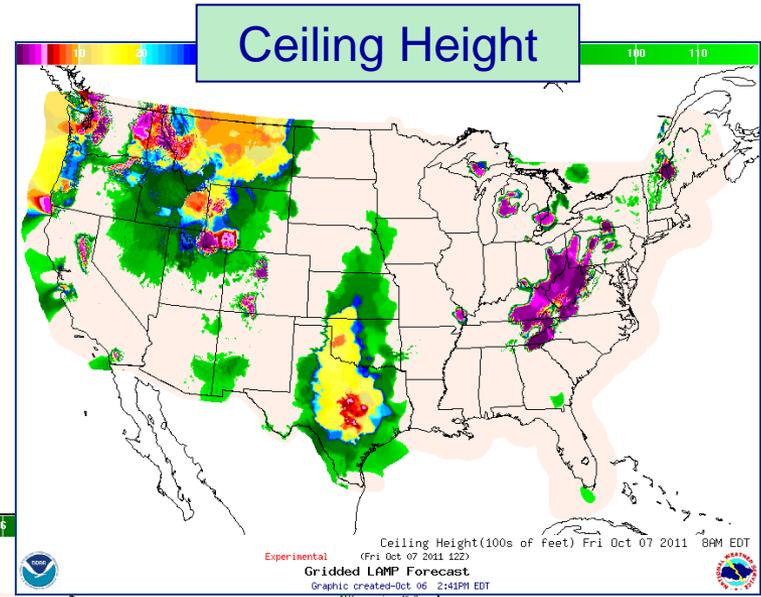
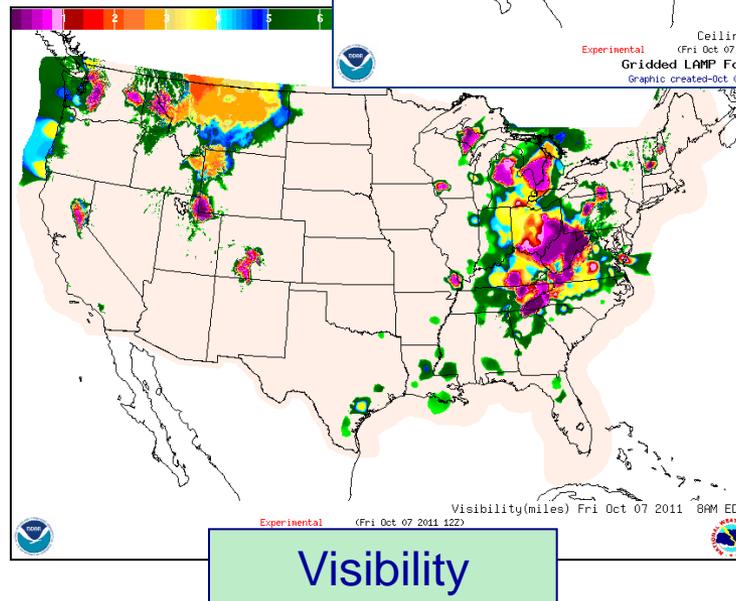
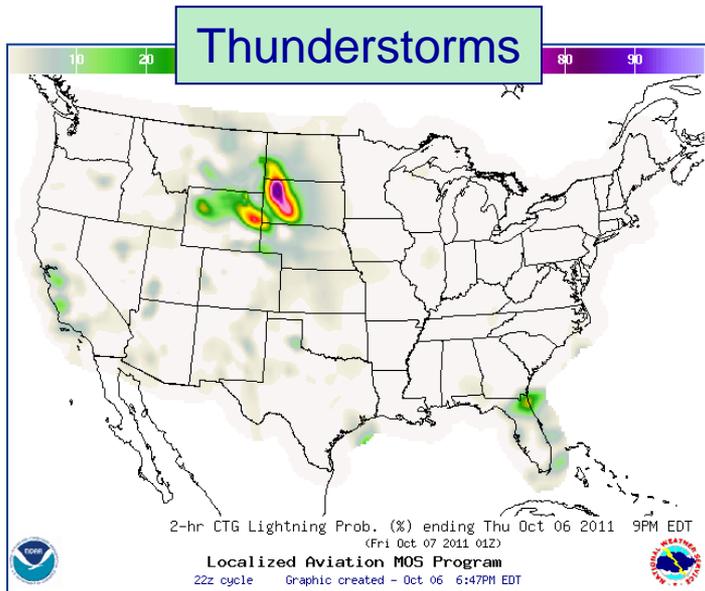
October 11, 2011

**“Friends/Partners in Aviation Weather” Forum
NBAA Convention
Las Vegas, NV**



LAMP Background

- Statistical Guidance of sensible weather
 - Produced hourly, 25-h forecast period
 - Valid at stations (airports) and on a grid
- Elements of interest to Aviation:
 - Winds (at stations)
 - Ceiling height (at stations and gridded)
 - Visibility (at stations and gridded)
 - Thunderstorms (at stations and gridded)



How Did New LAMP Convection Guidance Evolve ?

- Existing Product: LAMP Lightning (LAMP Itg)
 - Predictand: ≥ 1 Cloud-to-Ground (CTG) lightning strike
- Review of existing practices to verify convection products (ESRL) indicates radar refl. of ≥ 40 dBZ used as indicator of “convection”
 - Problem: the verifying “truth” is not consistent with what LAMP lightning was intended to forecast
- FAA evaluation of operational LAMP Itg probabilities
 - Lacks spatial detail, skill, and sharpness especially beyond 6 hours
- MDL decisions (June 2010)
 - Define convection predictand:
 - radar ≥ 40 dBZ and/or ≥ 1 CTG lightning strikes
 - Add NAM MOS (to GFS MOS) convection probabilities as additional model input

New LAMP Convective Guidance

Thunderstorm (current)

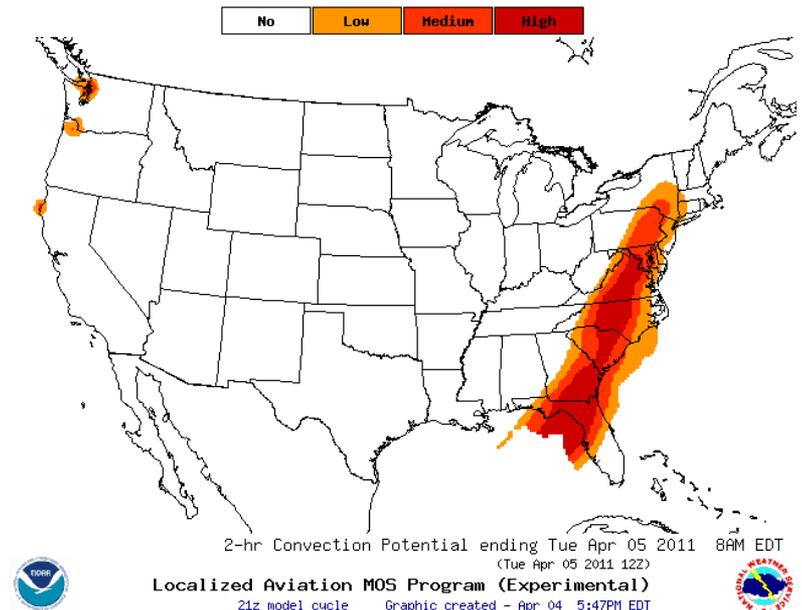
- Features:
 - Defined from Cloud-to-Ground (CTG) Itg
 - GFS MOS 3-h thunderstorm probability predictors
 - 2-h period / 20-km gridboxes
 - 1-h cycle; 3 – 25 h projections
 - Other predictors
- Criticisms:
 - Convection can occur without CTG lightning
 - Thunderstorm probabilities lack sharpness

Convection (future)

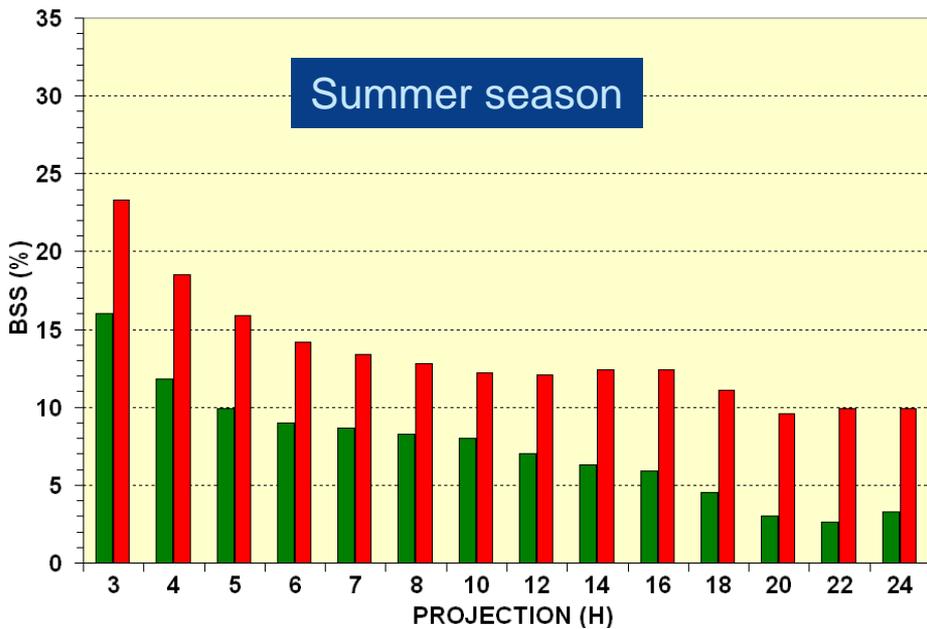
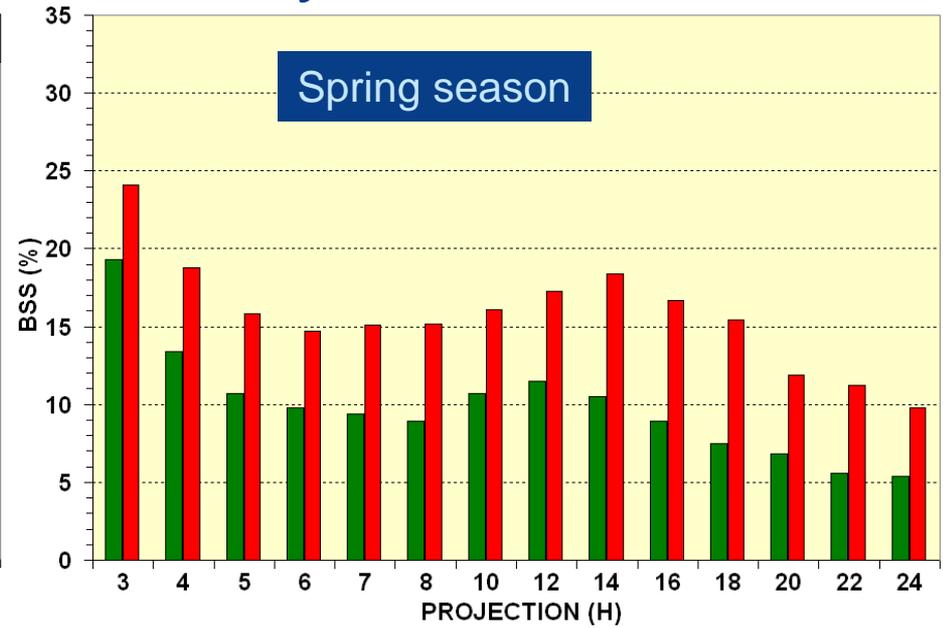
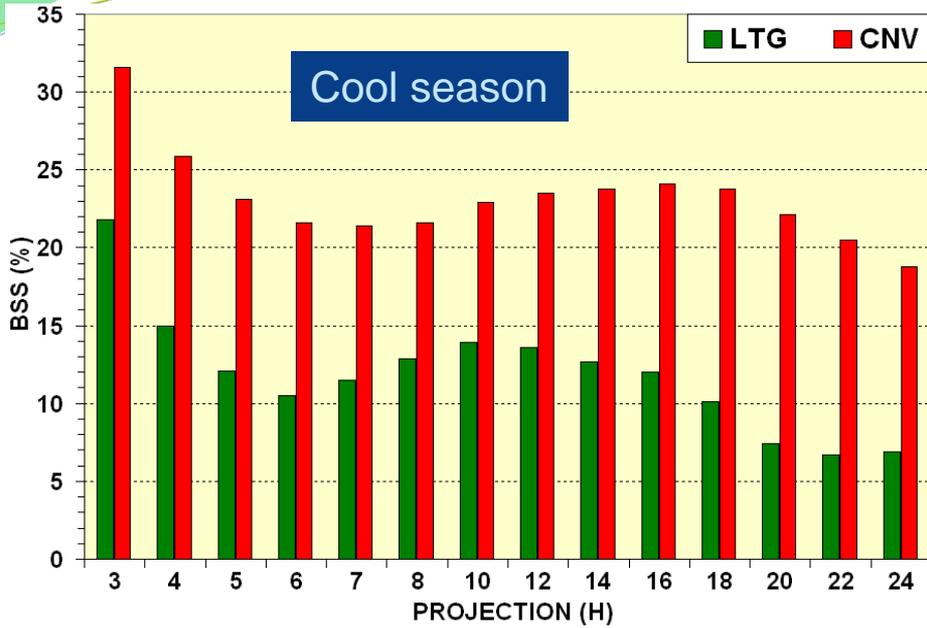
- Features:
 - Defined from CTG Itg / ≥ 40 dBZ radar reflectivity
 - GFS & NAM MOS 2-h convective probability predictors
 - 2-h period / 20-km gridboxes
 - 1-h cycle; 3 – 25 h projections
 - Other predictors
- Solution:
 - Convection can be indicated when there is little or no lightning
 - Convection probabilities exhibit good sharpness

Convection Potential

- Four convection potential categories
 - No, low, medium, and high
 - Each category is defined objectively from a pre-determined probability threshold
 - Each probability threshold corresponds to a prescribed bias criterion, where bias is
 - ❖ ~ 2.7 = low potential
 - ❖ ~ 1.1 = medium potential (lightning ~ 1.2)
 - ❖ ~ 0.4 = high potential
- Convection potential aids interpretation of probabilities with peak values $< 100\%$



LAMP Lightning (LTG) vs Convection(CNV) Prob. Skill for 1800 UTC Cycle

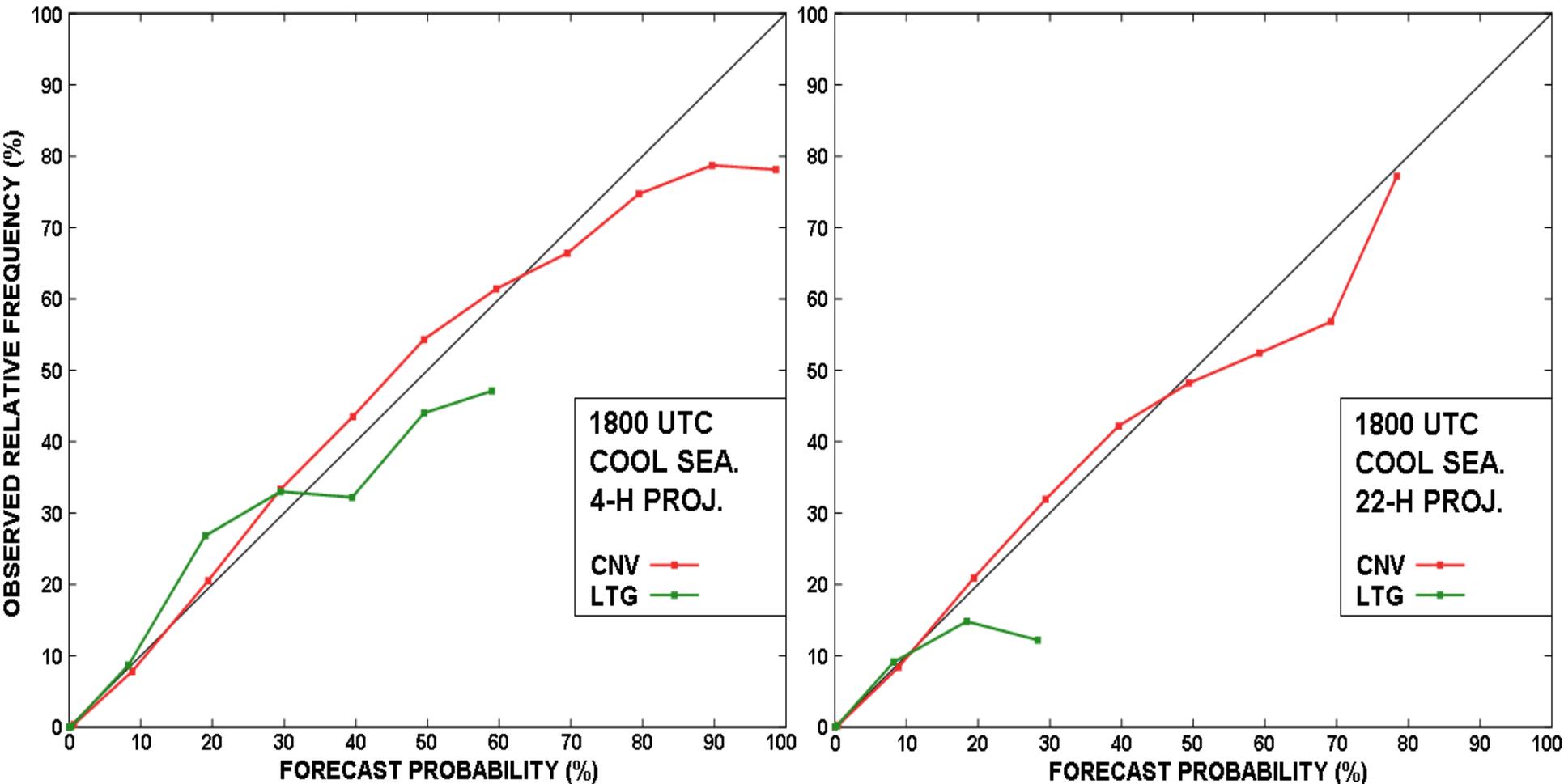


Independent sample

Oct 2009 – Oct 2010

LAMP Lightning vs Convection Probability

Reliability and Sharpness

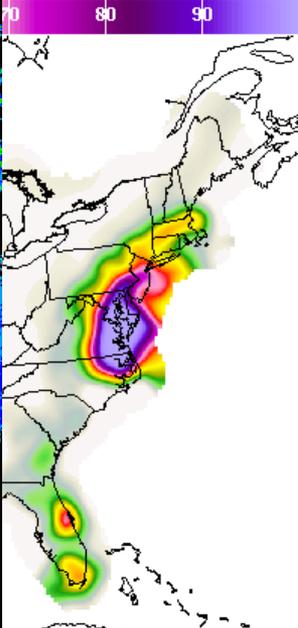
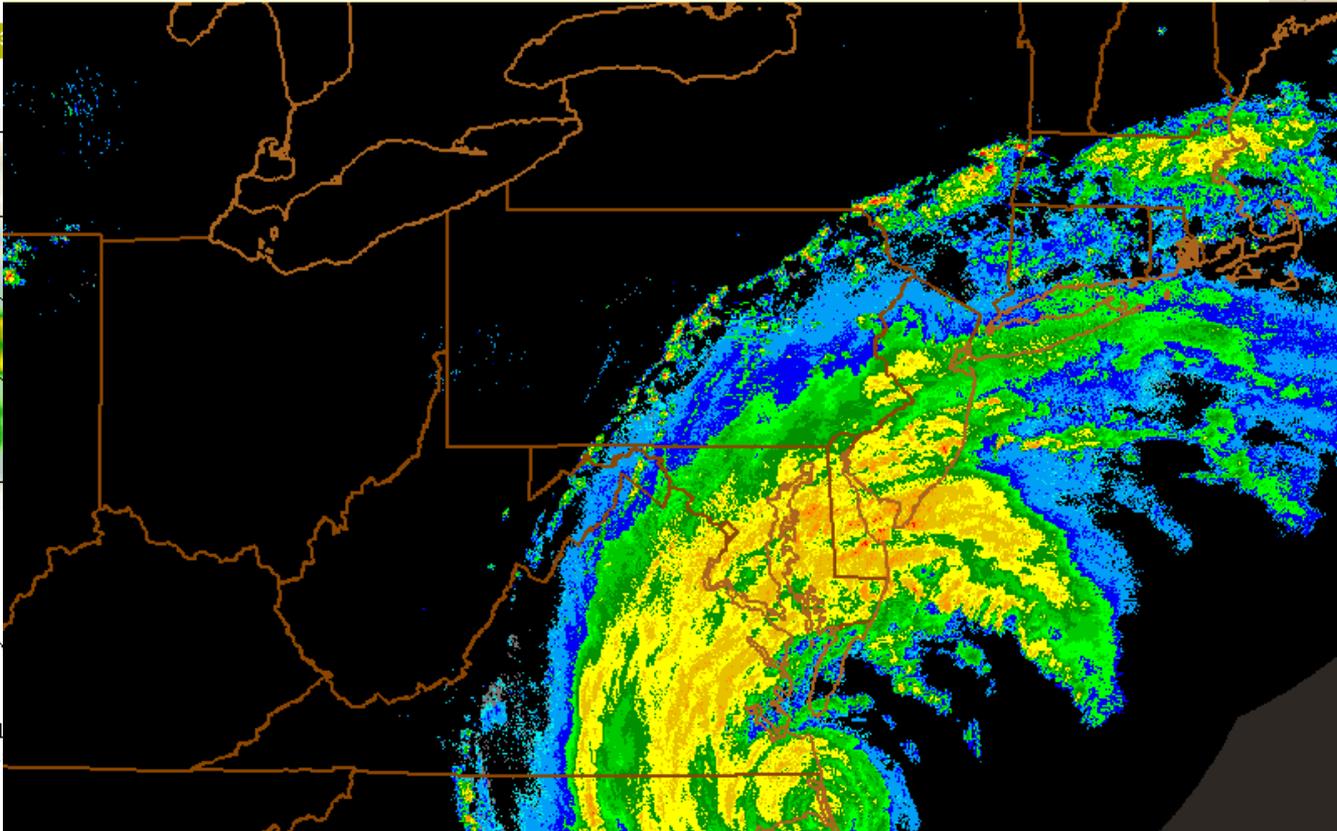
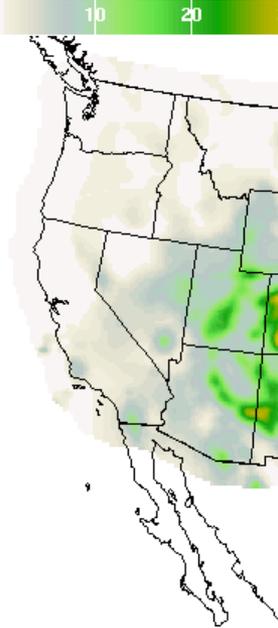


New LAMP Convective Guidance

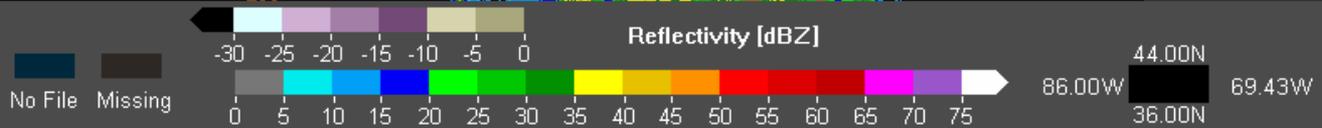
August 27, 2011: 1800 UTC cycle, Hurricane Irene

Composite Reflectivity
Derived From Mosaic3D

Valid At:
08/27/2011 21:00:00 UTC



at Aug 27 2011 5PM EDT
(Experimental)
7 2:47PM EDT

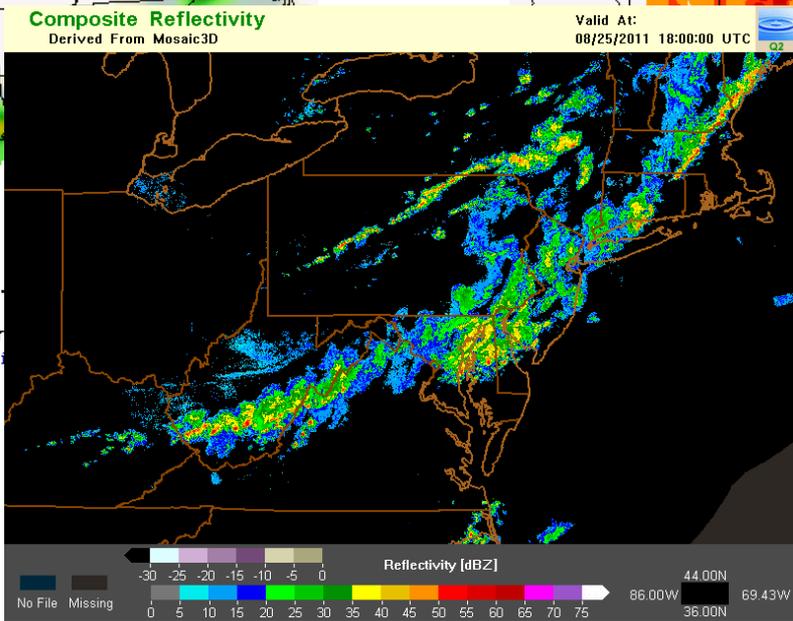
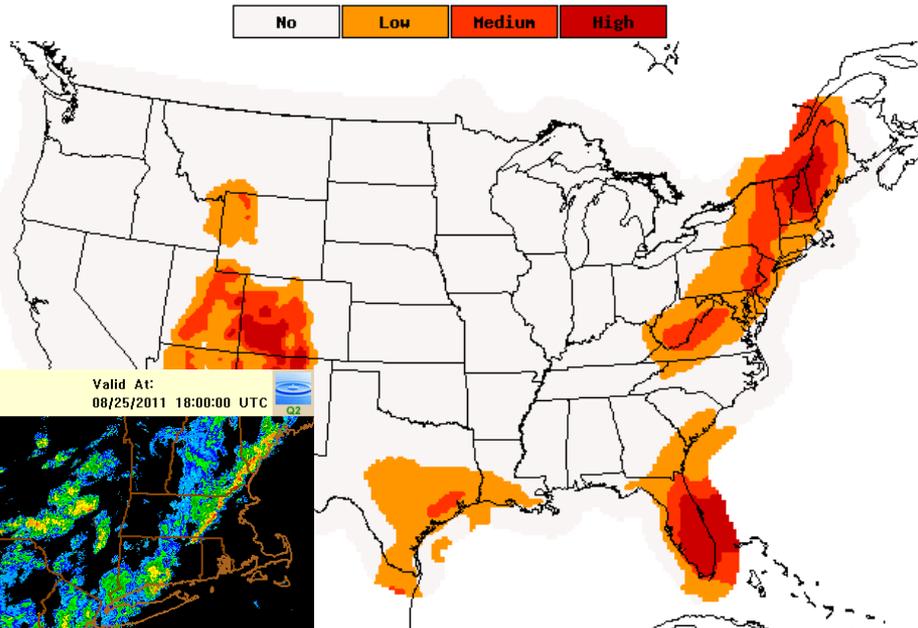
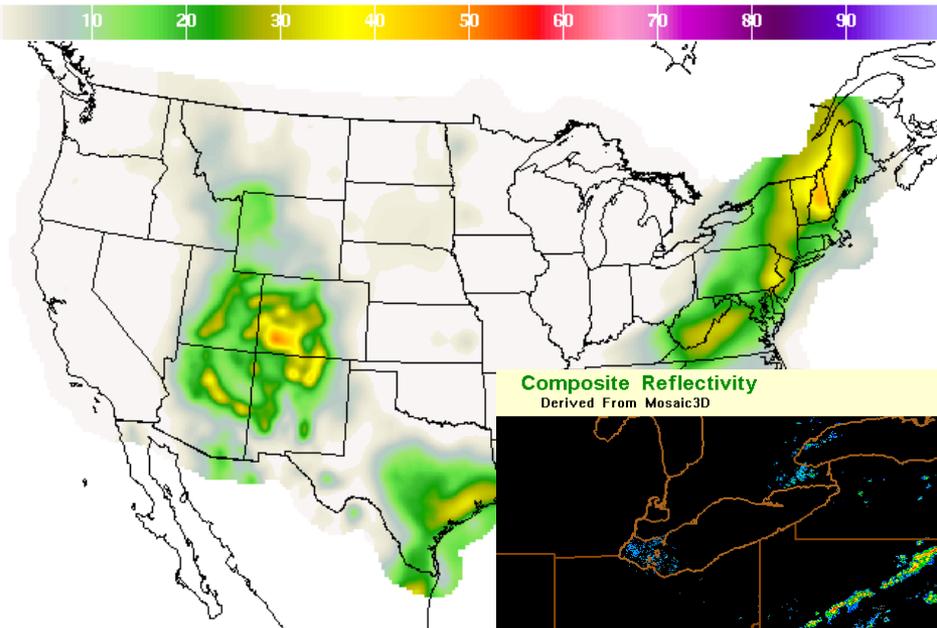


New LAMP Convective Guidance

August 25, 2011: 1200 UTC cycle, 6-8 hour projection

Convection Probabilities

Convection Potential



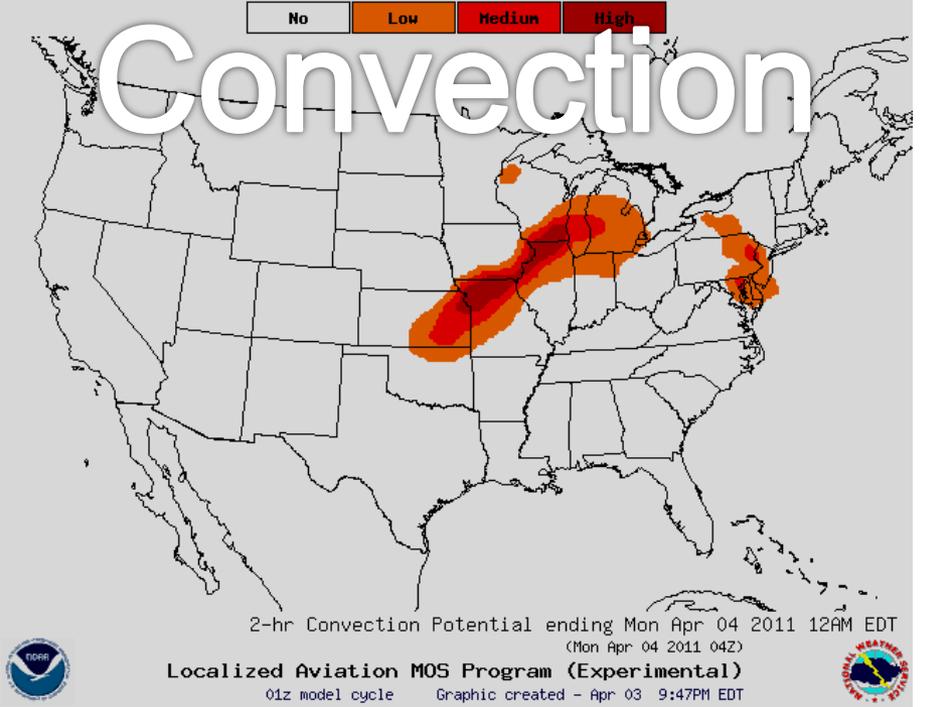
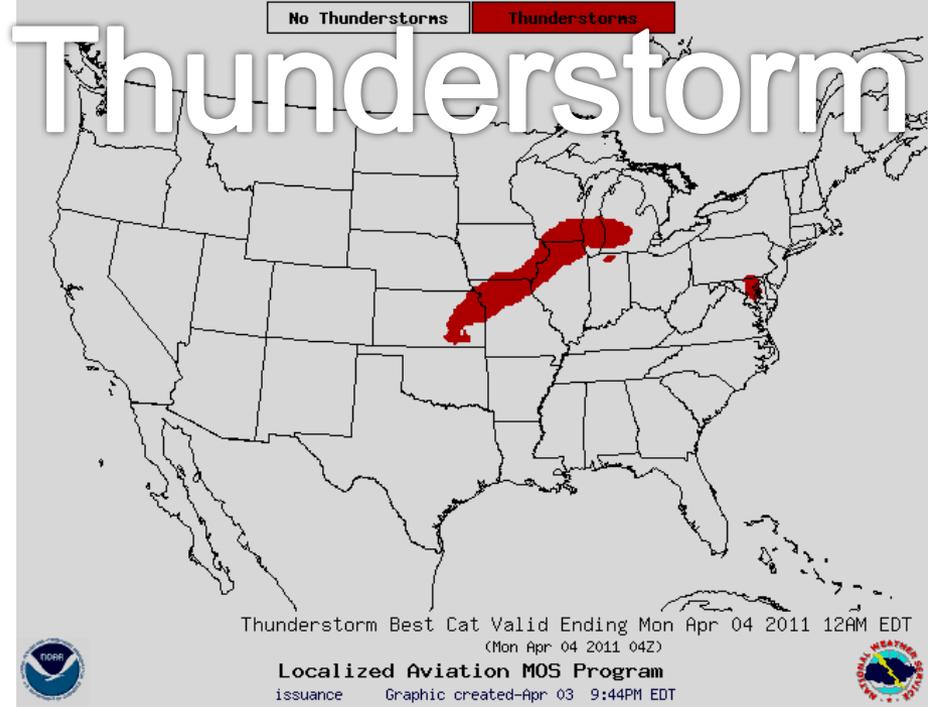
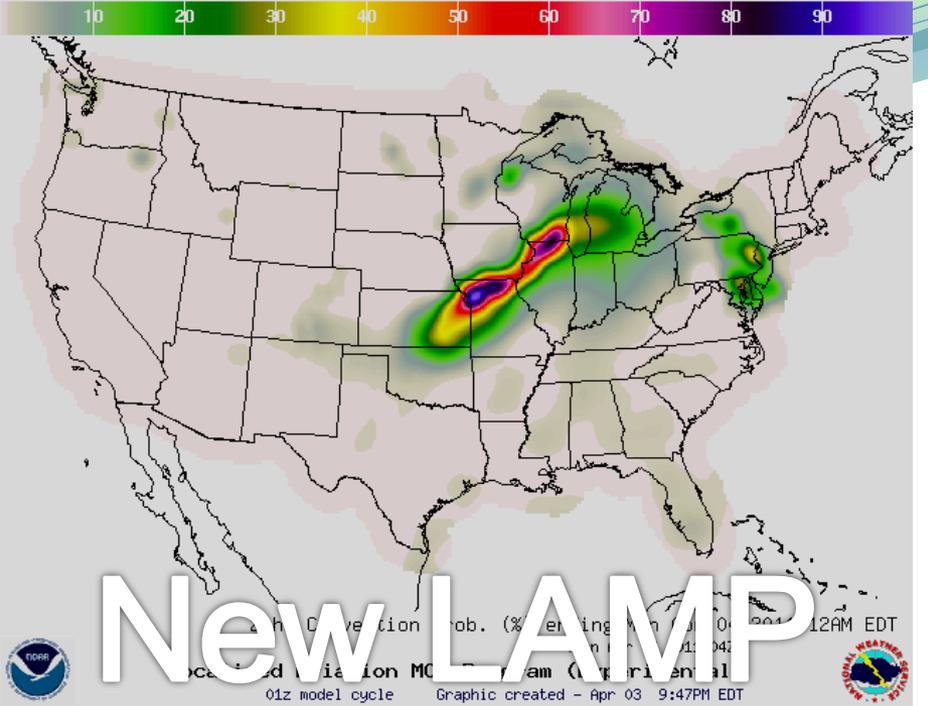
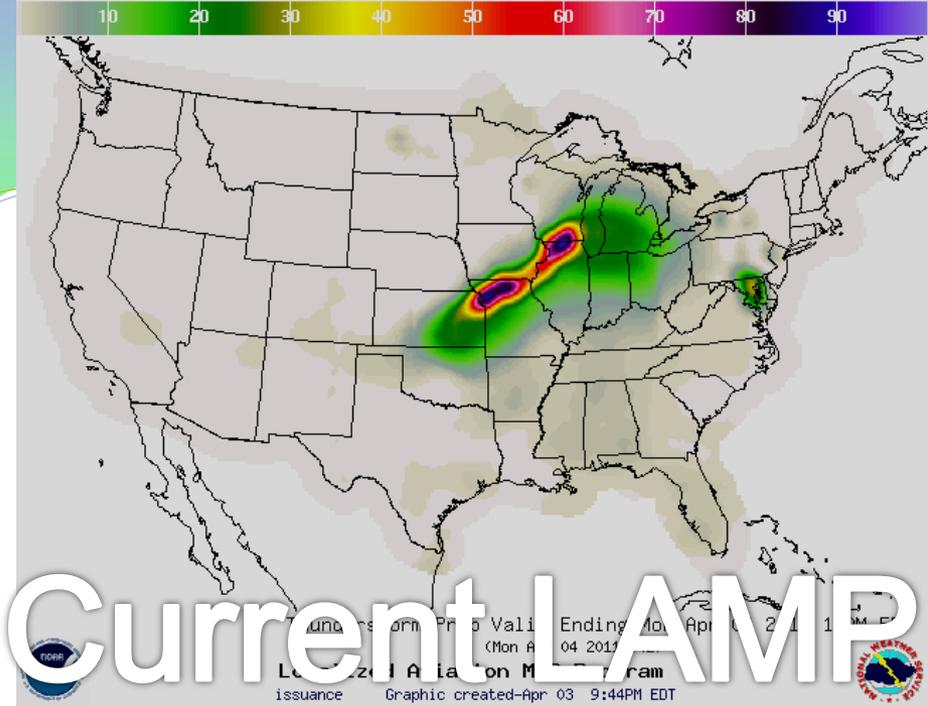
2-hr Convection Prob.

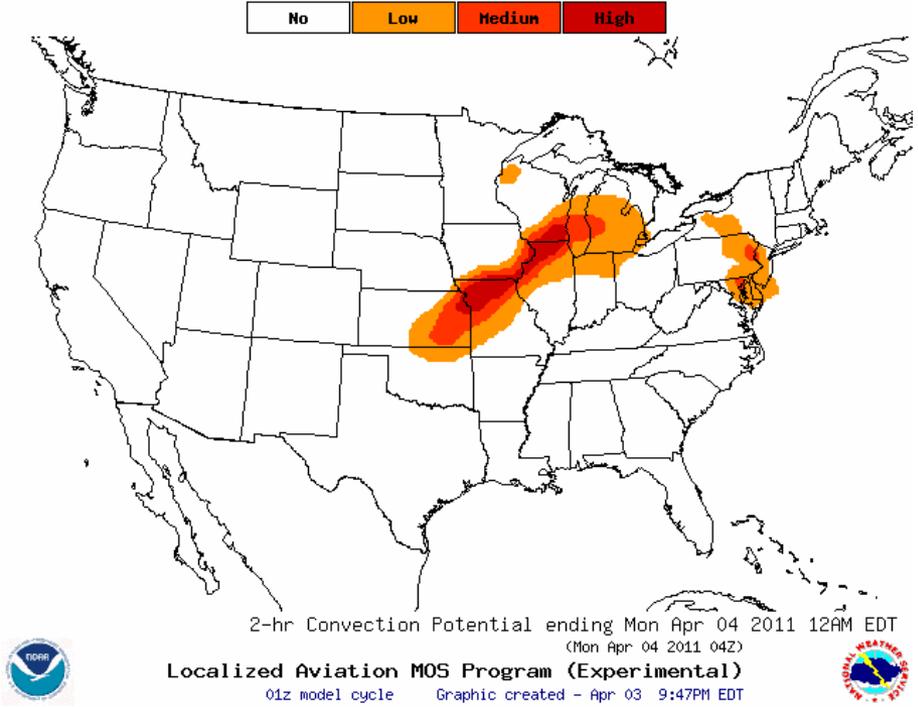
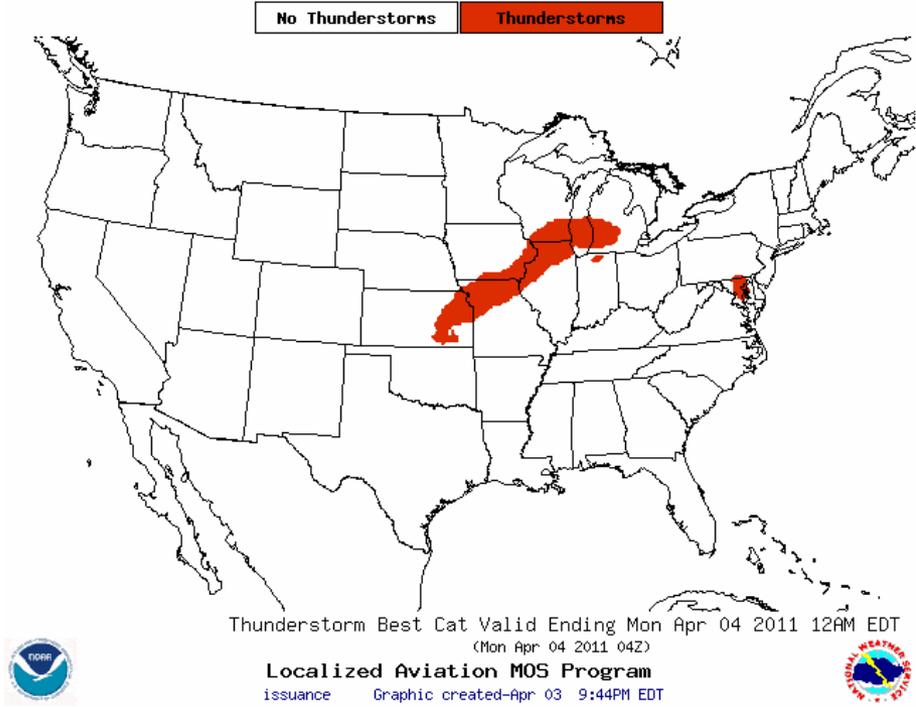
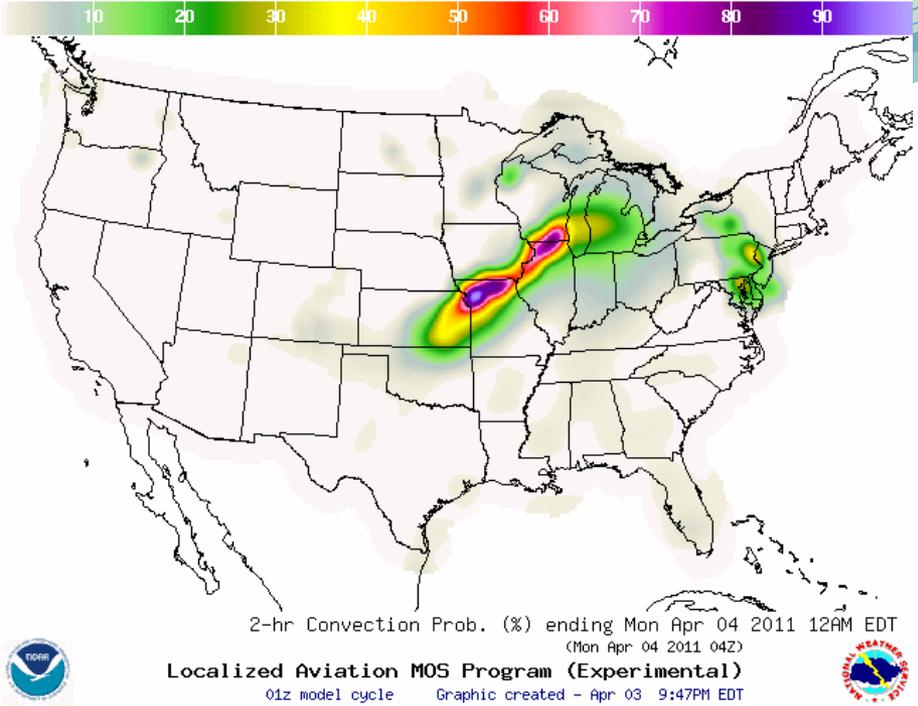
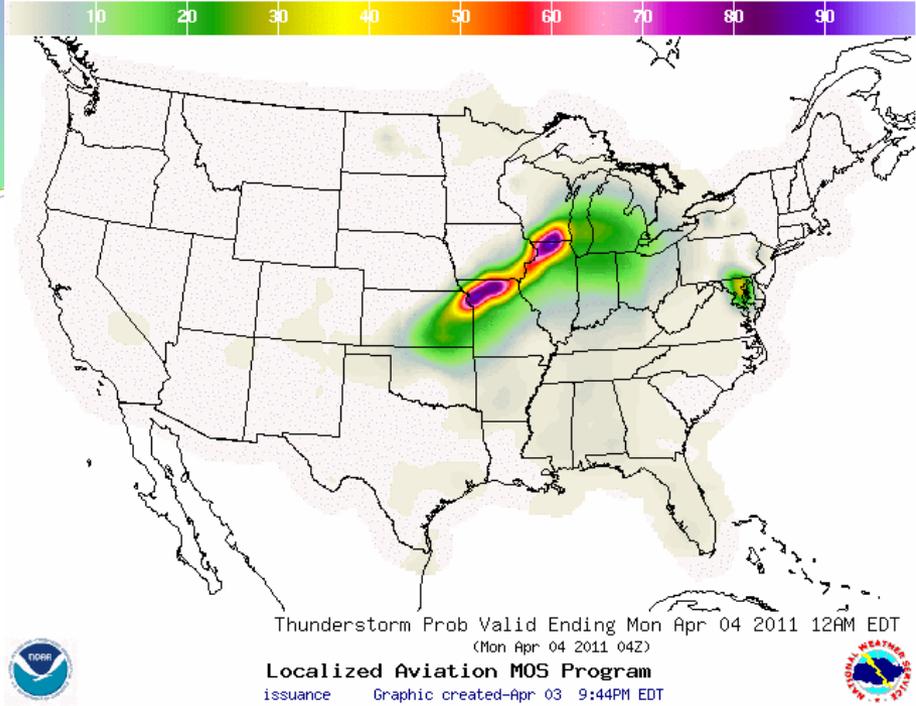
Localized Aviation MOS Program
12z cycle

Convection Potential ending Thu Aug 25 2011 4PM EDT
(Thu Aug 25 2011 20Z)

Localized Aviation MOS Program (Experimental)
12z cycle

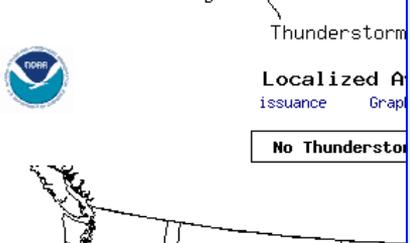
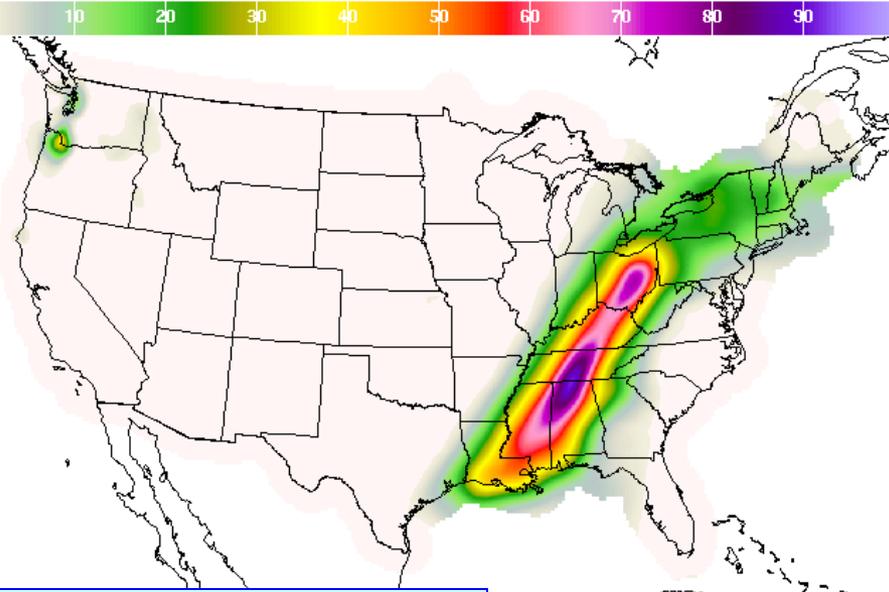
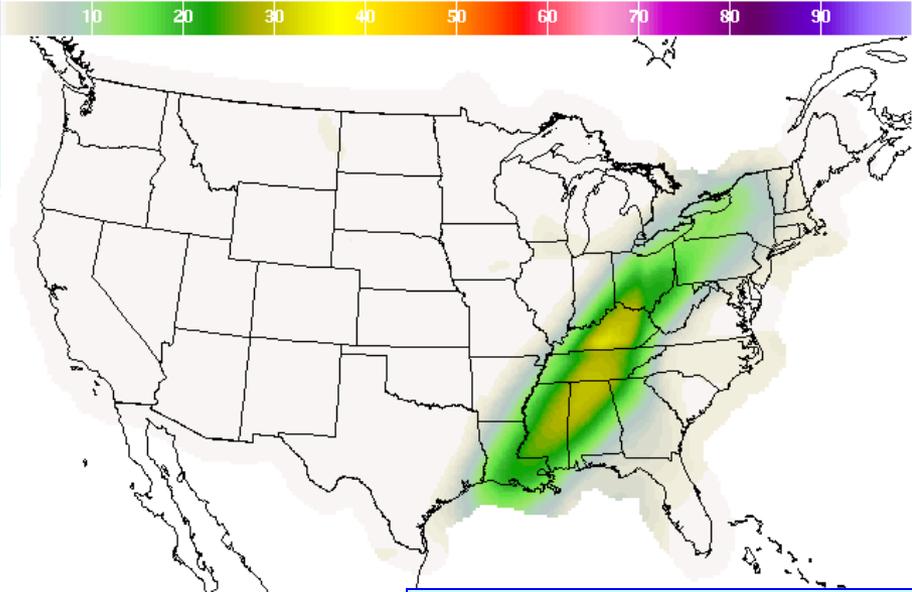




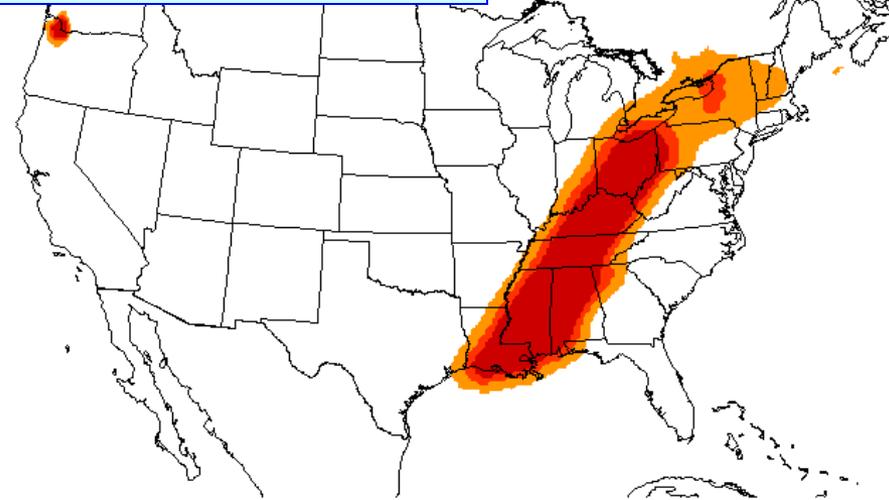
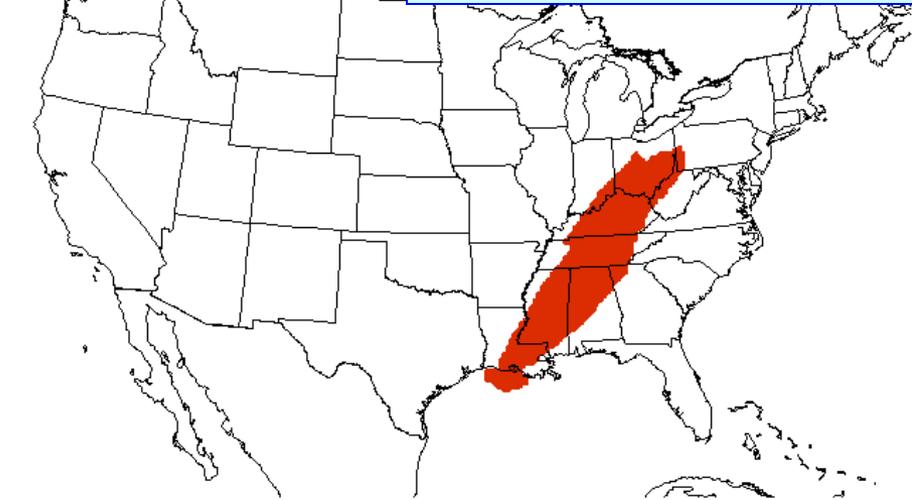


No Thunderstorms **Thunderstorms**

No **Low** **Medium** **High**

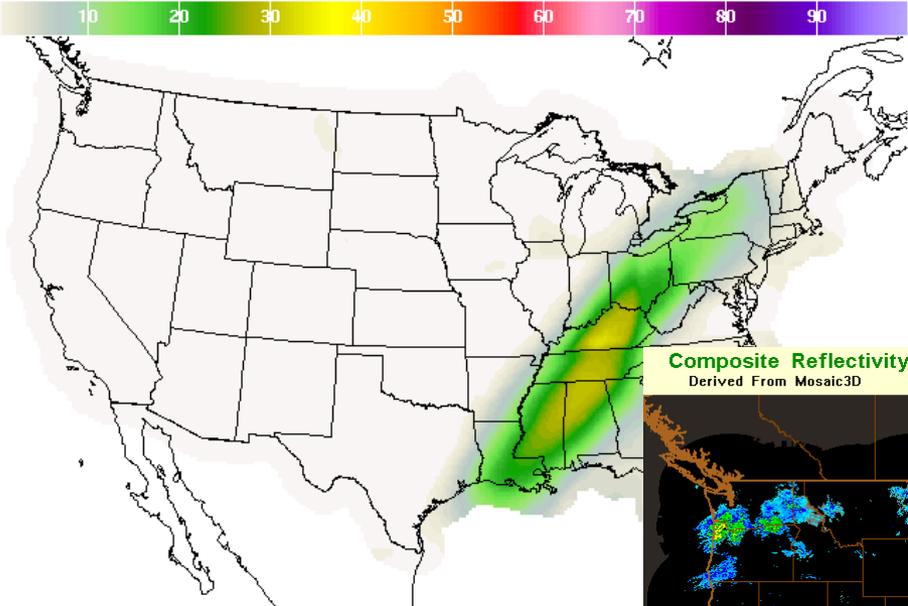


Note that this is a 23-hour projection, and the LAMP convective probabilities are about 90% while the LAMP thunderstorm probabilities are about 30%.



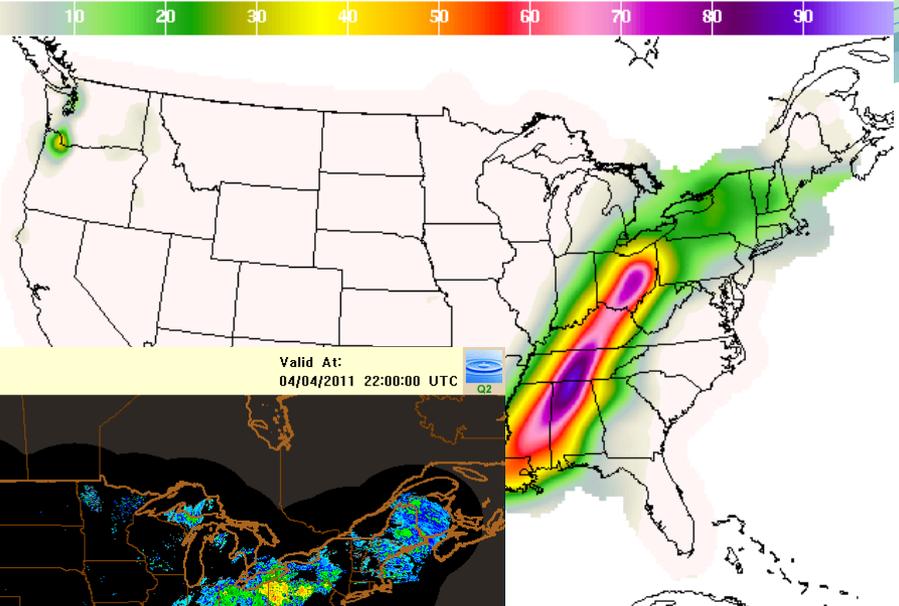
Thunderstorm Best Cat Valid Ending Mon Apr 04 2011 8PM EDT
 (Tue Apr 05 2011 00Z)
 Localized Aviation MOS Program
 issuance Graphic created-Apr 03 9:44PM EDT

2-hr Convection Potential ending Mon Apr 04 2011 8PM EDT
 (Tue Apr 05 2011 00Z)
 Localized Aviation MOS Program (Experimental)
 01z model cycle Graphic created - Apr 03 9:47PM EDT



Composite Reflectivity
Derived From Mosaic3D

Valid At:
04/04/2011 22:00:00 UTC

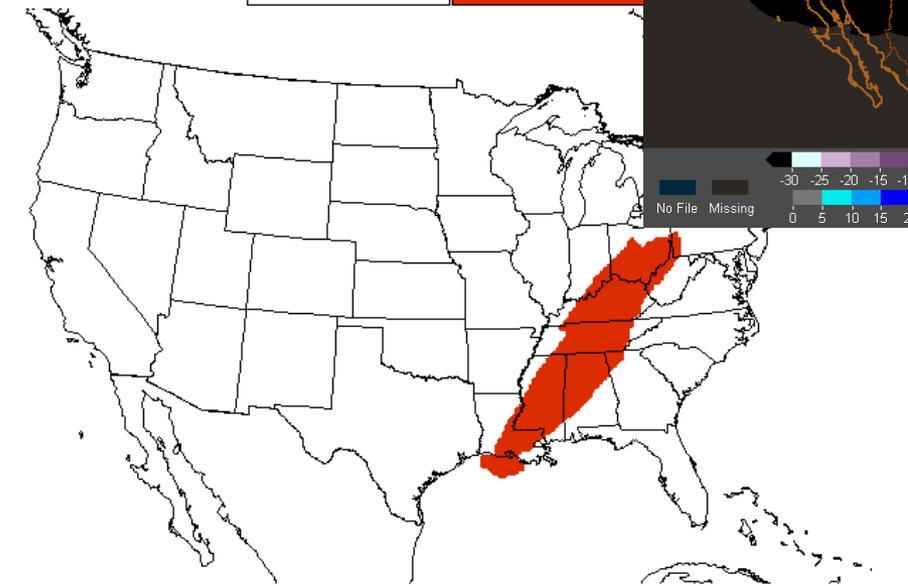
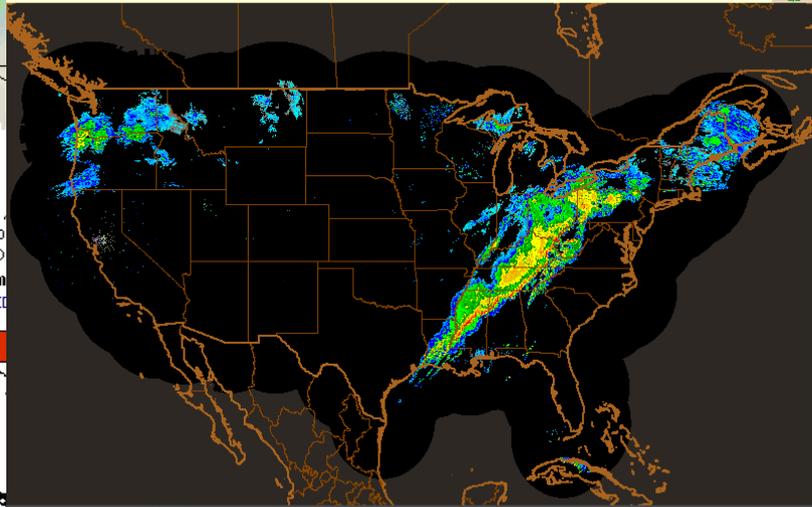


Thunderstorm Prob Valid Ending Mon Apr 04 2011 8PM EDT
(Tue Apr 05 2011 00Z)
Localized Aviation MOS Program
issuance Graphic created-Apr 03 9:44PM EDT

No Thunderstorms Thunderstorms

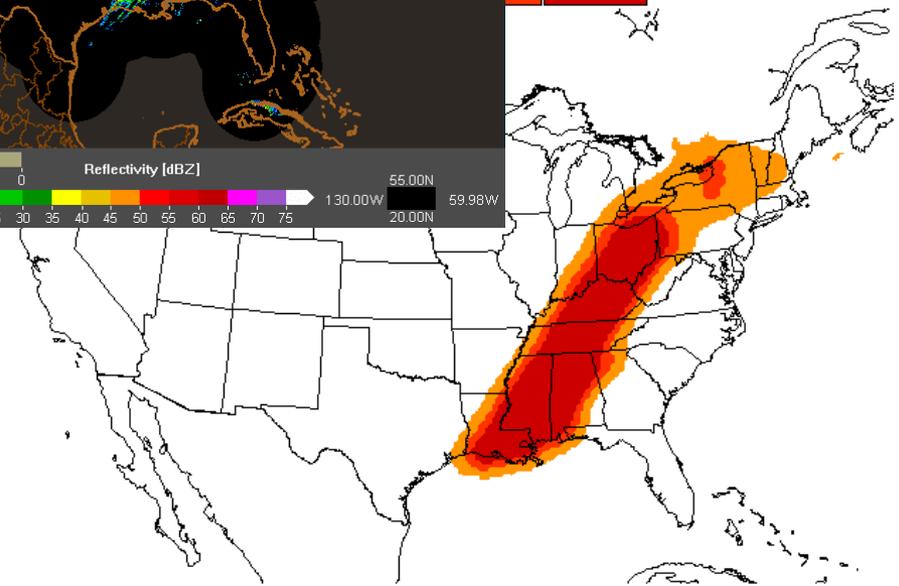
Thunderstorm Prob Valid Ending Mon Apr 04 2011 8PM EDT
(Tue Apr 05 2011 00Z)
Localized Aviation MOS Program (Experimental)
issuance Graphic created-Apr 03 9:47PM EDT

Low High



Thunderstorm Best Cat Valid Ending Mon Apr 04 2011 8PM EDT
(Tue Apr 05 2011 00Z)

Localized Aviation MOS Program
issuance Graphic created-Apr 03 9:44PM EDT



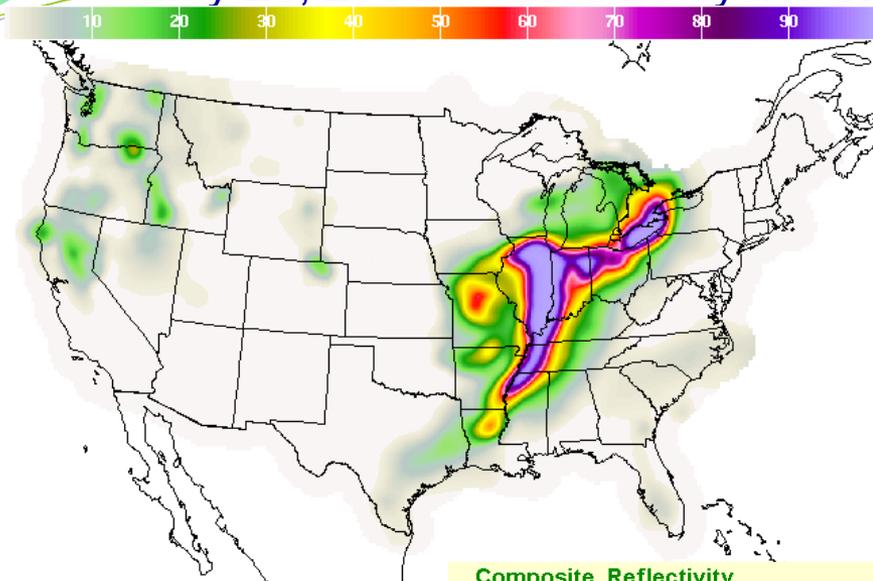
2-hr Convection Potential ending Mon Apr 04 2011 8PM EDT
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Localized Aviation MOS Program (Experimental)
01z model cycle Graphic created - Apr 03 9:47PM EDT

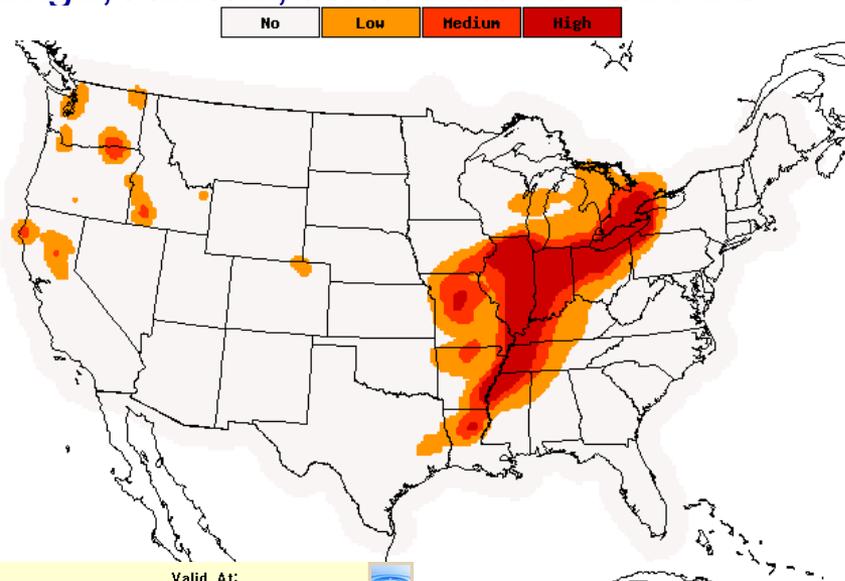


Convective Guidance Examples

May 26, 2011: 0000 UTC cycle: Chicago, Atlanta, New York all affected



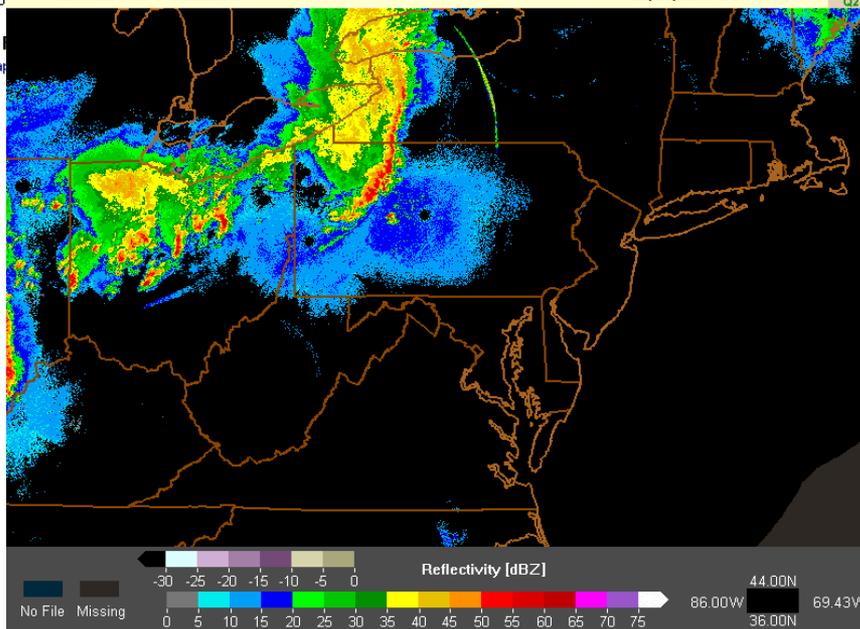
Composite Reflectivity
Derived From Mosaic3D



Valid At:
05/26/2011 03:00:00 UTC



2-hr Convection Pro
Localized Aviation MOS
00z cycle Gra



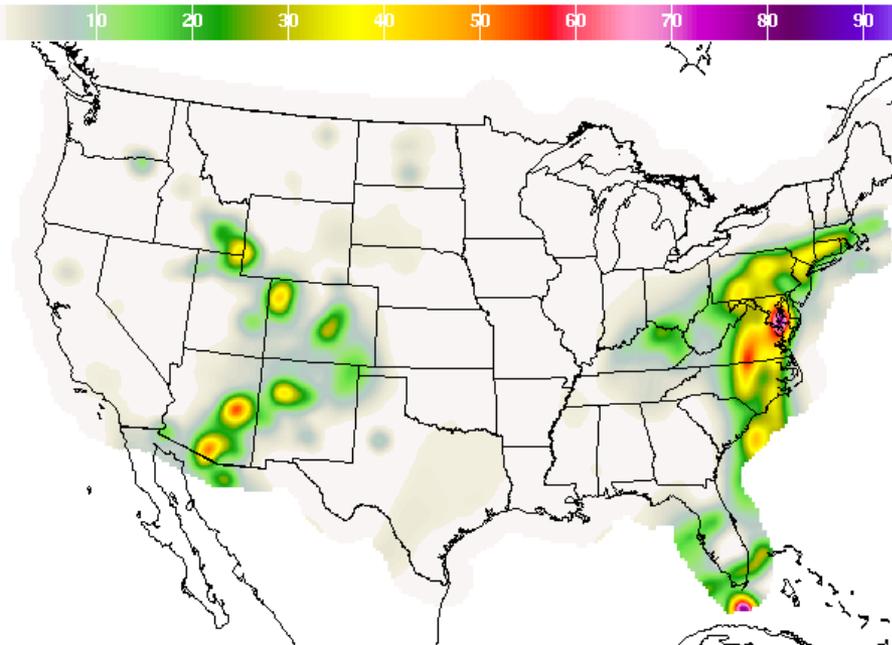
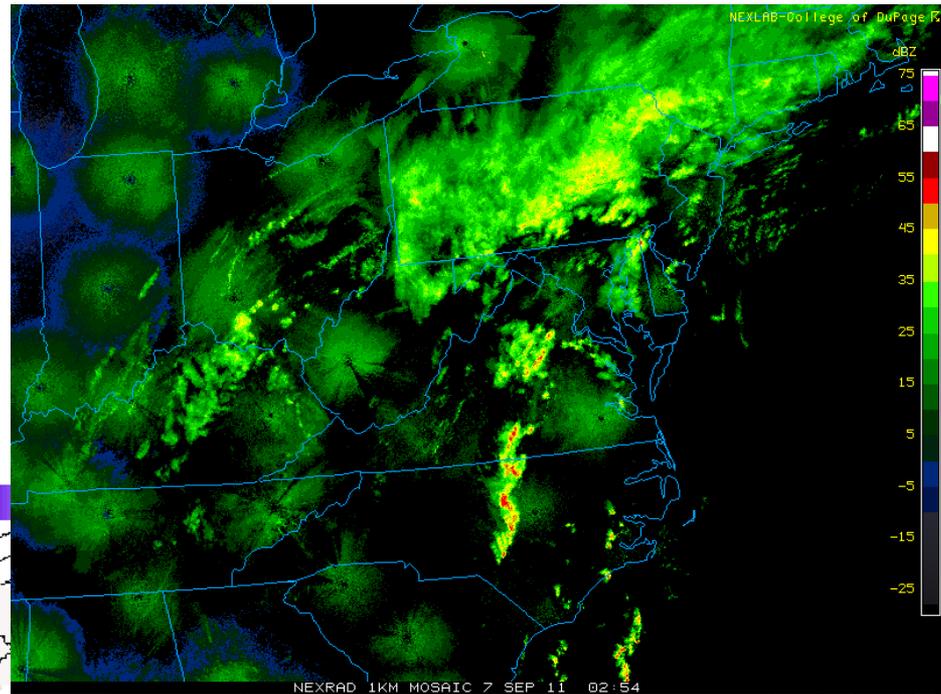
Reflectivity [dBZ]
-30 -25 -20 -15 -10 -5 0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
No File Missing
44.00N 86.00W 69.43W
36.00N

02 potential ending Wed May 25 2011 11PM EDT
(Thu May 26 2011 03Z)
Program (Experimental)
Graphic created - Aug 13 1:20AM EDT

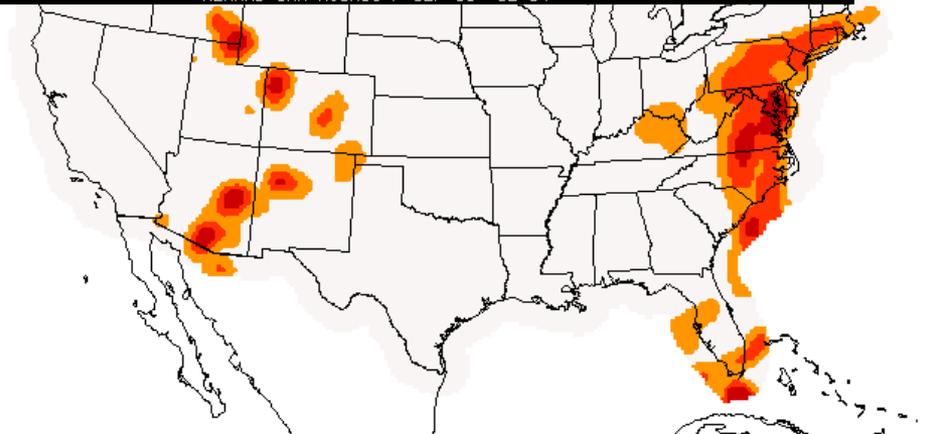


Convective Guidance Examples

September 07, 2011: 0000 UTC cycle



Localized Aviation MOS Program (Experimental)
00z cycle Graphic created - Sep 06 8:47PM EDT

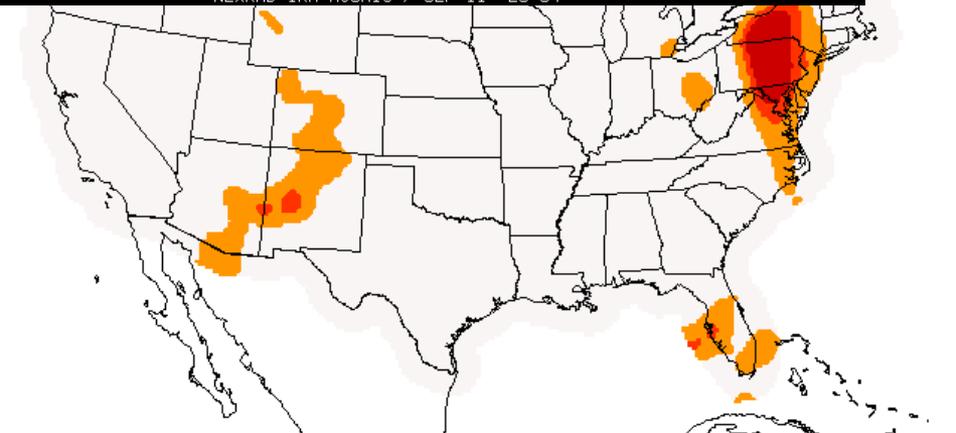
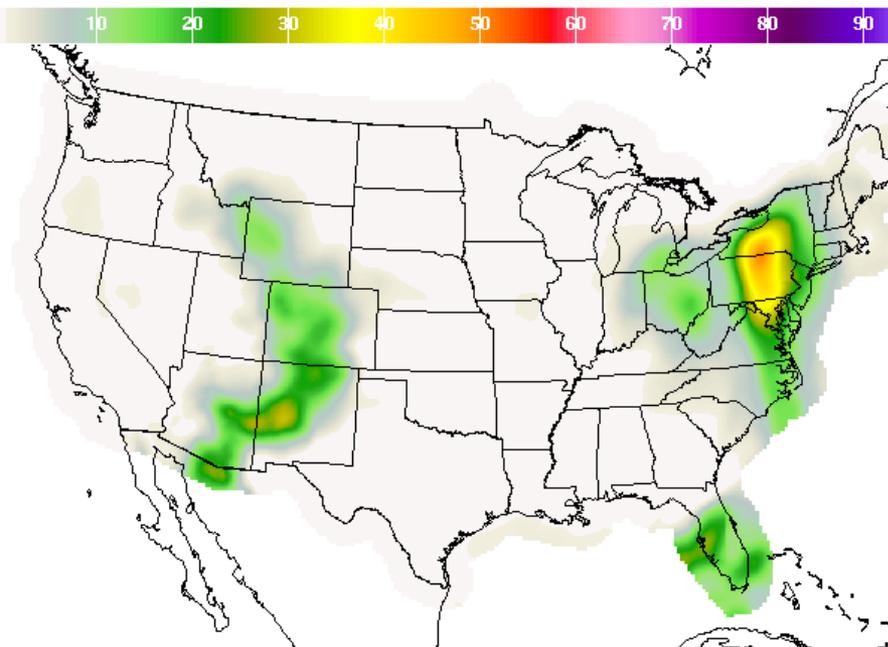
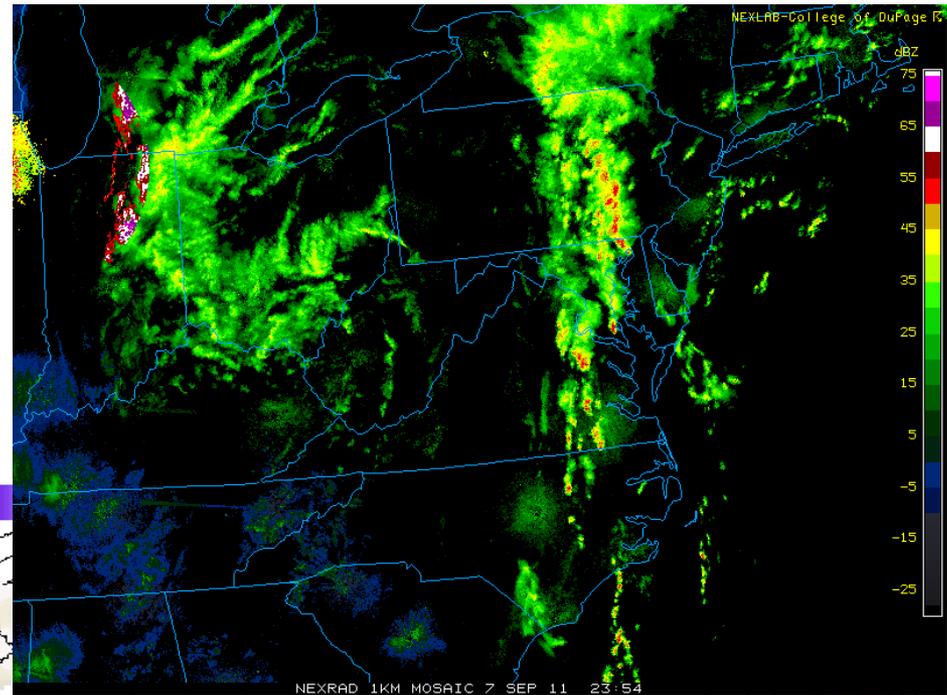


Localized Aviation MOS Program (Experimental)
00z cycle Graphic created - Sep 06 8:47PM EDT



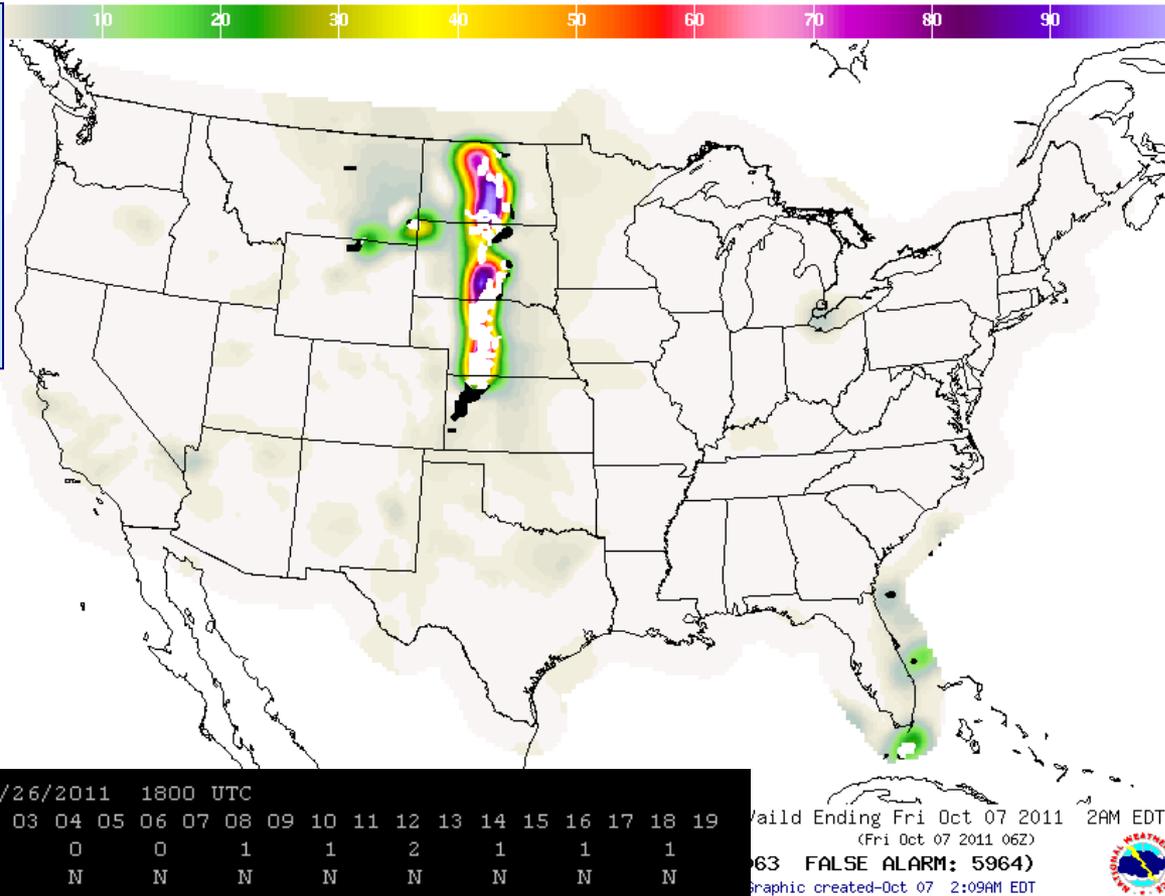
Convective Guidance Examples

September 07, 2011: 0000 UTC cycle: 22-24 hour projection



Future Work: Additional Products

Verification
Graphics: overlay
probabilities with
marker indicating
if convection was
observed



KBVY	GFS	LAMP	GUIDANCE	9/26/2011	1800	UTC																			
UTC	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
CP2		1	1	0	1	0	0	0	0	0	0	0	1	1	2	1	1	1	1	1	1	1	1	1	1
CC2		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

KBWI	GFS	LAMP	GUIDANCE	9/26/2011	1800	UTC																			
UTC	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
CP2		0	0	0	0	0	0	0	0	0	0	0	0	0	3	4	6	10	19	19	19	19	19	19	19
CC2		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	L

KCAK	GFS	LAMP	GUIDANCE	9/26/2011	1800	UTC																			
UTC	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19
CP2		57	54	52	44	41	35	20	8	8	9	8	6	4	2	1	1	1	1	1	1	1	1	1	1
CC2		H	H	H	H	H	H	L	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Text bulletins at
stations: to support
prototype Gate
Forecasts

Implementation Plans

- Convection products produced in real time since March 2011
 - 24 cycles per day (not supported 24x7)
 - Web Graphics at:
<http://weather.gov/mdl/lamp/compare.php>
<http://weather.gov/mdl/lamp/convection.php>
 - GRIB2 files available at:
http://www.mdl.nws.noaa.gov/~glmp/conv_grib/
- Implement on CCS parallel system before March 2012
- Available in experimental NDGD March 2012
- Transmit grids on SBN/NOAAPORT – planned FY12/13

- Contact: Judy.Ghirardelli@noaa.gov