

The GOES-R Proving Ground: 2012 Update



Jim Gurka

Steve Goodman

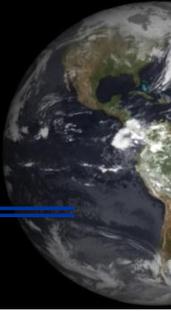
GOES-R Program Office

NOAA Satellite Science Week

Kansas City, MO April 30, 2012



Contributors



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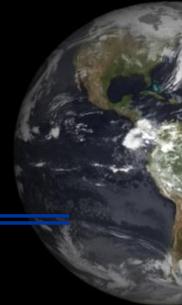
Donald Macgorman and Kristin Kuhlman
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Michael Folmer
NOAA/ NWS/ CampSprings, MD



Outline



- Overview of the GOES-R Proving Ground
- Examples of activities from the PG & Satellite Blogs
- Plans for 2012
- PG & training
- Looking to the future
- Summary



GOES-R Proving Ground



– What is the GOES-R Proving Ground?

- Collaborative effort between the GOES-R Program Office, selected NOAA/ NASA Cooperative Institutes, NWS forecast offices, NCEP National Centers, JCSDA, and NOAA Testbeds.
- Where proxy and simulated GOES-R products are tested, evaluated and integrated into operations before the GOES-R launch.
 - Training is a key component of this process
- A key element of GOES-R User Readiness (Risk Mitigation)



Proving Ground Mission Statement



The GOES-R Proving Ground engages NWS in pre-operational demonstrations of selected capabilities of next generation GOES

- **Objective is to bridge the gap between research and operations by:**
 - Utilizing current systems (satellite, terrestrial, or model/synthetic) to emulate future GOES-R capabilities
 - Infusing GOES-R products and techniques into NWS operations with emphasis on AWIPS and transitioning to AWIPS-II.
 - Engaging in a dialogue to provide feedback to developers from users
- **The Proving Ground accomplishes its mission through:**
 - Sustained interaction between developers and end users for training, product evaluation, and solicitation of user feedback.
 - Close coordination with GOES-R Algorithm Working Group (AWG) and Risk Reduction programs as sources of demonstration products, promoting a smooth transition to operations

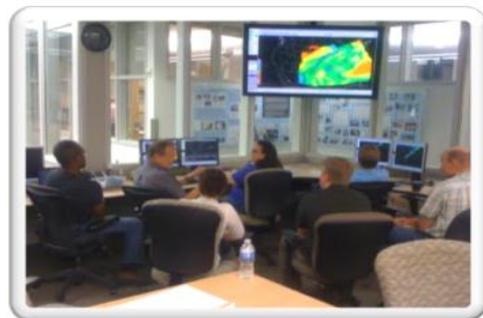
Intended outcomes are Day-1 readiness and maximum utilization for both the developers and users of GOES-R products, and an effective transition to operations



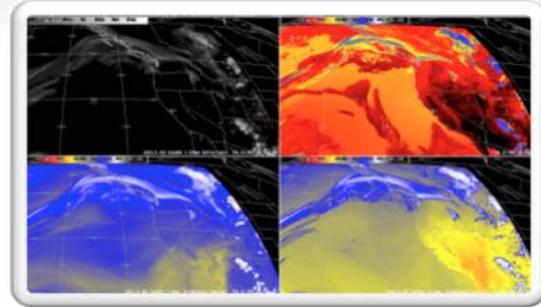
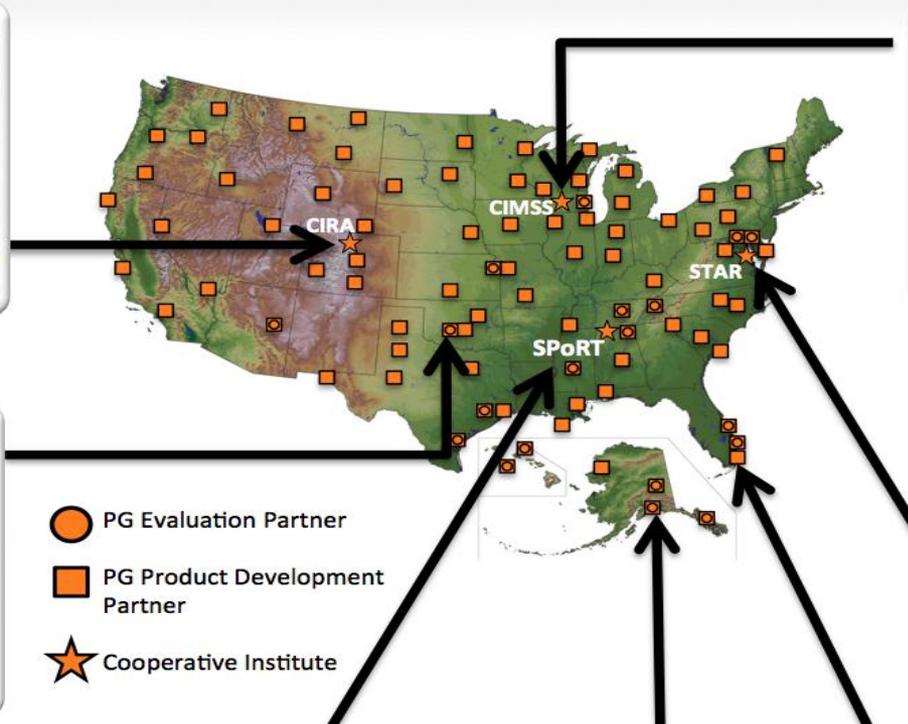
GOES-R Proving Ground Partners



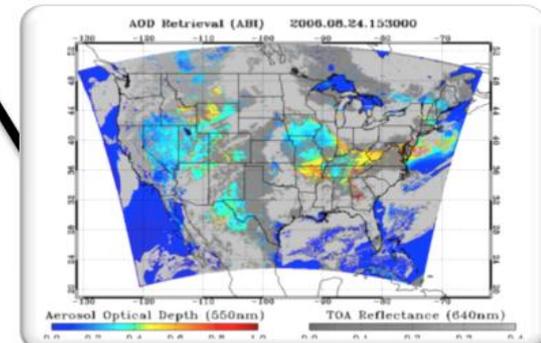
CIRA - Ft. Collins, CO
ABI Simulated Natural Color



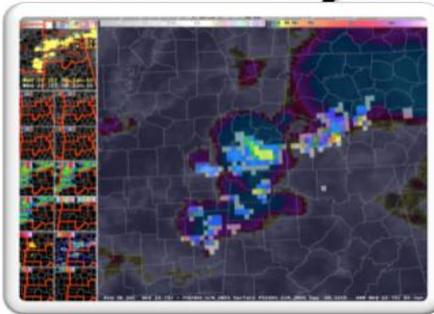
SPC - Oklahoma City, OK
Nearcast Training at the Hazardous Weather Testbed



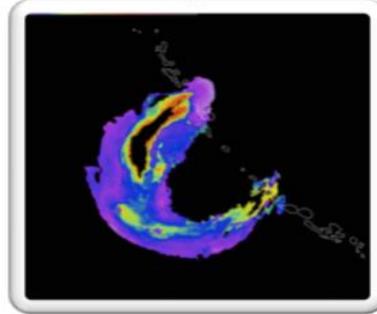
CIMSS - Madison, WI
Simulated ABI Bands



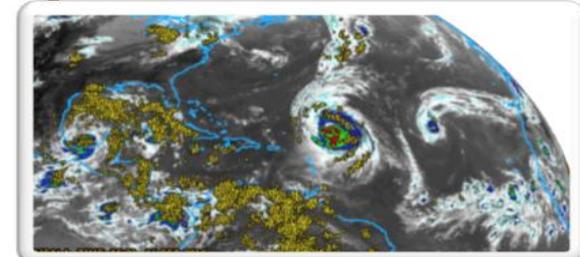
STAR - Camp Springs, MD
Aerosol Optical Depth Product



SPoRT - Huntsville, AL
GLM Lightning Flash Density



AFC - Anchorage, AK
Volcanic Ash Product



NHC - Miami, FL Rapid Intensification Index



Proving Ground Product Evaluation



The following products are part of current GOES-R Proving Ground demonstrations:

Baseline Products

- Cloud and Moisture Imagery
- Volcanic Ash: Detection and Height
- Hurricane Intensity
- Lightning Detection: Events, Groups & Flashes
- Rainfall Rate/QPE
- Total Precipitable Water
- Fire/Hot Spot Characterization
- Cloud Top Phase
- Cloud Top Height
- Cloud Top Temperature
- Derived Motion Winds
- Aerosol Detection
- Aerosol Optical Depth

Future Capabilities

- Aircraft Icing Threat
- Convective Initiation
- Enhanced "V"/Overshooting Top Detection
- Low Cloud and Fog
- SO₂ Detection



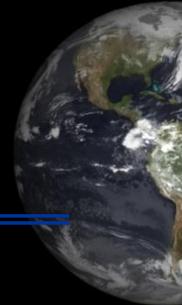
GOES-R PG Blogs Samples



- A wealth of information in the PG and satellite blogs
 - See: <http://www.goes-r.gov/users/proving-ground.html>
- Keep those BLOGS coming!
 - Leap Day Severe Weather (CIMSS): Several tornados over Missouri and Illinois
 - May 24, 2011 (HWT): Tornadic Storms in Oklahoma
 - Dallas Tornados (CIMSS)
 - A tale of 3 Northern Hemisphere Storms (HPC /OPC/SAB PG posted on the “Wide World of SPoRT”
 - Alabama Severe Wx, March 2, 2012 (Wide World of SPoRT)
 - Clouds vs Snow (CIRA)
 - Synthetic fog product (CIRA)



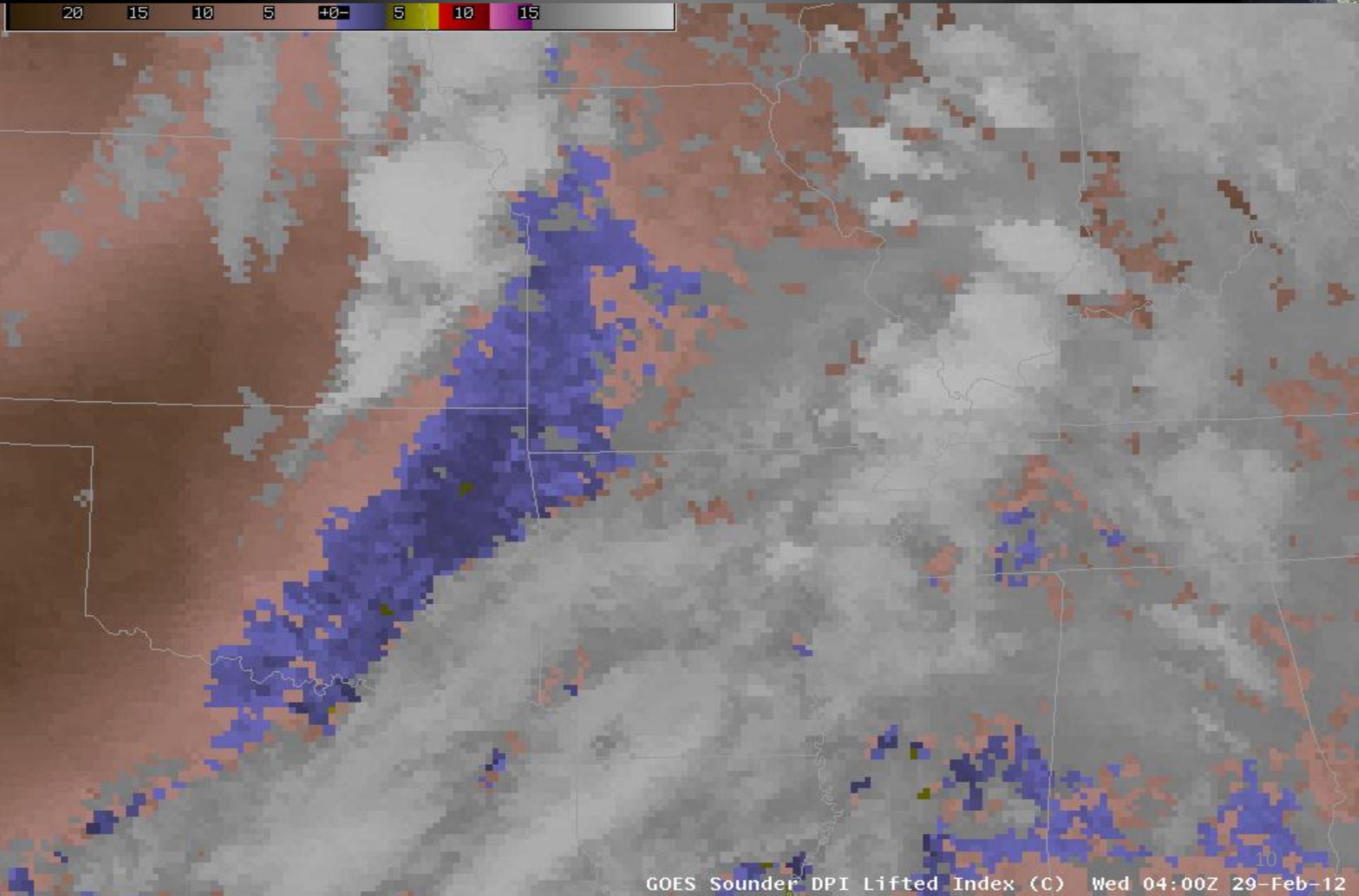
Leap Day Severe Wx

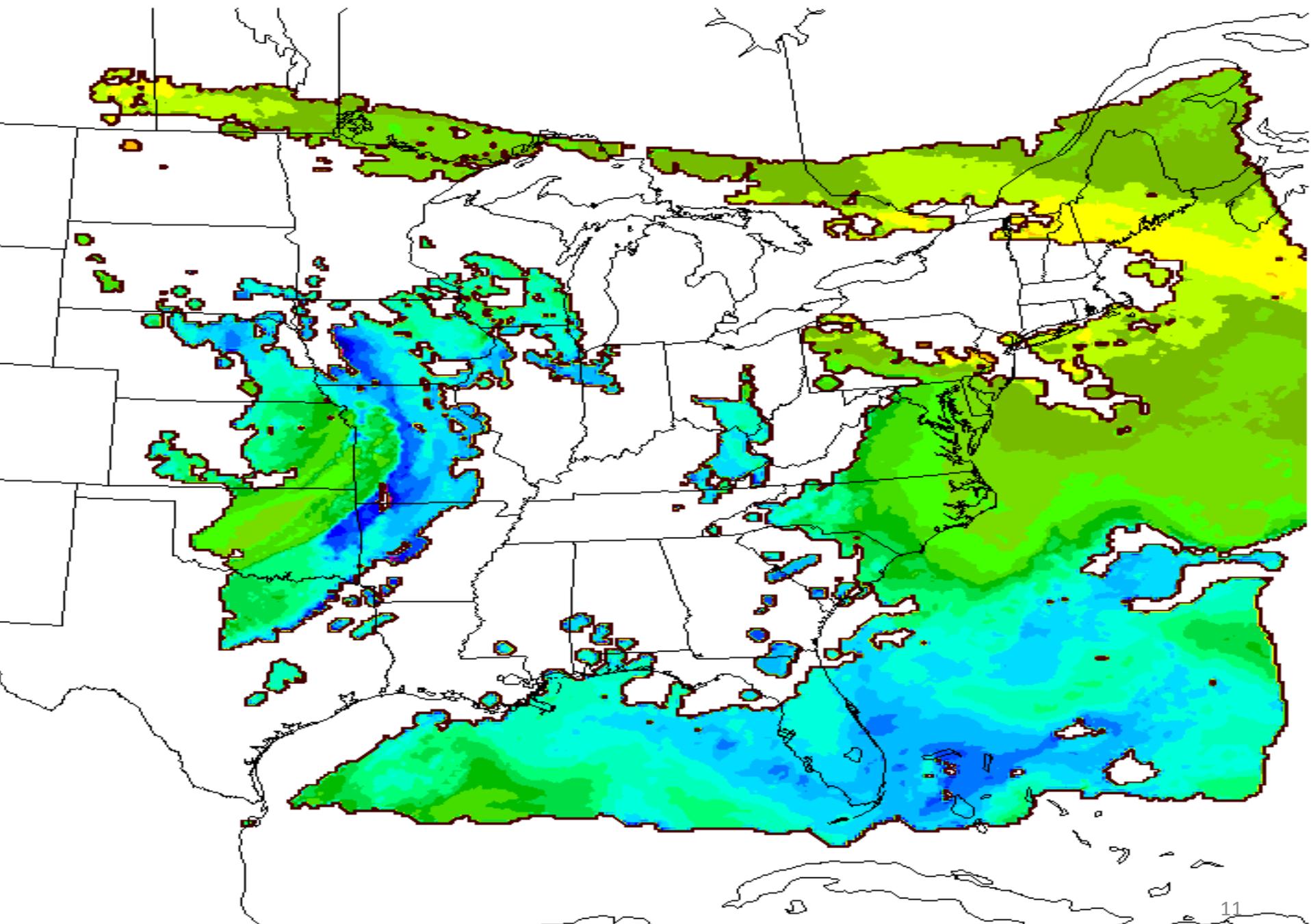


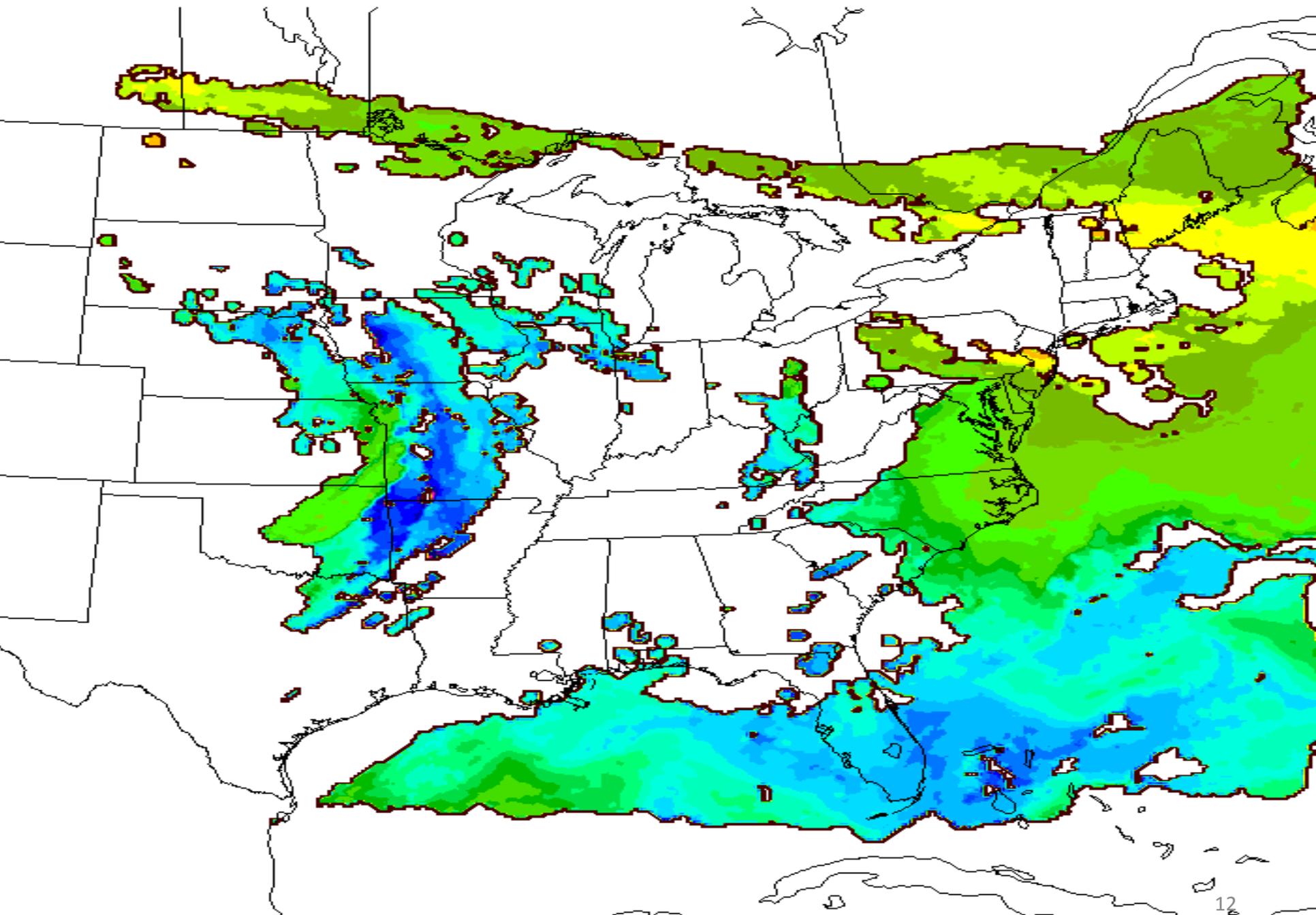
- Several tornados over Missouri including one near Branson and one near Lebanon
- GOES DPI LI at 0400 and 0700 UTC show tongue of instability movg east across MO
- NearCast suggested strong instability would help sustain development of Tstms over SW MO
- As cold front continued east, tornado hit Harrisburg IL at 10:56 UTC causing 6 deaths
- OT indicated 45 min prior to tornado hitting Harrisburg
- Examples of AVHRR cloud type, cloud height, and hi res IR

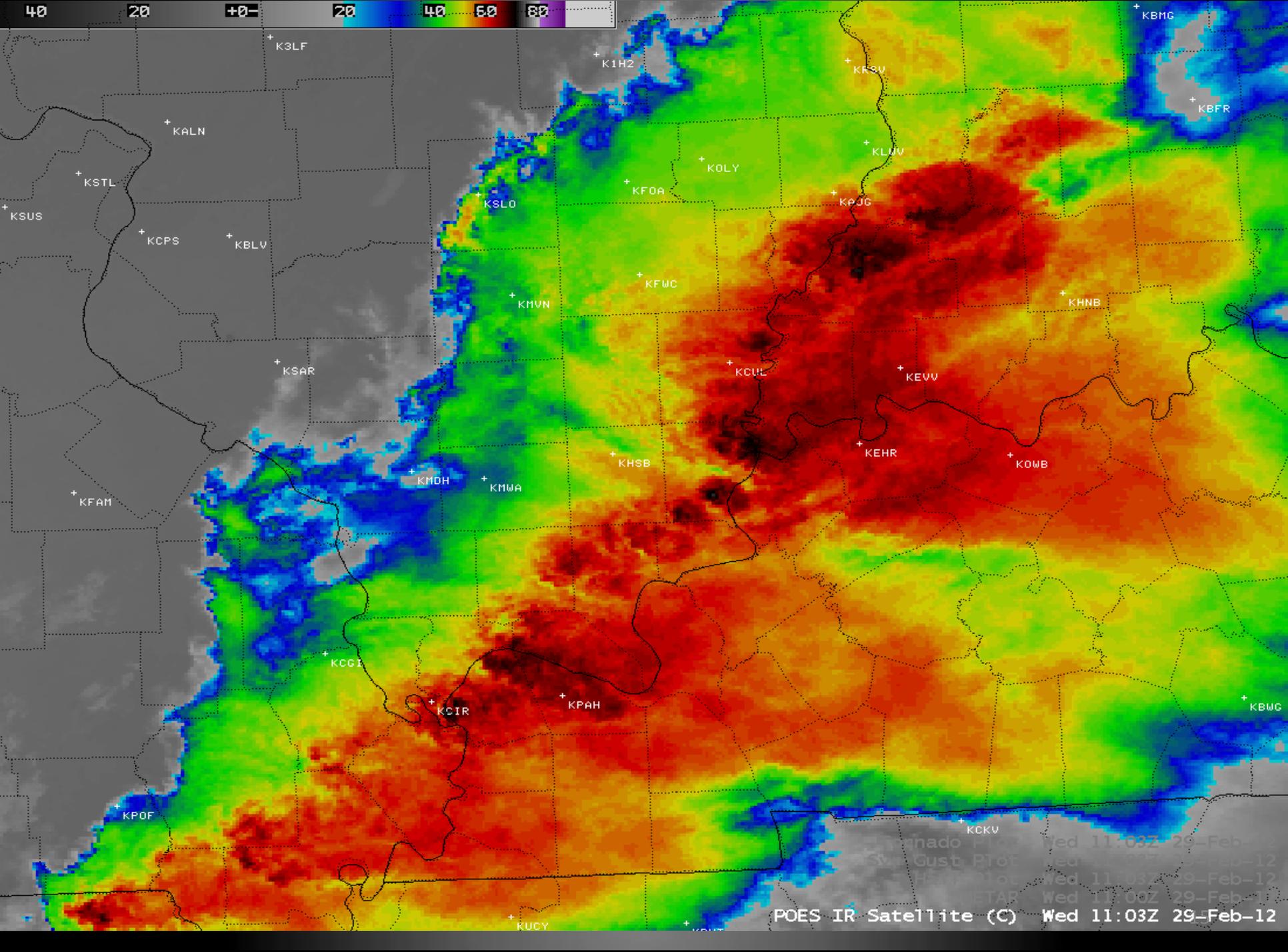


20 15 10 5 +0- 5 10 15









40 20 +0- 20 40 60 80

K3LF
K1H2
KRSV
KBMG
KBFR
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KSTL
KOLY
KLUV
KSLD
KFOA
KQJG
KUSUS
KCPS
KBLV
KMN
KFUC
KHNH
KSAR
KCVL
KEVV
KFAM
KMDH
KMMA
KHSB
KEHR
KOMB
KCCI
KCIR
KPAH
KPOF
KCKV
KUCY

POES IR Satellite (C) Wed 11:03Z 29-Feb-12
Tornado Wed 11:03Z 29-Feb-12
Sv Gust Prot Wed 11:03Z 29-Feb-12
Hail Tot Wed 11:03Z 29-Feb-12
STAR Wed 11:00Z 29-Feb-12



Cloud Cover vs Snow



- With short wave IR bands to be on GOES-R, this multi-channel product allows for distinguishing water cloud vs ice cloud vs snow cover
- With GOES-R this capability will be further improved with high temporal refresh enabling detection of snow fields currently obscured by cloud cover



Plans for 2012



- HWT: focus on severe convective storms; May 7 – June 15;
 - Products for evaluation include CMI, PGLM, CI, UWCI, Nearcasting model, WRF based lightning threat, **RGB airmass and simulated imagery in the CAPS ensemble**
 - AWIPS-2 running in real time
 - WES case on May 24 – Provides training exercise for all
 - Operations Plan: complete with training underway



Plans for 2012



- NHC: focus on tropical cyclones: Aug 1- Nov 30
 - Products for evaluation: HIE; RGB air mass product; SAL product; SRSO data; GOES-R natural color; RII; RGB dust product; Tropical overshooting top detection
 - More products in N-AWIPS in 2012
 - Planning for AWIPS-2 transition in 2013
 - Increased participation by the TAFB
 - More formalized method for forecaster feedback
 - Expand web interface already used by NHC
 - Operations plan: will be completed by June



Plans for 2012



- AWC: focus on aviation weather: Testbed 4-15 June (demo all products); Forecast operations 15 Jul. to 31 Dec (phase in 3 products to ops).
 - Products to be evaluated: Simulated CMI; UW CI; Low Cloud and Fog; Nearcasting Model; WRF and HRRR Lightning Threat; PGLM; Enhanced V/ Overshooting Top; Volcanic Ash Detection / Height & SO₂; Aircraft Icing Threat.
 - Operations plan: being evaluated by SDEB



Plans for 2012



- PAC Region: focus on tropical cyclones/heavy rainfall/aviation; March – Nov. phased approach to product evaluation;
 - Products to be evaluated: UWCI; Lightning Detection; Tropical Cyclone RII; Volcanic Ash Detection & Height; SO₂; ORI; Rainfall rate/ QPE; TPW, and Natural color
 - Operations Plan: complete



Plans for 2012



- Air Quality: focus on aerosol detection; AQ experiment in September; AQ workshop in October
 - Products to be Evaluated: Suspended Matter/ Aerosol Optical Depth; Fire Detection; RGB Imagery
 - Operations plan: Not available
- HPC/SAB: focus on Precipitation/ QPF; Phased approach to implementing products
 - Products to be Evaluated: CMI; Derived Motion Winds; RGB Air mass; Rainfall Rate/ QPE
 - Operations plan: being evaluated by SDEB



Plans for 2012



- OPC/SAB/TAFB: focus on offshore thunderstorms; Phased approach to implementing products
 - Products to be Evaluated: CMI; Lightning Detection; CI; Enhanced V/ Overshooting Top; Cloud Top Phase; Cloud Top Height; Cloud Top Temperature; RGB Air Mass
 - Operations plan: being evaluated by SDEB
- Alaska Region: focus on snow/cloud/volcanic ash/aviation
 - Products to be Evaluated: Volcanic Ash Detection and Height; Cloud Phase; Cloud/Snow Discrimination; Low Cloud and Fog; SO2 Detection; Aerosol Optical Thickness; Aerosol Particle Size Parameter; Suspended Matter
 - Operations plan: Not available



Training and Education



GOES-R:
Benefits of Next-Generation Environmental Monitoring

Overview: Environmental Monitoring Resources

GOES-R Mission

Instruments

Satellite System and Services

Satellite Synergy

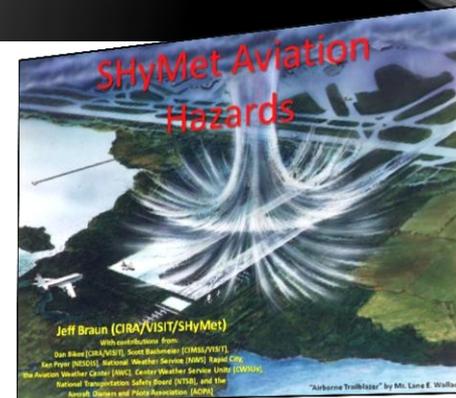
Global Observing System

GOES-R 101

Bernie Connell¹, Timothy J. Schmit^{2,3}, Jim Gurka⁵,
Steve Goodman⁵, Don Hillger^{2,4}, Steven Hill⁶,
And many other contributors

GOES-R Program in cooperation with
Satellite Hydrology and Meteorology (SHyMet) Forecasters Course

¹ Cooperative Institute for Research in the Atmosphere, Colorado State University
² NOAA/NESDIS Satellite Applications Research
³ Advanced Satellite Products Branch
⁴ Regional and Mesoscale Meteorology Branch
⁵ NOAA/NESDIS/OSD GOES-R Program Office
⁶ NOAA/NWS Space Weather Prediction Center
⁷ Cooperative Institute for Meteorological Studies, University of Wisconsin-Madison



Online training modules

- http://meted.ucar.edu/goes_r/envmon/
- <http://cimss.ssec.wisc.edu/satmet/>
- <http://rammb.cira.colostate.edu/visit/video/goesr101/player.html>
- http://rammb.cira.colostate.edu/training/shymet/forecaster_intro.asp

• Proving Ground is both a source and a recipient of Training

• PG Blogs: <http://www.goes-r.gov/users/proving-ground.htm>

• Outreach Projects (with NWSFOs): reach out to GOES-R Proving Ground Partners and connect with faculty and students to prepare for GOES-R



Future Plans: 2012 And Beyond



- Continue to apply lessons learned to incorporate new improvements each year. Example:
 - From HWT Spring Experiment... obvious that forecaster application of new products improves with additional training. In 2012 forecasters will have access to satellite training material prior to arrival in Norman.
- Demonstrate products and decision aids in NOAA Testbeds, NCEP Centers, WFOs, and the NWS Proving Ground at Training Center
- Transition from Warning Related Products to remaining Baseline Products, Day 2 Future Capability, Decision Aids, Decision Support Services
- Continue to develop, demonstrate, and test as part of decision support services
- Enhanced JPSS, international, and broadcaster community collaboration



Summary



- GOES-R Proving Ground provides mechanism to:
 - Involve CIs, AWG, National Centers, NOAA Testbeds and WFOs in user readiness
 - Get prototype GOES-R products in hands of forecasters
 - Keep lines of communication open between developers and forecasters
 - Allow end user to have say in final product, how it is displayed and integrated into operations
- Proving Ground continues to grow and plans are in place for 2012 and beyond.
- For GOES-R to be a success, forecasters must be able to use GOES-R products on Day 1!

Save the Date

“Strengthening Partnerships to Enhance User Readiness, Reception, and Utility”

You are cordially invited to join us for
this engaging event focused on users

NOAA Satellite Conference
April 8-12, 2013
Miami, Florida

<http://satelliteconferences.noaa.gov/Miami2013>



Backup



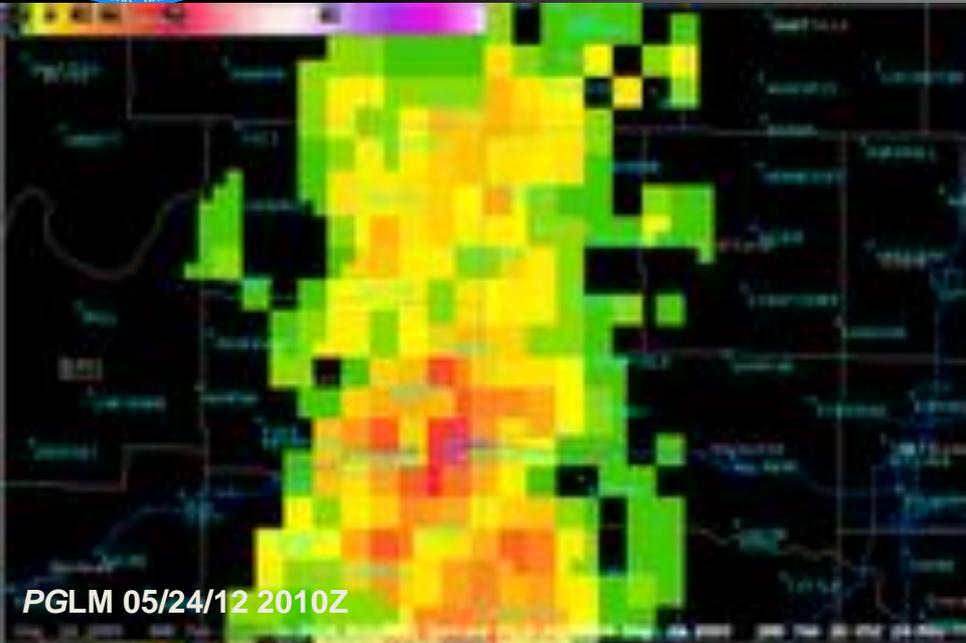


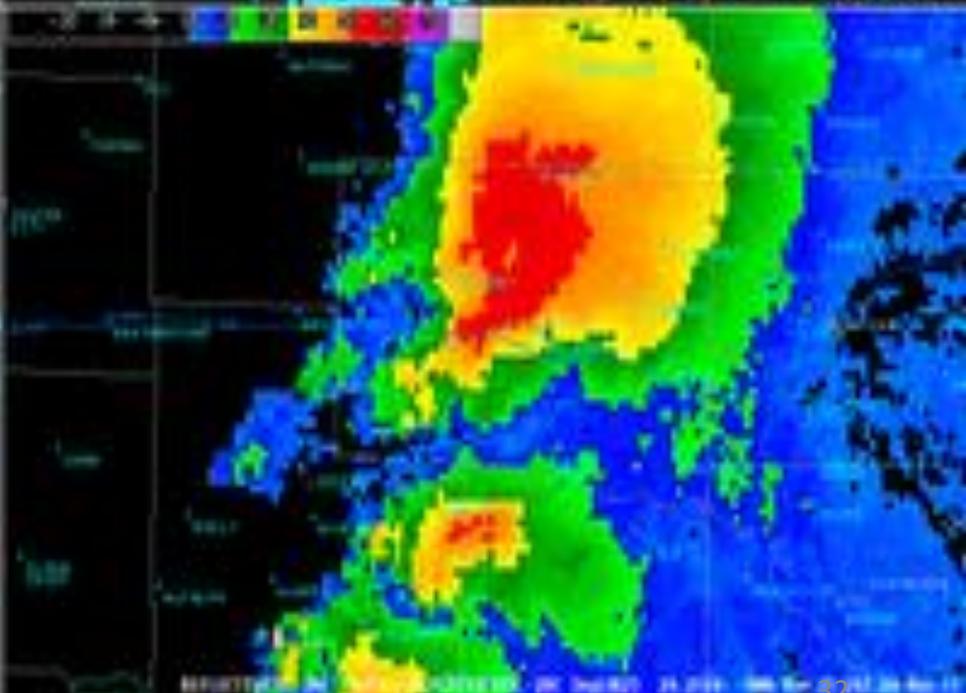
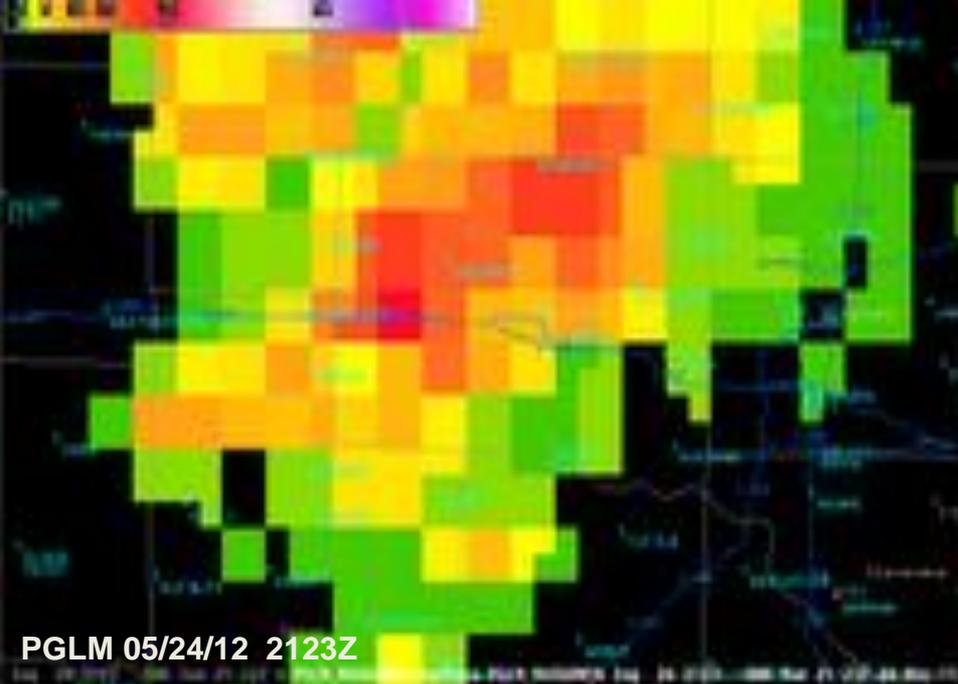
May 24 Tornadic Storms OK



- CI products IDd initial convection 15-20 min before PGLM
- Flash rates increased rapidly & 1st tornadic storm occurred as two isolated storms merged near Weathersford OK
- Increase in flash rates coincident with increase in mid level rotation... led to 1st warning of the day
- Max PGLM flash densities consistently tracked ahead of the main updraft and helped ID changes in storm motion
- Several times PGLM indicated main center of rotation shifting prior to the ID of new rotation tracks on MSMR
- While lgtng jumps preceded many of the tornados, fcstrs would also like to examine trends for individual storms





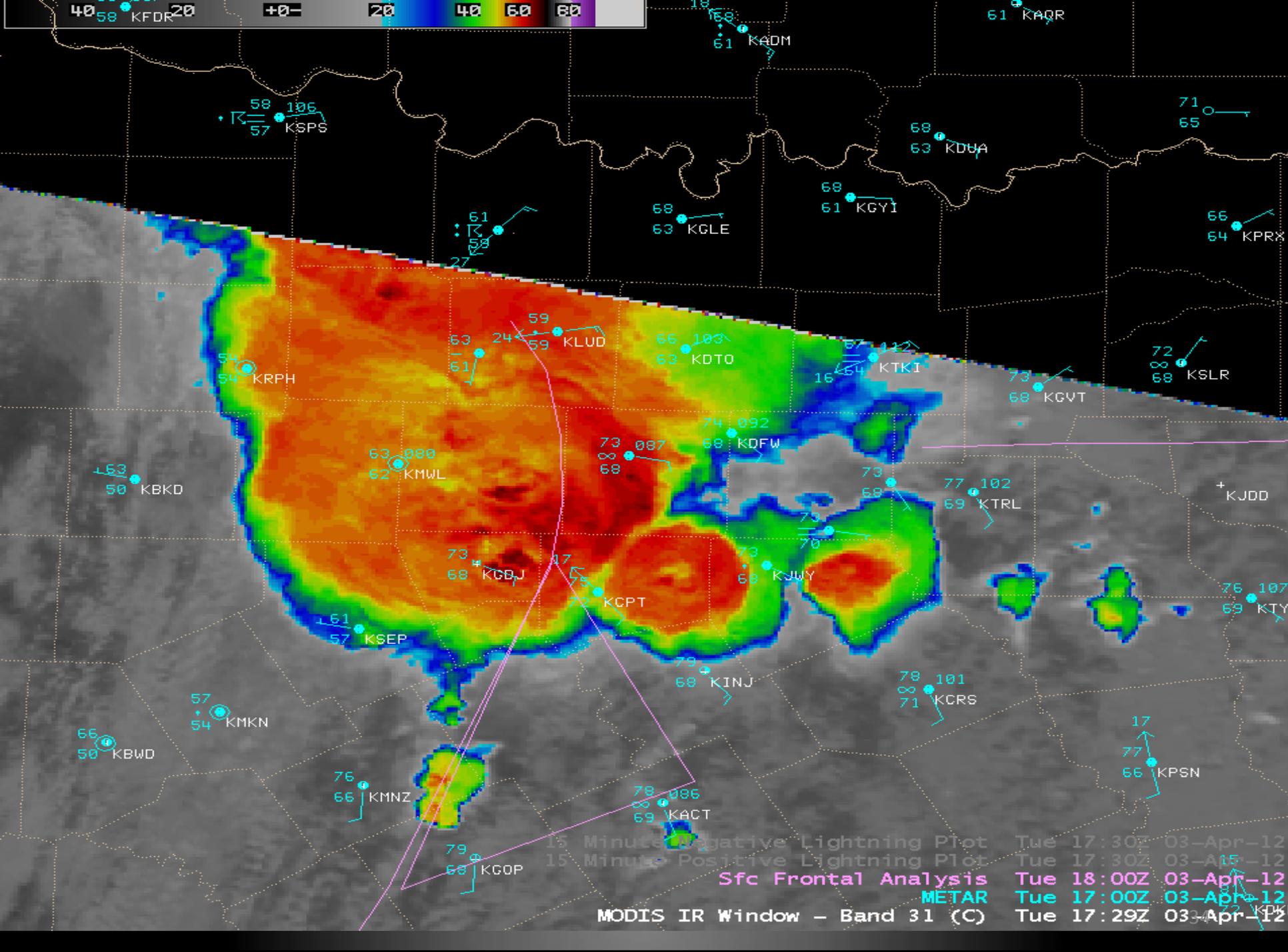




Dallas/Fort Worth tornados



- Thunderstorms along cold front on April 3 produced a number of tornados and hail as large as 2.75 inches.
- Striking comparisons of resolution on Suomi NPP and MODIS images vs GOES
- With more details available on Higher res MODIS, pronounced thermal couplet (-63C/-52C) exhibited by storm located just east of Cleburne (KCPT) where 1st tornado was reported by spotters at 17:35 UTC



40 58 20 +0- 20 40 60 80

58 105
57 KSPS

61 KADM

61 KAQR

71
65

68
63 KDBA

68
61 KGYI

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64 KPRX

68
63 KGLE

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58

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54 KRPB

63 24 59
61 KLUD

66 103
63 KDTO

67 112
64 KTKI

73
68 KGVY

72
68 KSLR

153
50 KBKD

63 080
62 KMWL

73 087
68

74 092
68 KDFW

73
69

77 102
69 KTRL

+ KJDD

73 68 KGBJ

70
68 KCPT

73
68 KJWY

73
70

76 107
69 KTY

161
57 KSEP

73
68 KINJ

78 101
71 KCRS

66
50 KBWD

57
54 KMKV

76
66 KMNZ

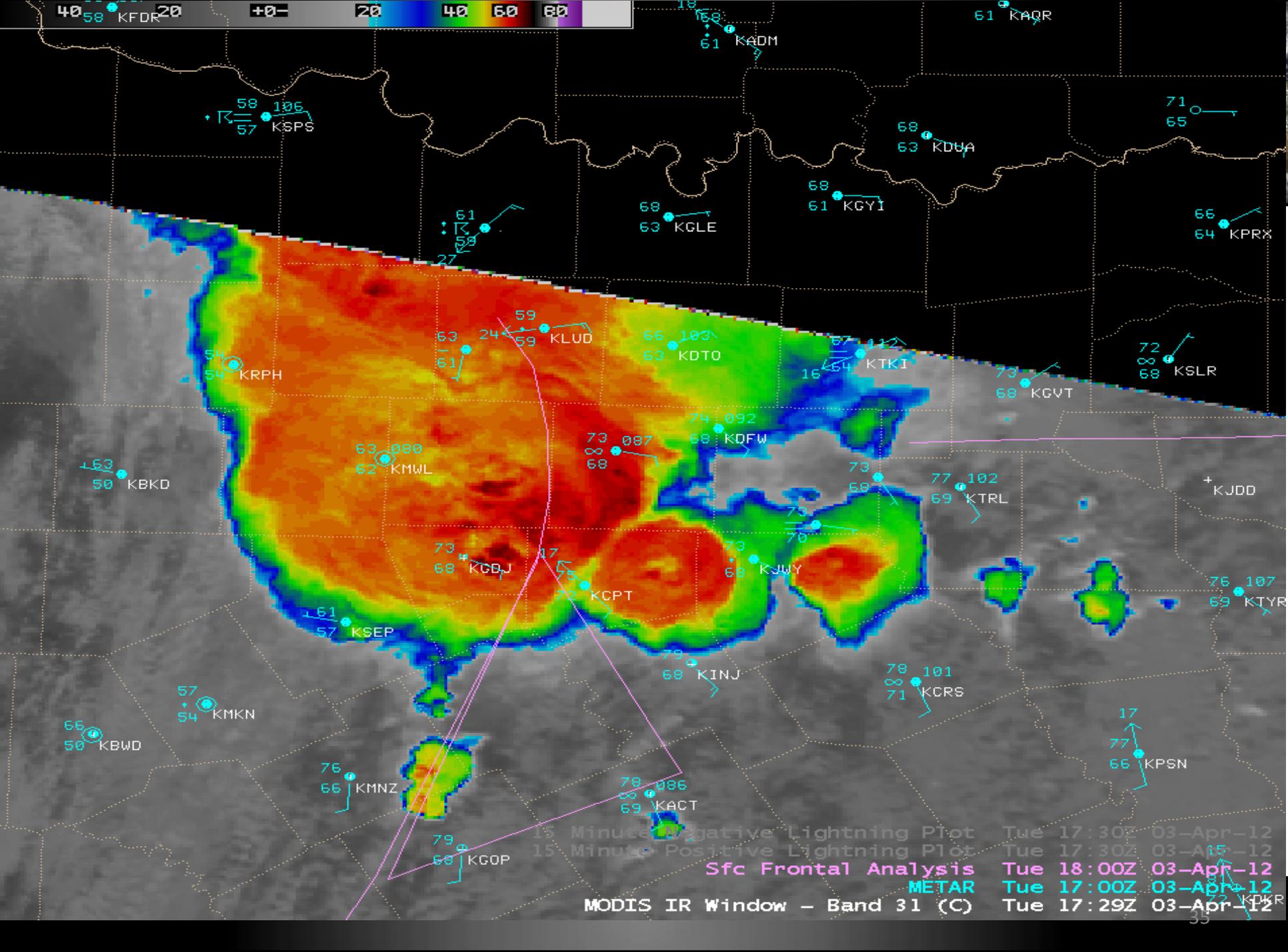
78 086
69 KACT

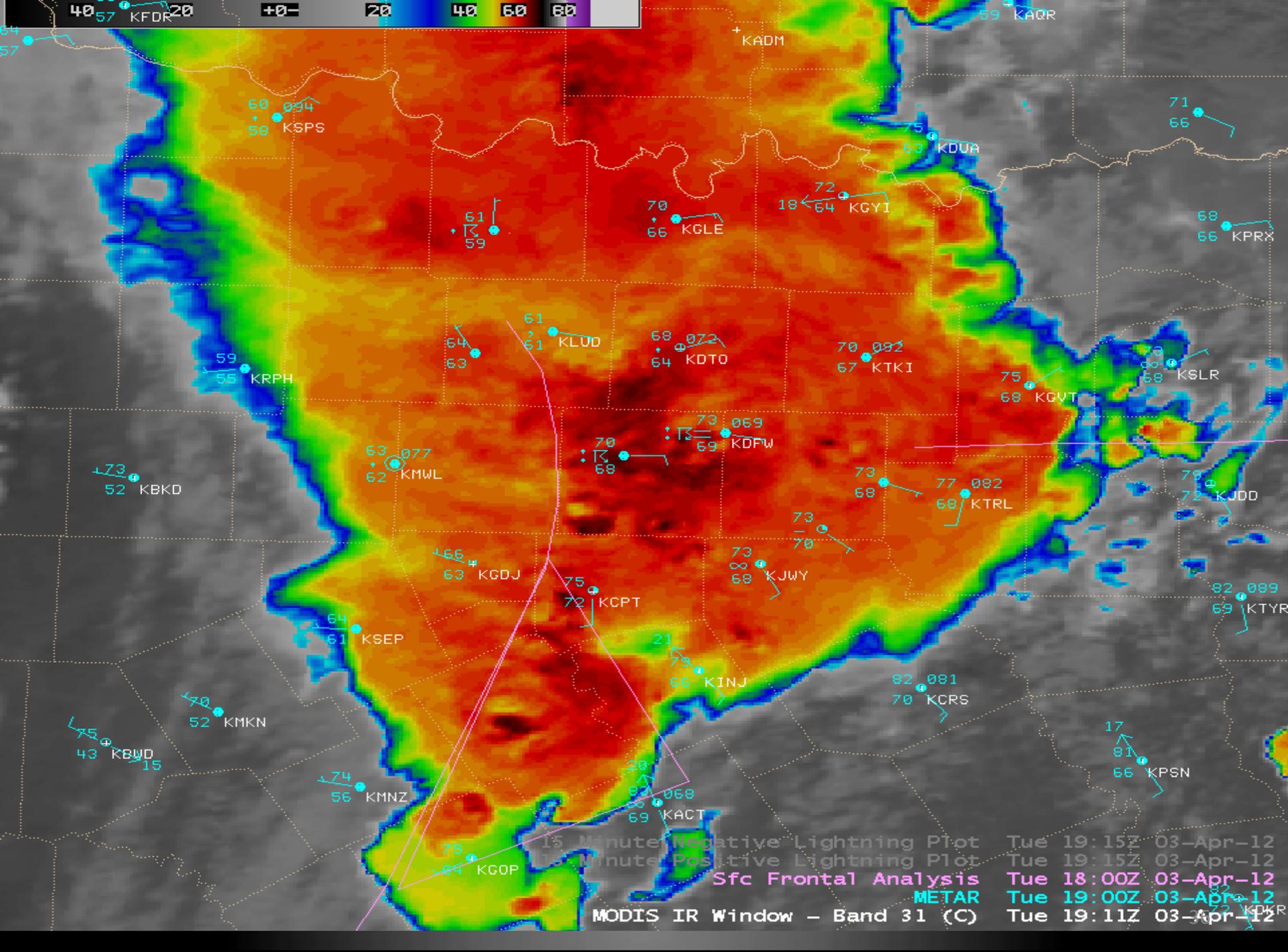
17
77
66 KPSN

79
68 KGOP

MODIS IR Window - Band 31 (C)

Tue 17:29Z 03-Apr-12





40 57 KFDR 20 +0- 20 40 60 80

KADM

69 KAOR

60 094
59 KSPS

71
66

61
59

70
66 KGLE

72
64 KGYI

68
66 KPRX

59
55 KRPH

61
61 KLUD

68
64 KDTO

70
67 KTKI

75
68 KCVT

70
68 KSLR

173
52 KBKD

53
62 KMWL

70
68

73
69 KDFW

73
68

77
68 KTRL

78
72 KJDD

166
63 KGDJ

75
72 KCPT

73
68 KJWY

82
69 KTYR

64
61 KSEP

21
70 KINJ

82
70 KCRS

145
43 KBWD

140
52 KMKN

174
56 KMNZ

20
87
69 KACT

17
81
66 KPSN

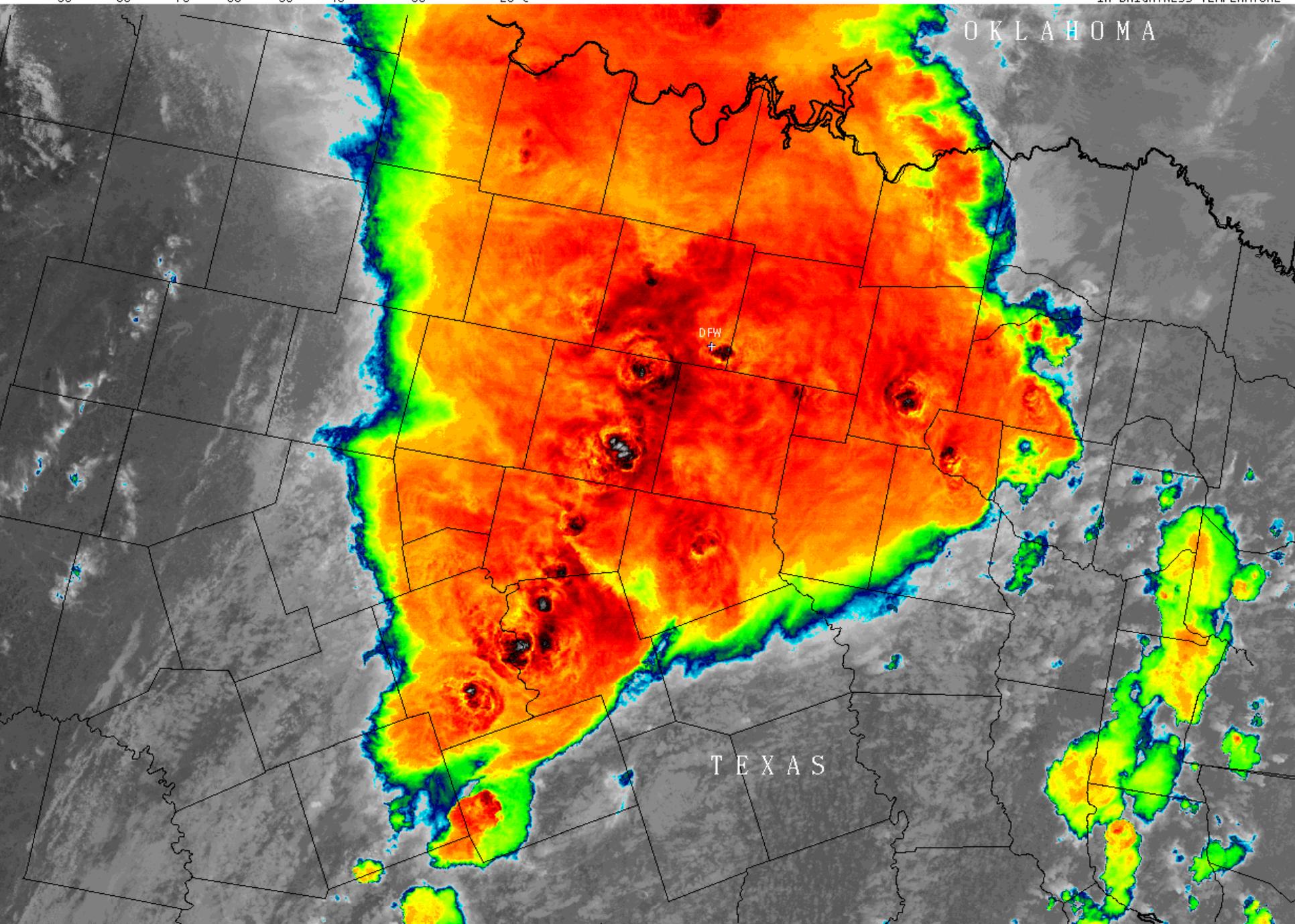
75
64 KGOP

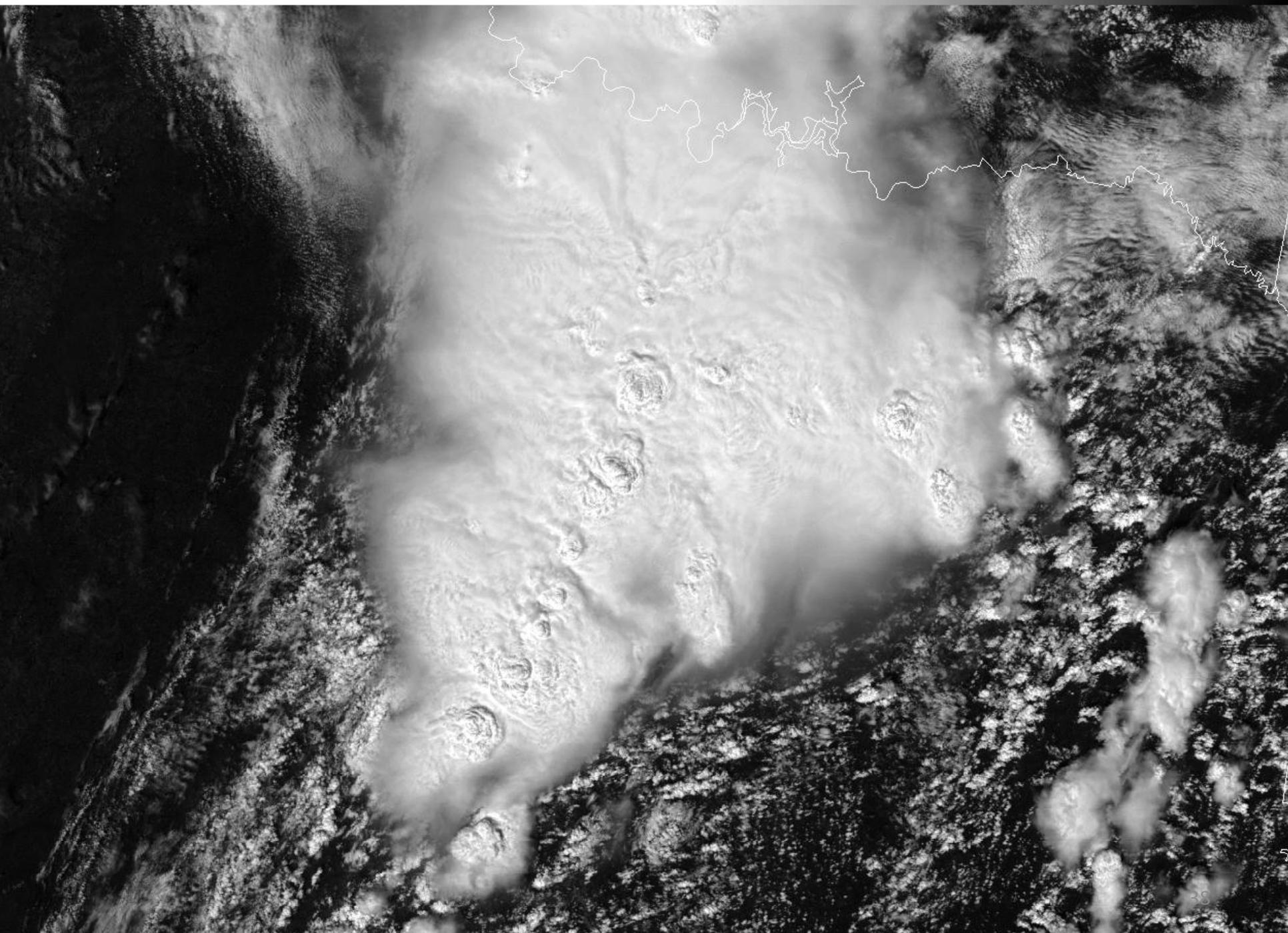
15 Minute Negative Lightning Plot
15 Minute Positive Lightning Plot
Sfc Frontal Analysis
METAR
MODIS IR Window - Band 31 (C)

Tue 19:15Z 03-Apr-12
Tue 19:15Z 03-Apr-12
Tue 18:00Z 03-Apr-12
Tue 19:00Z 03-Apr-12
Tue 19:11Z 03-Apr-12

-90 -80 -70 -60 -50 -40 -30 -20 C

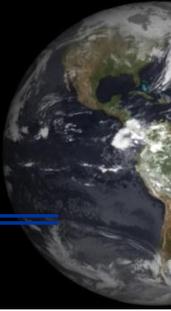
IR BRIGHTNESS TEMPERATURE



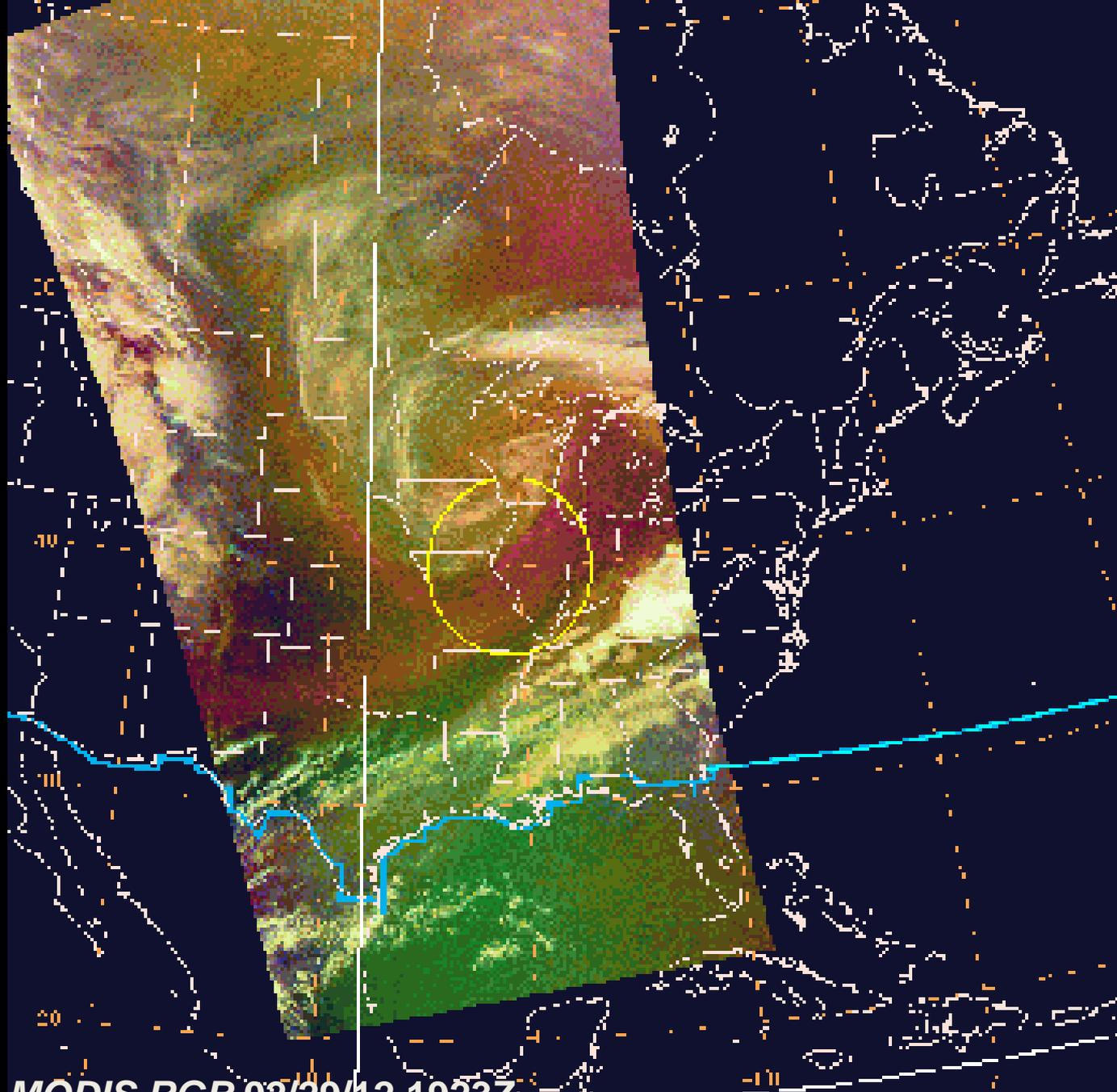




Tale of 3 Storms

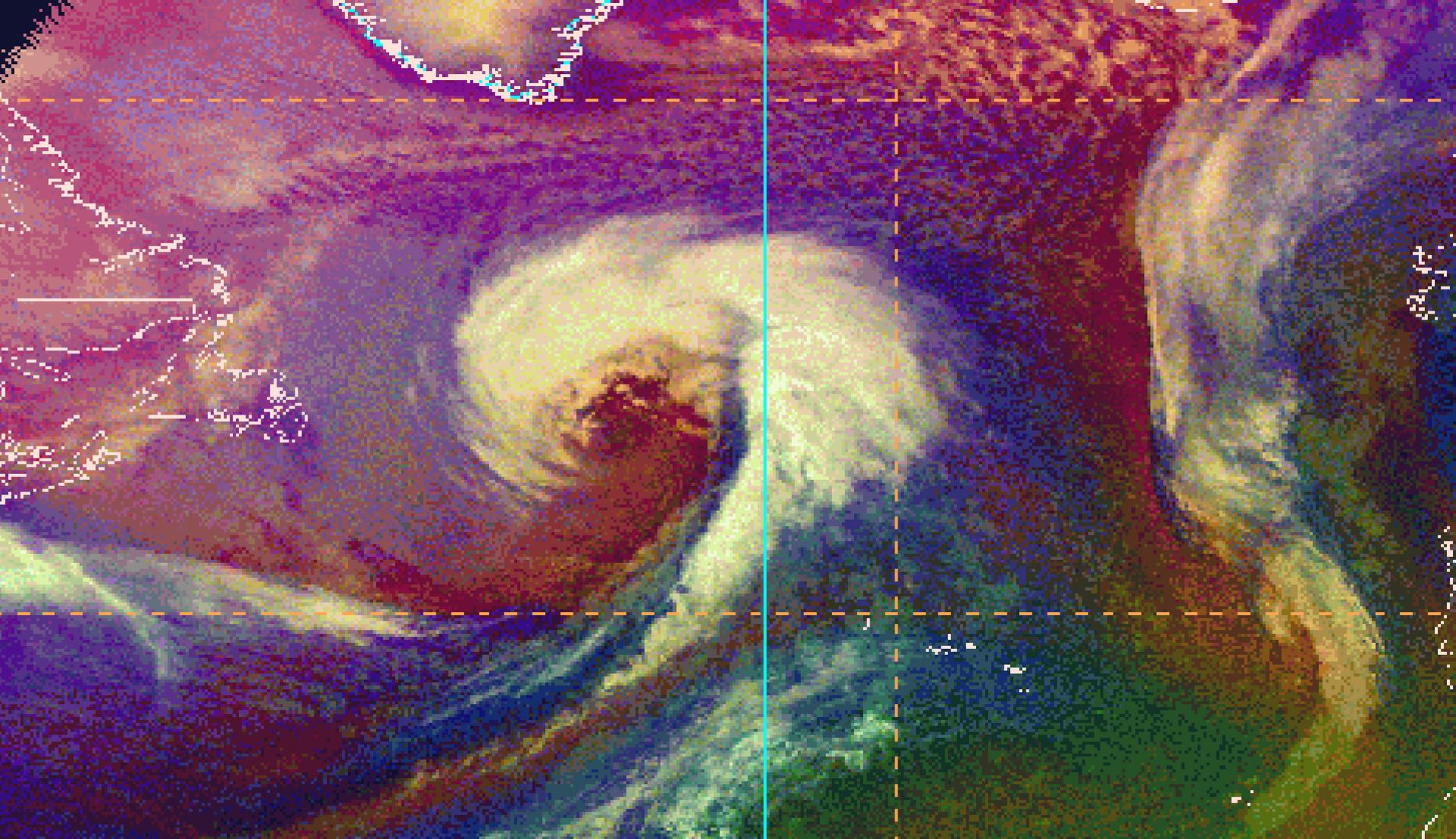


- Midwest storm produced devastating tornados
- Rapidly intensifying storm over the North Atlantic produced hurricane force winds
- Strong storm in the Eastern Mediterranean with major impacts in Turkey, Lebanon, Israel, and Egypt
- RGB airmass product used to show stratospheric intrusions in all three storms
- Stratospheric intrusions: typically associated with rapidly deepening cyclones....tongue of high PV, ozone rich air subsides isentropically into the troposphere



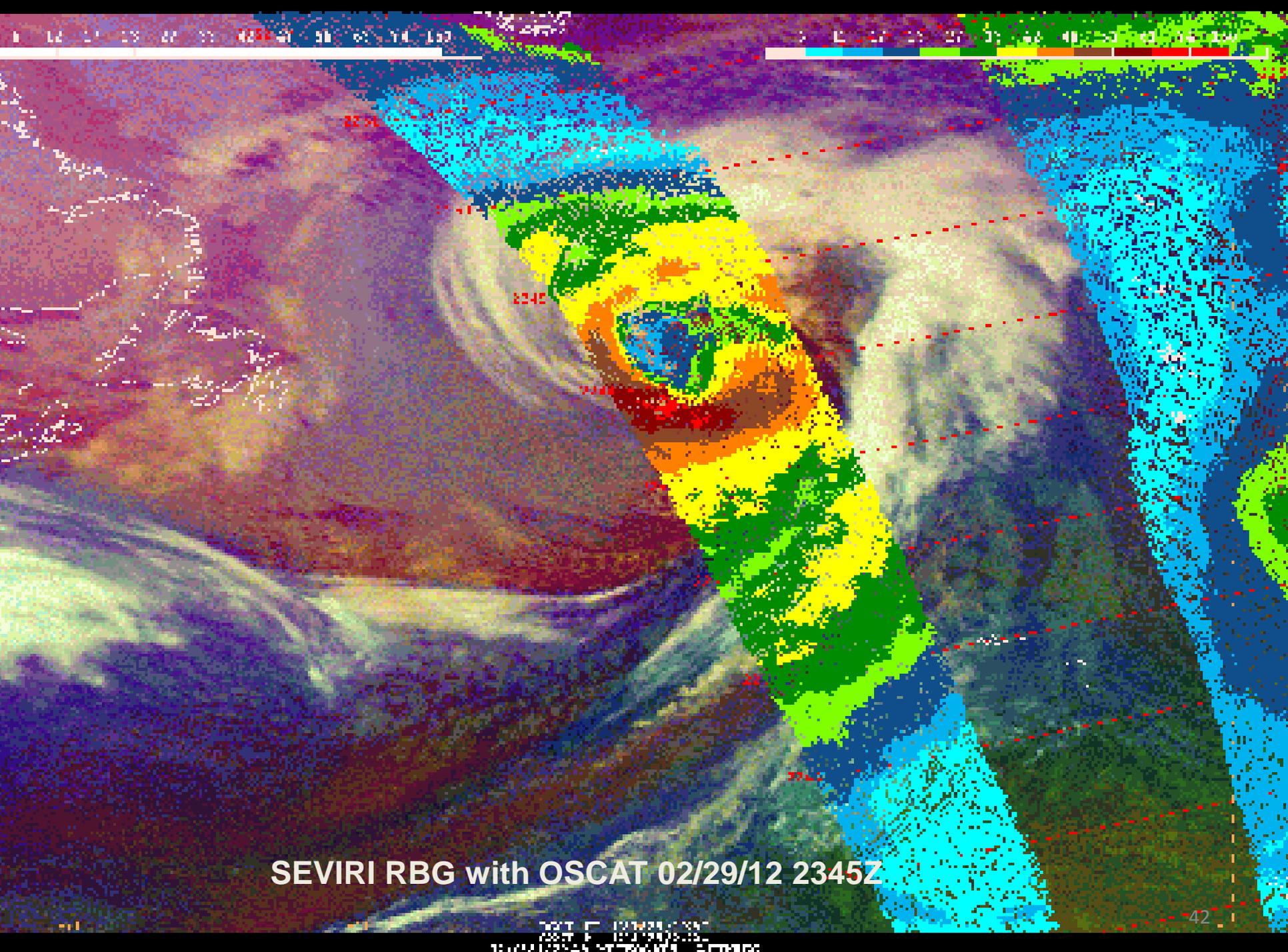
MODIS RGB 02/29/12 1923Z

130339Z/1501 4000-R 0000 4000000

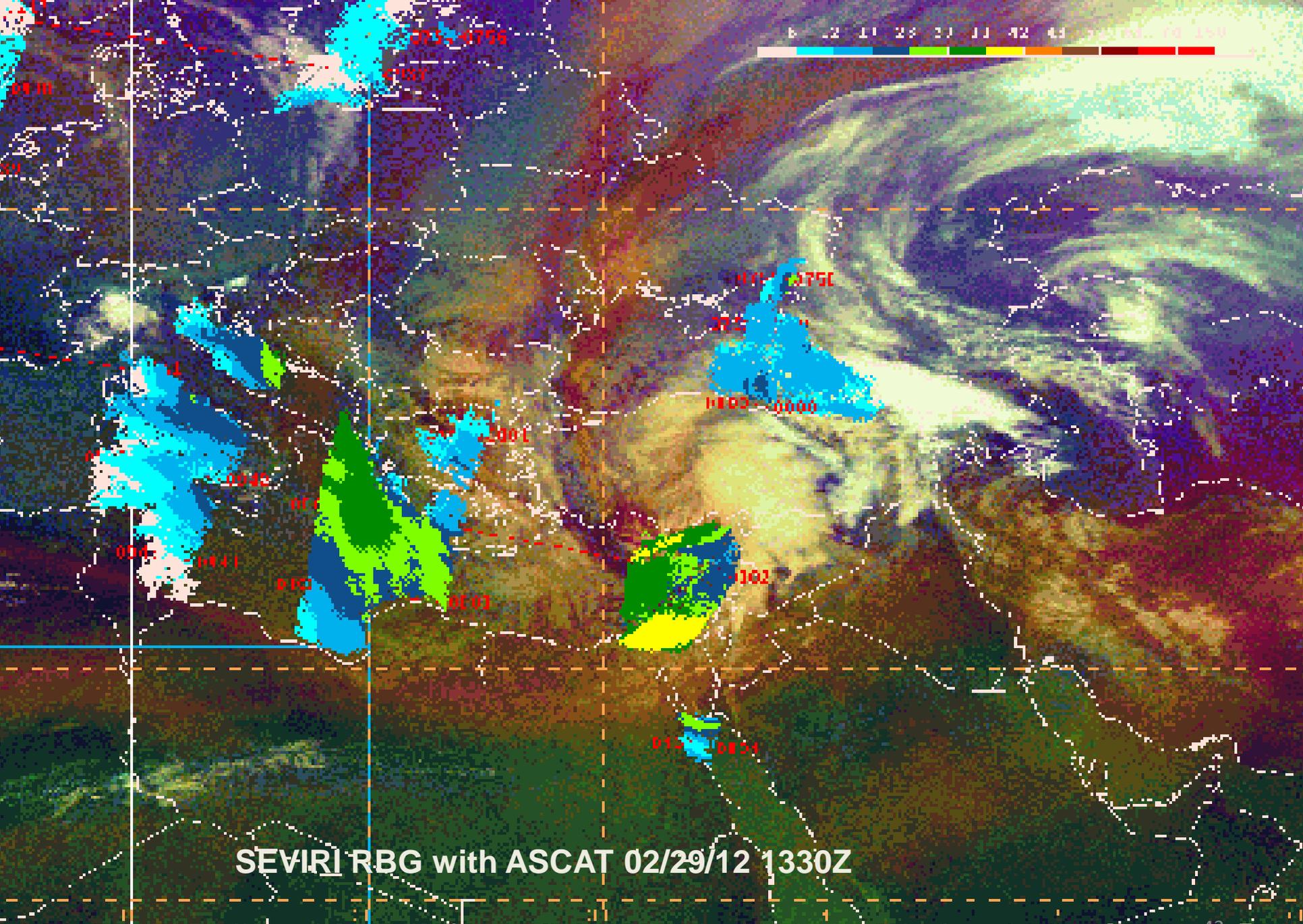


SEVIRI RGB 02/29/12 1900Z

SEVIRI 0061/6200Z



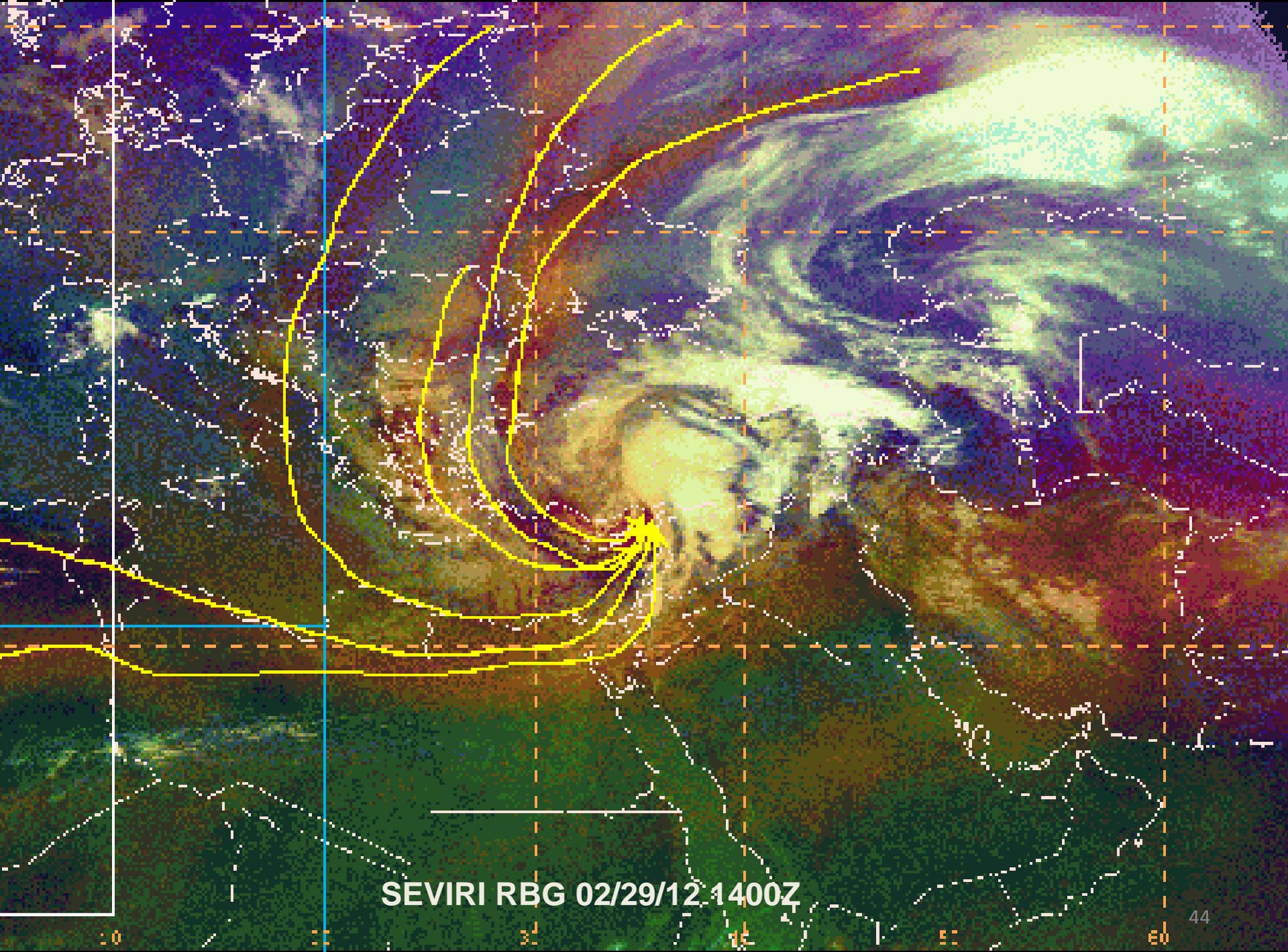
SEVIRI RGB with OSCAT 02/29/12 2345Z



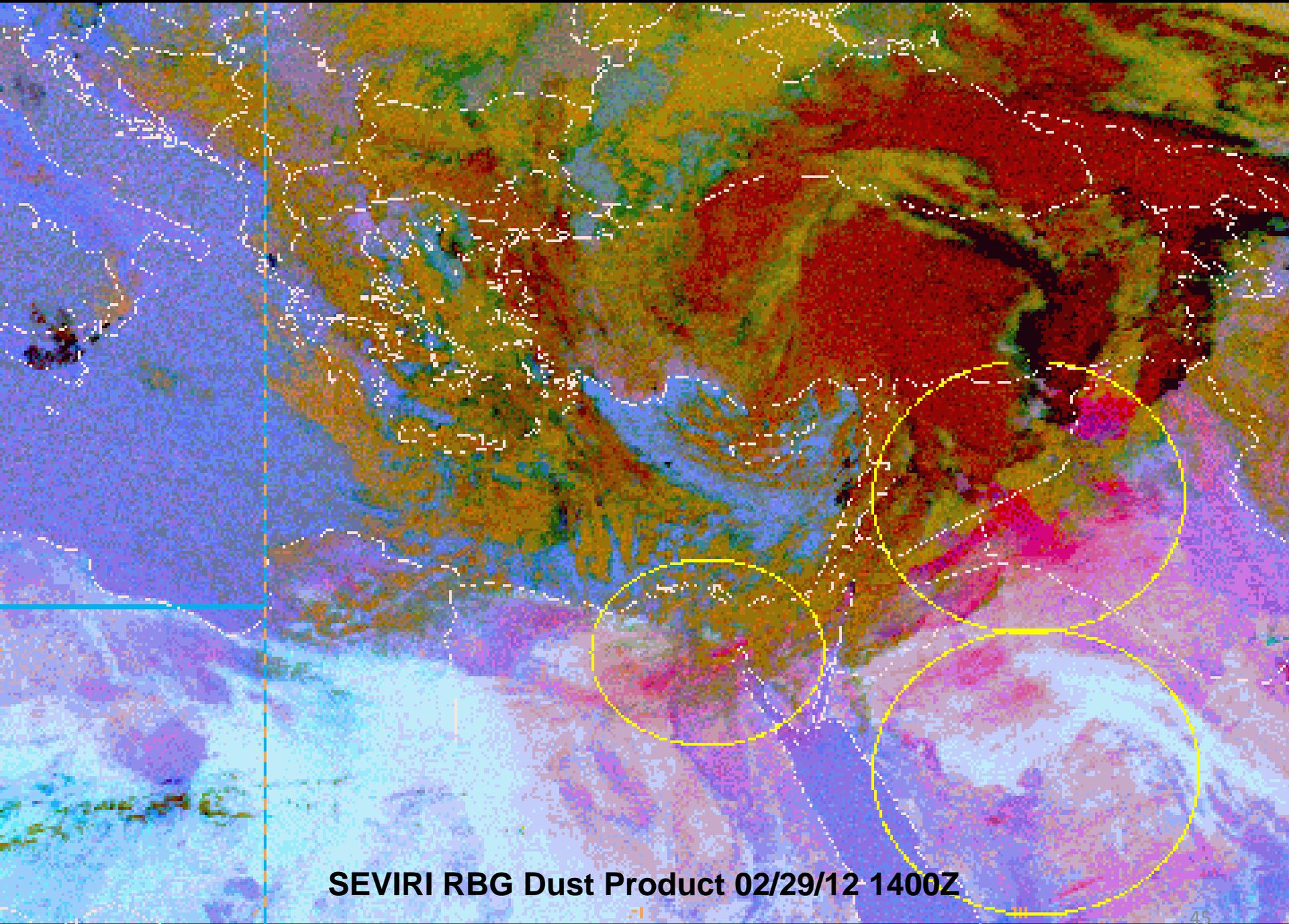
6 12 18 24 30 36 42 48 50

SEVIRI RGB with ASCAT 02/29/12 1330Z

02/29/12 13:30 UTC
13:30 UTC 02/29/12



SEVIRI RBG 02/29/12 1400Z



SEVIRI RBG Dust Product 02/29/12 1400Z



March 2, 2012 Huntsville



- With inconclusive signals from radar...LMA source density spike tips balance in favor of issuing warning
- With LMA updates every 2 minutes vs 6 minutes for radar in VCP 11, lightning spike was indicated before radar update
- Storm produced golfball size hail

March 2, 2012 1442Z Alabama

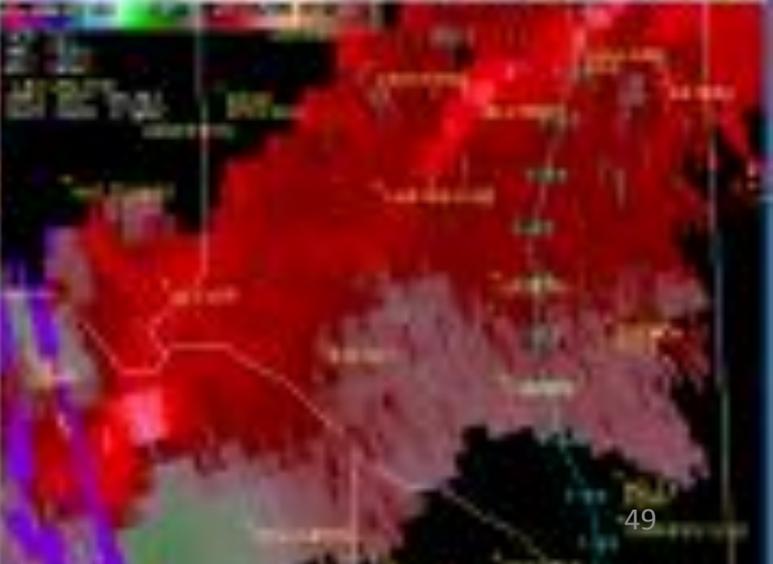
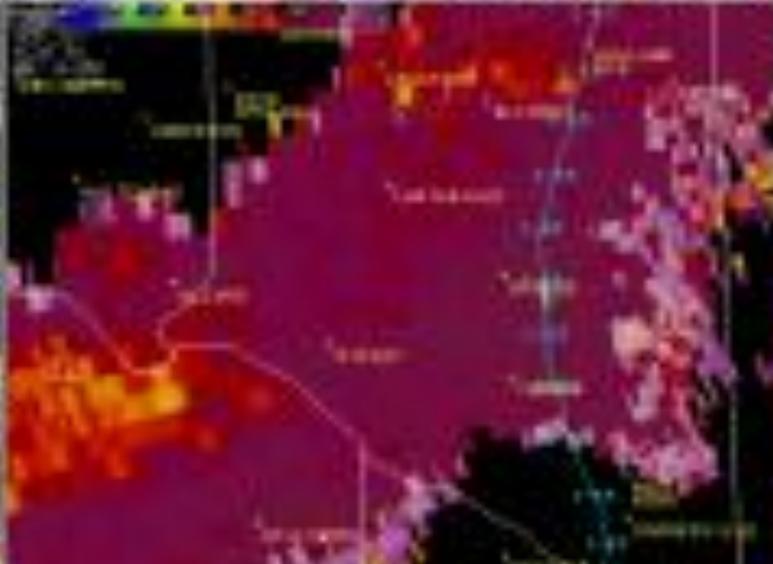
LMA

HTX Radar

.5 deg. Correl Coef

.5 deg. Velocity

March 2, 2012 1446Z Alabama





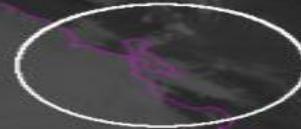
Synthetic Fog Product



- Synthetic fog product produced from the NSSL WRF-ARW
- 10.35 – 3.9 micrometer difference
- Color scheme in example.... Grey into light blue represents increasing confidence in liquid water clouds
- Example shows good agreement between forecast and observation

15 UTC

Note the evolution
of the forecast
and
observed low cloud
field



16 UTC

17 UTC

18 UTC



What is available now?



Listed/linked on GOES-R Home page

- Proving Ground Overview
- Presentations from GUCs/ AMS/ etc:
 - <http://www.goes-r.gov/users/conf-mtgs.html>
- GOES-R 101 (SHyMet)
- Satellite Meteorology for Grades 7 – 12
- GOES-R: Benefits of Next-Generation Environmental Monitoring (COMET)
- GOES-R Trifold flyer
- <http://www.goes-r.gov/users/training.html>



Recent COMET Publications



- Monitoring the Climate System with Satellites
- Space Weather Basics (2nd Edition)
- Atmospheric Dust
- Satellite Feature Identification
- <http://www.meted.ucar.edu>