# REVIEW OF THE PLOWS IOPS

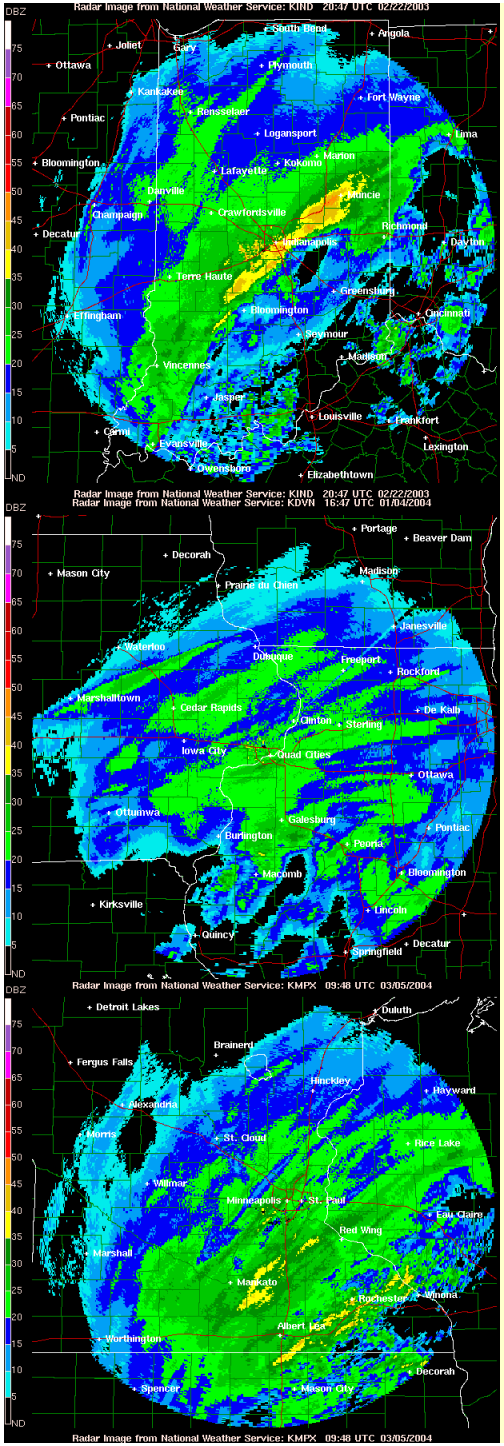
**24 IOPS during two years of sampling**

**3 IOPS were aircraft calibration or survey flights**

**21 IOPS dedicated to science missions**

Platform participation in 21 science IOPS

| | |
|---|---|
| **MIPS** | **17** |
| **MAX** | **13** |
| **MISS** | **13** |
| **MISSOU** | **10** |
| **C-130** | **13** |




# RANKING BASED ON PLOWS SCIENCE QUESTIONS

1) What are the predominant spatial patterns of organized precipitation substructures, such as bands and generating cells, in these quadrants and how do they evolve?

2) How do frontal scale systems above and within the boundary layer such as warm fronts,, cold fronts aloft, and occluded fronts relate to these precipitation substructures?

3) What are the thermodynamic and kinematic structures of these frontal systems including the distribution of moisture and vertical motion?

4) What instabilities and types of mesoscale forcing (e.g., moist CSI, moist frontogenesis, gravity waves, and elevated upright convection) control the generation and evolution of precipitation substructures?

5) How do microphysical processes vary between the different precipitation substructures and what are the consequences?

6) Is instability triggered in ice-saturated ascent critical in some of these instances and is it through the release of the latent heat of deposition that instabilities can persist?

## RANKING FOR PLOWS IOPS

| | | | |
|---|---|---|---|
| 5 | Excellent: | Met most or all PLOWS objectives | Top Priority |
| 8 | Very Good: | Met many PLOWS objectives | High Priority |
| 5 | Good | Data support PLOWS objectives | Medium Priority |
| 3 | Fair | Data interesting, but not likely to satisfy PLOWS objectives | Low priority |
| 0 | P: Poor | Data met little if any PLOWS Objectives | Very low priority |

# EXCELLENT

IOP-1 **10 February 2009, 0800 UTC – 12 February 2009 0000 UTC**
N. Illinois: Rockies cyclone moves over midwest
MIPS/MAX/MISSOU (KLOT:VCP-11)

IOP-9 **2 December 2009, 0000 UTC – 03 December 2009 0700 UTC**
Indiana-Illinois: Gulf Coast cyclone moves up into Ohio Valley
All Facilities deployed (KIND: VCP-11)

IOP-10 **08 December 2009, 0000 UTC – 09 December 2009 1200 UTC**
Eastern Iowa: Rockies cyclone produces heavy snow across Iowa
All Facilities deployed (KDVN VCP-11)

IOP-19 **14 February 2010, 1200 UTC – 15 February 2010 1800 UTC**
Southern Indiana: Cyclone forms in Midwest on wave orbiting polar vortex
MAX/MISS/C-130 deployed (KVWX VCP-11)

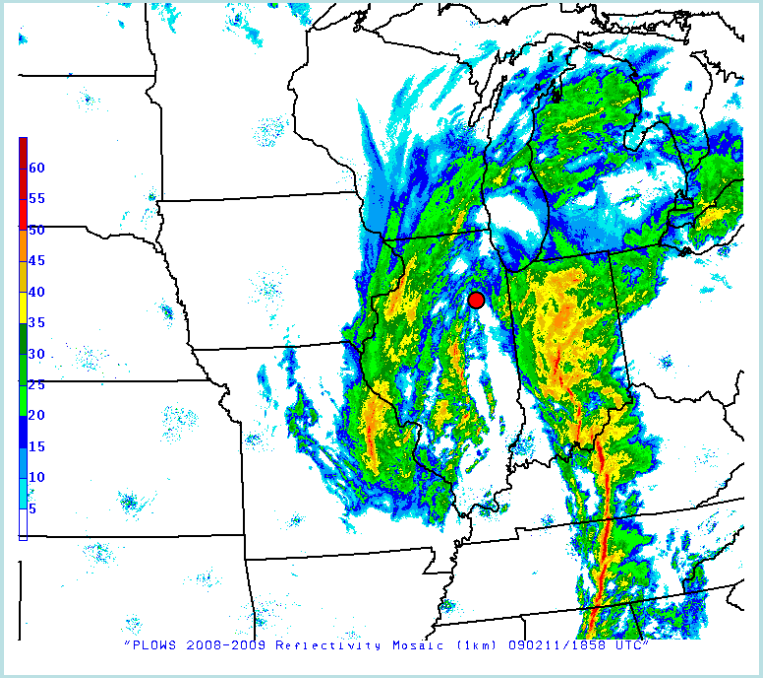
IOP-21 **21 February 2010, 1200 UTC – 22 February 2010 1200 UTC**
Iowa/Missouri/Illinois: Cyclone forms on weak wave from Southern Rockies
All Facilities deployed (KILX VCP-11)

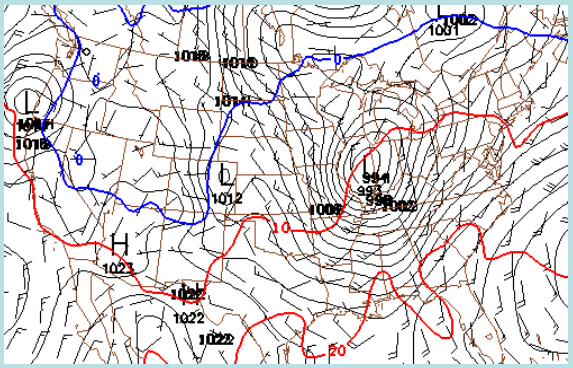
IOP-1 **10 February 2009, 0800 UTC – 12 February 2009 0000 UTC**

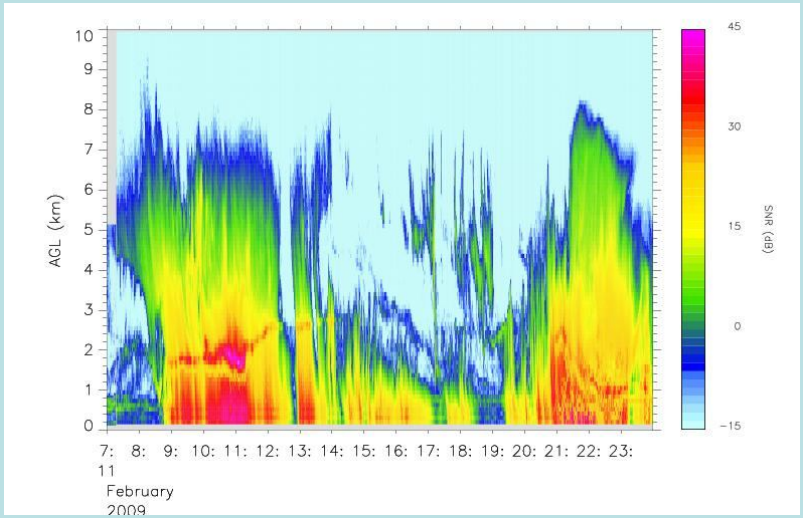
(Year 1) N. Illinois: Rockies cyclone moves over midwest

MIPS/MAX/MISSOU

(KLOT: VCP-11)



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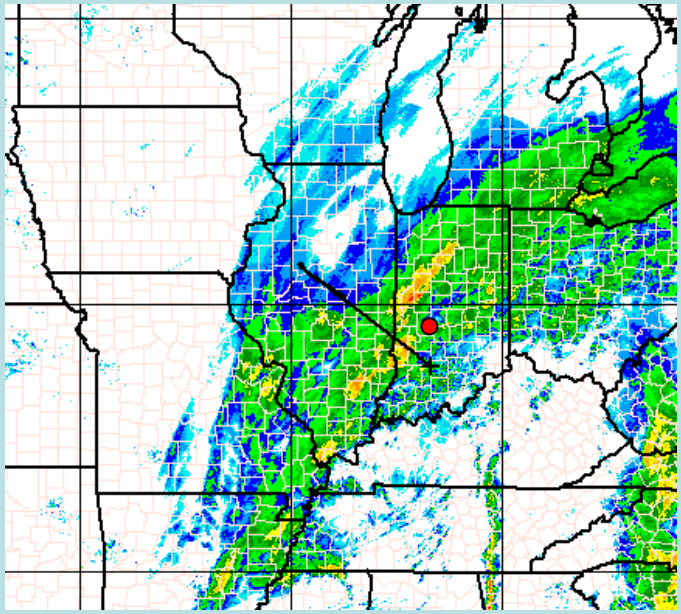
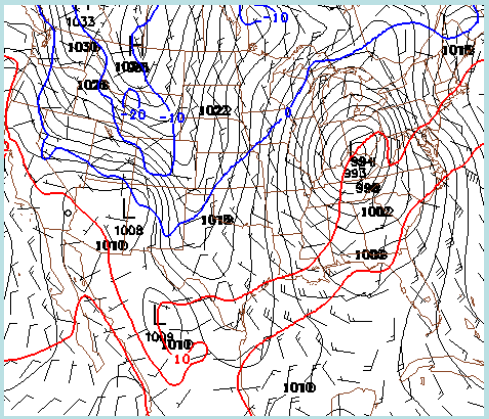
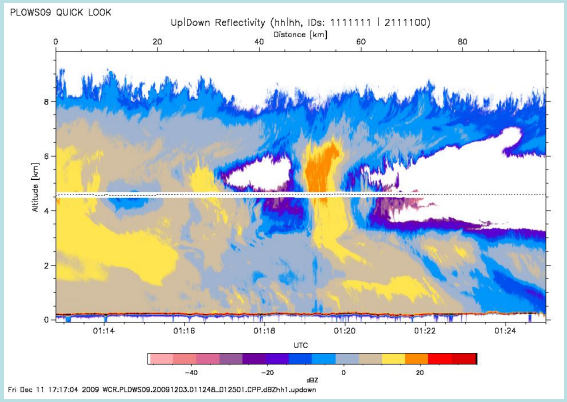
Indiana-Illinois: Gulf Coast cyclone moves up into Ohio Valley

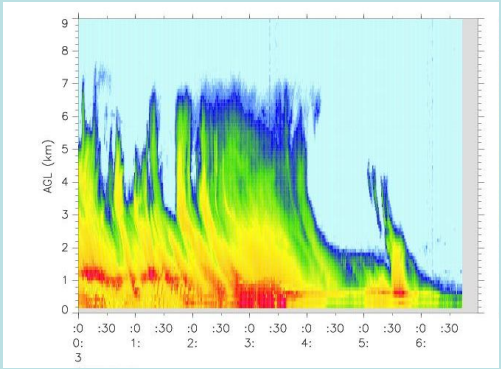
All Facilities deployed (KIND: VCP-11)

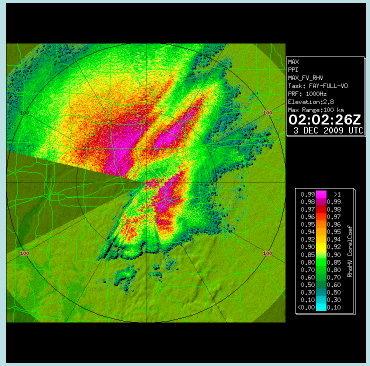


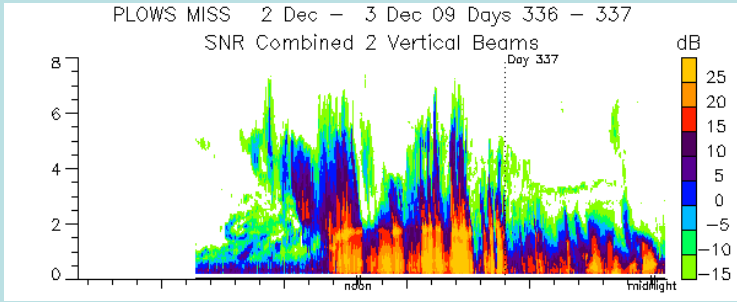
RF-03





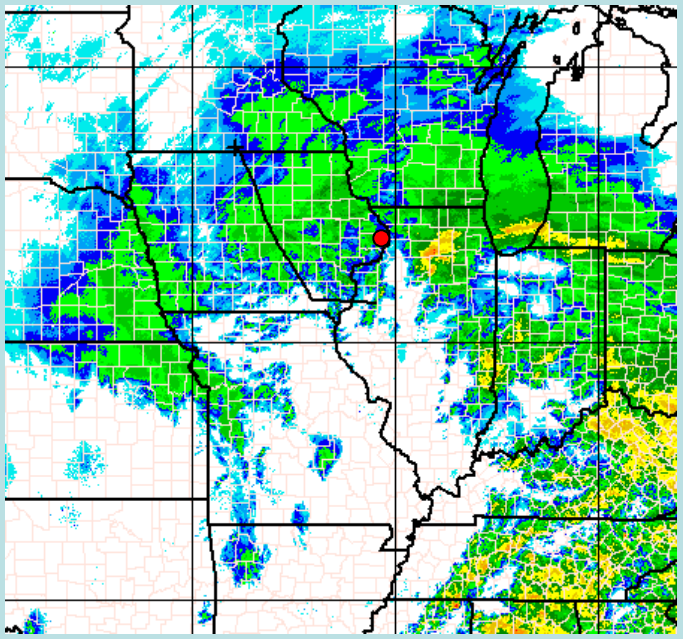



IOP-10 **08 December 2009, 0000 UTC – 09 December 2009 1200 UTC**

Eastern Iowa: Rockies cyclone produces heavy snow across Iowa

All Facilities deployed (KDVN: VCP-11)



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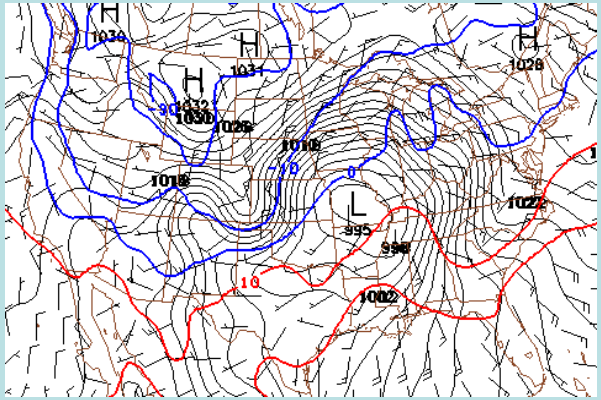
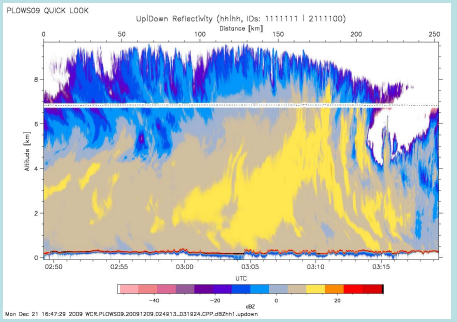
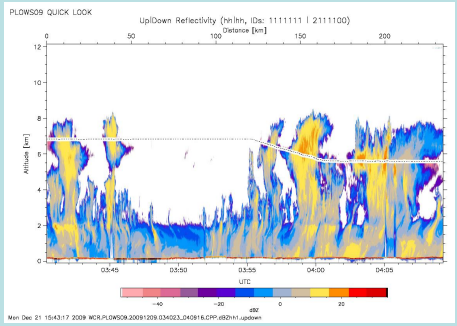
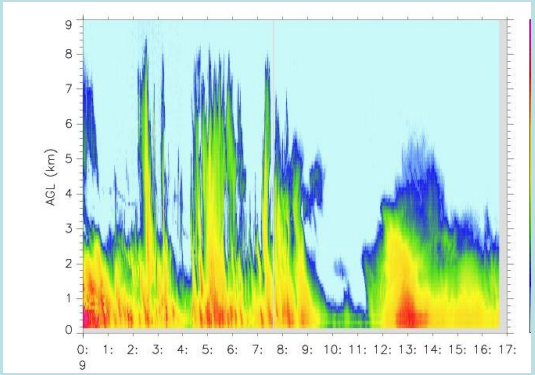
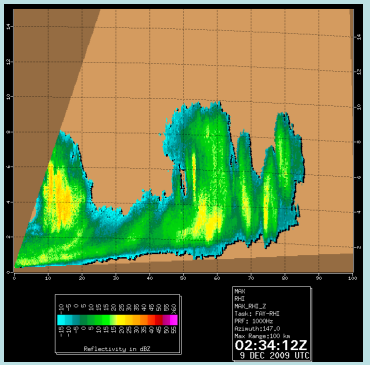
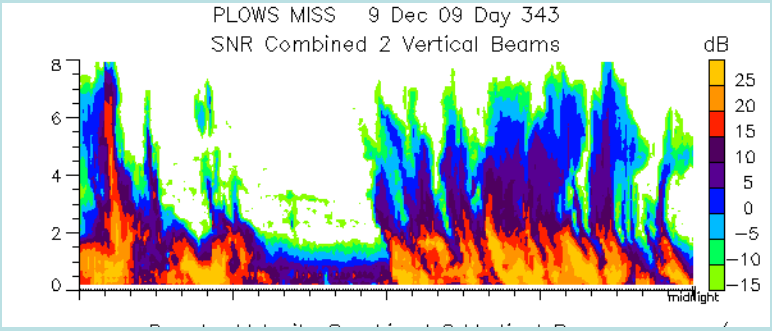




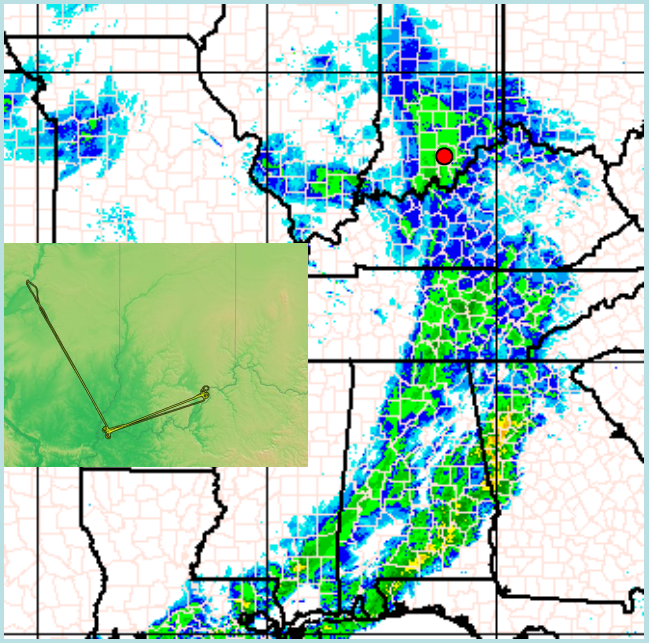



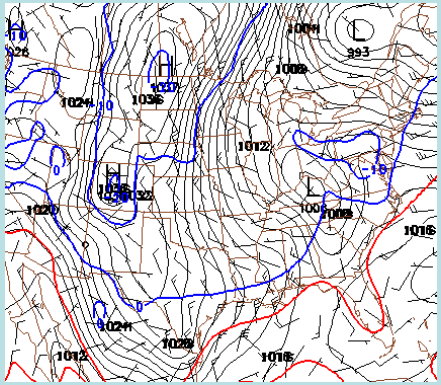
IOP-19 **14 February 2010, 1200 UTC – 15 February 2010 1800 UTC**

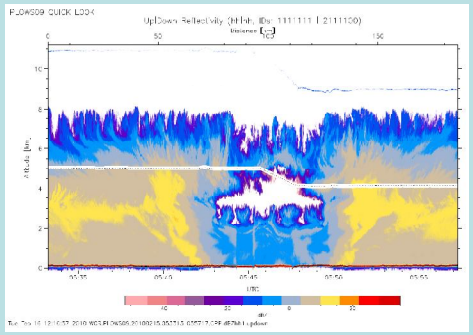
Southern Indiana: Cyclone forms in Midwest on wave orbiting polar vortex

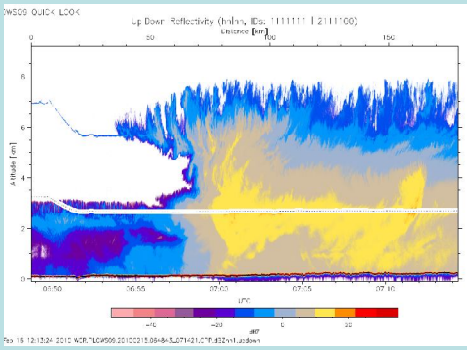
MAX/MISS/C-130 (MIPS had severe attenuation) (KVWX: VCP-11)

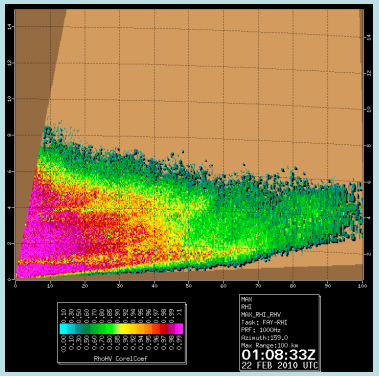


RF-12

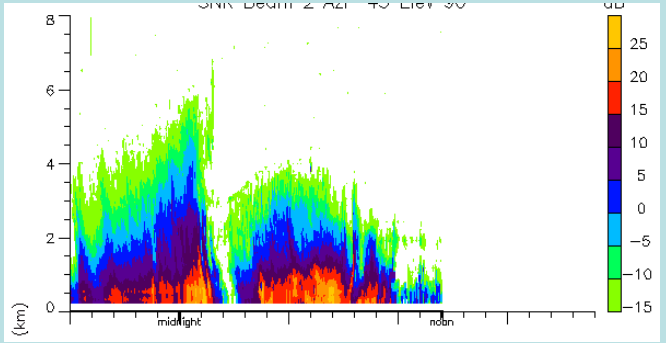








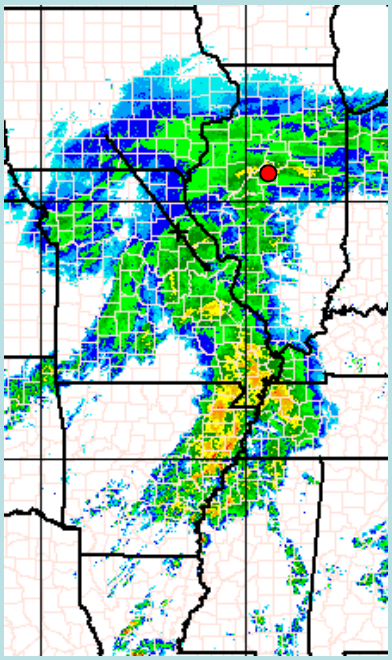
Vortac-Vortac X-Section

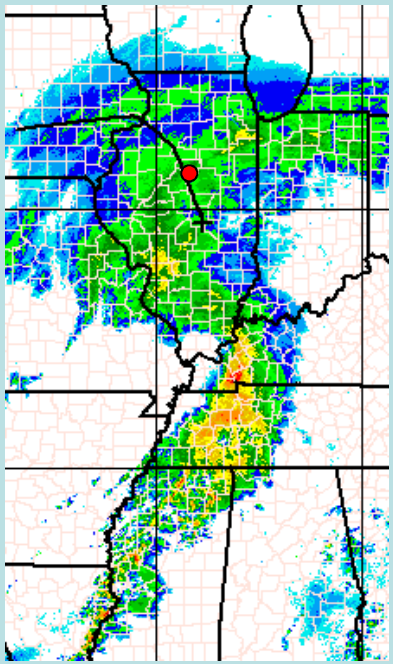


IOP-21 **21 February 2010, 1200 UTC – 22 February 2010 1200 UTC**

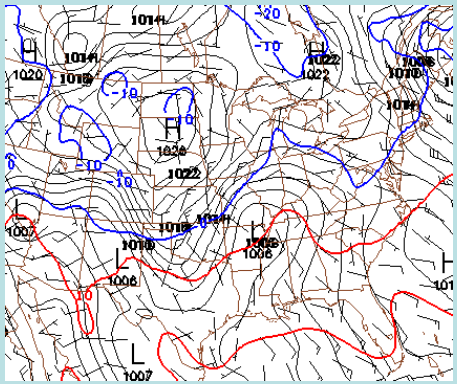
Iowa/Missouri/Illinois: Cyclone forms on weak wave from Southern Rockies

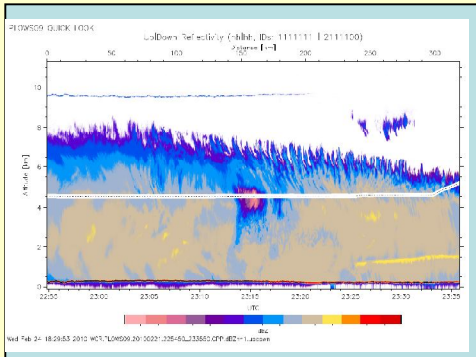
All Facilities deployed (KILX: VCP-11)

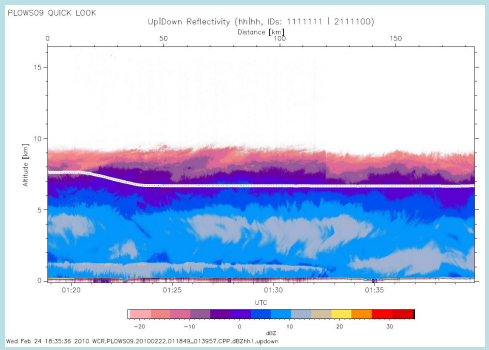


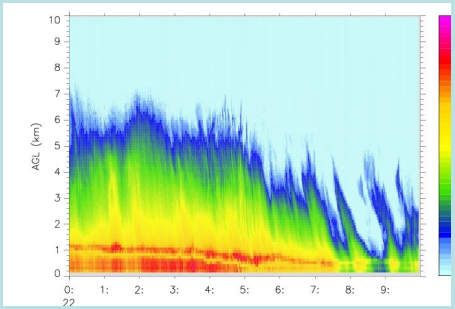


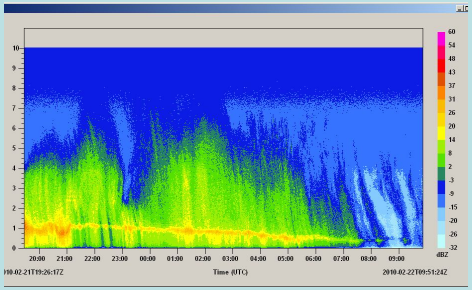
RF-14

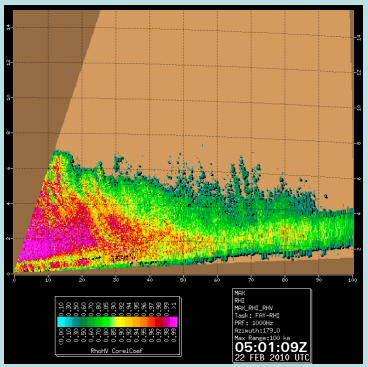


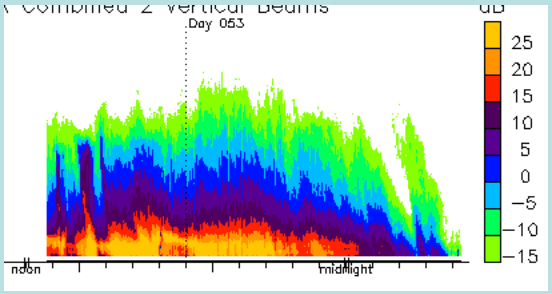













Vortac-Vortac
X-Section

# VERY GOOD

IOP-4 **7 March 2009, 2200 UTC – 8 March 2009 2100 UTC**
E. Iowa: Rockies cyclone moves across Midwest
MIPS/MAX/MISS (KVDN: VCP-11)

IOP-5 **28 March 2009, 1900 UTC – 29 March 2009 1800 UTC**
N. Illinois: Rockies cyclone moves over midwest
MIPS/MAX/MISSOU (KLOT: VCP-11)

IOP-8 **23 November 2009, 0000 UTC – 25 November 2009 1300 UTC**
Central Iowa: Weak cyclone moves out of S. Rockies, regenerates bands
All Facilities deployed (KDMX: VCP-11)

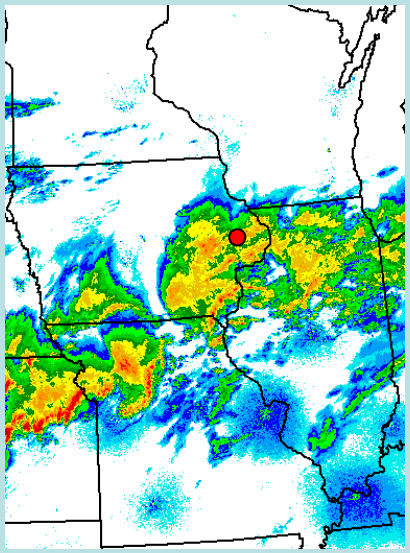
IOP-11 **14 December 2009, 0000 UTC – 15 December 2009 0000 UTC**
Central Wisc: Weak cyclone but very interesting bands
C-130 only (No special NWS scans)

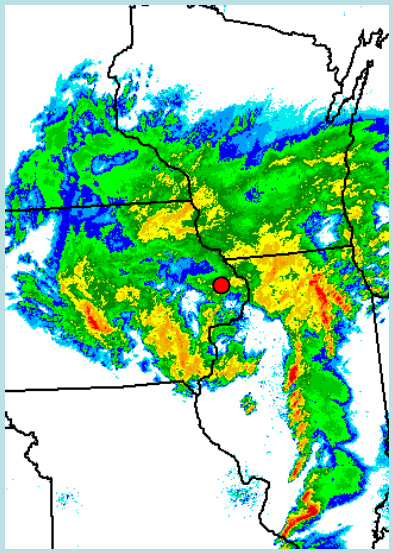
IOP-15 **29 January 2010, 0000 UTC – 30 January 2010 1200 UTC**
Missouri/Illinois: Gulf Cyclone produces snowstorm across S. Central US
C-130/MISS (No special NWS scans)

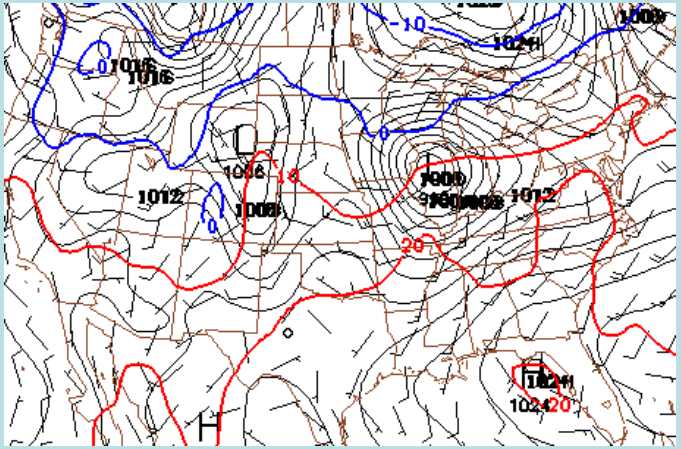
IOP-4 **7 March 2009, 2200 UTC – 8 March 2009 2100 UTC**

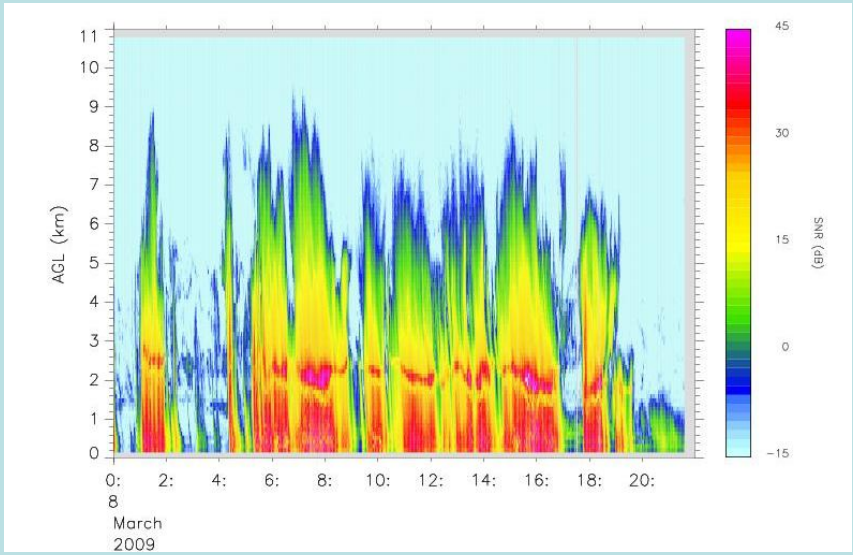
(Year 1) E. Iowa: Rockies cyclone moves across Midwest

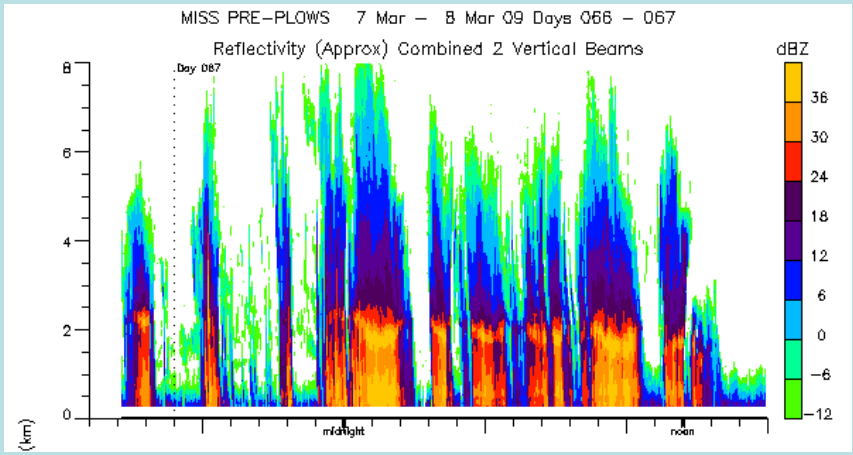
MIPS/MAX/MISS (KVDN: VCP-11)







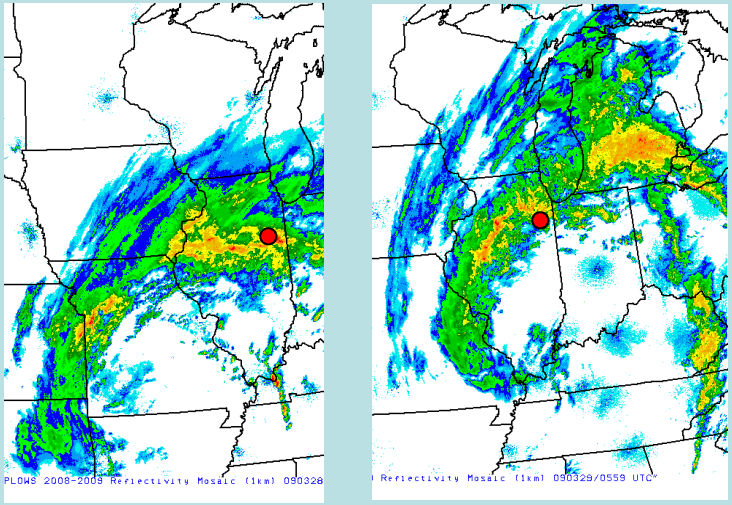



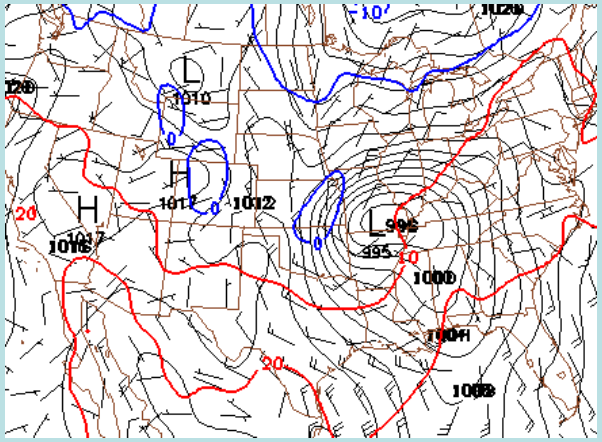



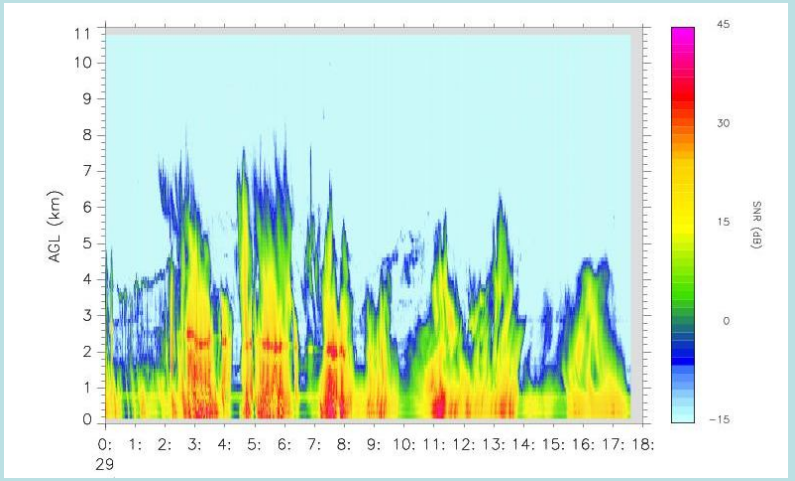
IOP-5 **28 March 2009, 1900 UTC – 29 March 2009 1800 UTC**

(Year 1) N. Illinois: Rockies cyclone moves over midwest

MIPS/MAX/MISSOU (KLOT: VCP-11)





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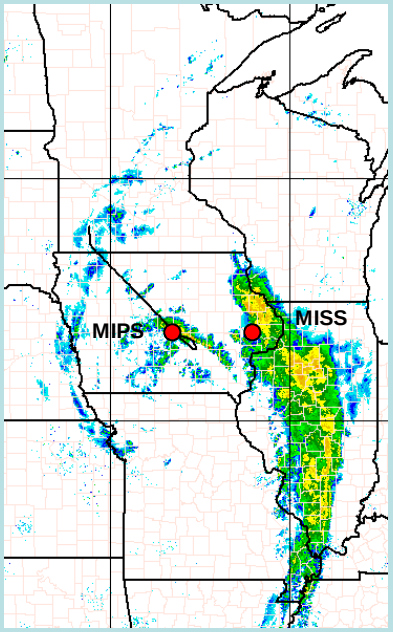
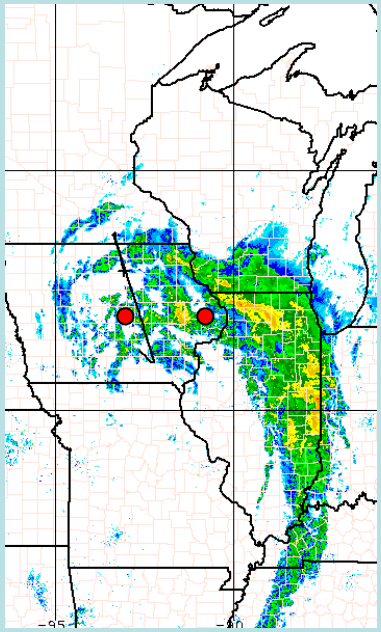
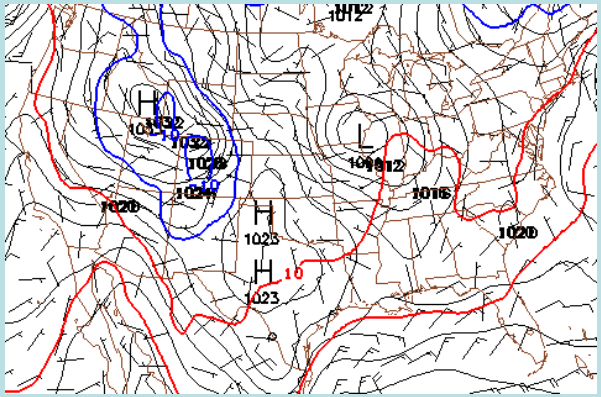
Central Iowa: Weak cyclone moves out of S. Rockies, regenerates bands

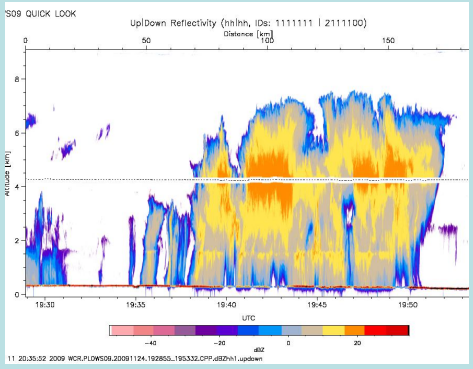
All Facilities deployed (KDMX: VCP-11)

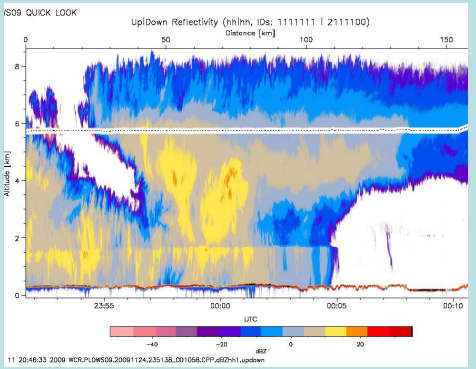


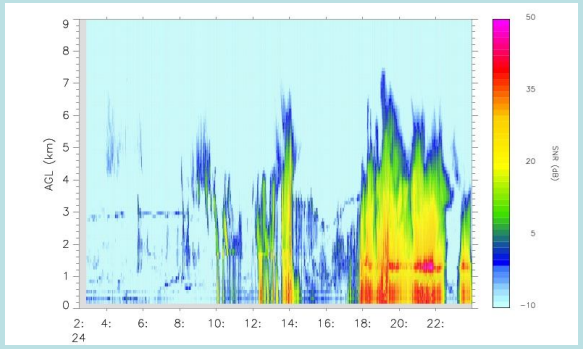



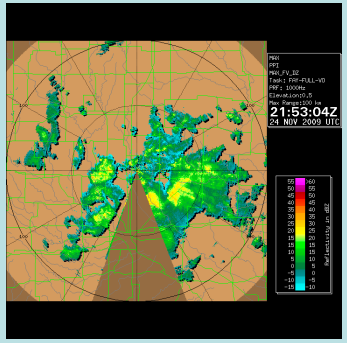
RF-02

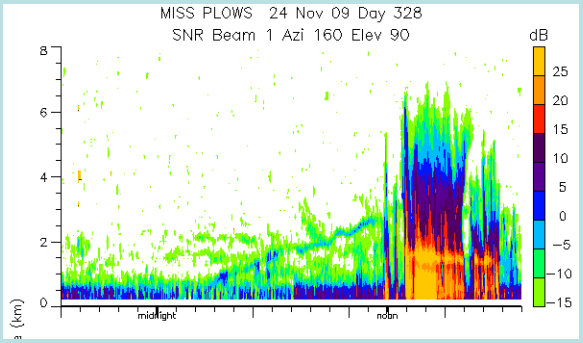


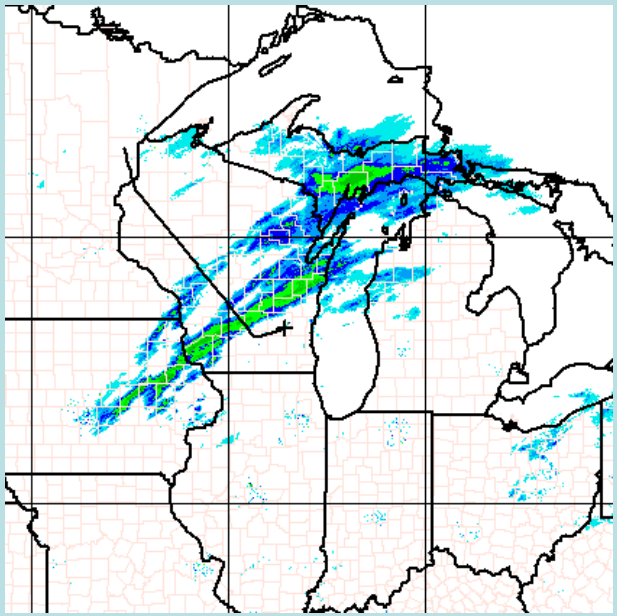



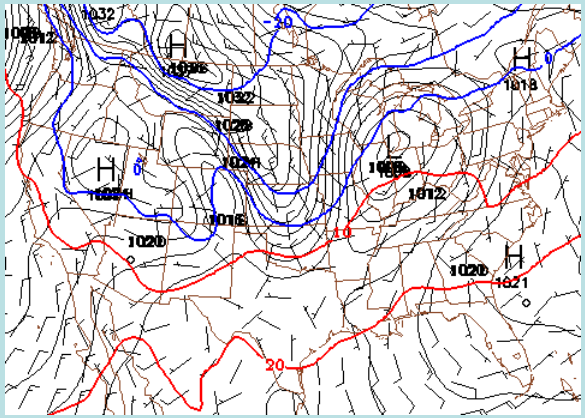
IOP-11 **14 December 2009, 0000 UTC – 15 December 2009 0000 UTC**

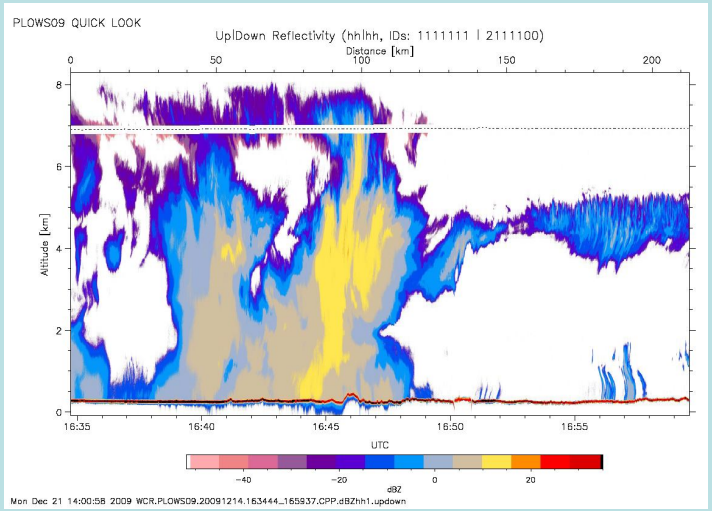
Central Wisc: Weak cyclone but very interesting bands

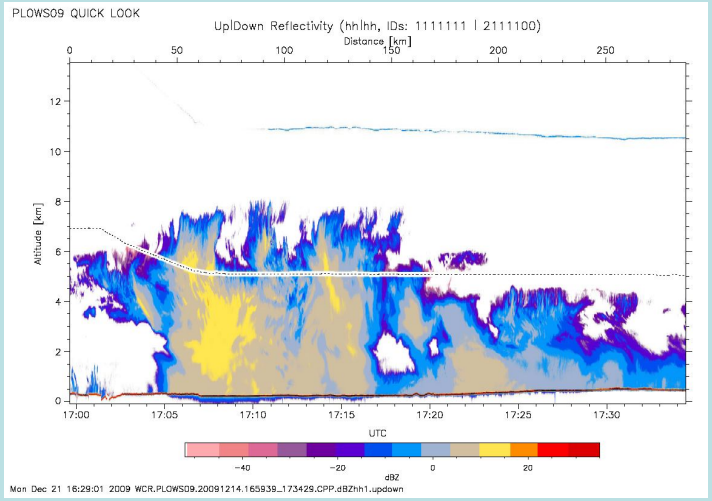
C-130 only



RF-05



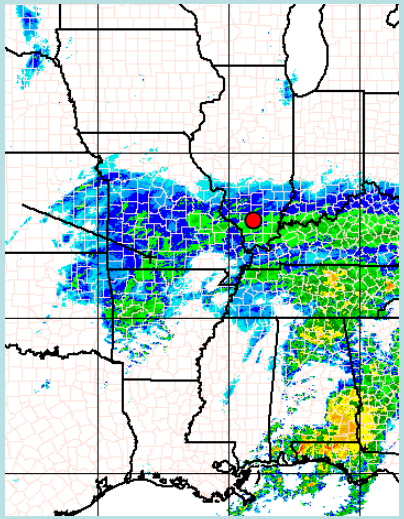


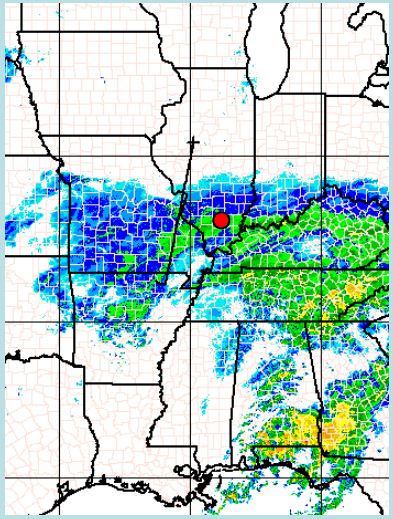



IOP-15 **29 January 2010, 0000 UTC – 30 January 2010 1200 UTC**

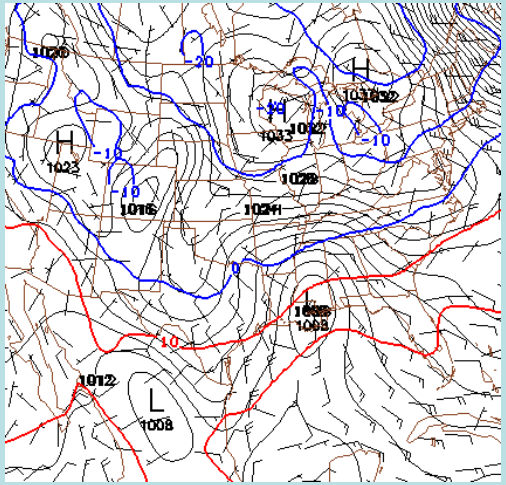
Missouri/Illinois: Gulf Cyclone produces snowstorm across S. Central US

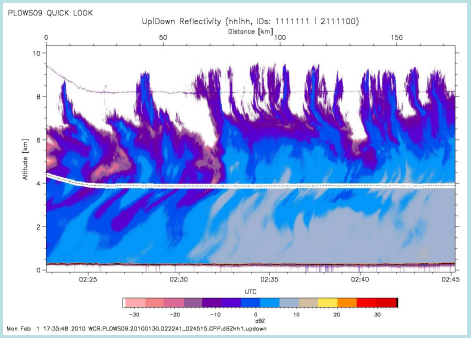
C-130/MISS

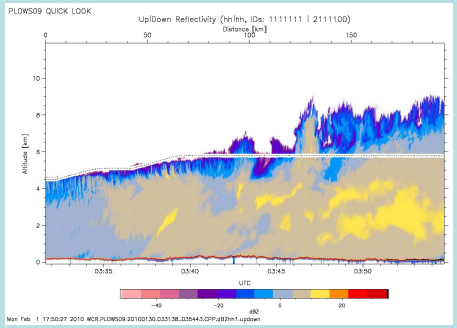


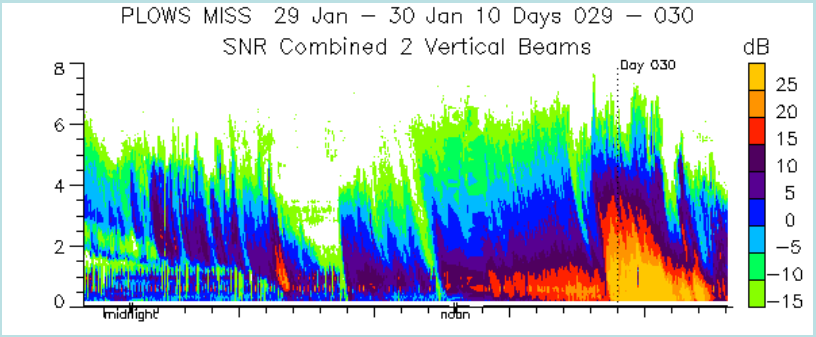


RF-07





# VERY GOOD

IOP-17 **4 February 2010, 0000 UTC – 6 February 2010 1200 UTC**
S. Indiana/AK/MI/LA: Gulf cyclone merges with wave from Canada
MIPS/MAX/MISS/C-130 (KIND: VCP-11)

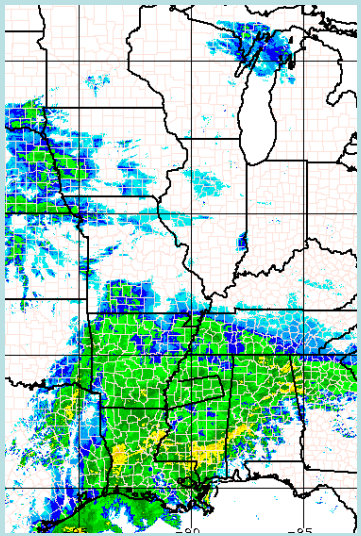
IOP-18 **8 February 2010, 1200 UTC – 10 February 2010 1800 UTC**
Wisc/N. Indiana: Cyclone forms in Midwest on wave orbiting polar vortex
MIPS/MISS/C-130 (No special NWS scans)

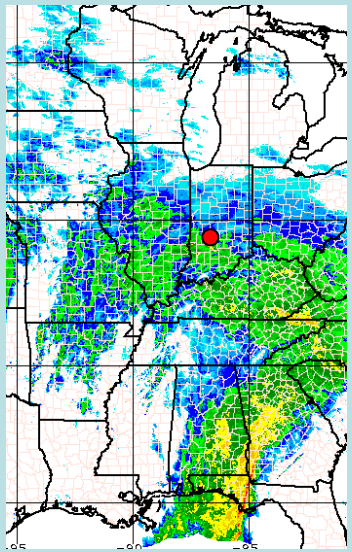
IOP-23 **1 March 2010, 1200 UTC – 03 March 2010 0000 UTC**
South Carolina/LA: Cyclone traverses Gulf/East Coast
MIPS/MAX/C-130 (KCAE: VCP-11)

IOP-17 **4 February 2010, 0000 UTC – 6 February 2010 1200 UTC**

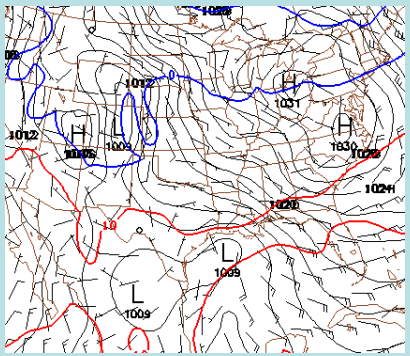
S. Indiana/AR/MI/LA: Gulf cyclone merges with wave from Canada

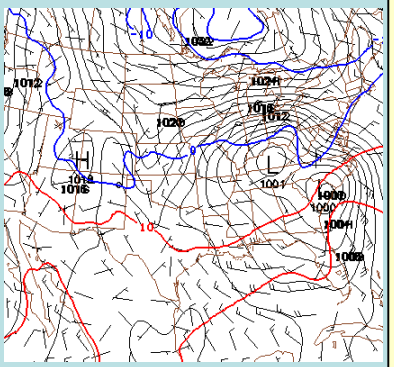
MIPS/MAX/MISS/C-130 (KIND: VCP-11)

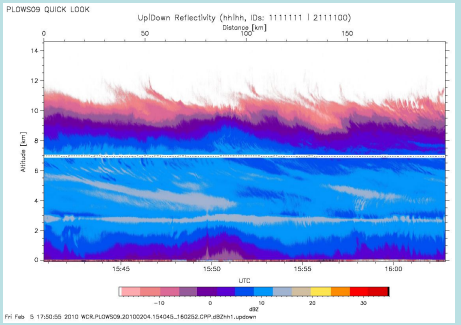


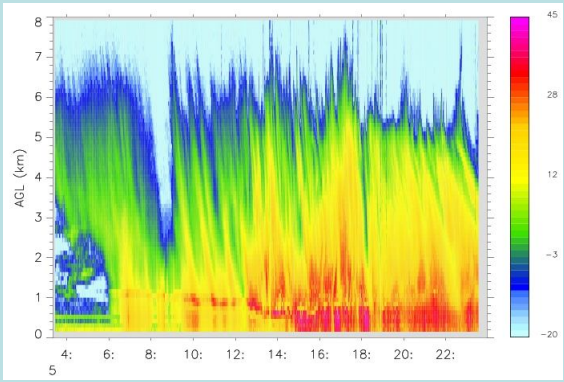


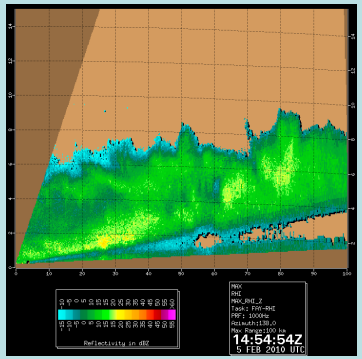
RF-09

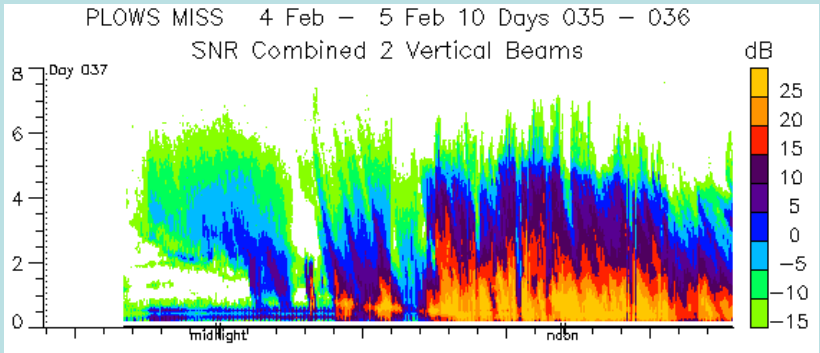






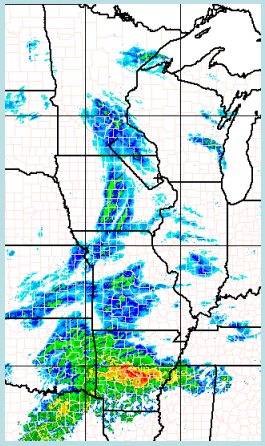



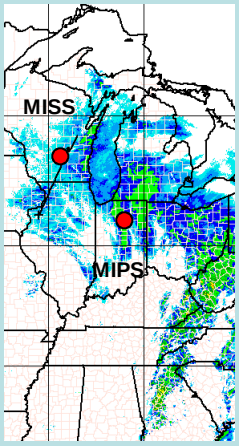



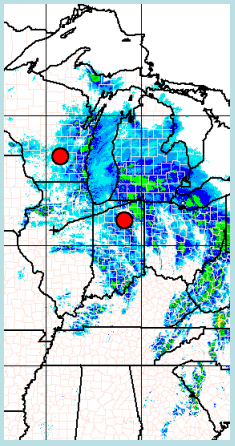
IOP-18 **8 February 2010, 1200 UTC – 10 February 2010 1800 UTC**

Wisc/N. Indiana: Cyclone forms in Midwest on wave orbiting polar vortex

MIPS/MISS/C-130

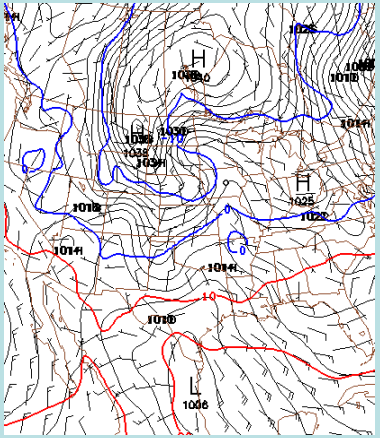


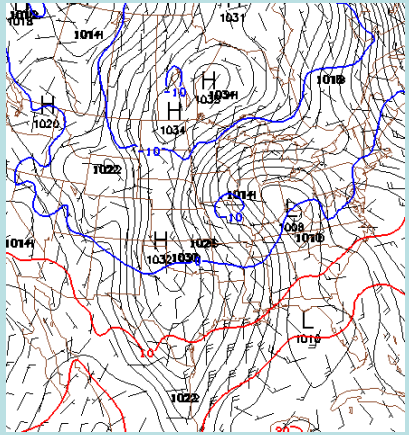


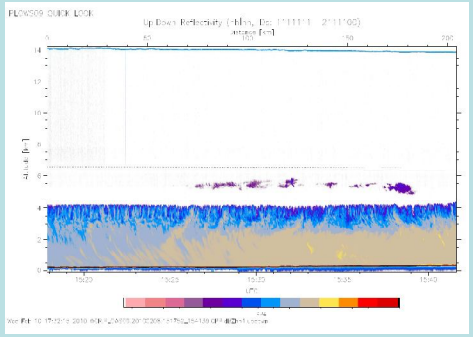



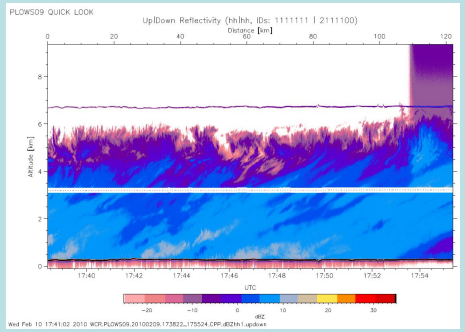
RF-10
8 Feb

RF-11
9 Feb

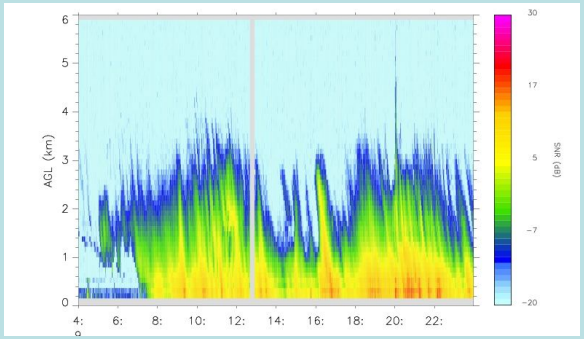


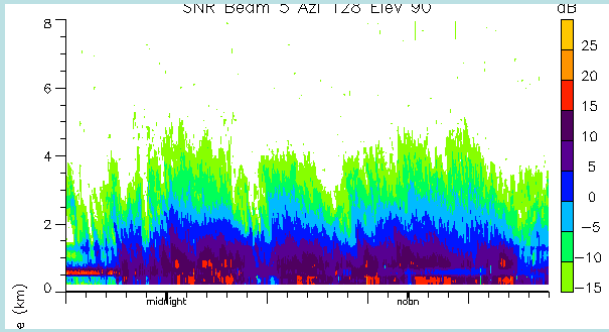






RF-10 RF-11

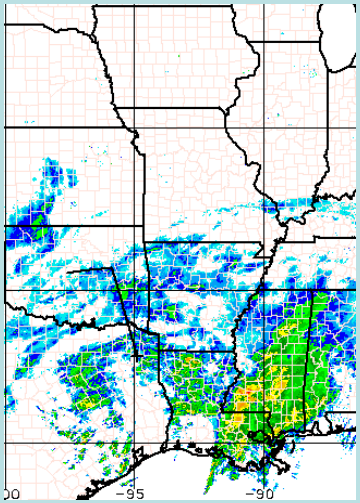


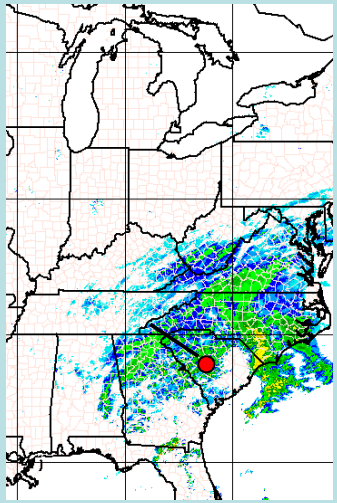
IOP-23 **1 March 2010, 1200 UTC – 03 March 2010 0000 UTC**

South Carolina/LA: Cyclone traverses Gulf/East Coast

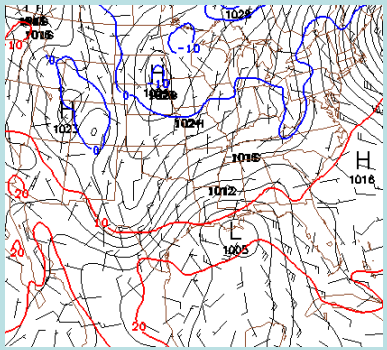
MIPS/MAX/C-130 (KCAE: VCP-11)

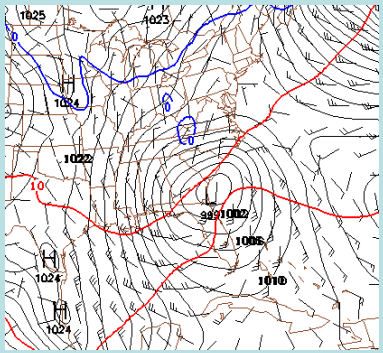


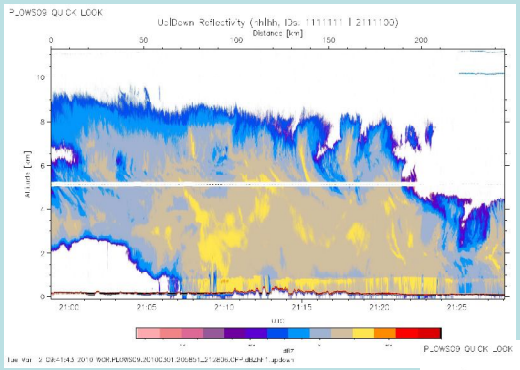
RF-16
1 Mar



RF-17
2 Mar

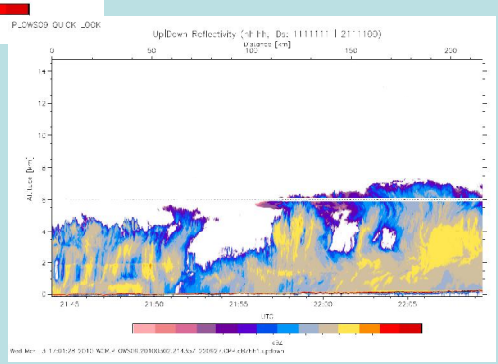


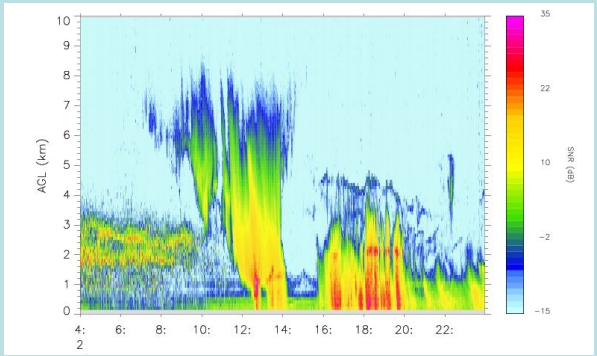




RF-17

RF-16





# GOOD

IOP-7 **16 November 2009, 0000 UTC – 18 November 2009 0000 UTC**
W. Iowa/Nebraska: Cyclone moves out of Rockies
MIPS/MAX/MISS/MISSOU (KEAX: VCP-11)

IOP-13 **16 January 2010, 1200 UTC – 17 January 2010 0000 UTC**
Alabama: Cyclone traverses Gulf
MIPS/MAX/MISSOU/C-130 aborts (KHTX and KBMX: VCP-11)

IOP-14 **4 February 2010, 0000 UTC – 6 February 2010 1200 UTC**
S. Wisc: Secondary low develops on primary cyclone cold front
MIPS/MISS/MISSOU (KMKX: VCP-11)

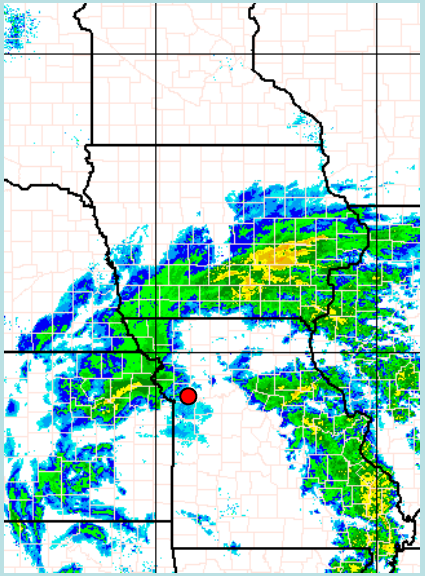
IOP-22 **26 February 2010, 1200 UTC – 27 February 2010 0000 UTC**
N. Texas/AK: Weak Gulf cyclone
C-130 (No special NWS scans)

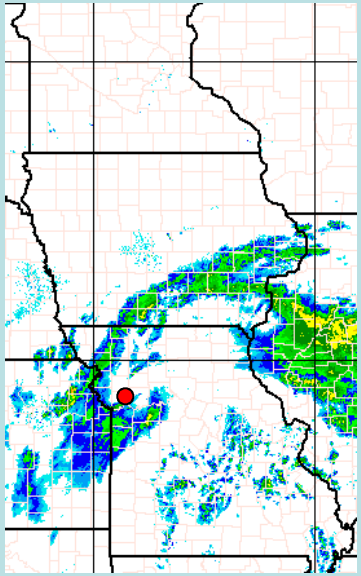
IOP-24 **1 March 2010, 1200 UTC – 03 March 2010 0000 UTC**
Iowa/Nebraska: Rockies cyclone traverses Midwest
MIPS/MAX/MISS/C-130 (KDMX: VCP-11)

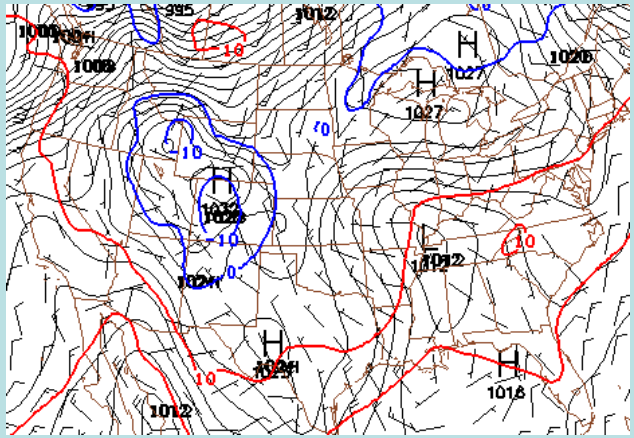
IOP-7 **16 November 2009, 0000 UTC – 18 November 2009 0000 UTC**

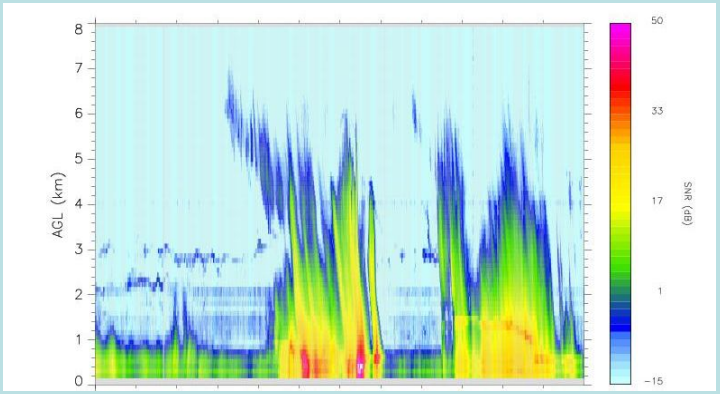
W. Iowa/Nebraska: Cyclone moves out of Rockies

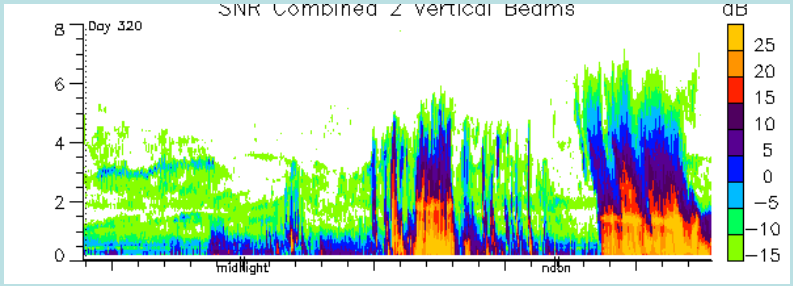
MIPS/MAX/MISS/MISSOU (KEAX: VCP-11)

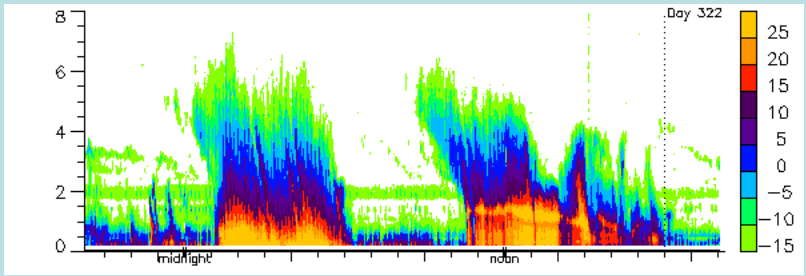








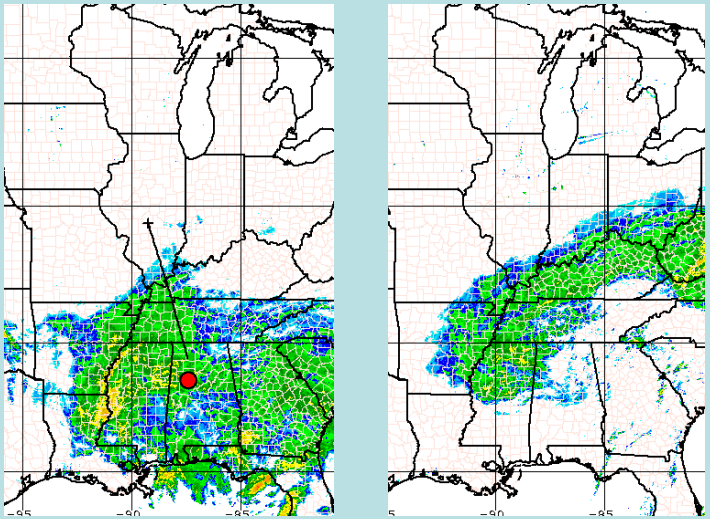



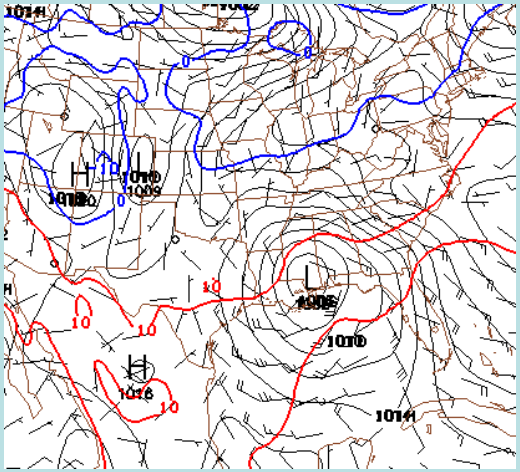
IOP-13 **16 January 2010, 1200 UTC – 17 January 2010 0000 UTC**

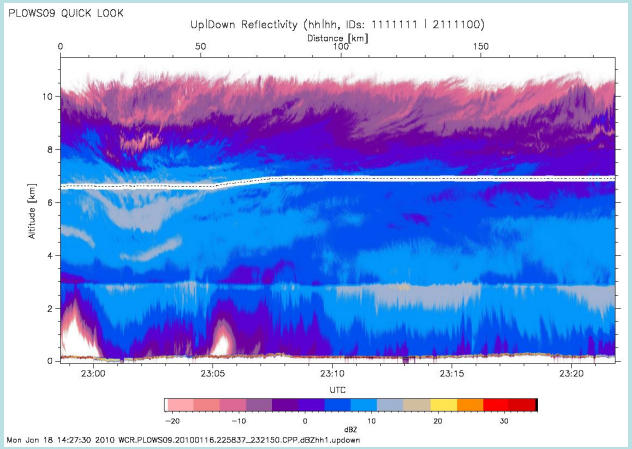
Alabama: Cyclone traverses Gulf

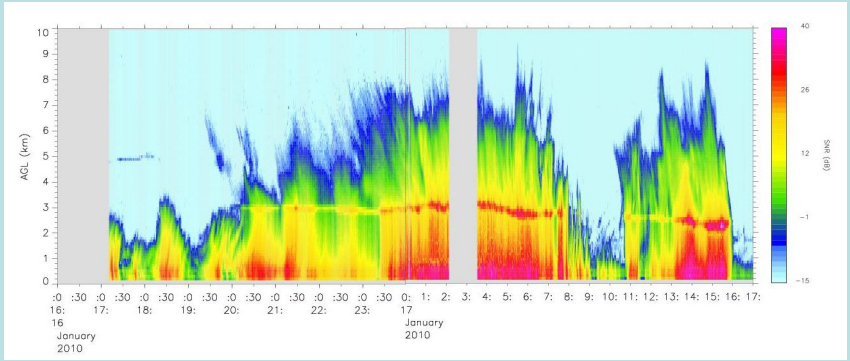
MIPS/MAX/MISSOU/C-130 aborts (KHTX and KBMX: VCP-11)



RF-06



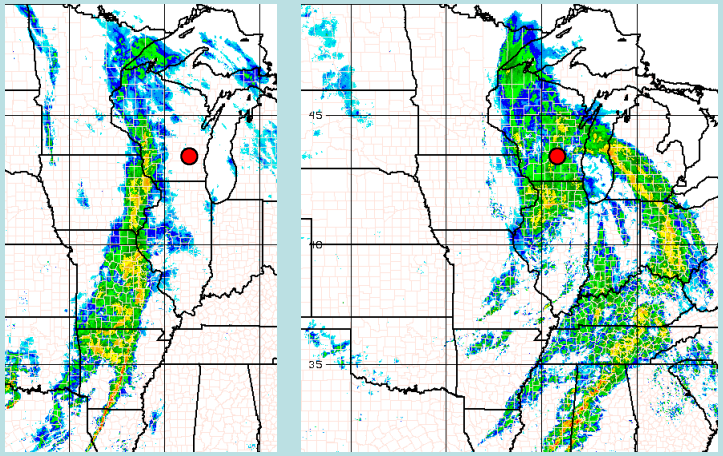


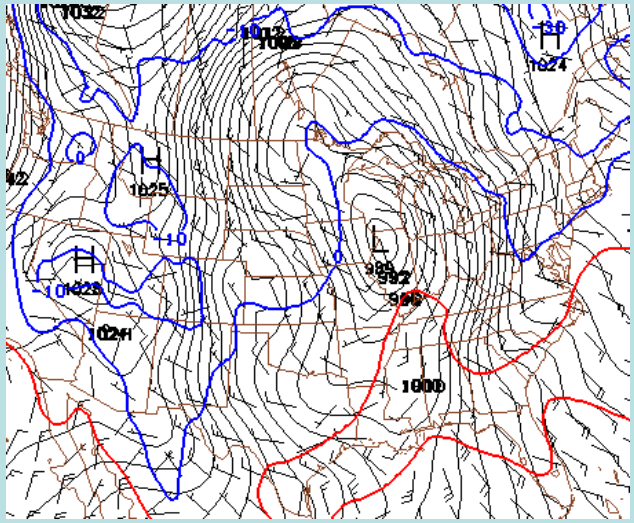



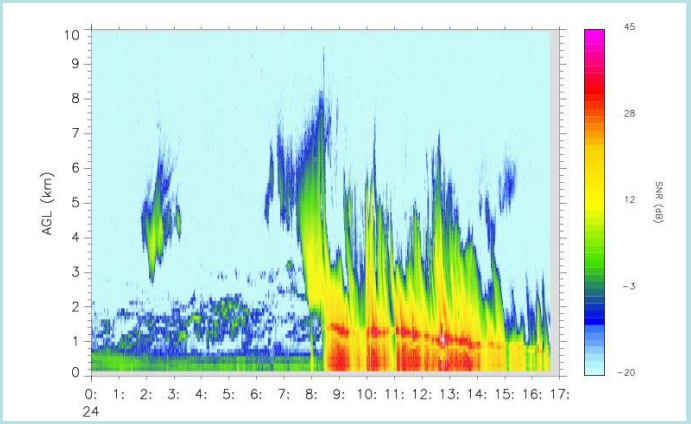
IOP-14 **4 February 2010, 0000 UTC – 6 February 2010 1200 UTC**

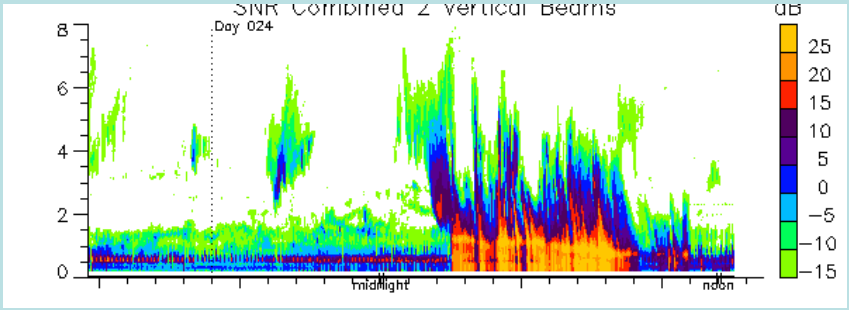
S. Wisc: Secondary low develops on primary cyclone cold front

MIPS/MISS/MISSOU (KMKX: VCP-11)





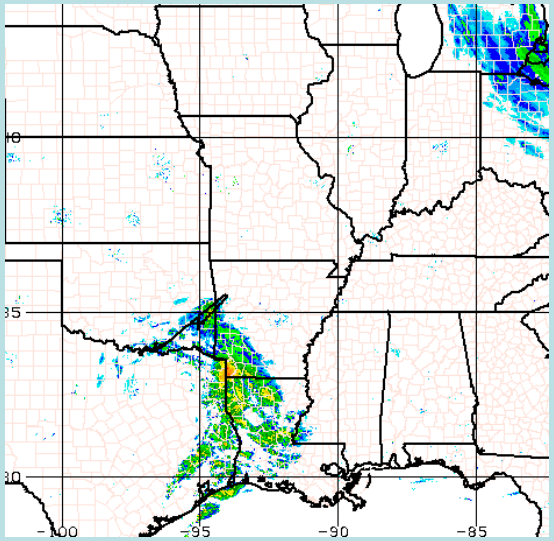


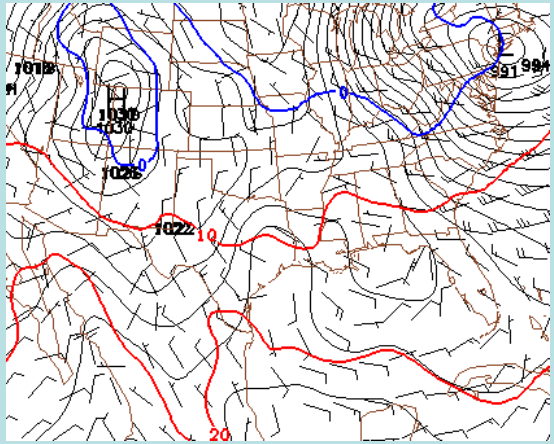
IOP-22 **26 February 2010, 1200 UTC – 27 February 2010 0000 UTC**

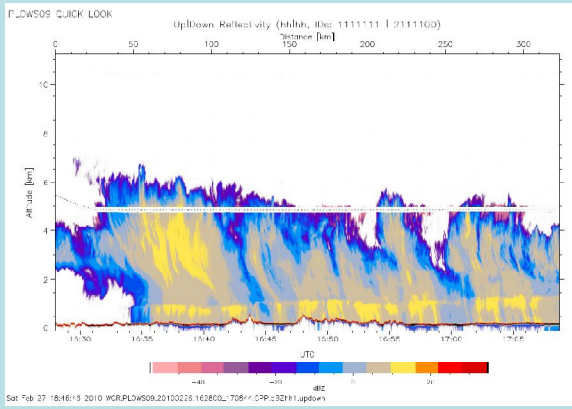
N. Texas/AR: Weak Gulf cyclone

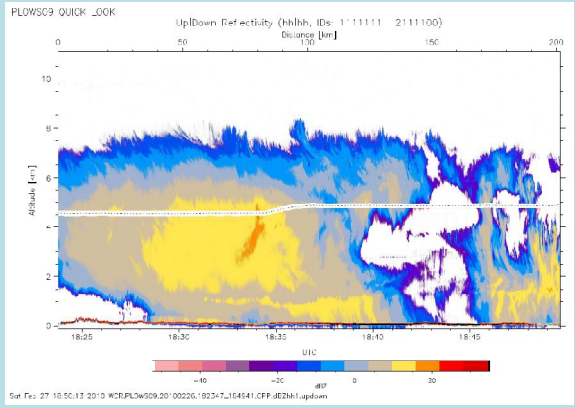
C-130




RF-15



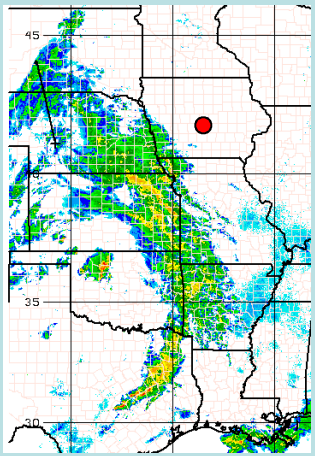



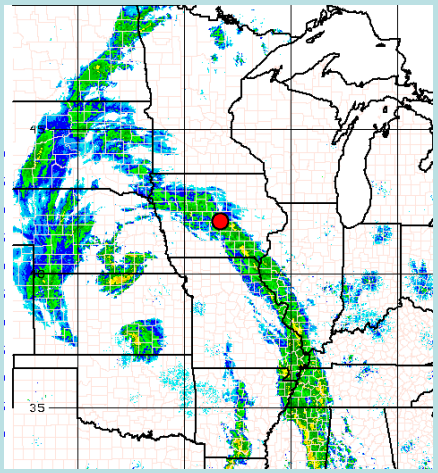



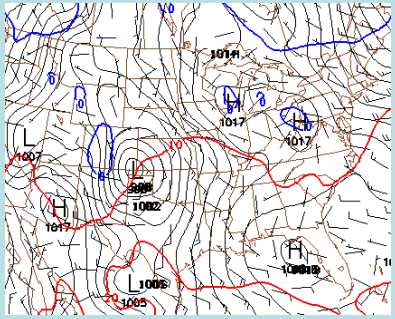
IOP-24 **1 March 2010, 1200 UTC – 03 March 2010 0000 UTC**

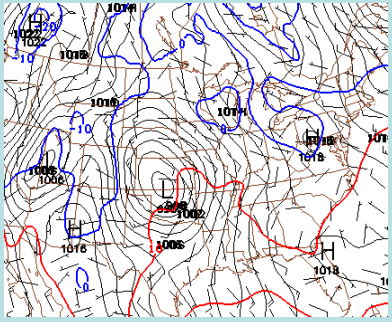
Iowa/Nebraska: Rockies cyclone traverses Midwest

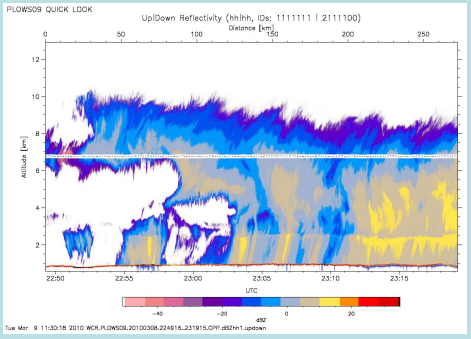
MIPS/MAX/MISS/C-130 (KDMX: VCP-11)

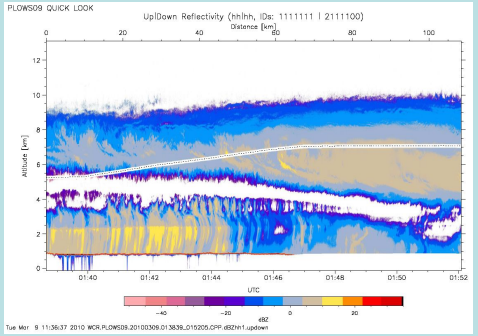


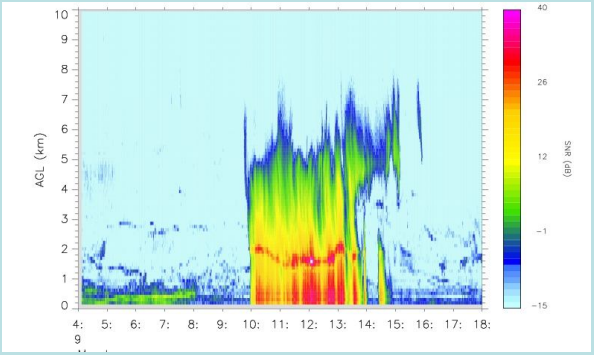


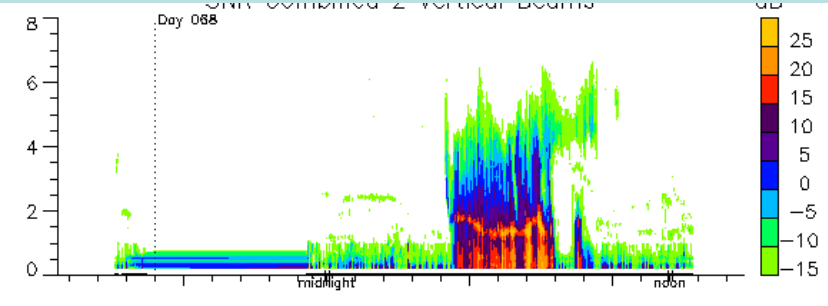






# Fair

IOP-2 **18 February 2009, 0200 UTC – 18 February 2009 1800 UTC**
S. Wisconsin: Cyclone moves out of Rockies
MIPS/MAX/MISSOU (KMKX: VCP-11)

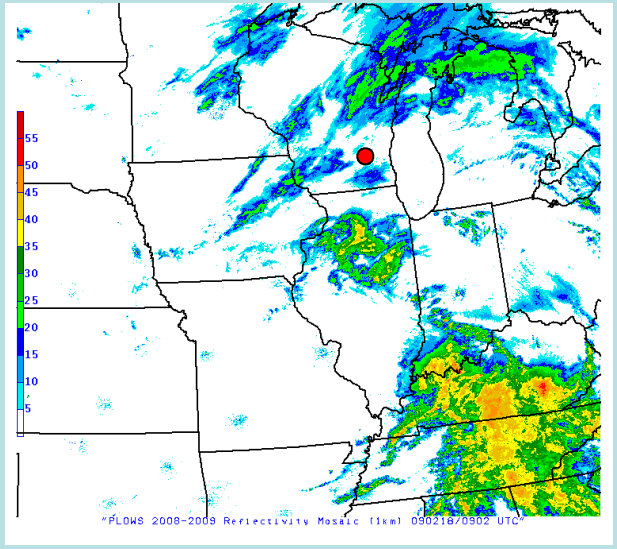
IOP-3 **26 February 2009, 1800 UTC – 27 February 2009 0000 UTC**
C. Wisc: Cyclone moves out of Rockies
MISS (No special NWS scans)

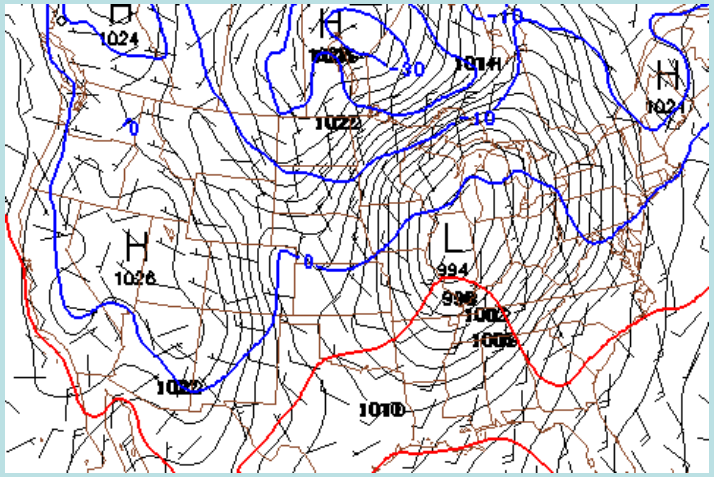
IOP-12 **18 December 2009, 0000 UTC – 19 December 2009 0000 UTC**
Alabama: Cyclone traverses Gulf
MIPS, ARMOR (No special NWS scans)

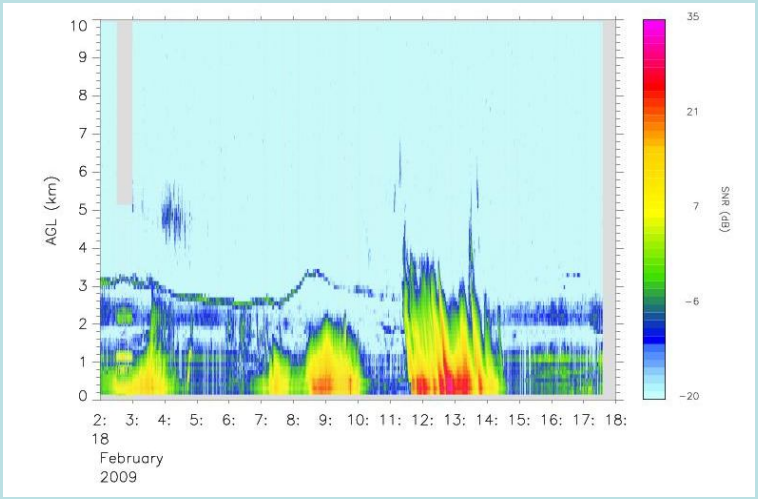
IOP-2 **18 February 2009, 0200 UTC – 18 February 2009 1800 UTC**

(Year 1) W. Iowa/Nebraska: Cyclone moves out of Rockies

MIPS/MAX/MISSOU (KMKX: VCP-11)



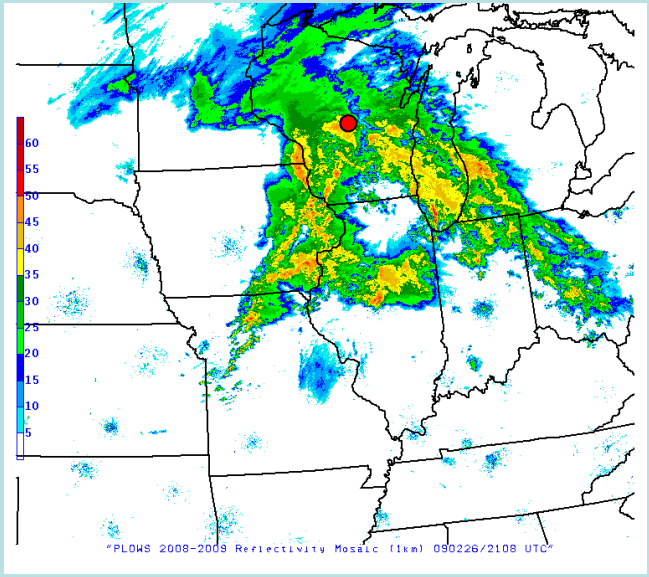



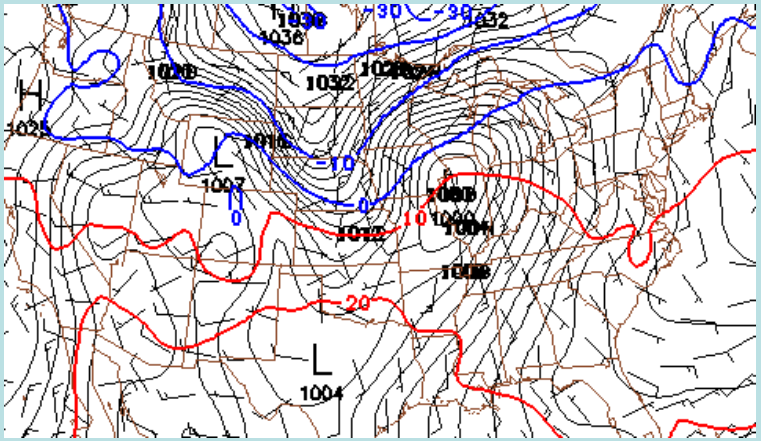



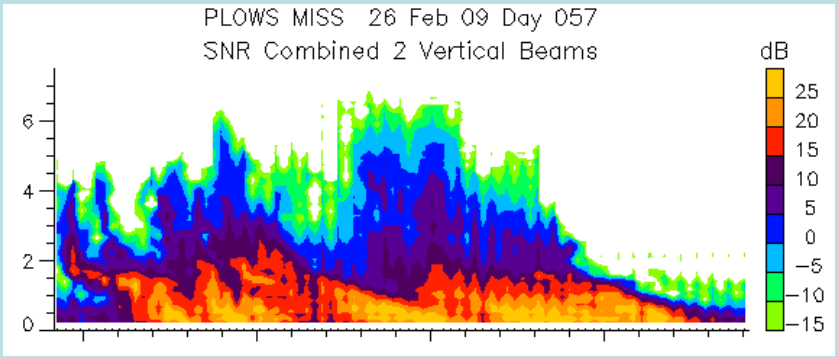
IOP-3 **26 February 2009, 1800 UTC – 27 February 2009 0000 UTC**

(Year 1) C. Wisc: Cyclone moves out of Rockies

MISS



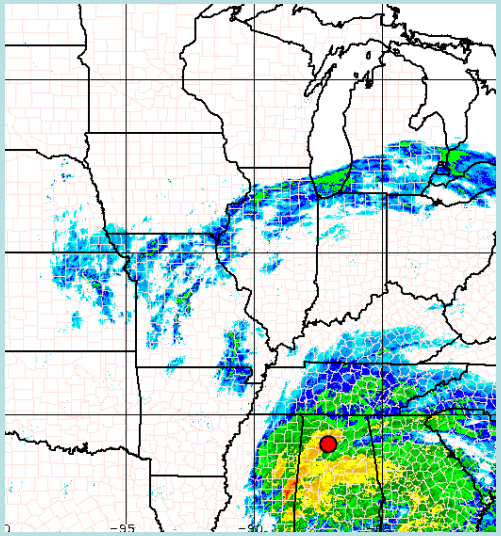



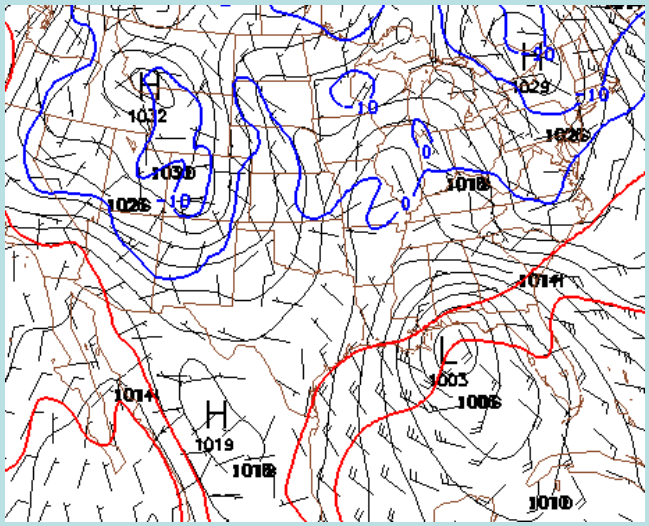


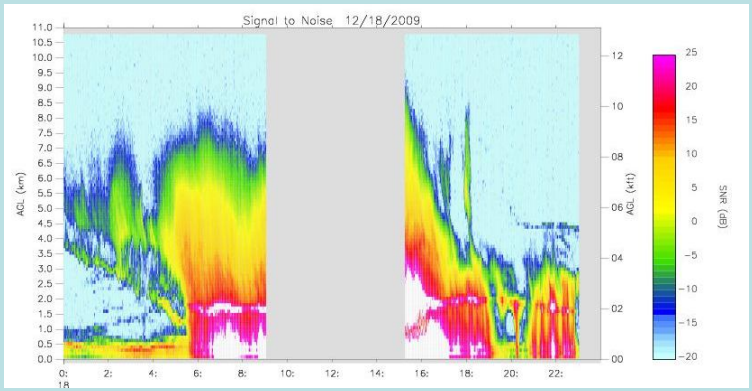
IOP-12 **18 December 2009, 0000 UTC – 19 December 2009 0000 UTC**

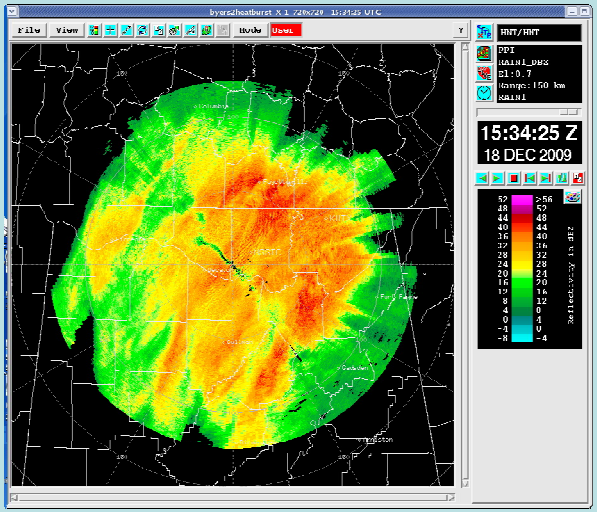
Alabama: Cyclone traverses Gulf

MIPS, ARMOR





MIPS
UAHuntsville