Northwest Flow Snow 2007-2008 Season Review and Forecast Methodology

GSP Winter Weather Seminar
Blair Holloway
11/18/08

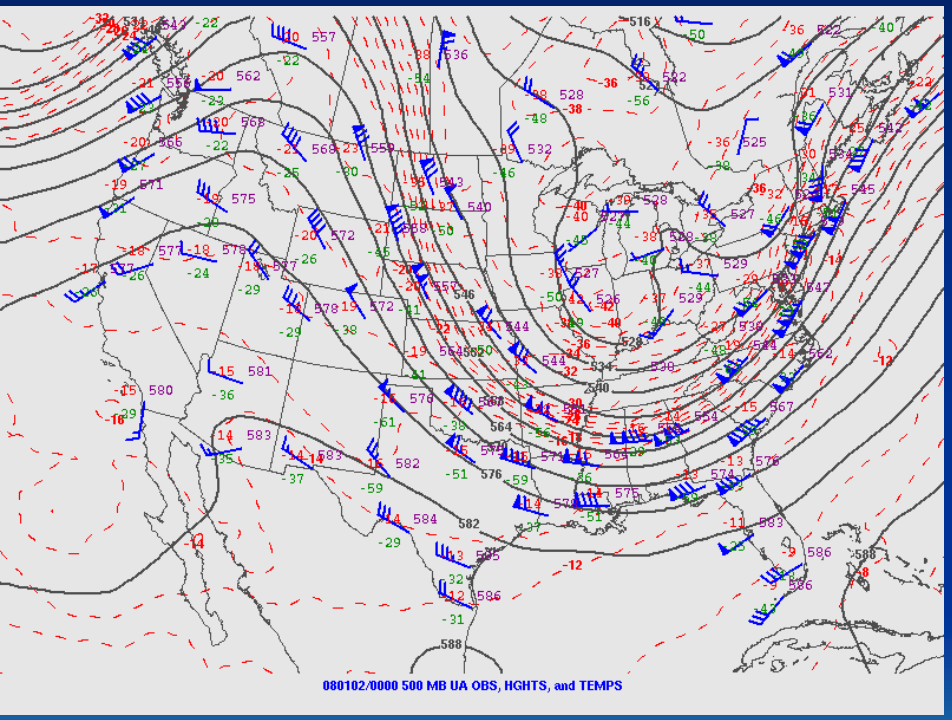
Outline

- 2007-2008 winter season review
  - 1-2 January event
  - 26-28 February event
- Forecast methodology
  - Climatology based forecast aid
  - Using graduated snow-to-liquid ratio values for SnowAmt grids in GFE

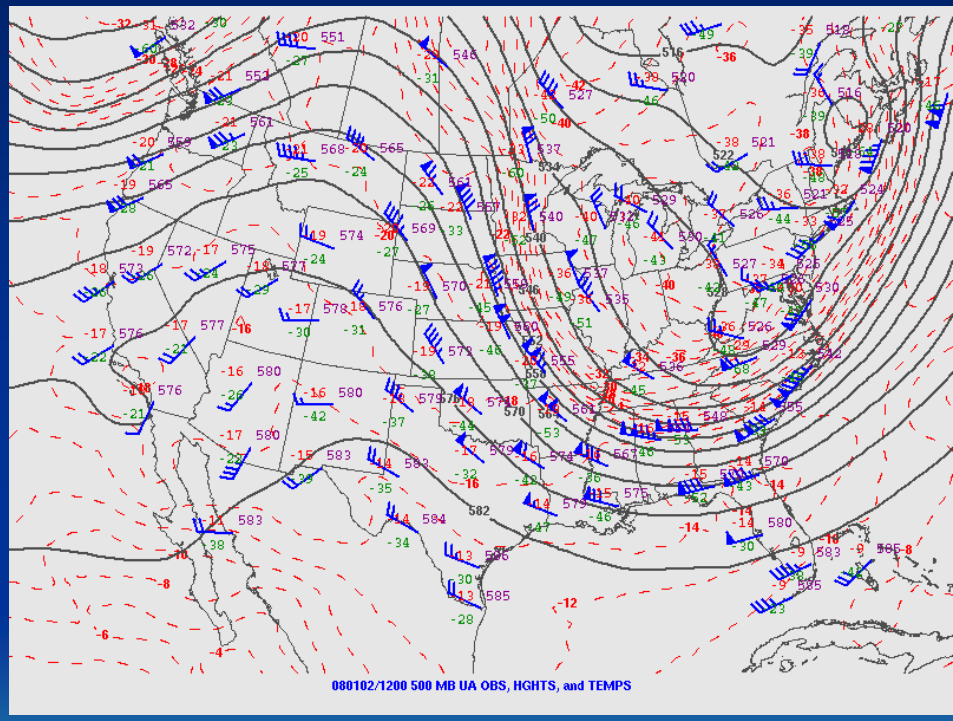
2007-2008 Season Review

- Several low end, advisory type of events
- Highest impact events occurred 1-2 January and 26-28 February
- Both events were well anticipated with good POD, FAR, and LT

1-2 January 2008



500 hPa – 00 UTC 2 Jan.



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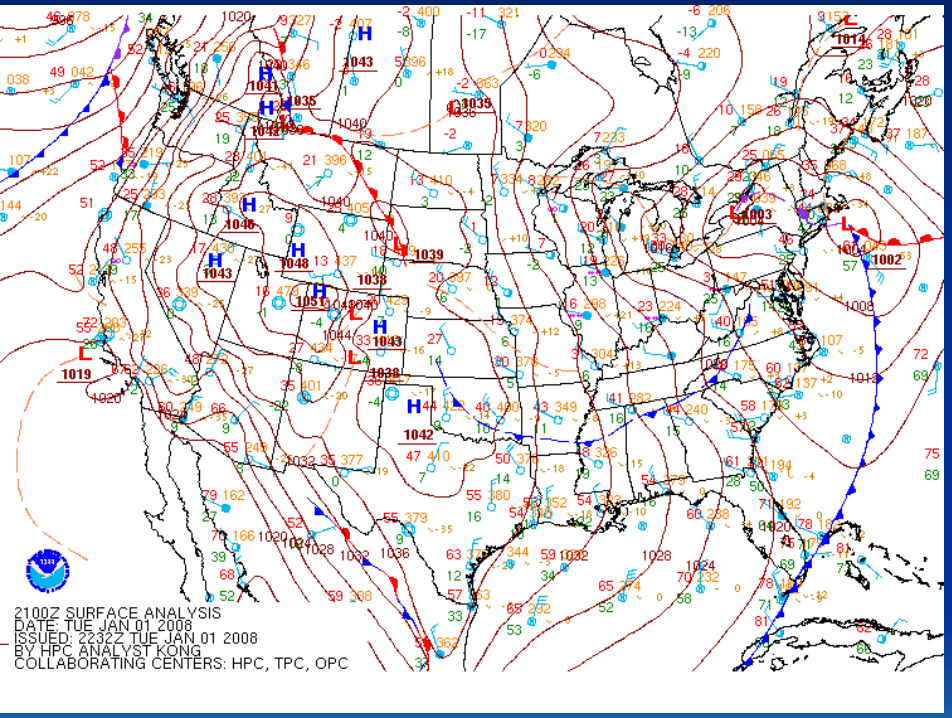
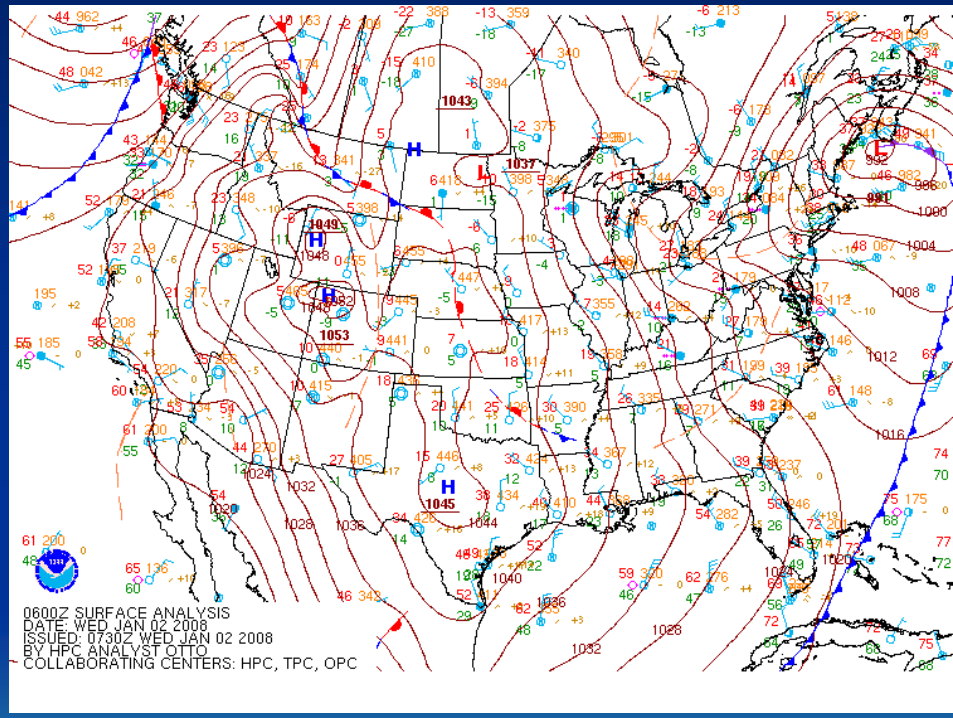
1-2 January 2008

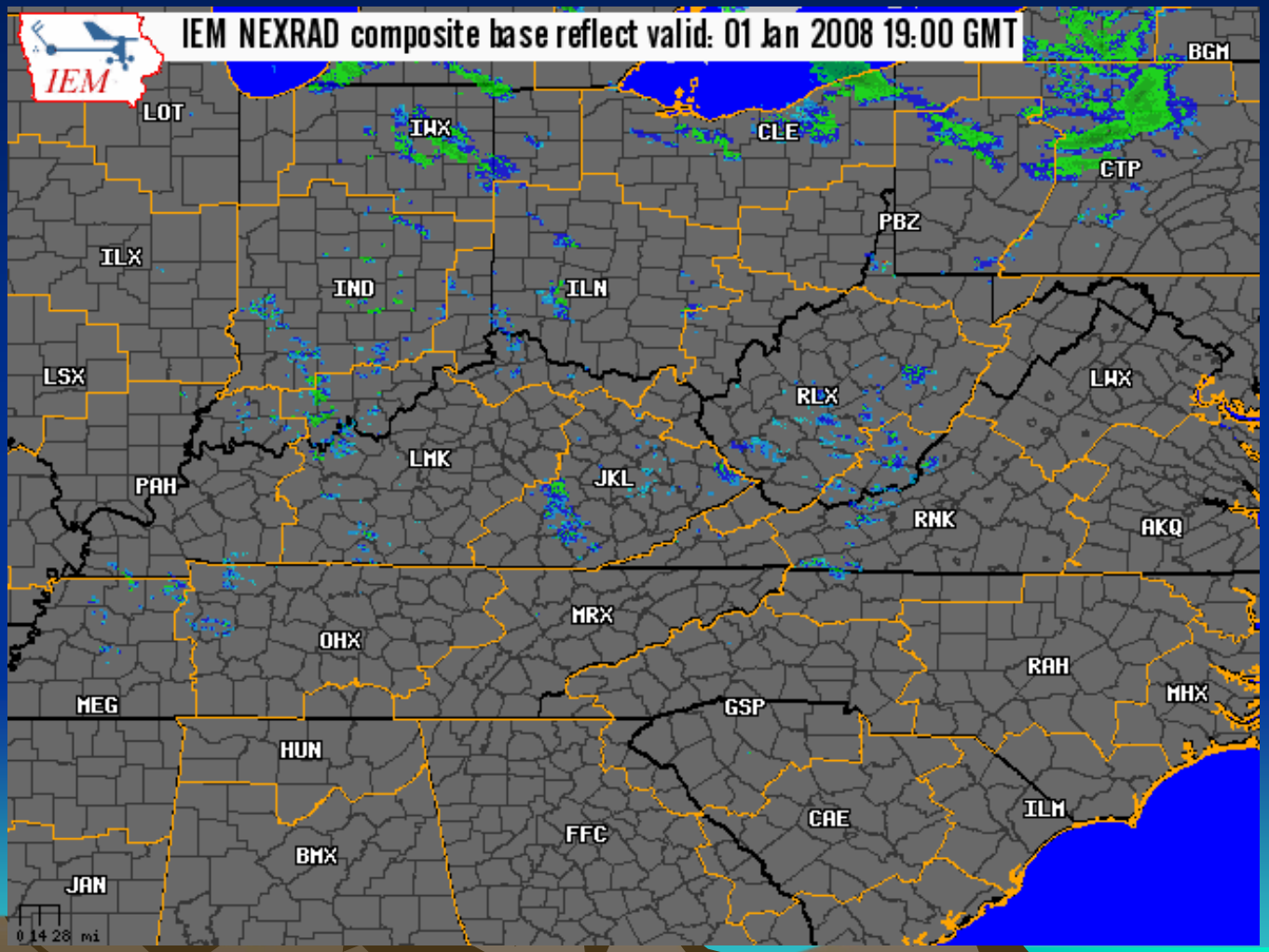


Surface – 21 UTC 1 Jan.



Surface – 06 UTC 2 Jan.

1-2 January 2008

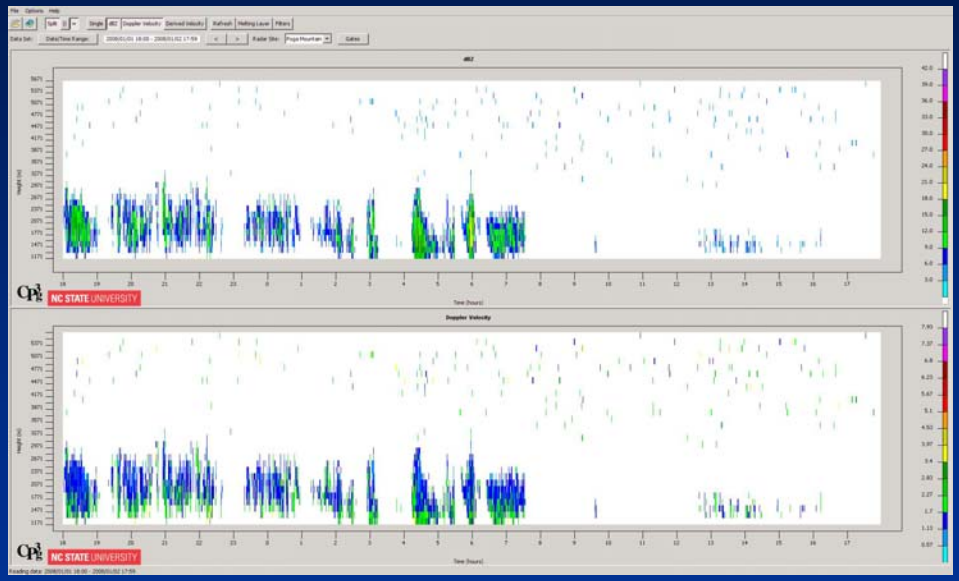


Regional Radar: 19 UTC 1 Jan. – 18 UTC 2 Jan.

1-2 January 2008

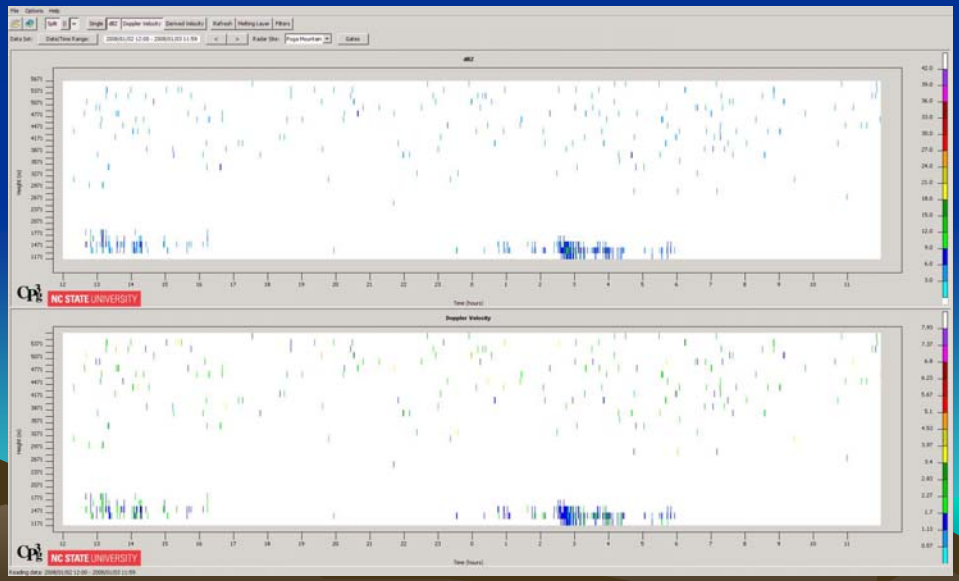
18 UTC 1 Jan. –

18 UTC 2 Jan.



12 UTC 2 Jan. –

12 UTC 3 Jan.

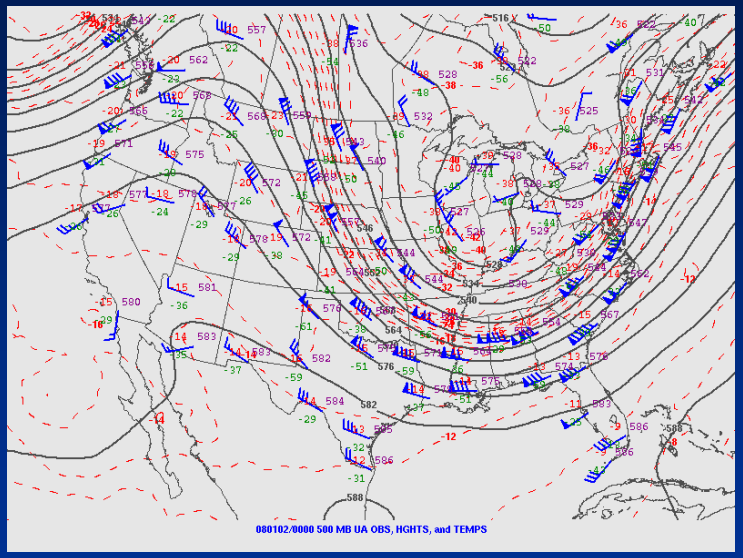


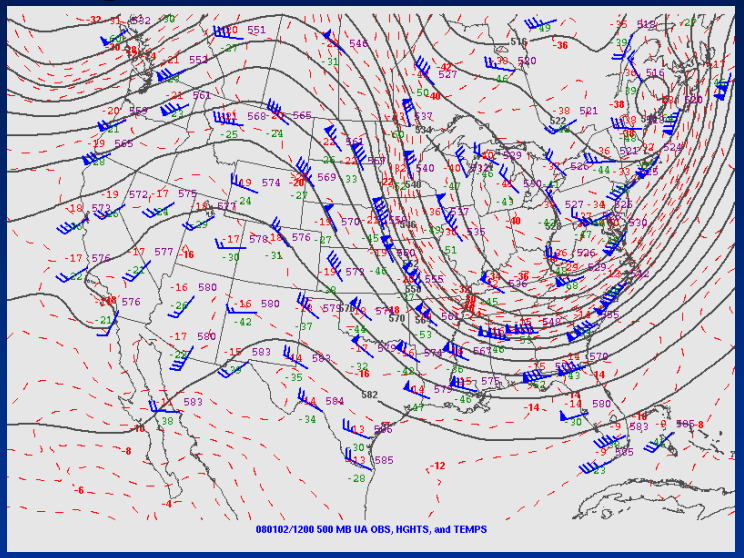
MicroRainRadar (MRR)

Flat Springs, NC

1-2 January 2008

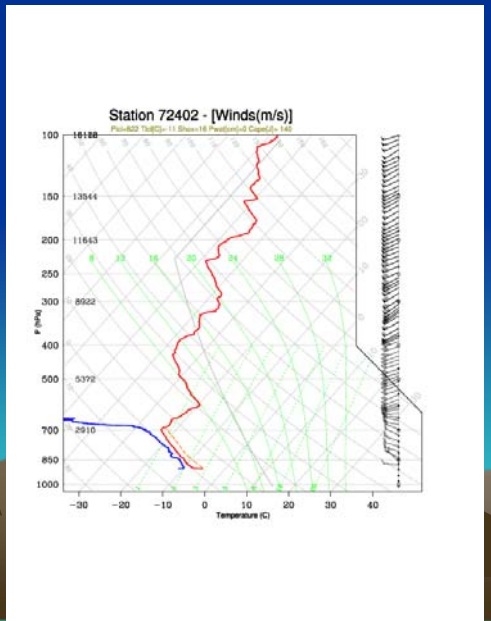
500 hPa
00 UTC
2 Jan.



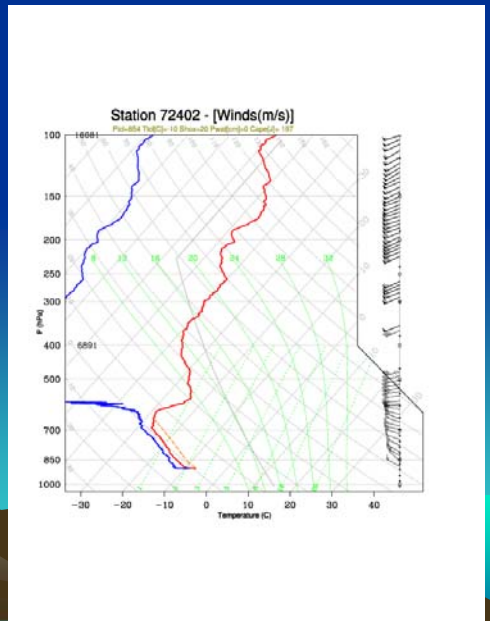


500 hPa
12 UTC
2 Jan.

03 UTC
2 Jan.

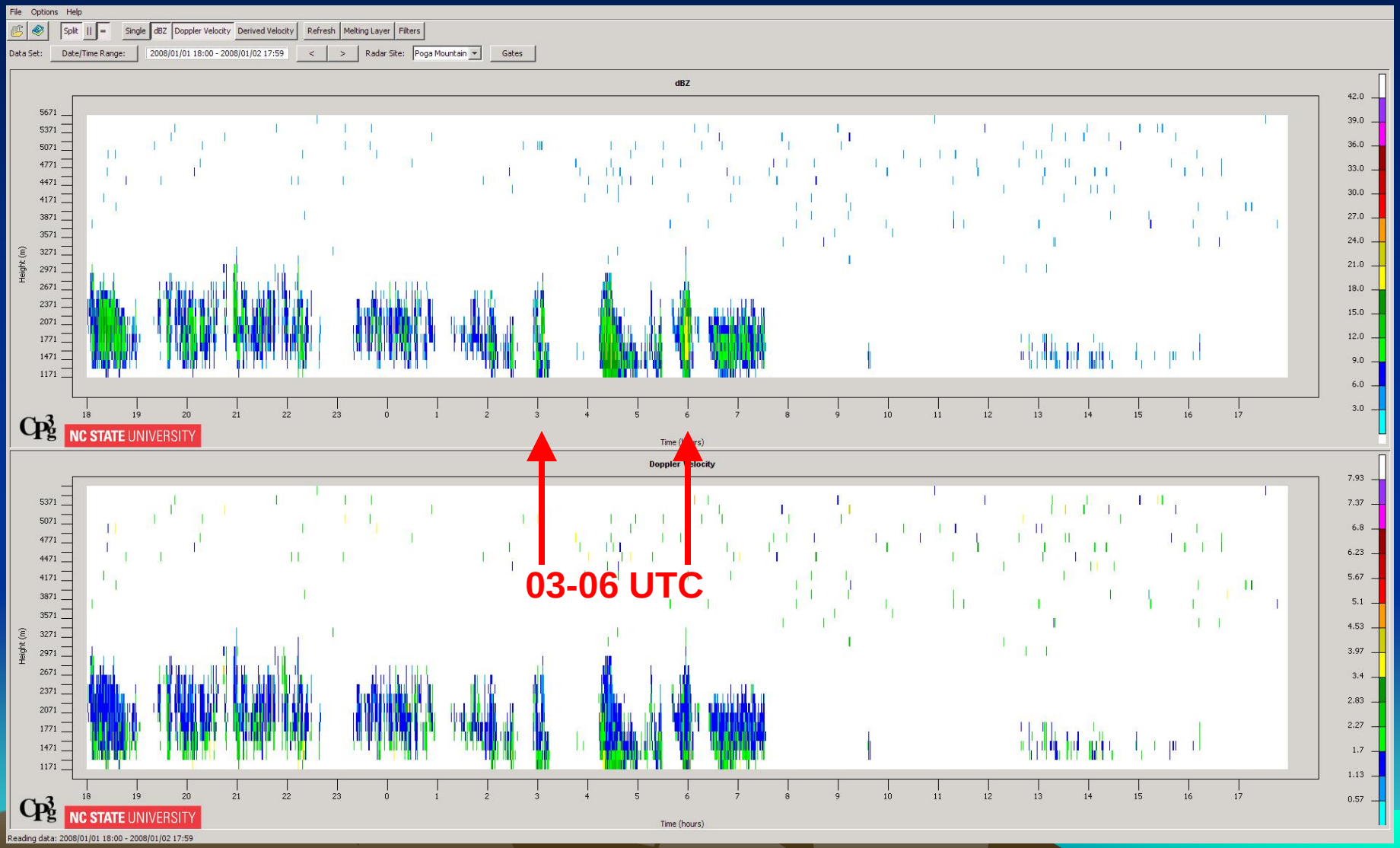


Flat Springs
Soundings

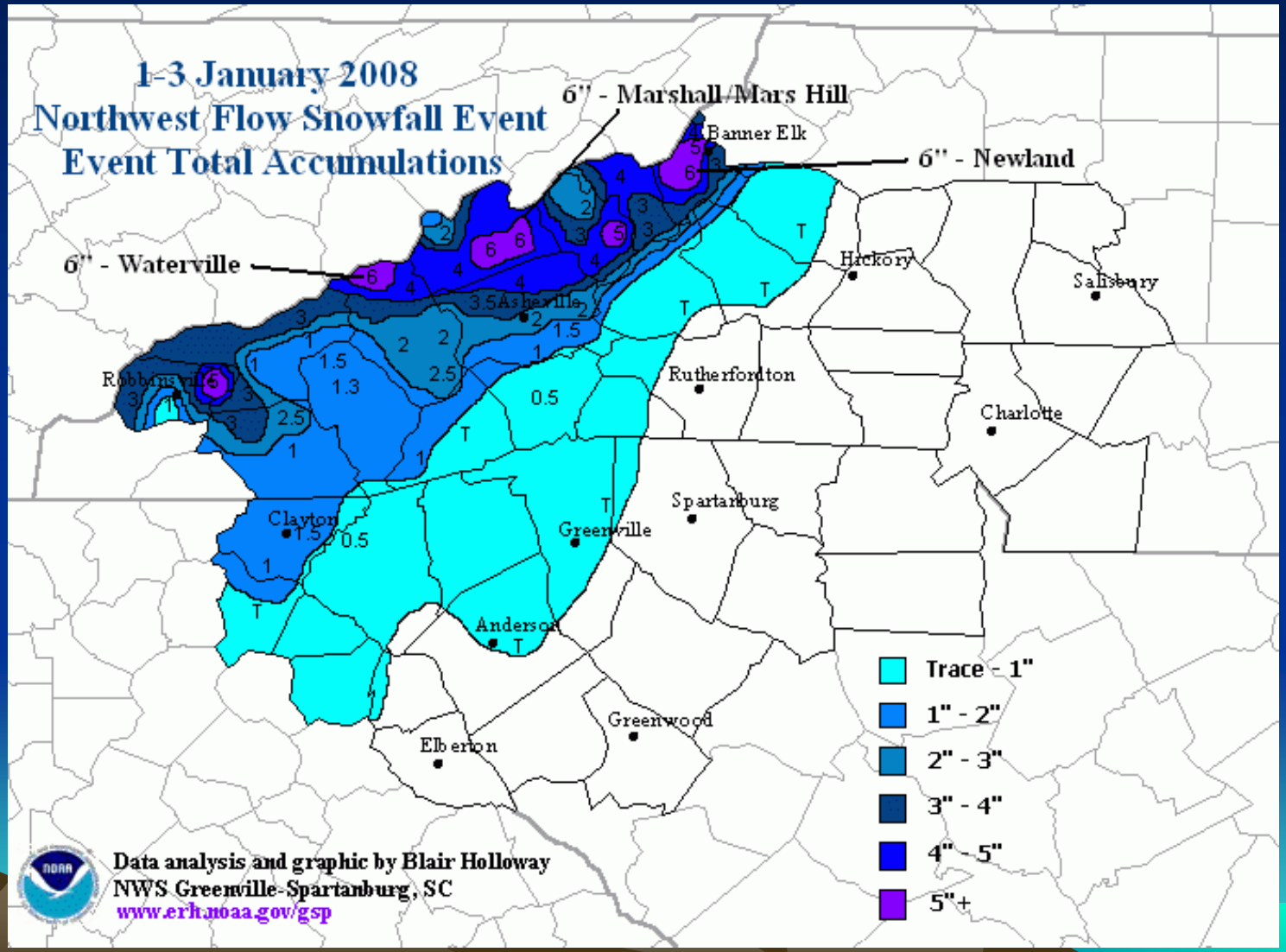


06 UTC
2 Jan.

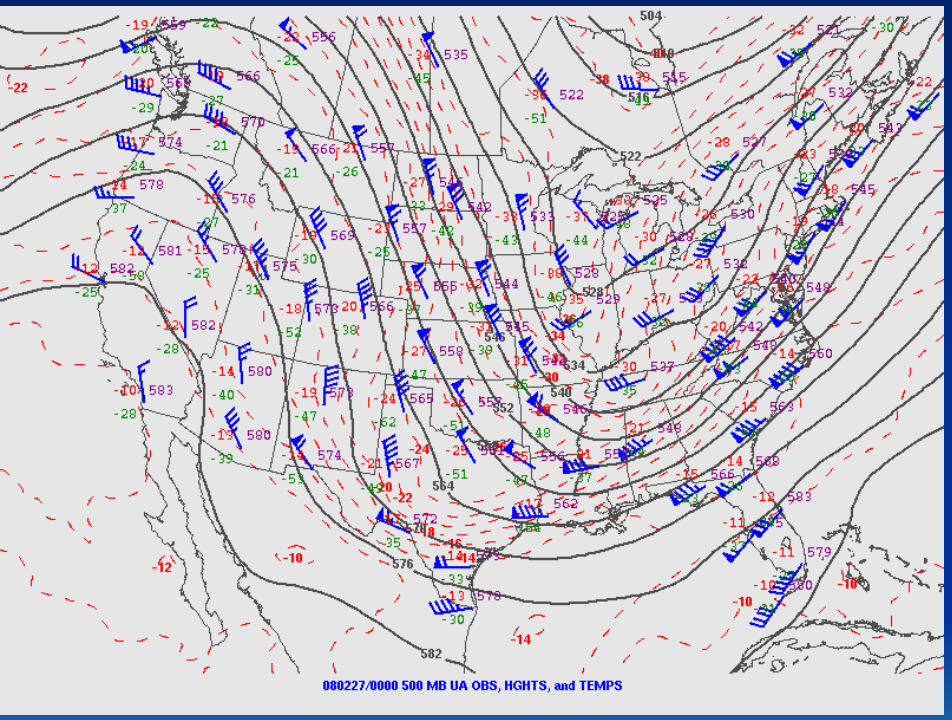
1-2 January 2008



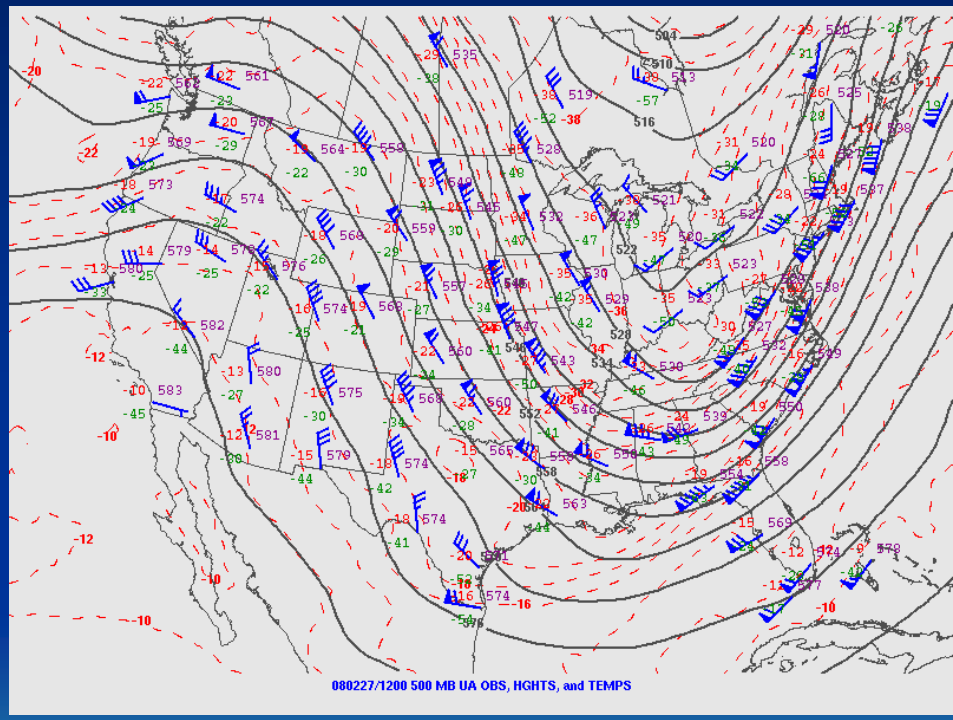
1-2 January 2008



26-28 February 2008

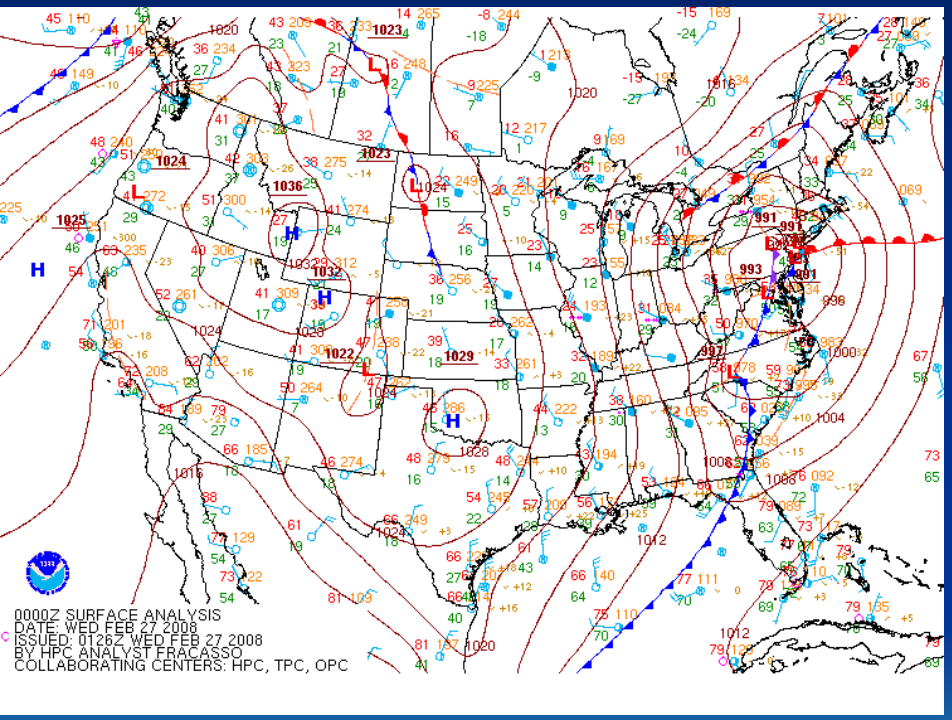


500 hPa – 00 UTC 27 Feb.

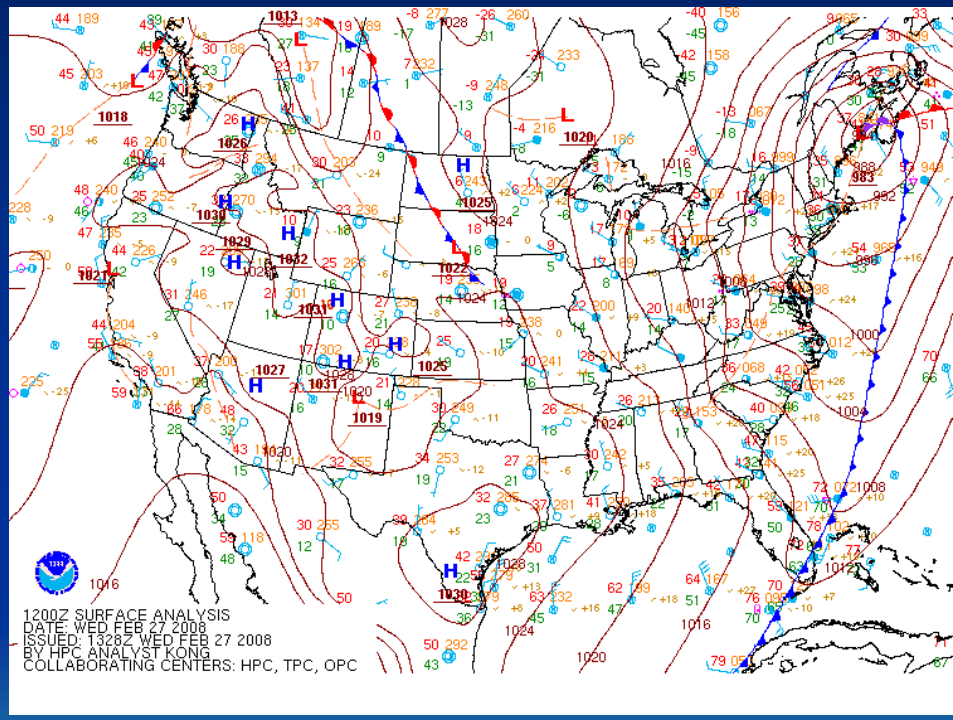


500 hPa – 12 UTC 27 Feb.

26-28 February 2008

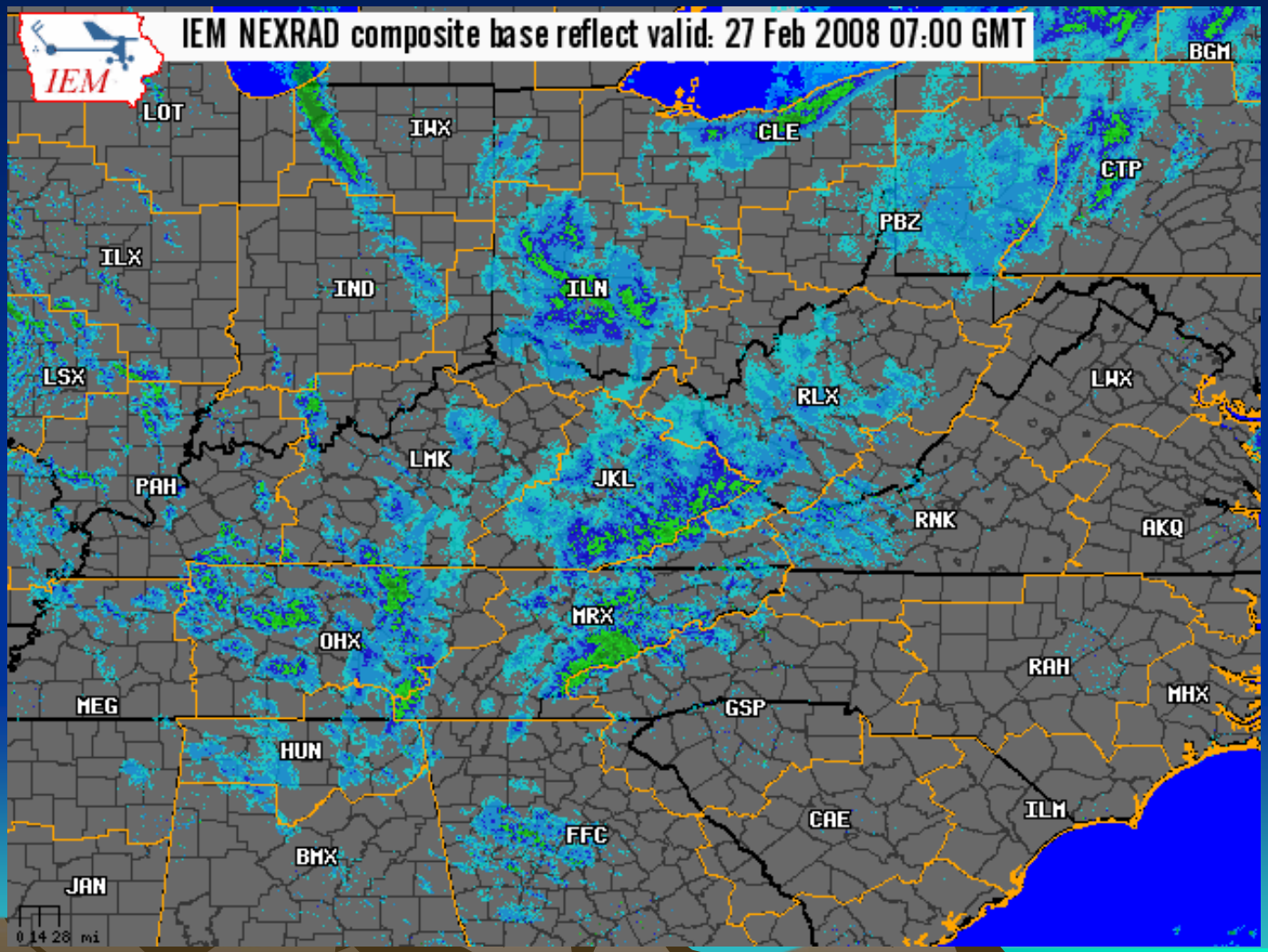


Surface – 00 UTC 27 Feb.



Surface – 12 UTC 27 Feb.

26-28 February 2008

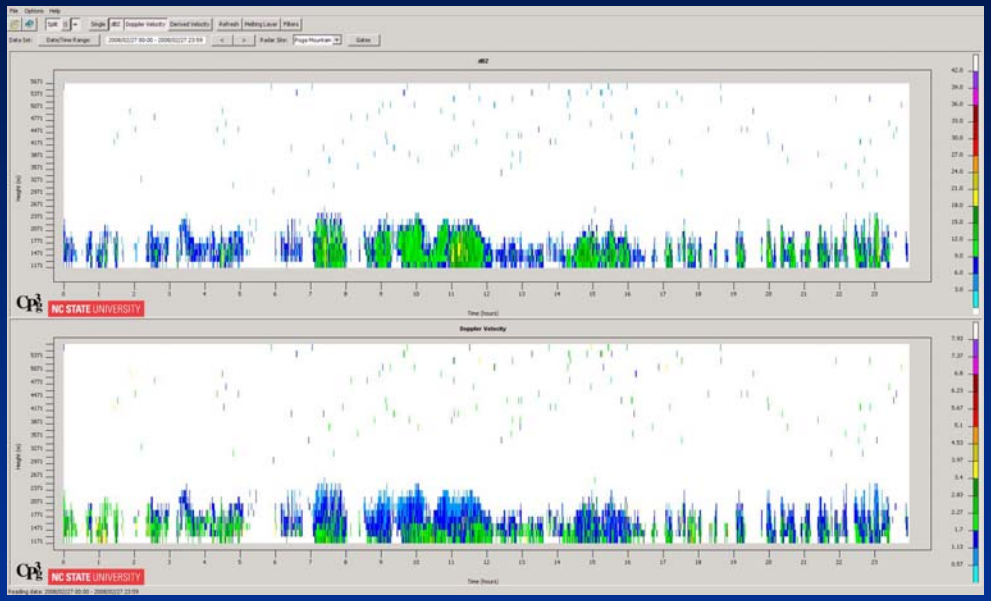


Regional Radar: 07 UTC 27 Feb. – 18 UTC 28 Feb.

26-28 February 2008

00 UTC 27 Feb. –

00 UTC 28 Feb.



00 UTC 28 Feb. –

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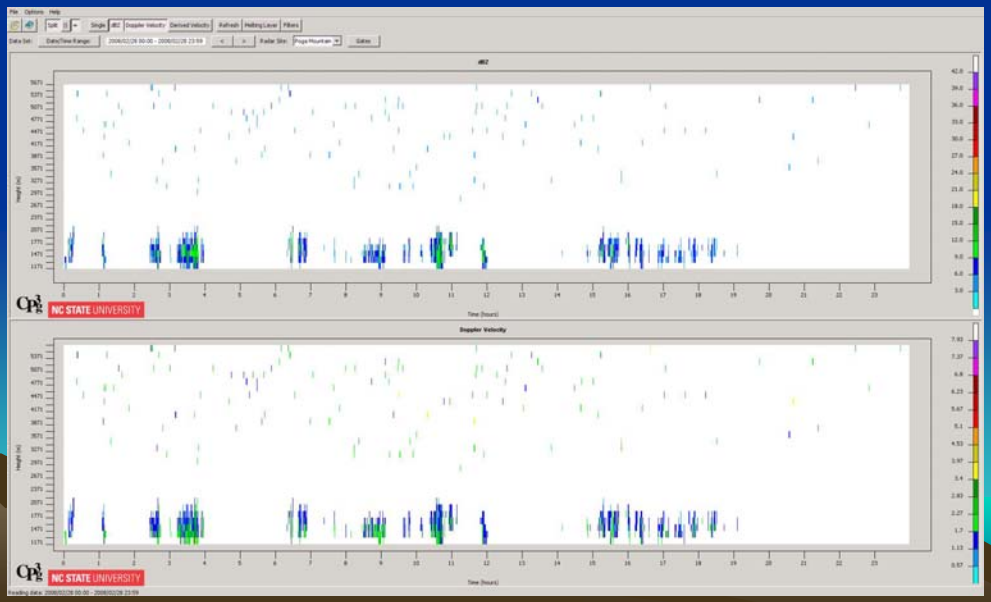
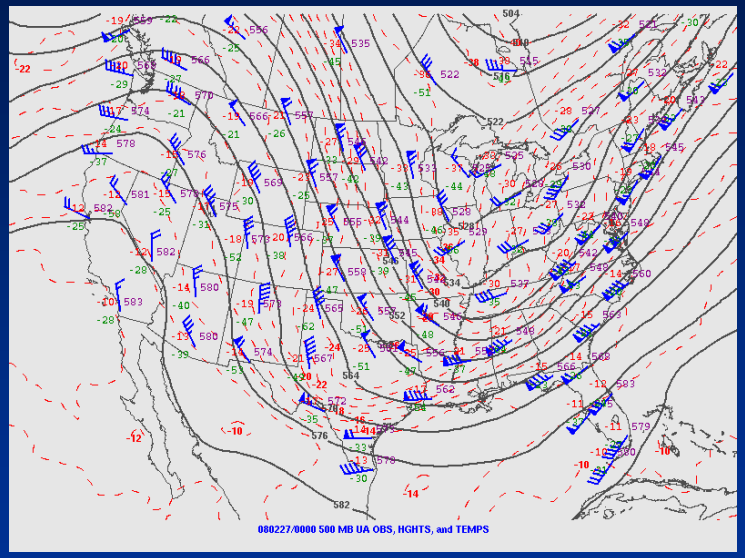


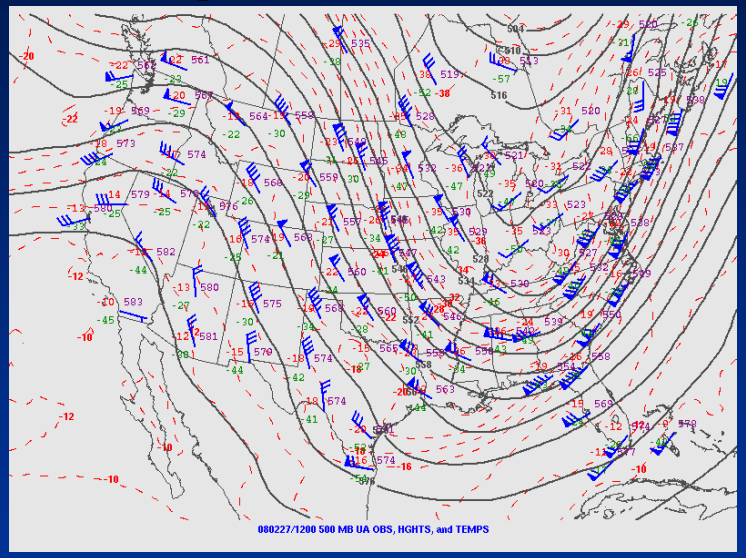
MicroRainRadar (MRR)

Flat Springs, NC

26-28 February 2008

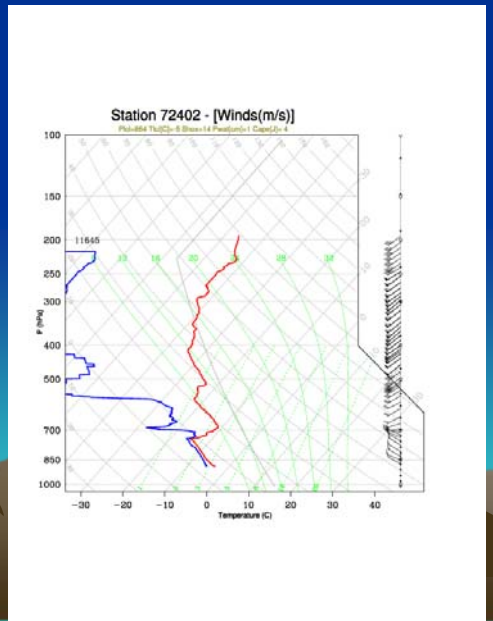
500 hPa
00 UTC
27 Feb.





500 hPa
12 UTC
27 Feb.

06 UTC
27 Feb.



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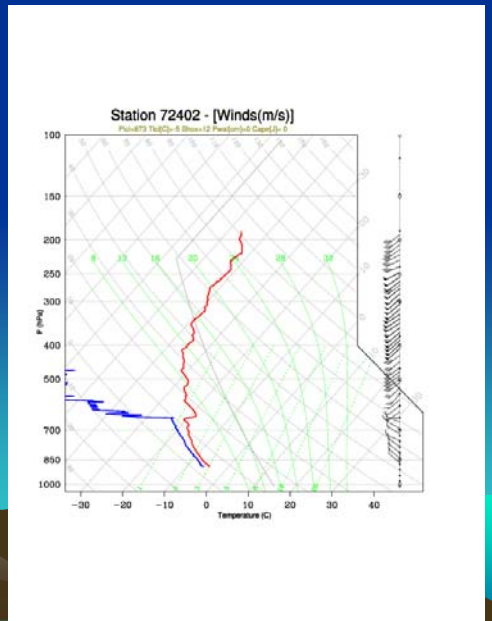
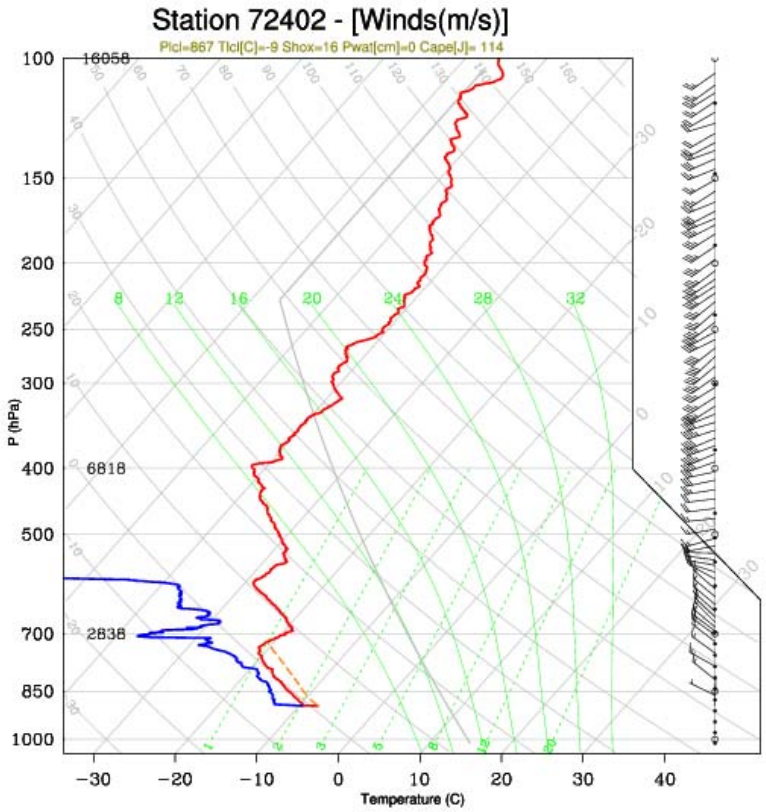
Soundings



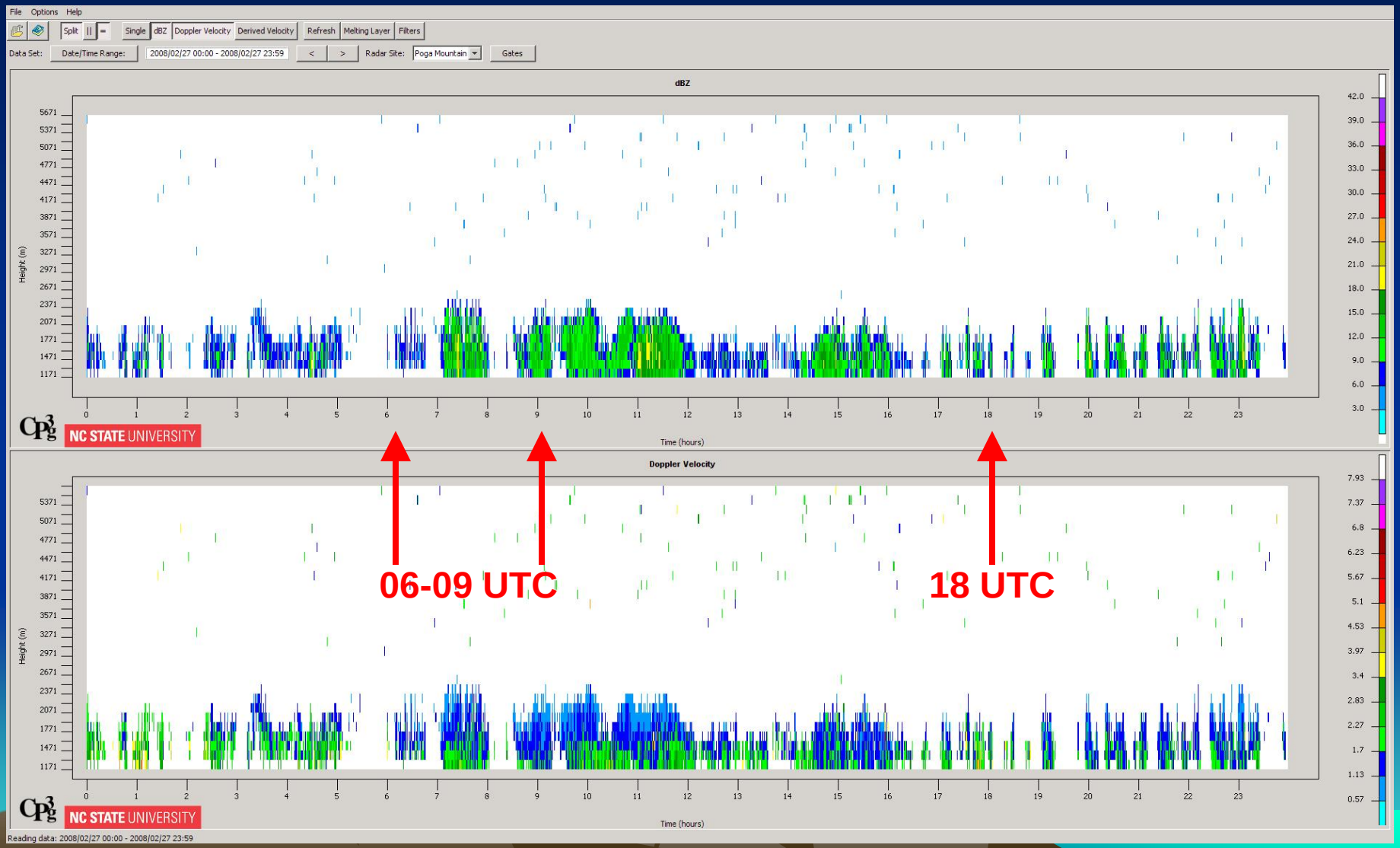
09 UTC
27 Feb.

26-28 February 2008

18 UTC 28 Feb.



26-28 February 2008



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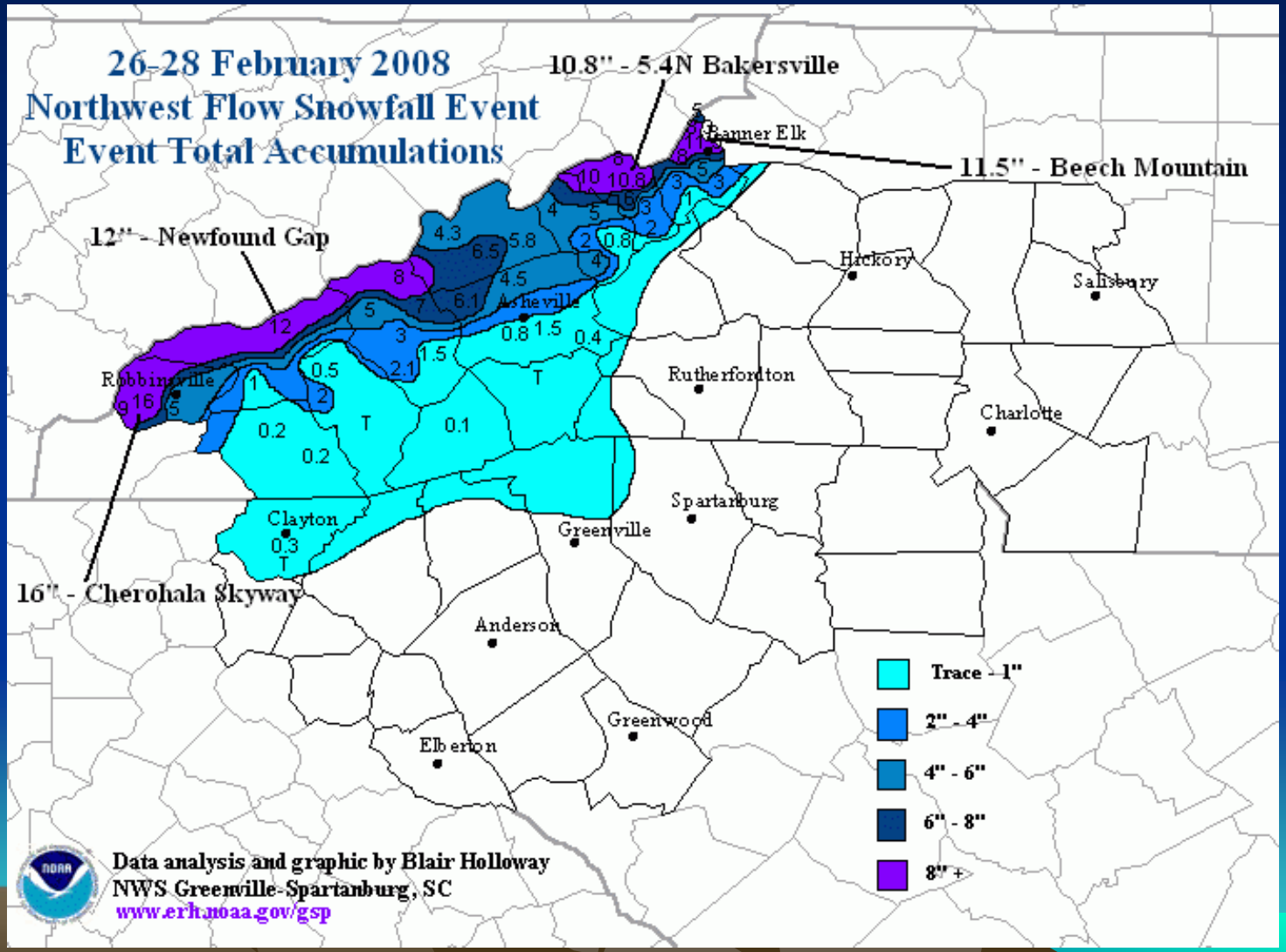


2007-2008 NWFS Events

- Both events well anticipated

- 1-2 January 2008
  - Watch stats; 1.0 POD, avg. lead time 61 hours
  - Warning stats; 1.0 POD, avg. lead time 48 hours

- 26-28 February 2008
  - Watch stats; 1.0 POD, avg. lead time 48 hours
  - Warning stats; 1.0 POD, avg. lead time 23 hours

Event Differences

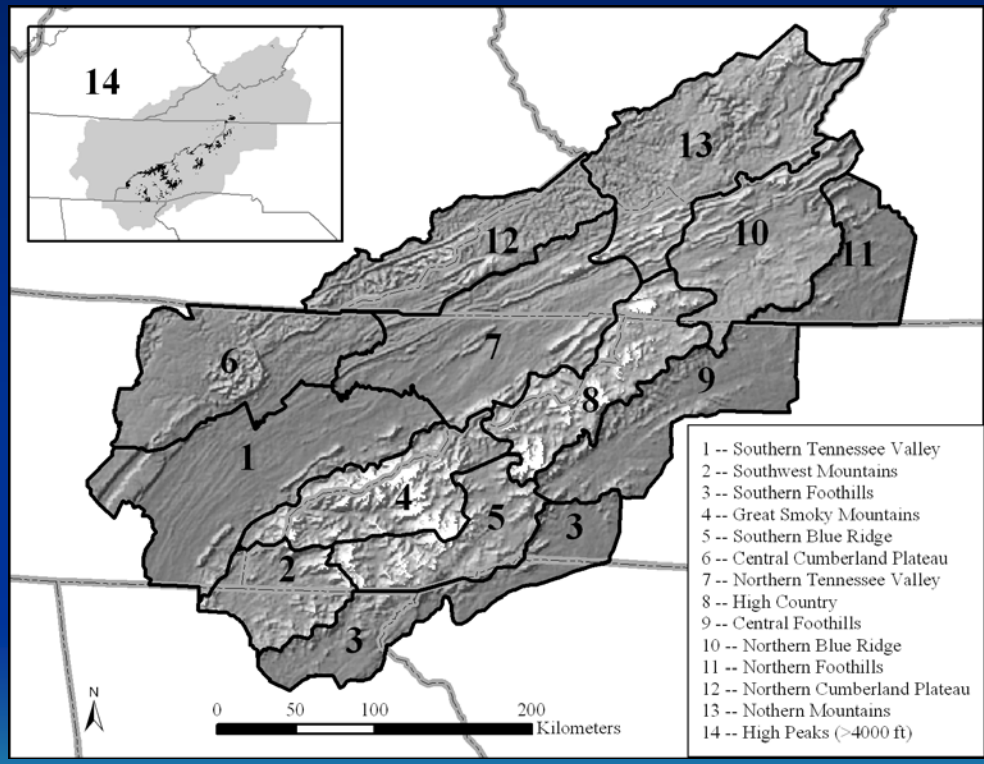
- Duration – February event lasted about 12 hours longer
- Moisture – Flat Springs RH values
  - January event: 83.3%
  - February event: 91.4%
- Snow density – Flat Springs observations
  - January event: 33 kg/m^3 (30.8 snow-to-liquid ratio)
  - February event: 47 kg/m^3 (21.3 snow-to-liquid ratio)
- Wind – RNK sounding
  - January event: 35 kts at 850 hPa
  - February event: 21 kts at 850 hPa
- Low snow density, blowing and drifting of snow helped reduce measurable accumulations in the January event

Forecast Methodology

- We all have good conceptual models of NWFS events
- But what separates a warning event from an advisory event?
- What values of atmospheric parameters should we be looking for?

Forecast Methodology

- Synoptic climatology of NWFS events from 1950-2000 (Perry 2006)
- All values for snow region 8
- Total of 574 events



Perry (2006) fig. 2.5

Forecast Methodology

Northwest Flow Snow Climatology - Forecast Aid						
	All Cases (574)		Ascent (159)		Subsidence (415)	
Temporal Element/Synoptic Field	Light (431) (Advisory)	Heavy (143) (Warning)	Light (120) (Advisory)	Heavy (39) (Warning)	Light (313) (Advisory)	Heavy (102) (Warning)
Event Duration (hours)*	<12	12-24	<12	12-24	<12	12-24
Mean 1000-500 mb RH (%)	59	68	69	78	56	61
500 mb RH (%)	35	44	47	61	31	35
850 mb RH (%)	76	82	79	85	74	80
500 mb Height (m)	5429	5385	5451	5403	5426	5363
850 mb Wind Direction (deg)	302	297	299	299	303	297
850 mb Wind Speed (m/s)	13	12	11	10	13	14
850 mb Temperature (°C)	-7	-8	-5	-6	-7	-9
1000-500 mb Thickness (m)	5300	5279	5339	5308	5292	5247
Precipitable Water (cm/in)	0.79 / 0.31	0.84 / 0.33	1.07 / 0.42	1.04 / 0.41	0.71 / 0.28	0.66 / 0.26
Mean Snowfall (inches)	**1.2**	**3.1**	**1.8**	**4.7**	**1.1**	**2.3**
Max Snowfall (inches)	**3.5**	**9.5**	**5.0**	**13.0**	**3.1**	**7.9**

Perry (2006) Chapter 3: Tables 3.1, 3.2, and 3.3

Light <= 2.4 inches (Approx. 6 cm)
Heavy >=2.5 inches

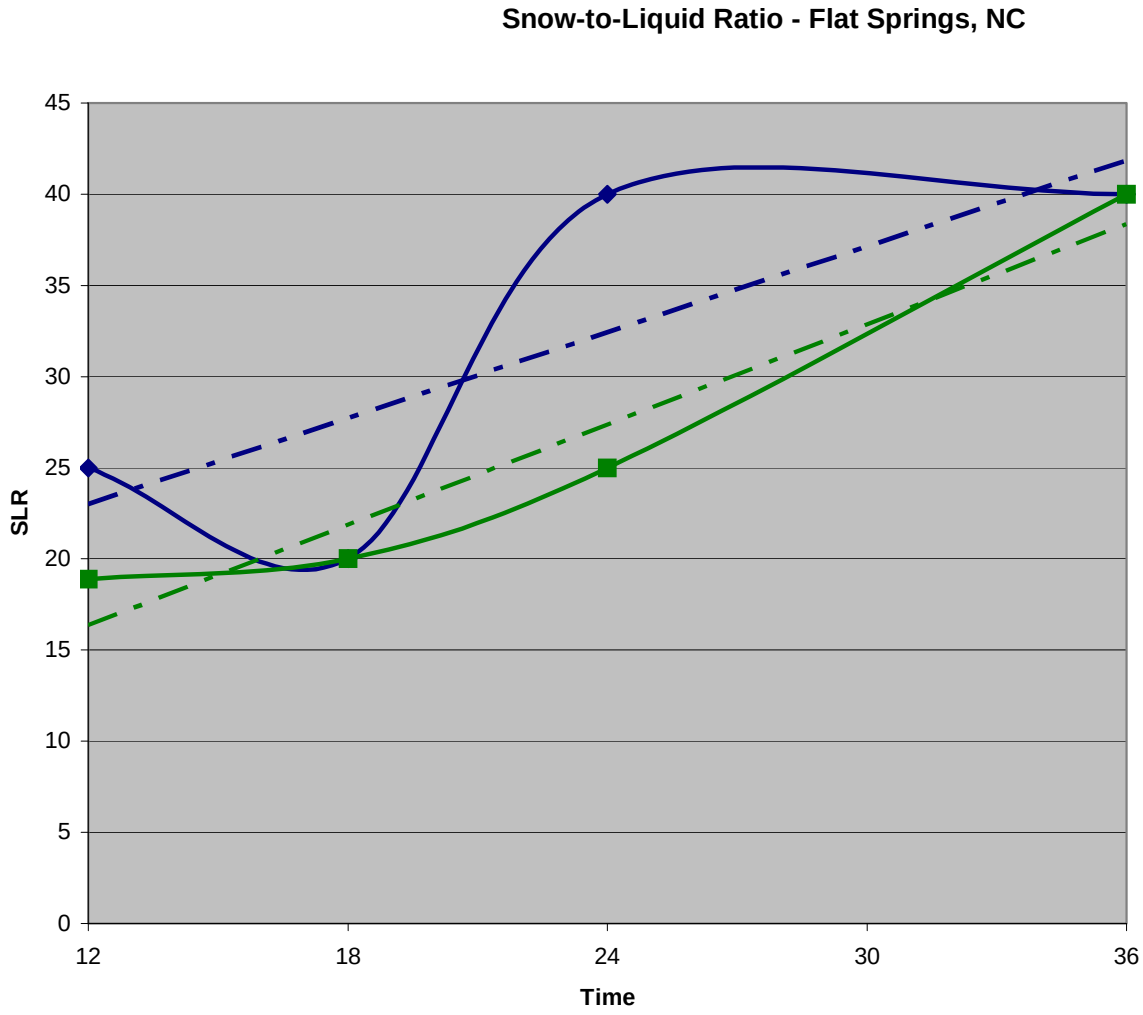
*Event duration is meant to be a rough estimate for our area. Advisory caliber events usually last 12 hours or less, warning caliber events are usually 12-24 hours, or longer.

Ascent vs. Subsidence - Events with upward vs. downward motion at 700 hPa

Forecast Methodology

- Hard to create SnowAmt grids in GFE that portray the spatial variability in NWFS events
- Limited by QPF guidance from operational models
- But we do know that snow-to-liquid ratio changes throughout NWFS events

Forecast Methodology



Average SLR

January Event – 30.8

February Event – 21.3

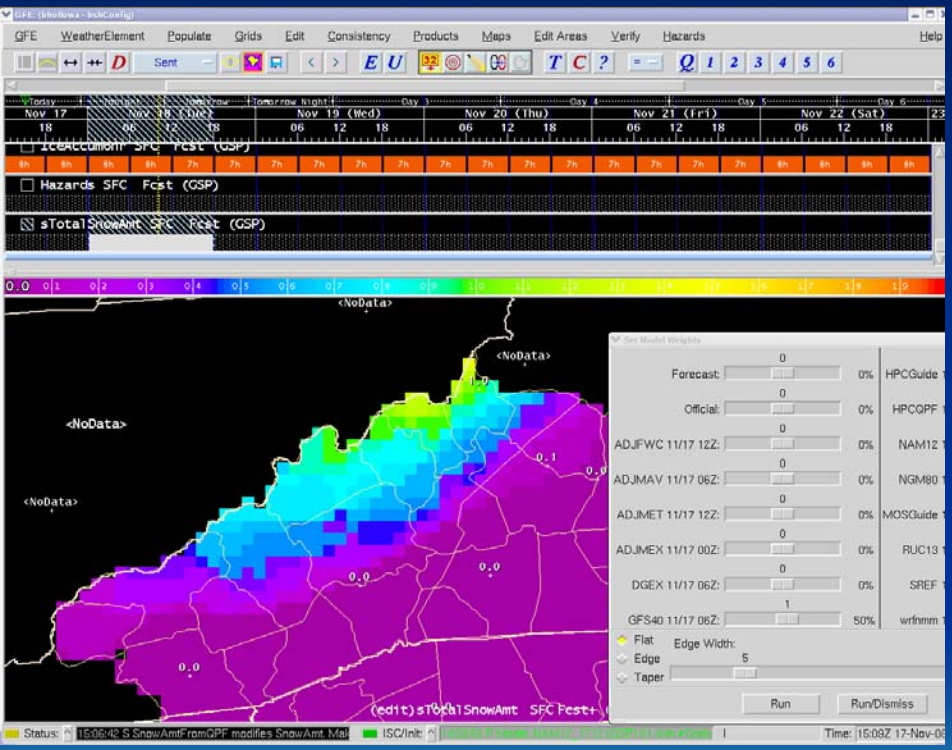
Forecast Methodology

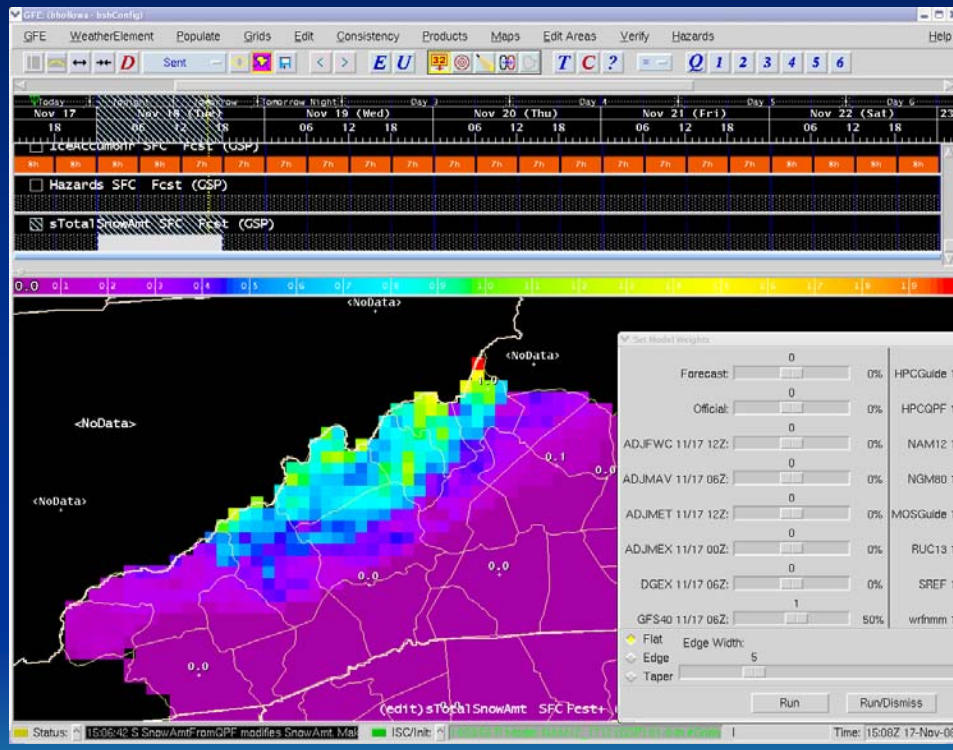
- SLR trends upward throughout NWFS events
- Perhaps use UWM snow ratio probability to settle on an “average” SLR
- Then, using the SnowAmtFromQPF smart tool gradually increase the SLR used as the event progresses
- Can be done with 3 hour or 6 hour snow grids to capture increasing trend in SLR

Forecast Methodology

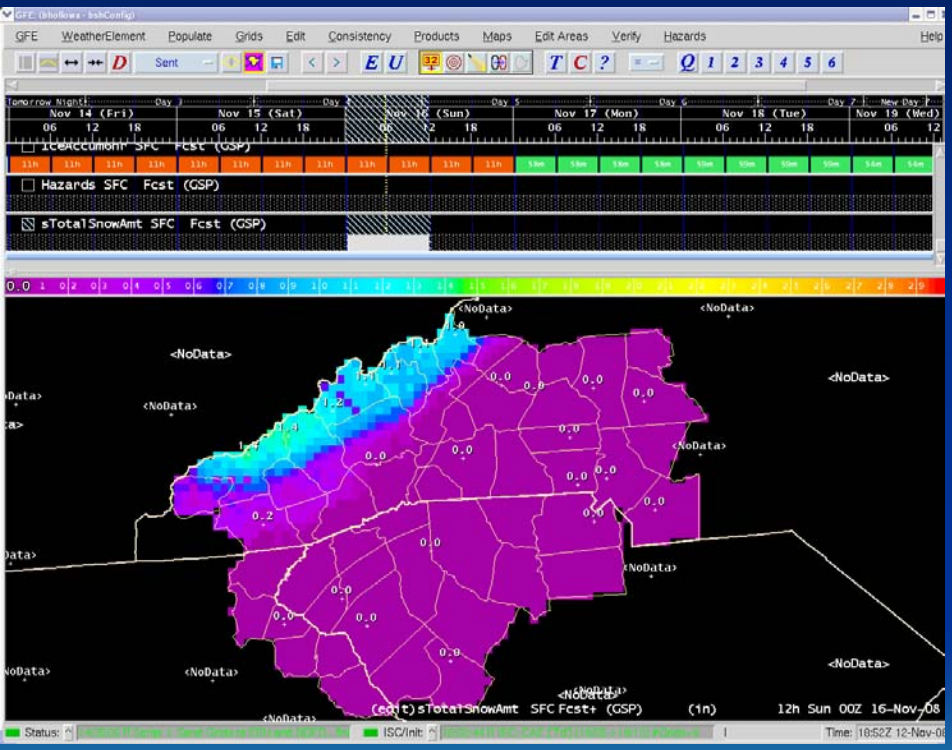
- My method:
  1. Figure out QPF blend (NAM, GFS, SREF, etc.)
  2. Run QPF_SmartTool to create some upslope enhancement/downslope shadowing
  3. Use graduated SLR values in SnowAmtFromQPF, usually finishing at or just over 20:1

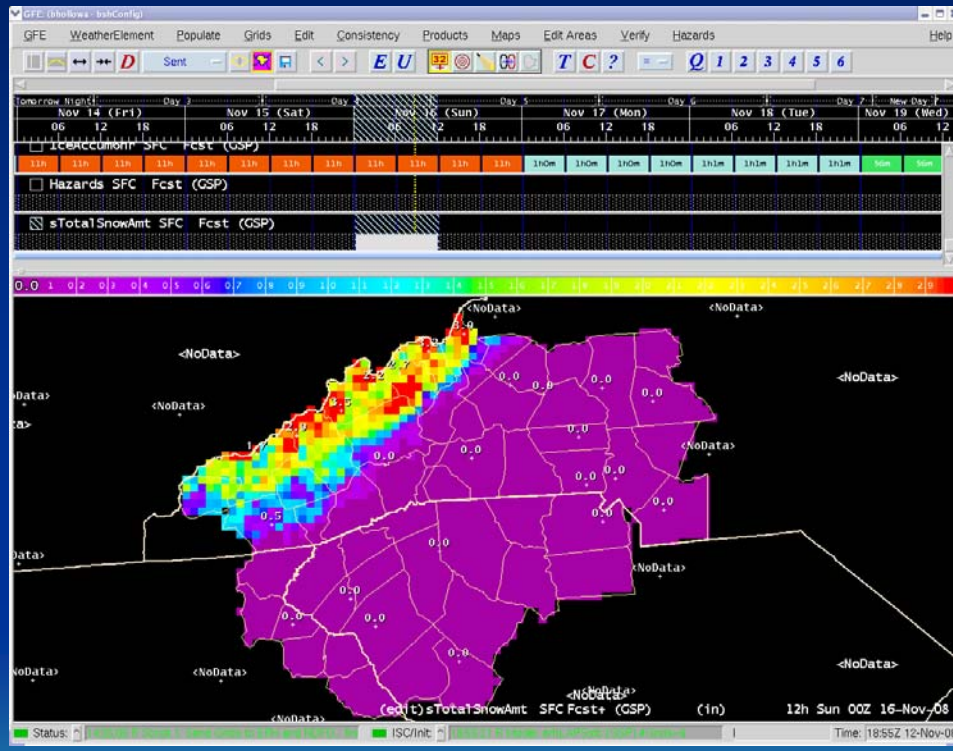
Forecast Methodology





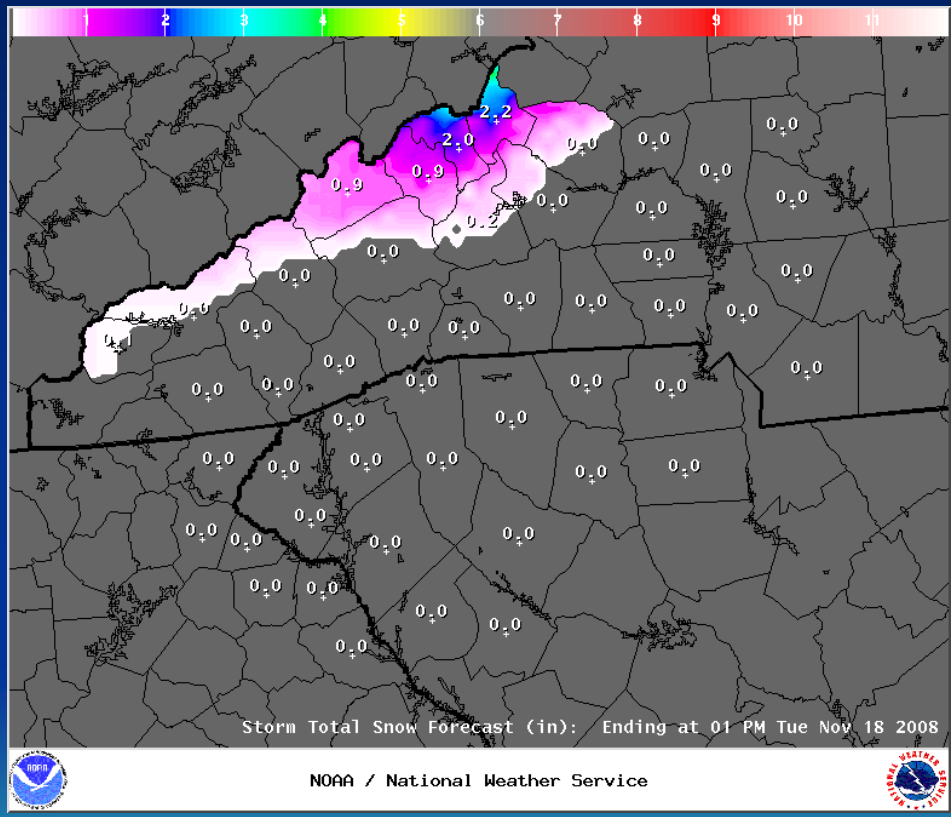
Forecast Methodology





Forecast Methodology

- A more representative storm total snow grid
- More beneficial now that we are advertising on briefing web page



Summary and Conclusions

- Office has a good handle on NWFS events
- Field studies have provided beneficial information about event details
- We know SLR increases throughout NWFS events
- Can use this information to create SnowAmt grids and a more representative storm total snow depiction