



Weather101: **Observations and** **Upper Air (U/A) Patterns**

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National Weather Service – Nashville, TN

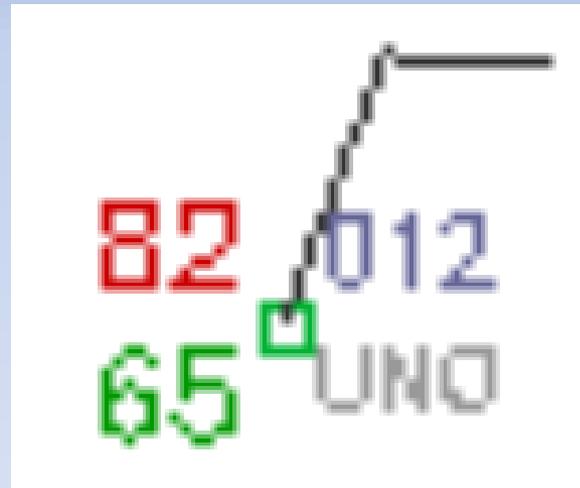
Observations in 3-D: METARs and U/A Patterns

What we will attempt to cover in this class:

- The ins and outs of METARs
- How are METARs used?
- Upper air patterns
 - Why are some storm systems stronger than others

Observation in 3-D: METARs

KUNO 241553Z AUTO 01007KT 10SM CLR 29/18 A3012 RMK AO2 SLP185 T02890183



Raw METARs

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KATL 240352Z 25003KT 5SM VCTS RA BR FEW025CB BKN050 BKN080 OVC150 22/21 A2992 RMK AO2 SLP121 OCNL LTGIC N & SE-SW TS VC N & SE-SW MOV NW P0014 T02220206
KATL 240452Z 02007KT 8SM -RA FEW020 BKN070 BKN110 OVC150 23/21 A2992 RMK AO2 SLP121 TSE52 TS DSIPTD P0006 T02280206 402940200
KATL 240552Z 04005KT 10SM FEW009 FEW055 SCT110 BKN150 OVC180 22/20 A2991 RMK AO2 RAE43 SLP118 P0002 60082 T02220200 10272 20222 58001
KATL 240652Z 05009KT 10SM FEW009 SCT048 OVC180 22/20 A2990 RMK AO2 SLP116 T02220200
KATL 240752Z COR 08008KT 10SM FEW005 SCT075 SCT180 22/21 A2990 RMK AO2 SLP114 T02170206
KATL 240852Z 09007KT 8SM BKN006 BKN075 BKN180 22/21 A2991 RMK AO2 SLP117 CIG 005V007 T02170206 55001
KATL 240952Z 09006KT 9SM OVC008 22/21 A2991 RMK AO2 SLP120 CIG 006V010 BINOVC T02170206
KATL 241052Z 09007KT 7SM SCT006 SCT016 SCT180 SCT250 22/20 A2993 RMK AO2 SLP125 SCT006 V BKN T02170200
KATL 241152Z 06006KT 9SM SCT006 SCT110 SCT180 BKN250 22/20 A2994 RMK AO2 SLP130 70082 T02220200 10222 20217 53012
KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK AO2 SLP136 T02330200
KATL 241352Z 07006KT 9SM FEW010 BKN020 OVC110 23/21 A2997 RMK AO2 SLP140 T02330206
KATL 241452Z 07007KT 10SM FEW015 BKN025 OVC110 24/19 A2998 RMK AO2 SLP143 BINOVC S T02390194 51012
KATL 241552Z 06006KT 10SM FEW017 BKN027 OVC110 24/20 A2999 RMK AO2 SLP147 T02440200
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Raw METARs

KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200

Raw METARs

Station Identifier



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KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200
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Raw METARs

Date/Time Stamp in UTC



KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200

Raw METARs

Wind Direction and Speed



KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200

Raw METARs

Visibility



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KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200
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Raw METARs

Ceilings or cloud levels



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KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200
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Raw METARs

Temperature / Dew Point in Celsius



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KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200
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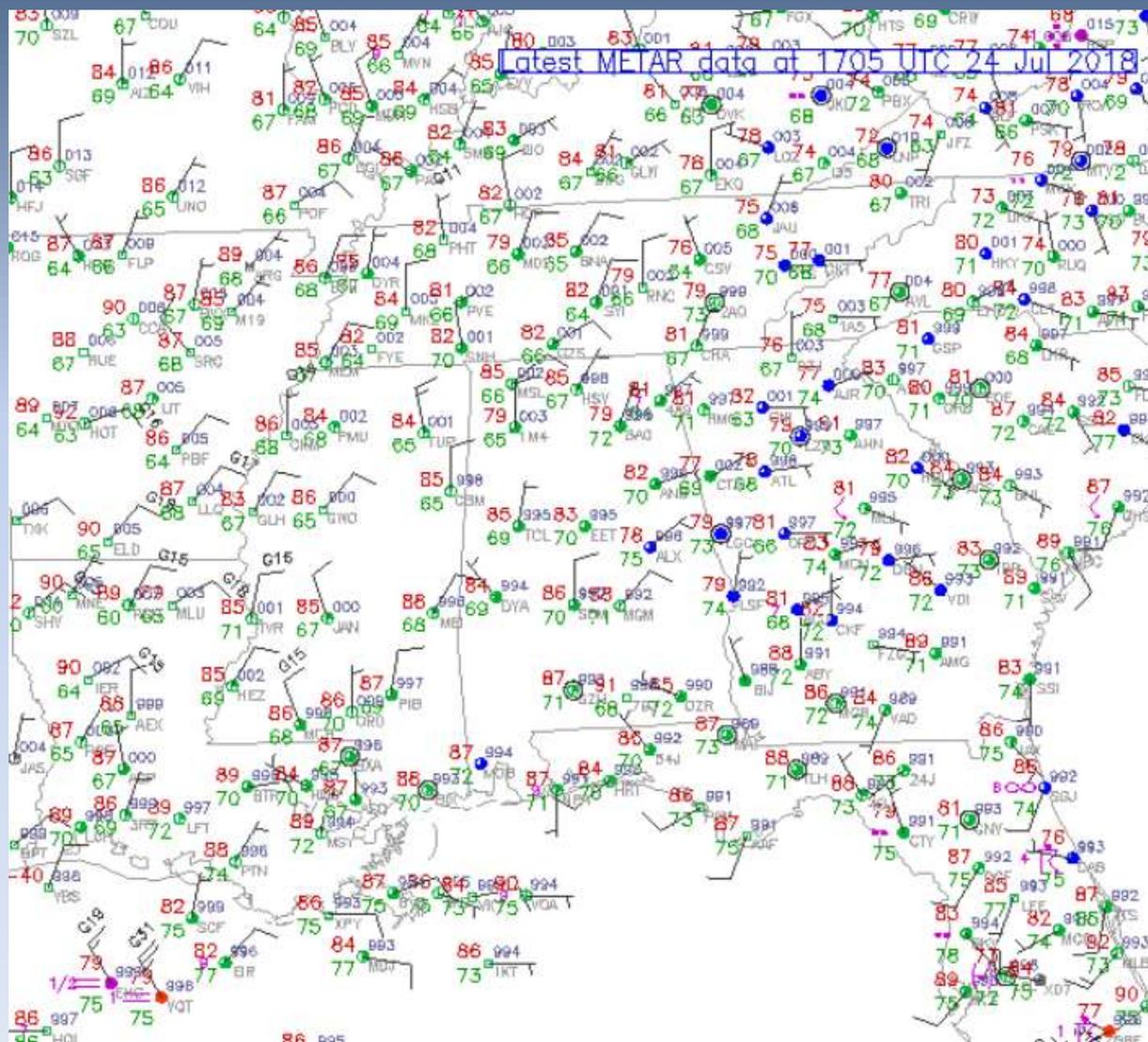
Raw METARs

Aviation extras
(unnecessary for our purposes today)

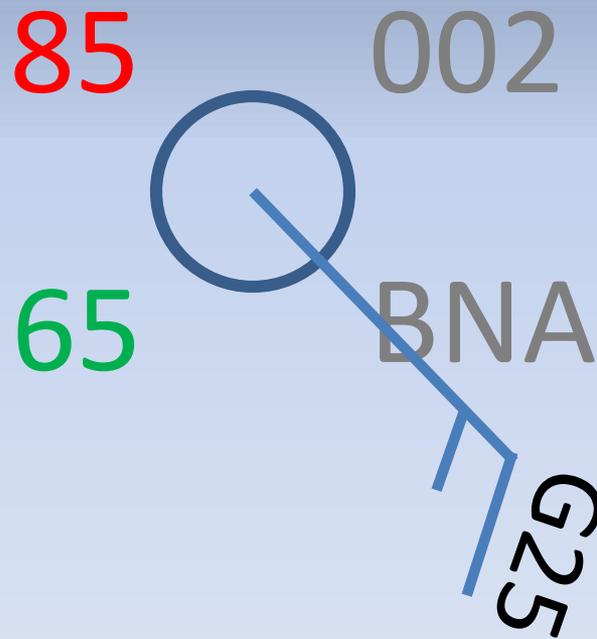


KATL 241252Z 08006KT 8SM BKN009 BKN110 23/20 A2996 RMK A02 SLP136 T02330200

Plotted METARs

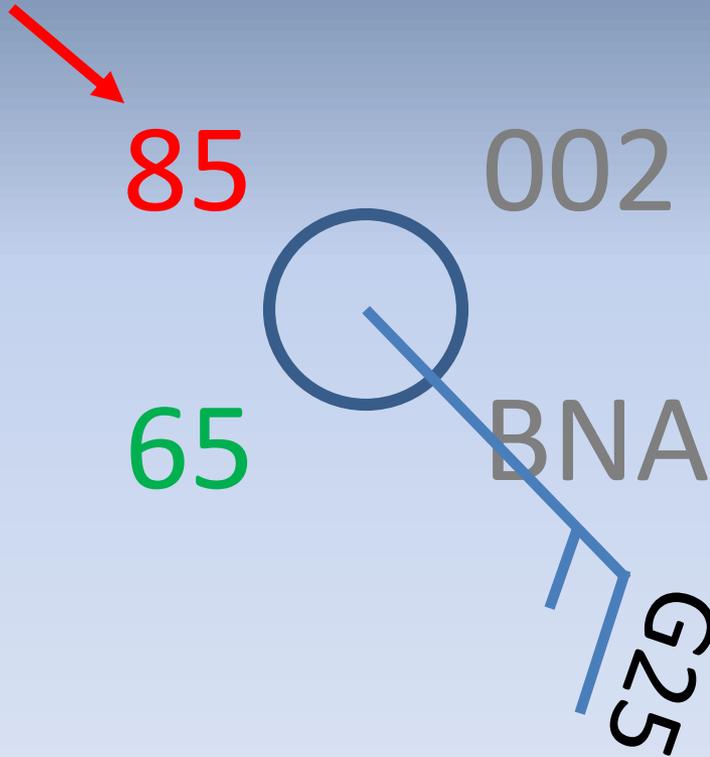


Plotted METARs

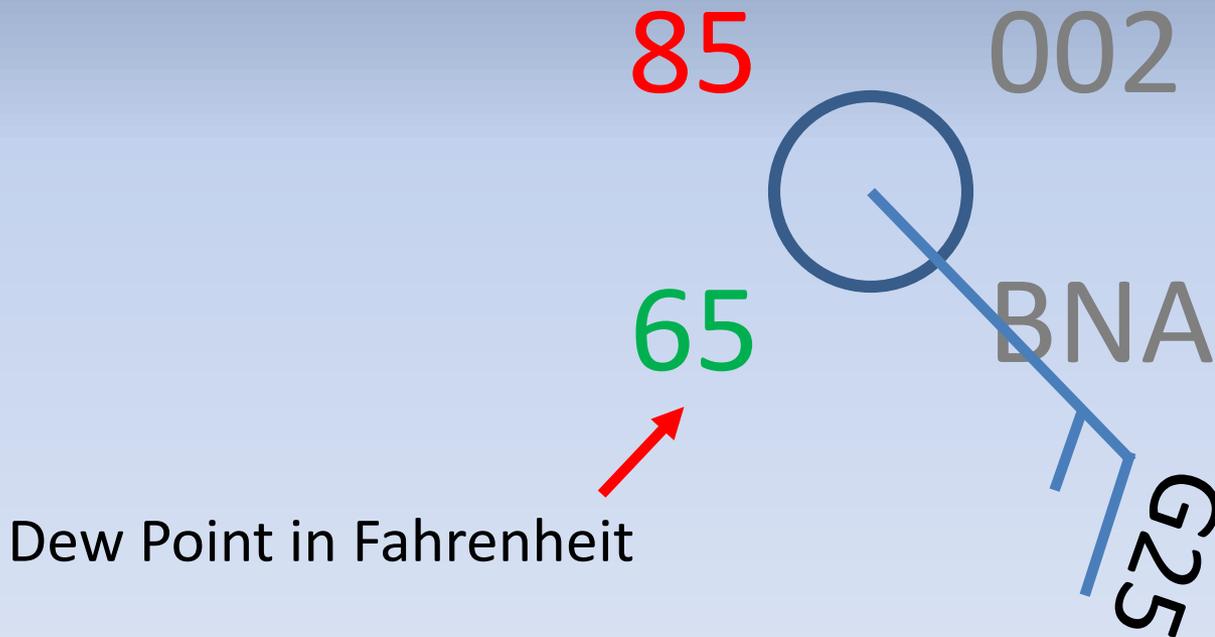


Plotted METARs

Temperature in Fahrenheit

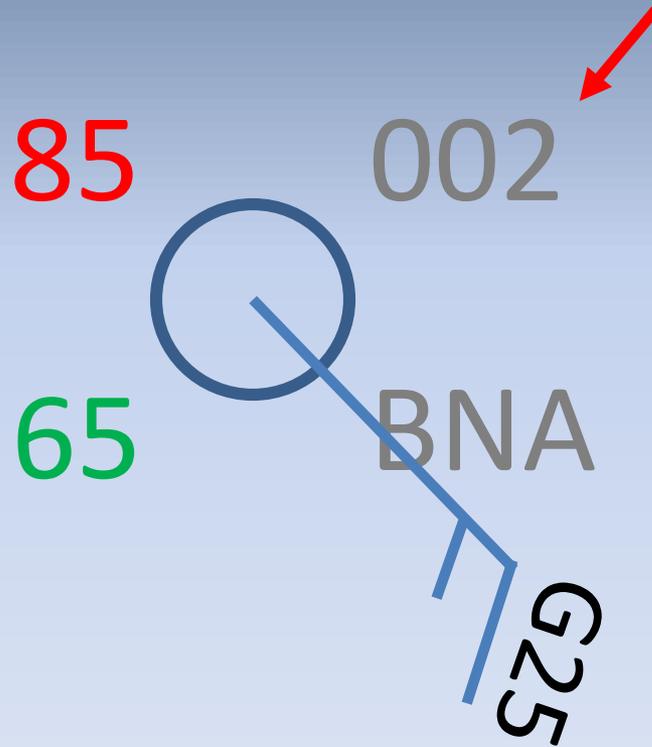


Plotted METARs



Plotted METARs

Surface pressure in millibars (mb)



Plotted METARs

Surface pressure in millibars (mb)

85

002

65

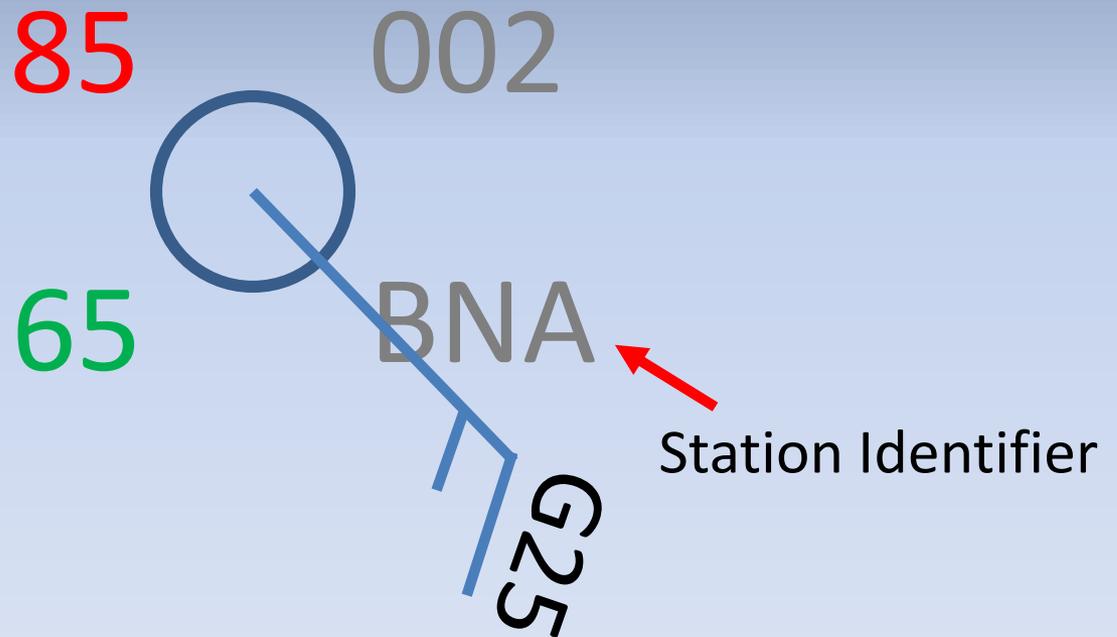
BNA

G25

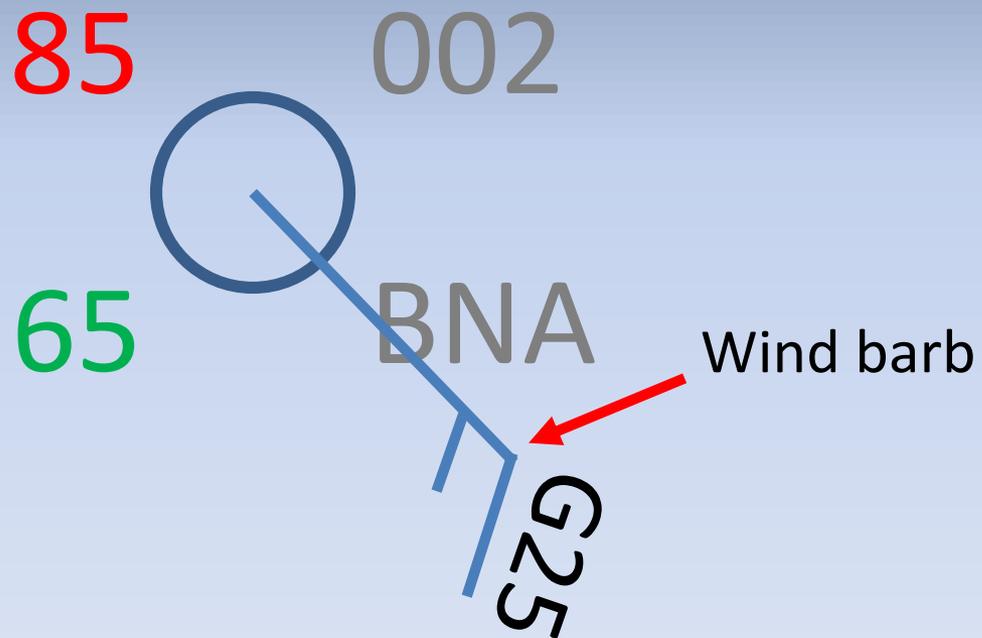
Additional notes:

- If the pressure starts with a “0” or “1”, put another “1” in front of it.
This example: 1002 mb
- If the pressure starts with an “8” or “9”, for example “992”, that’s the pressure in mb

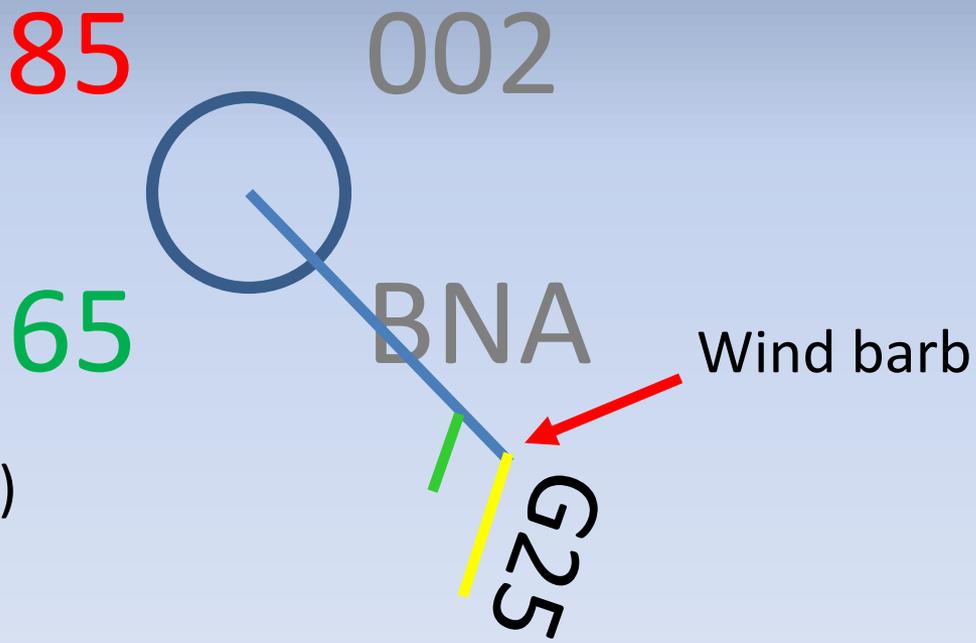
Plotted METARs



Plotted METARs



Plotted METARs

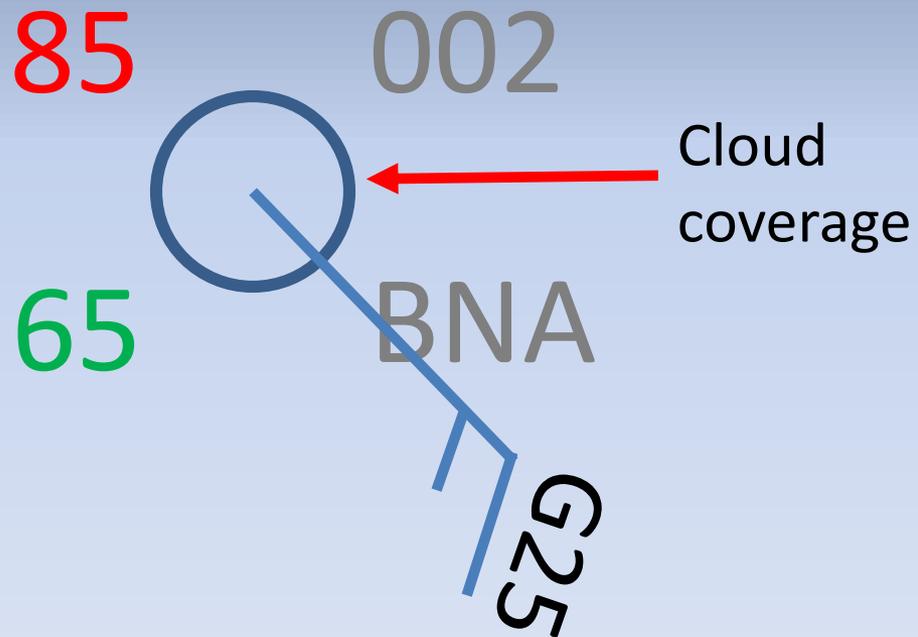


Additional notes:

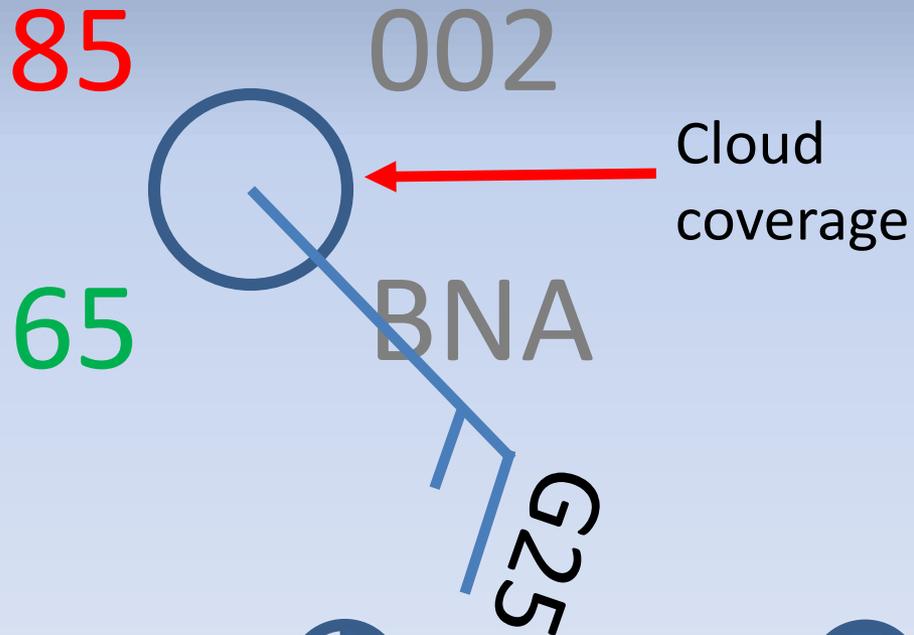
- Long line = 10 knots (kts)
- Short line = 5 kts
- Flag = 50 kts
- "G" indicates Gusts. In this example,

the wind is **out of** the southeast at 15 kts, gusting to 25 kts

Plotted METARs



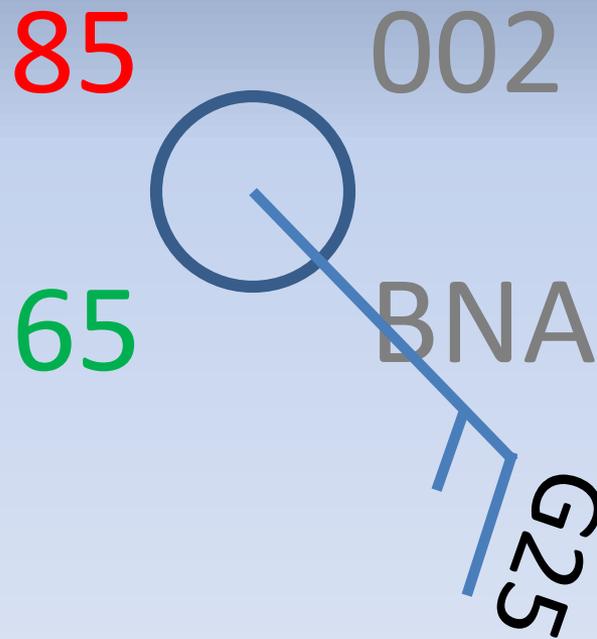
Plotted METARs



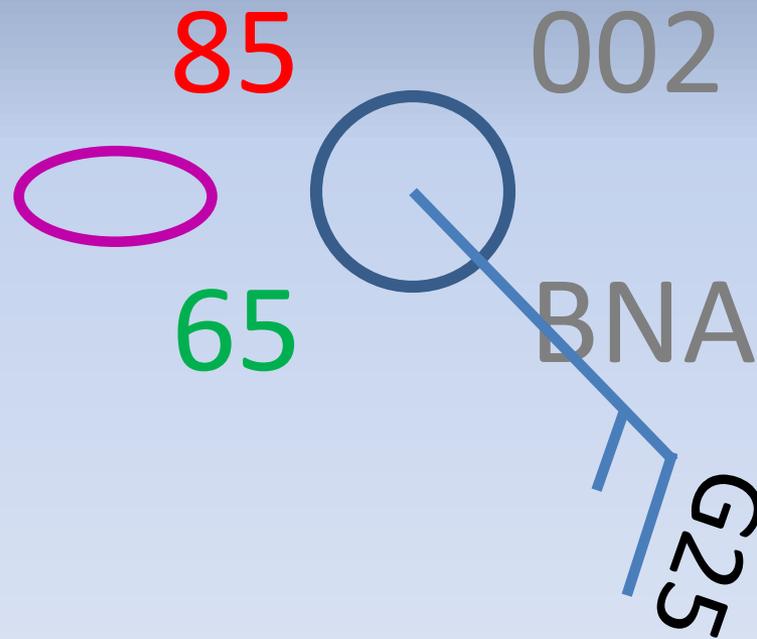
Additional notes:



Plotted METARs



Plotted METARs



WEATHER SYMBOLS

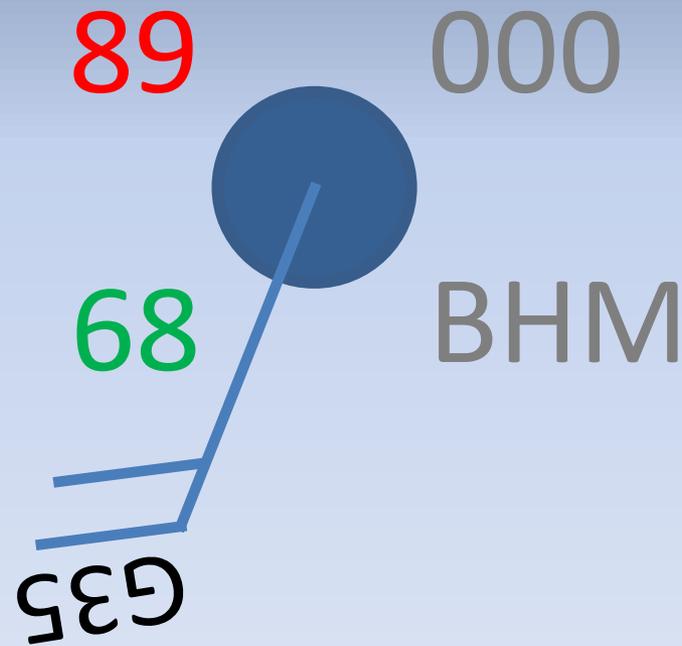
Numbers indicate the weather code as used in synoptic weather reports (ww, present weather reported from a manned weather station, as defined in WMO Pub. No. 306-A).

00  Cloud development not observed/observable during past hour.	01  Clouds generally dissolving during past hour.	02  State of sky unchanged during past hour.	03  Clouds generally forming or developing during past hour.	04  Visibility reduced by smoke.	05  Haze.	06  Dust suspended in the air, but not raised by wind.	07  Dust or sand raised by wind.	08  Dust devils now or within past hour.	09  Duststorm or sandstorm not at station but within sight.
10  Mist.	11  Patches of shallow fog at station, not deeper than 2 m (10 m at sea).	12  Continuous shallow fog at station, not deeper than 2 m (10 m at sea).	13  Lightning visible, but no thunder heard.	14  Precipitation visible but not reaching ground at station.	15  Precipitation reaching the ground not at or near the station but at a distance.	16  Precipitation reaching the ground not at the station but nearby.	17  Thunder heard but no precipitation at the station.	18  Wind squall now or during the past hour.	19  Tornado, waterspout, or funnel cloud observed now or during past hour.
20  Recent drizzle (not freezing, not showers) during past hour.	21  Recent rain (not freezing, not showers) during past hour.	22  Recent snow (not showers) during past hour.	23  Recent rain and snow (not showers) during past hour.	24  Freezing drizzle or rain (not showers), not now but during past hour.	25  Rain showers, not now but during past hour.	26  Snow showers, not now but during past hour.	27  Hail or hail and rain, not now but during past hour.	28  Fog, not now but during past hour.	29  Thunderstorm, with or without precipitation, not now but during past hour.
30  Slight/moderate duststorm or sandstorm, decreased during hour.	31  Slight/moderate duststorm or sandstorm, no change during hour.	32  Slight/moderate duststorm or sandstorm, increased during hour.	33  Severe duststorm or sandstorm, which has decreased during hour.	34  Severe duststorm or sandstorm, no change during past hour.	35  Duststorm or sandstorm, severe, has increased during past hour.	36  Drifting snow, slight or moderate.	37  Drifting snow, heavy.	38  Blowing snow, slight or moderate.	39  Blowing snow, heavy.
40  Fog at a distance but not at station during past hour.	41  Patchy fog.	42  Fog, sky discernible, and has become thinner during past hour.	43  Fog, sky not discernible, and has become thinner during past hour.	44  Fog, sky discernible, no change during past hour.	45  Fog, sky not visible, no change during past hour.	46  Fog, sky visible, has begun or become thicker during past hour.	47  Fog, sky not visible, has begun or become thicker during past hour.	48  Freezing fog, sky visible.	49  Freezing fog, sky not visible.
50  Drizzle, light, intermittent, not freezing.	51  Drizzle, light, continuous, not freezing.	52  Drizzle, moderate, intermittent, not freezing.	53  Drizzle, moderate, continuous, not freezing.	54  Drizzle, heavy, intermittent, not freezing.	55  Drizzle, heavy, continuous, not freezing.	56  Freezing drizzle, light.	57  Freezing drizzle, moderate or heavy.	58  Drizzle and rain mixed, light.	59  Drizzle and rain mixed, moderate or heavy.
60  Rain, light, intermittent, not freezing.	61  Rain, light, continuous, not freezing.	62  Rain, moderate, intermittent, not freezing.	63  Rain, moderate, continuous, not freezing.	64  Rain, heavy, intermittent, not freezing.	65  Rain, heavy, continuous, not freezing.	66  Freezing rain, light.	67  Freezing rain, moderate or heavy.	68  Rain and snow mixed, light.	69  Rain and snow mixed, moderate or heavy.
70  Snow, light, intermittent.	71  Snow, light, continuous.	72  Snow, moderate, intermittent.	73  Snow, moderate, continuous.	74  Snow, heavy, intermittent.	75  Snow, heavy, continuous.	76  Ice needles, with or without fog.	77  Snow grains, with or without fog.	78  Snow crystals, with or without fog.	79  Ice pellets (sleet).
80  Rain showers, light.	81  Rain showers, moderate or heavy.	82  Rain showers, torrential.	83  Rain/snow showers mixed, light.	84  Rain/snow showers mixed, moderate or heavy.	85  Snow showers, light.	86  Snow showers, moderate or heavy.	87  Ice pellet showers, light.	88  Ice pellet showers, moderate or heavy.	89  Hail, light, not associated with thunder.
90  Hail, moderate or heavy, not associated with thunder.	91  Rain, light. Thunder heard during past hour but not now.	92  Rain, moderate or heavy. Thunder heard during past hour but not now.	93  Light snow or rain/snow mixed with hail. Thunder heard during past hour.	94  Moderate or heavy snow or rain/snow with hail. Thunder in past hour.	95  Thunderstorm, light or moderate. Rain or snow, but no hail.	96  Thunderstorm, light or moderate, with hail.	97  Thunderstorm, severe. Rain or snow, but no hail.	98  Thunderstorm, with duststorm or sandstorm.	99  Thunderstorm, severe, with hail.

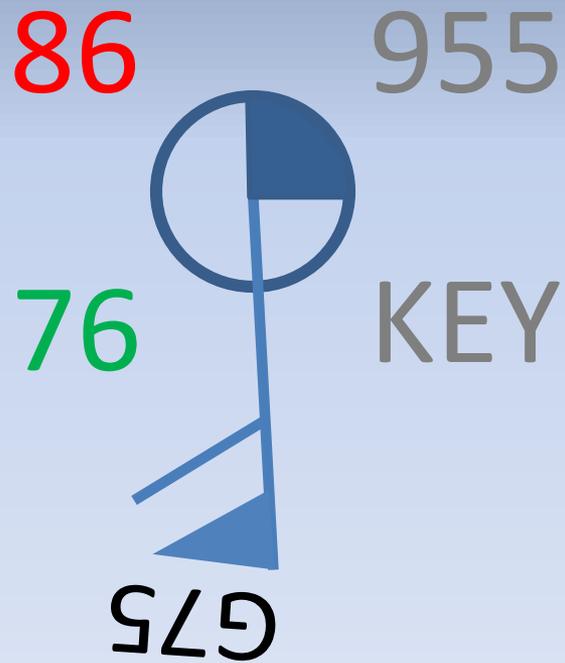
Participation Time

KMEM 292310Z 06015KT 2 1/2SM +TSRA BR BKN013 OVC035CB 25/25 A3008 RMK A02 WSHFT 2255 LTG DSNT ALQDS OCNL
LTGICCG ALQDS TS ALQDS MOV E P0019 T02500250 \$

Participation Time



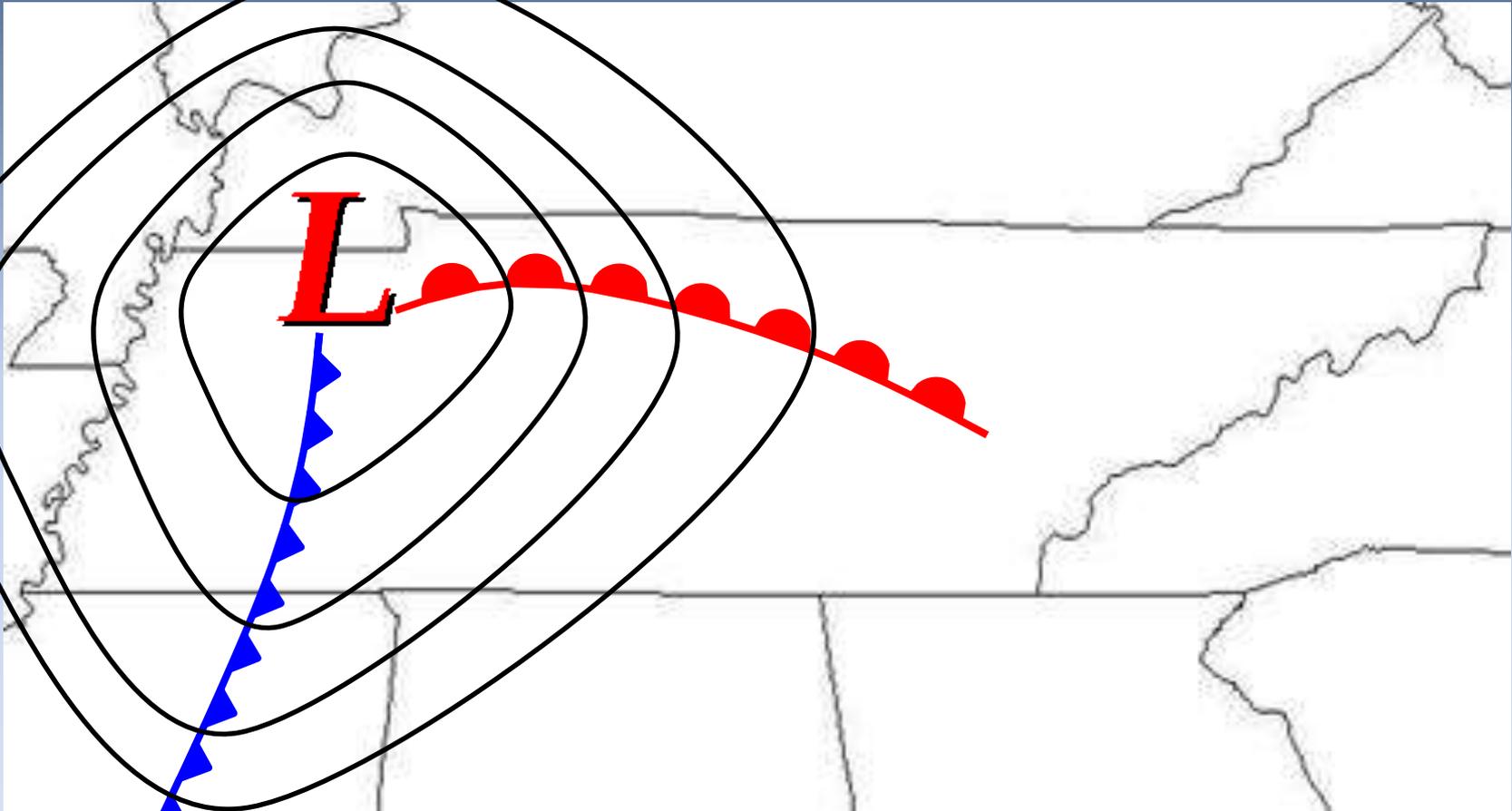
Participation Time



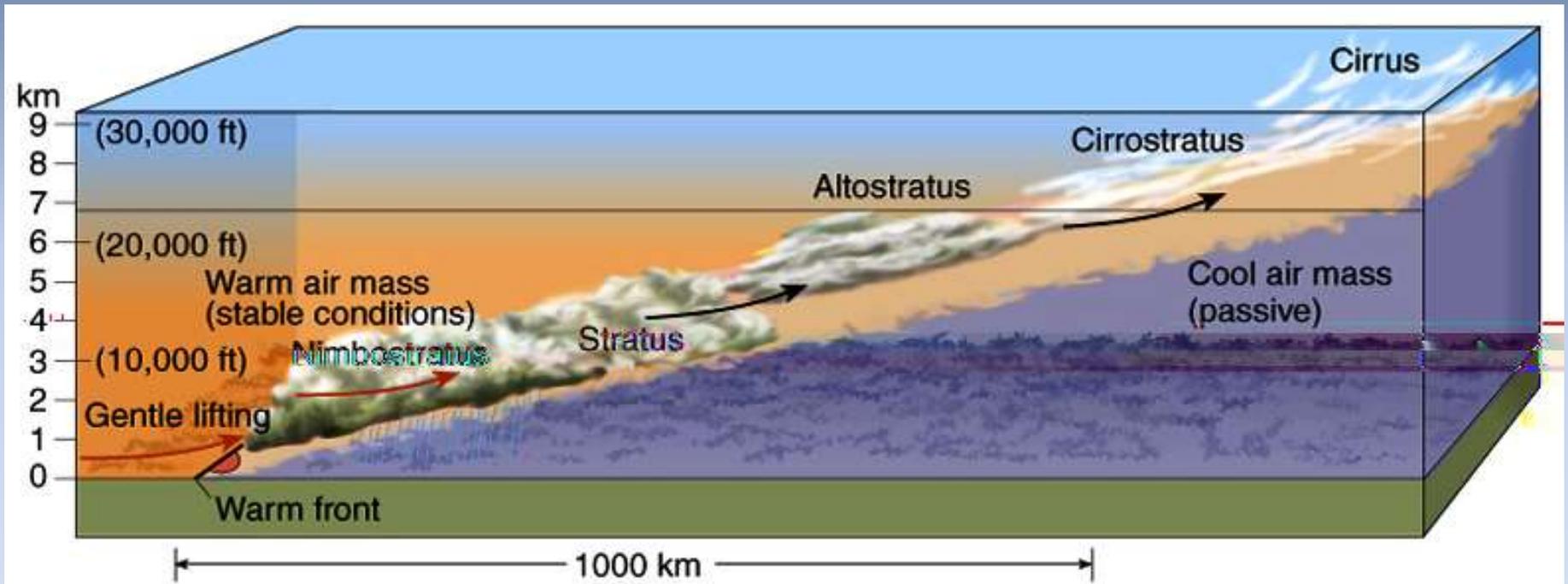
Observations in 3-D: METARs and U/A Patterns

How do we use these METARs?

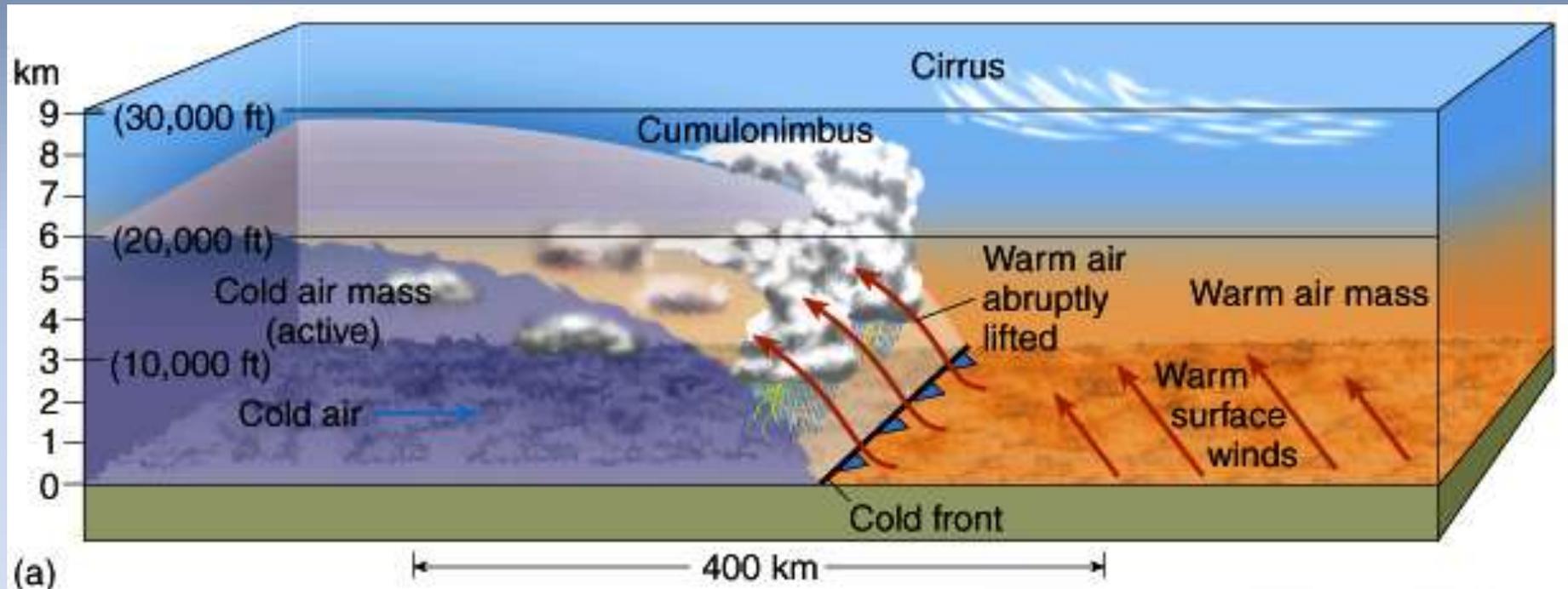
Observation in 3-D: Low Pressure Systems



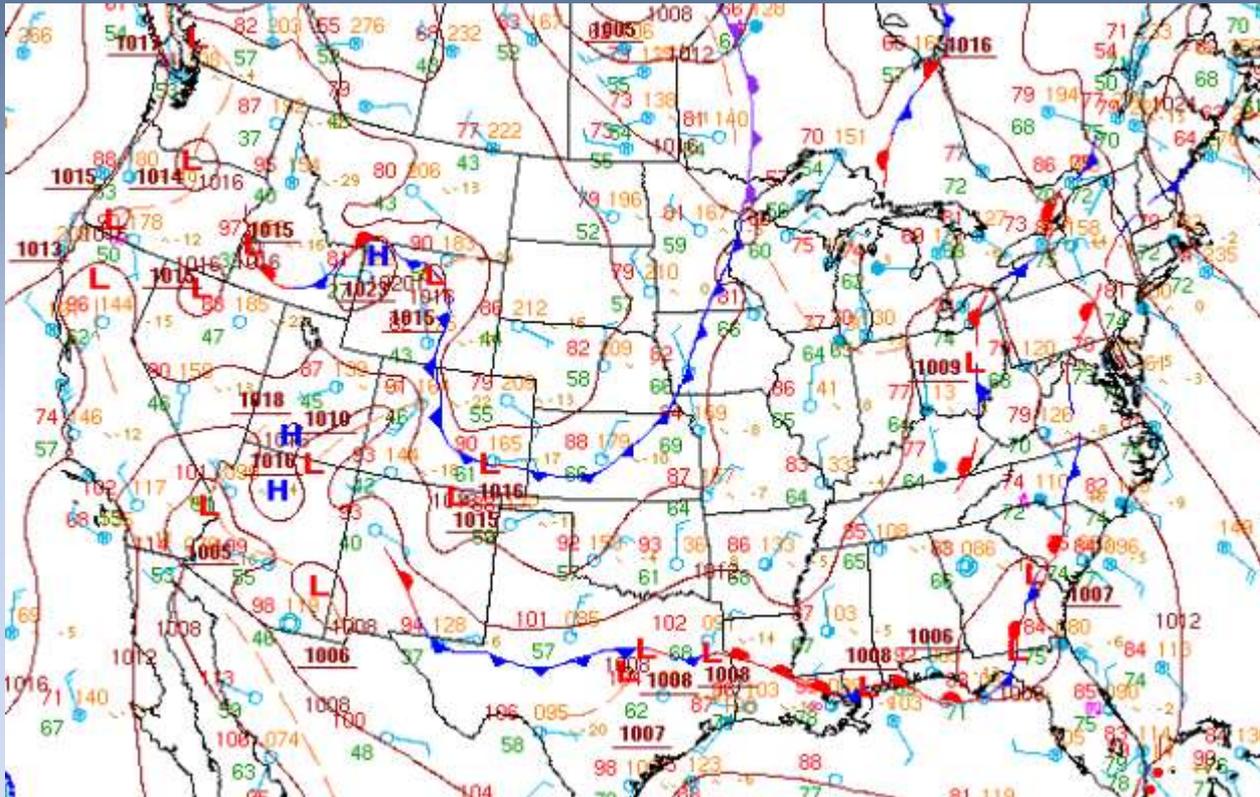
Observation in 3-D: Warm Front



Observation in 3-D: Cold Front



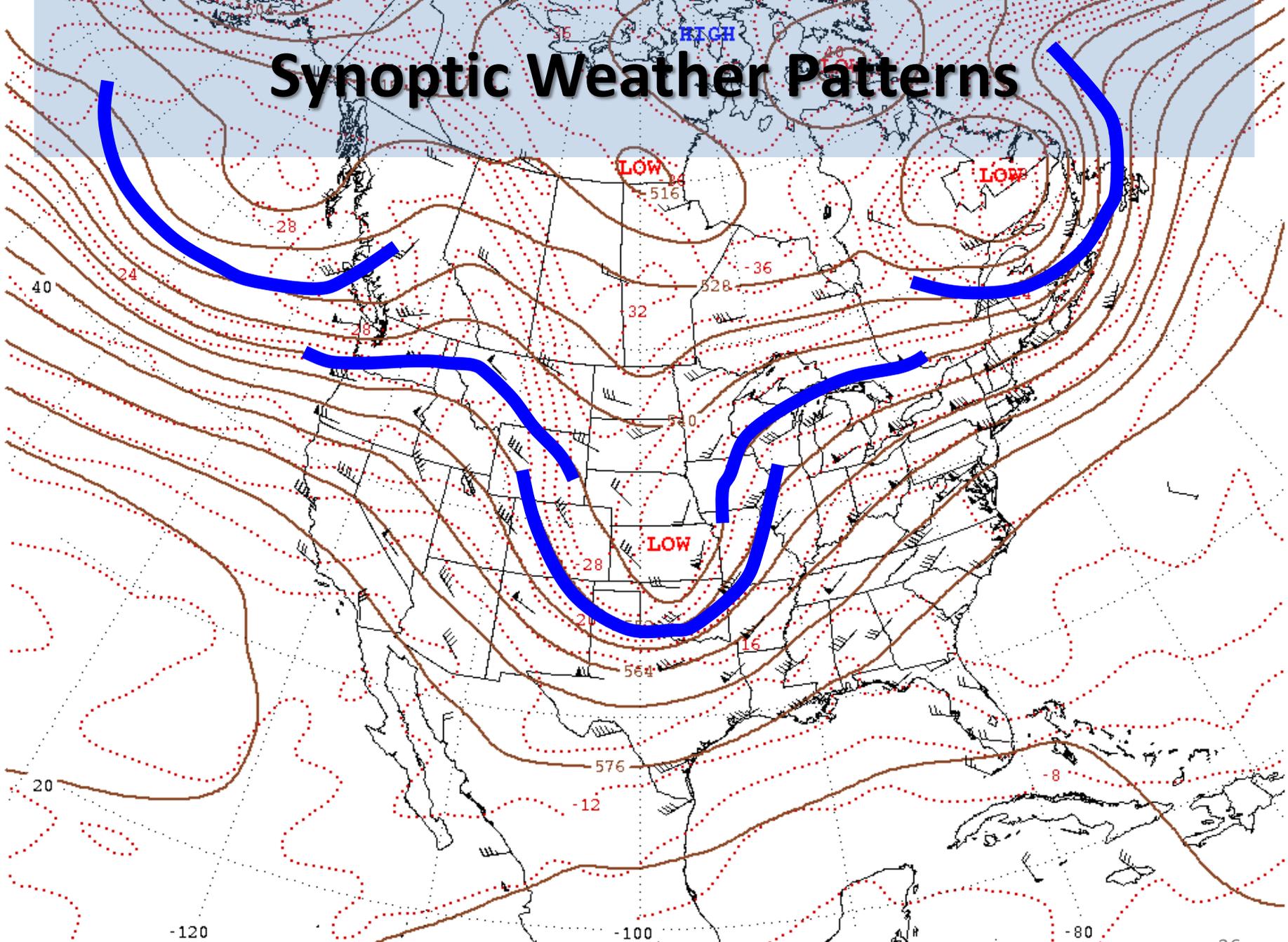
Live examples



Observations in 3-D: U/A Patterns

Why are some systems stronger than others?

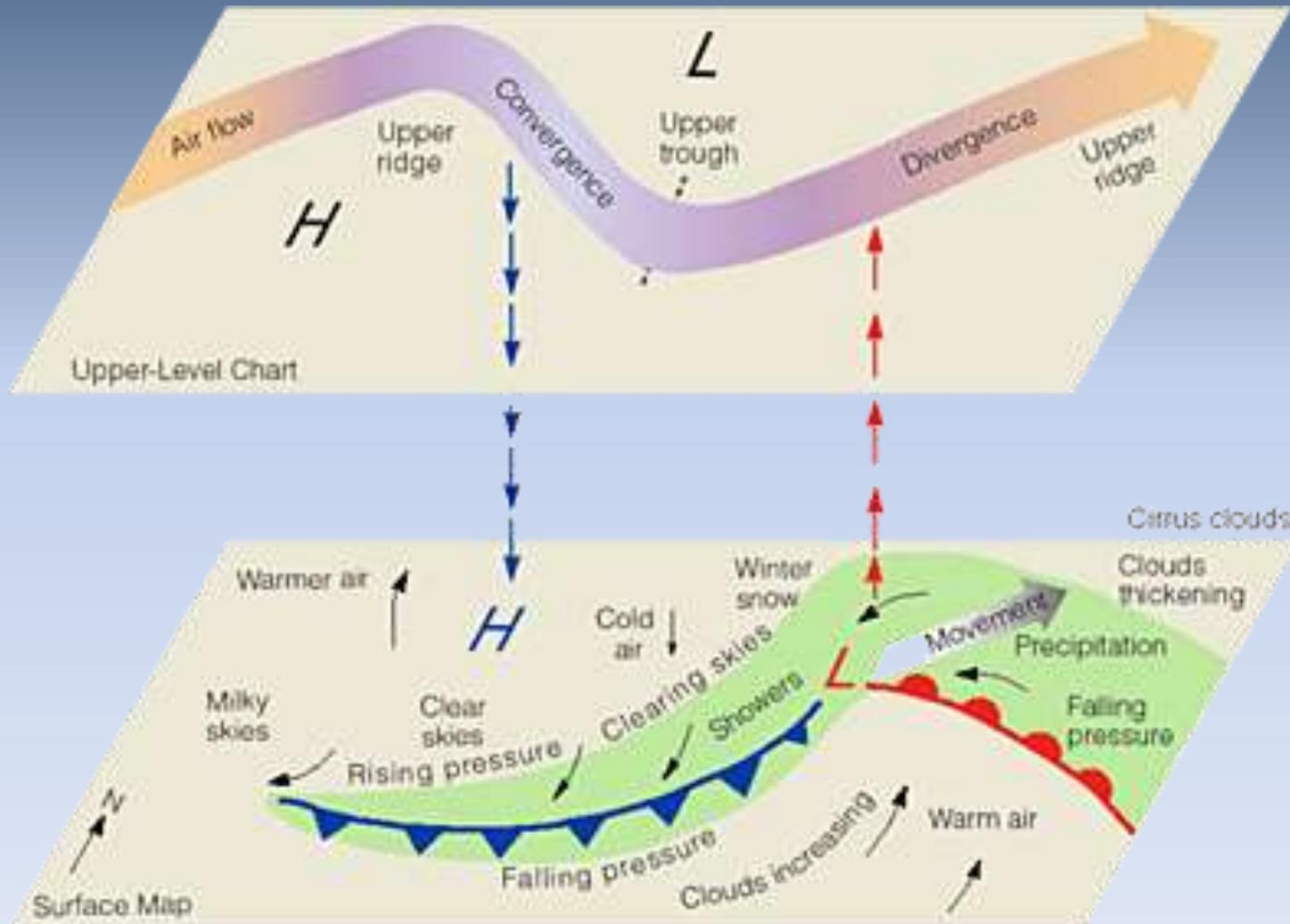
Synoptic Weather Patterns

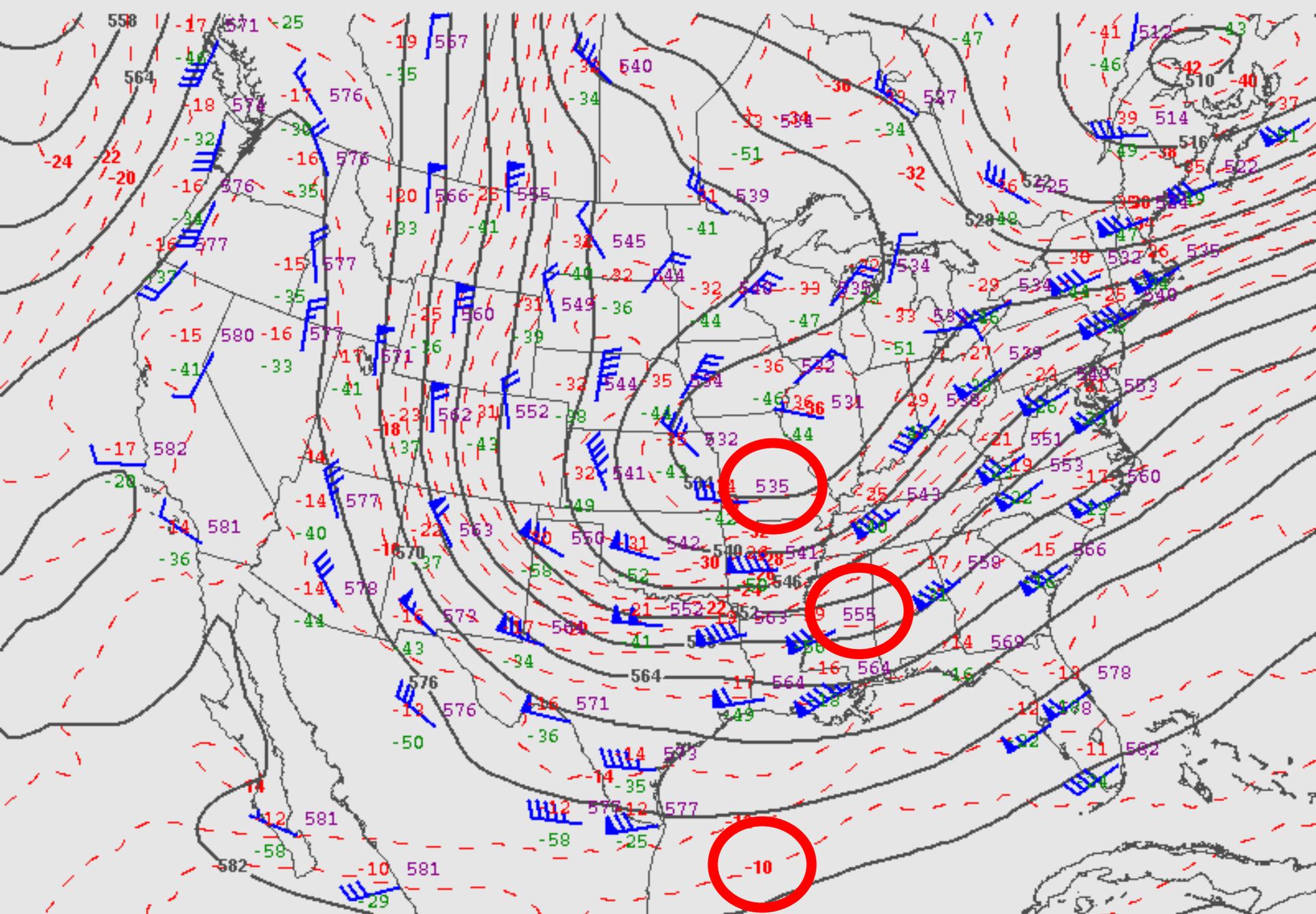


THU, JAN 10, 2008

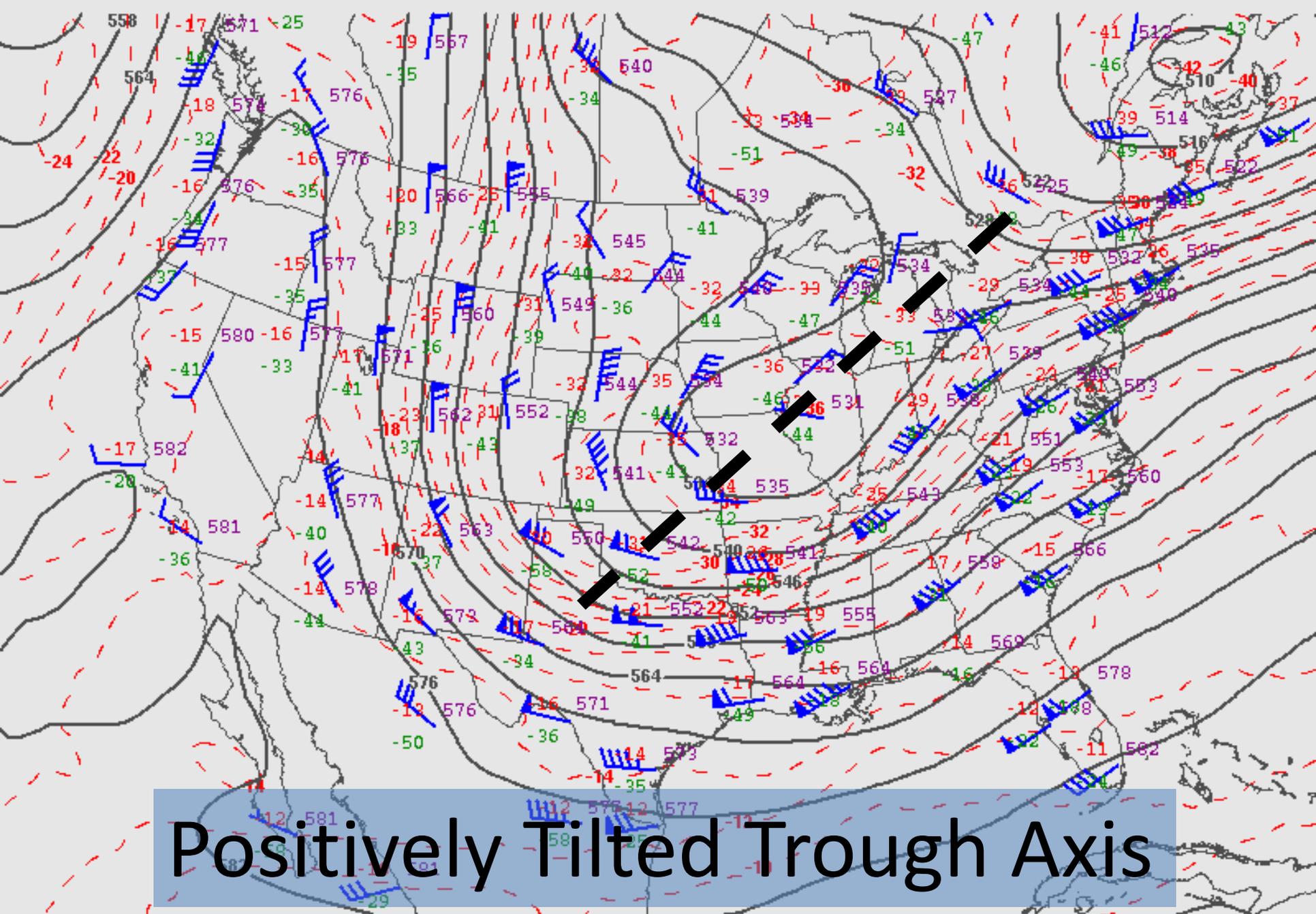
500-Millibar Height Contours at 7:00 A.M. E.S.T.

Observations in 3-D: U/A Patterns

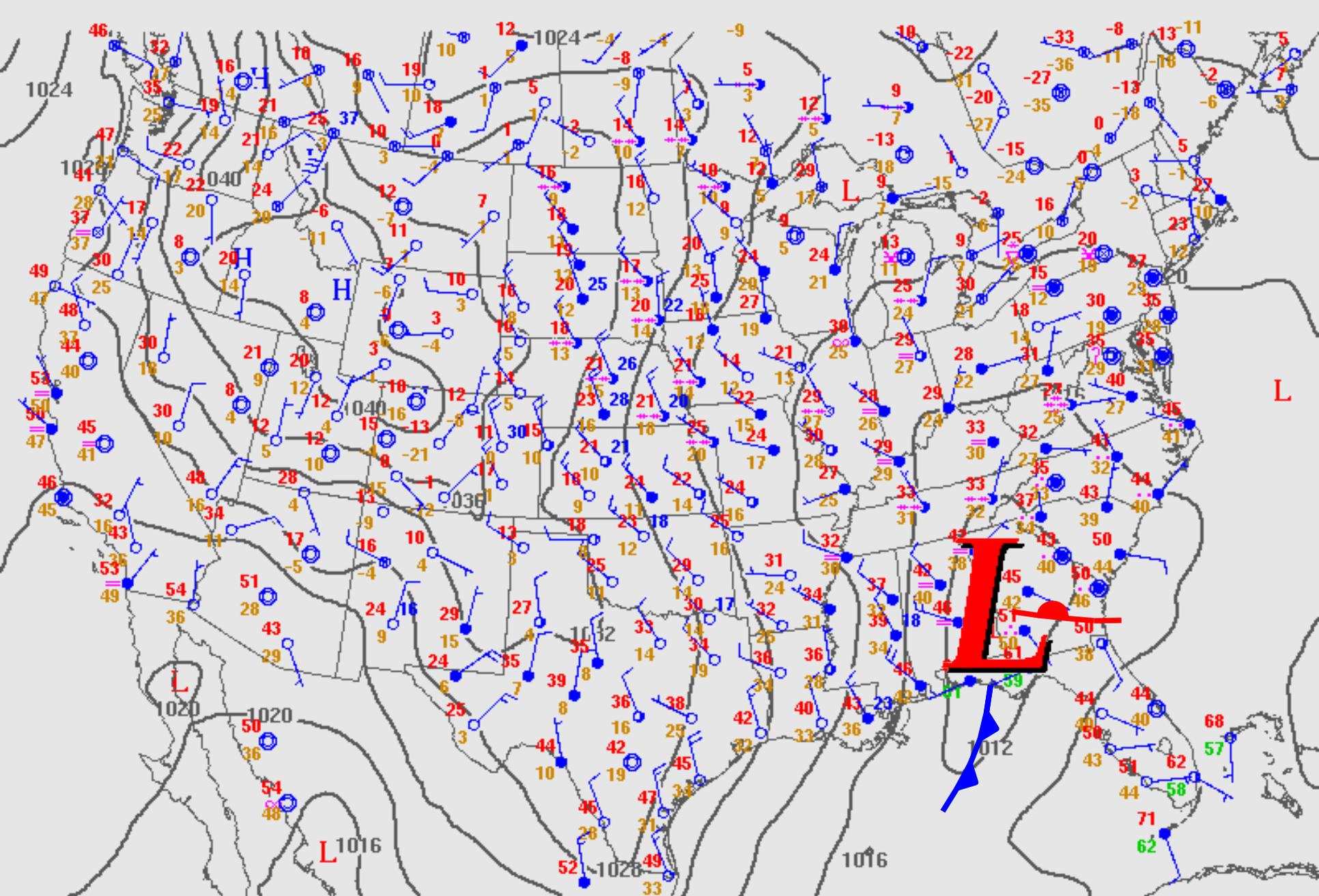




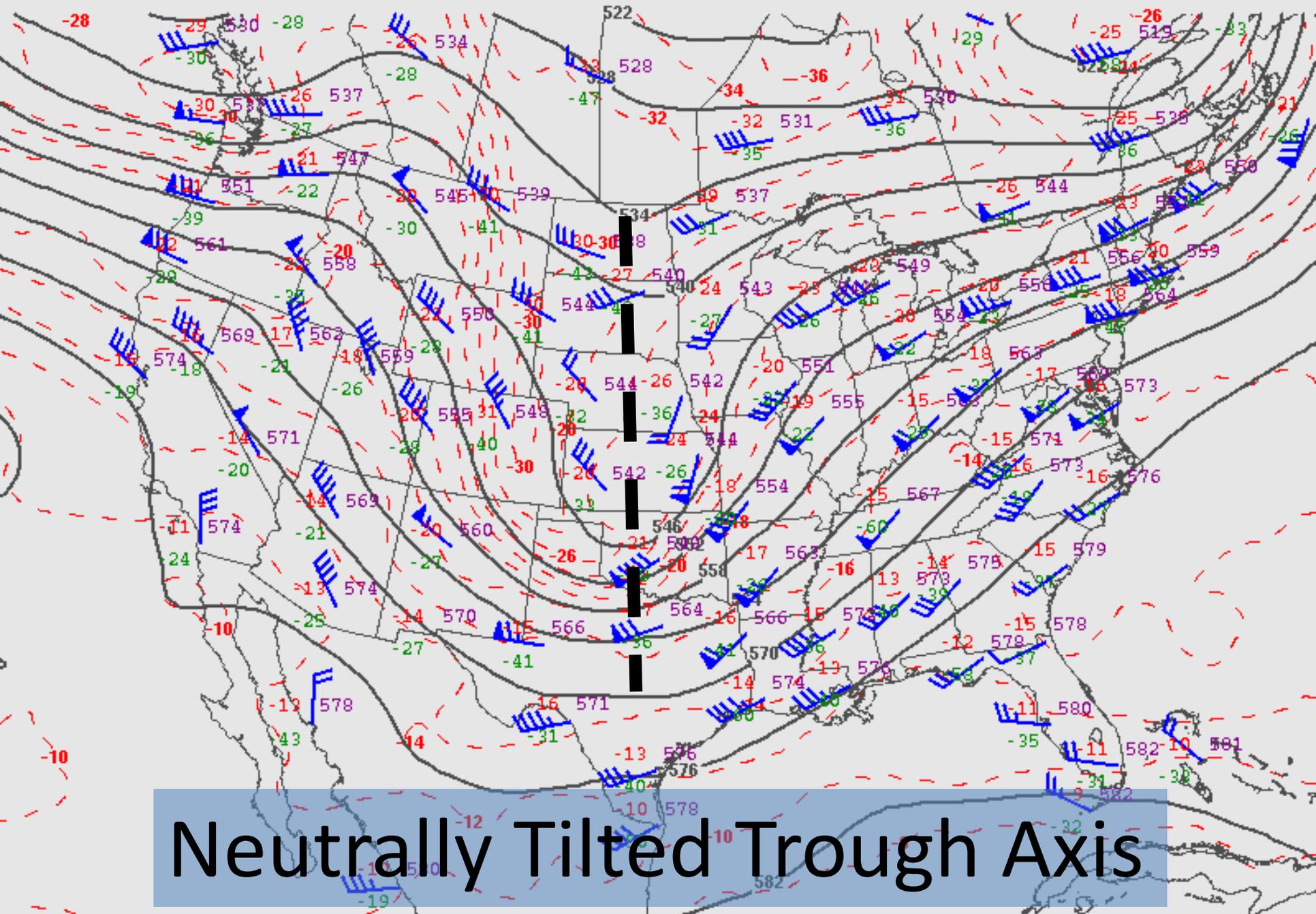
060211/1200 500 MB UA OBS, HGHTS, and TEMPS



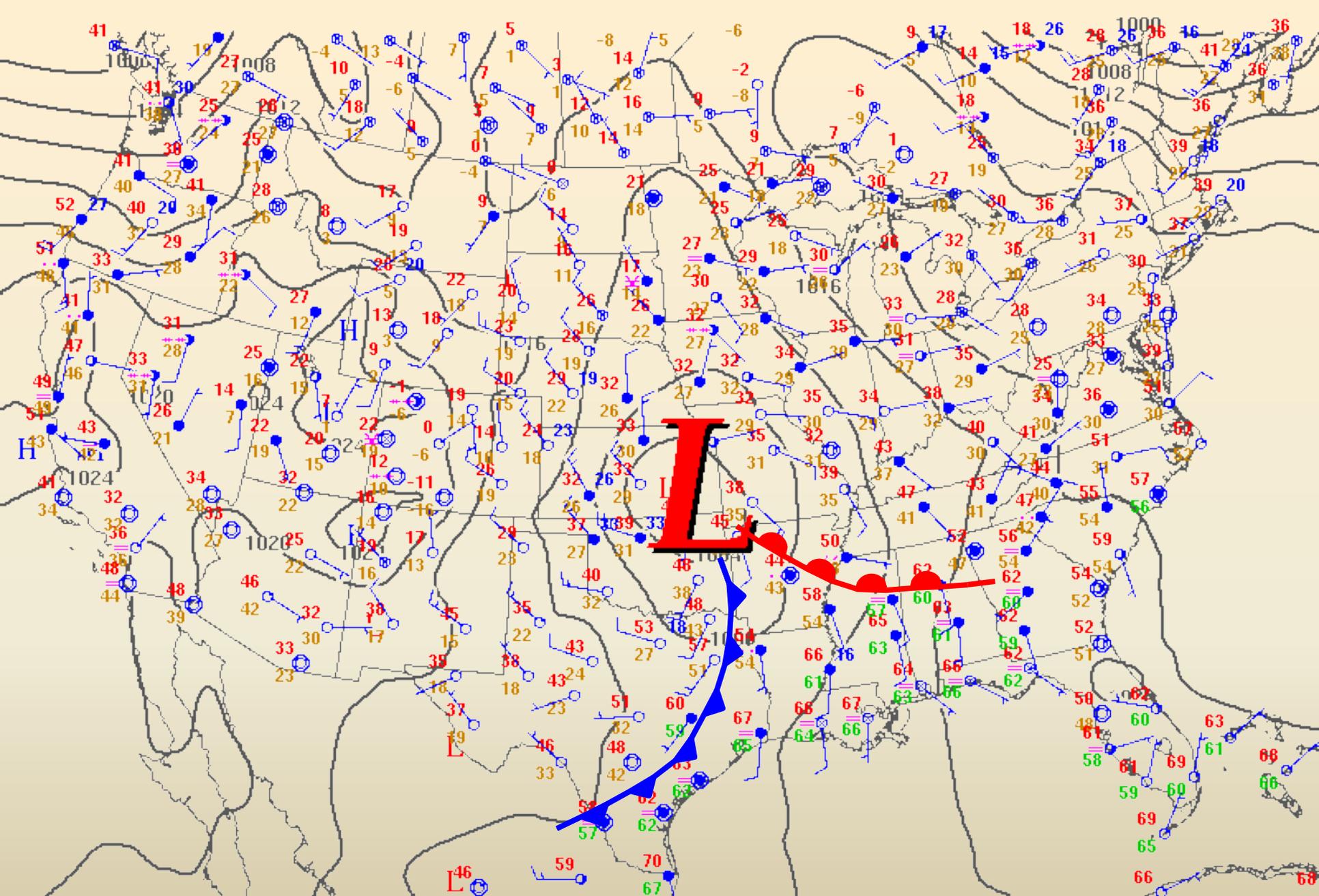
Positively Tilted Trough Axis



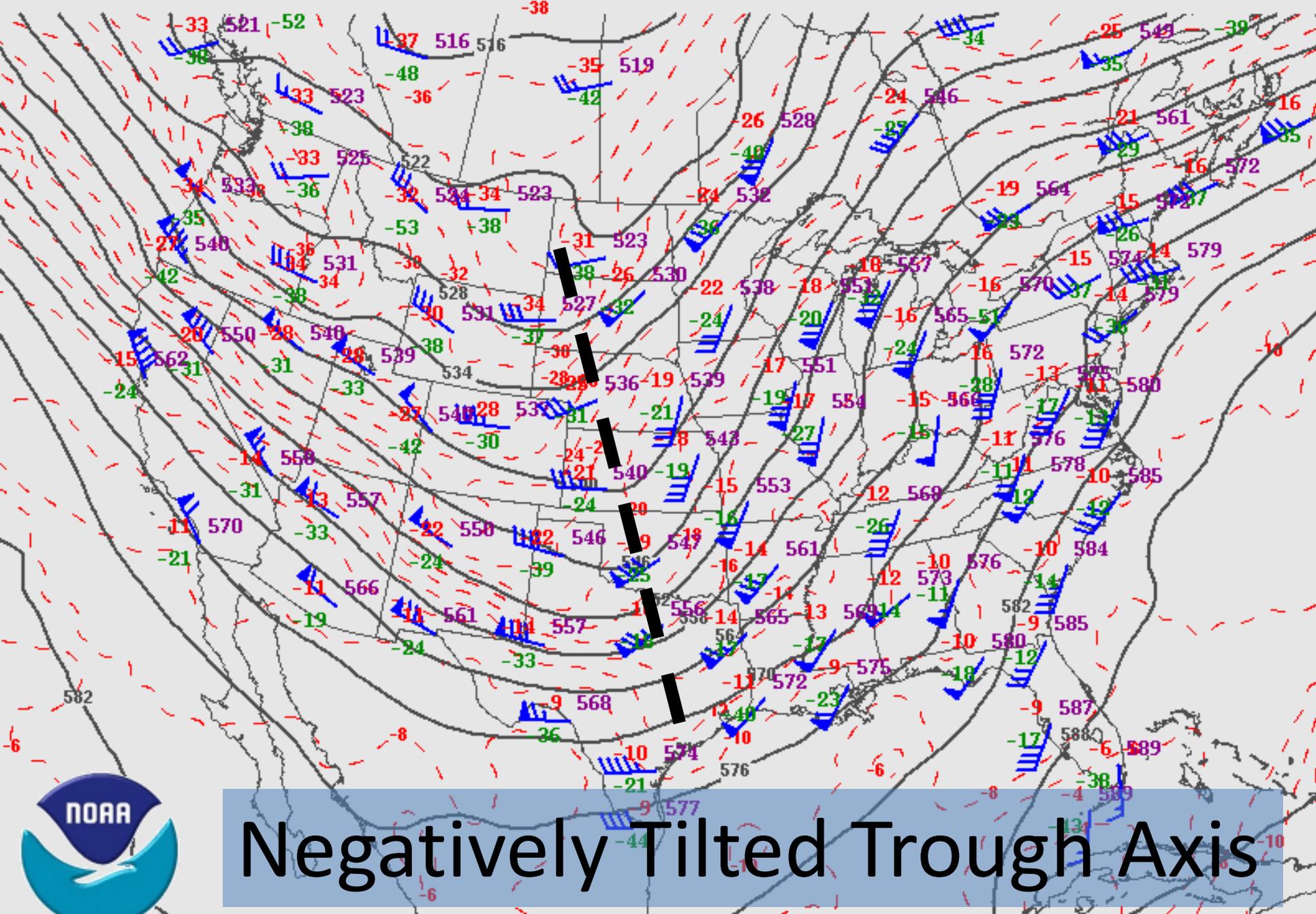
060211/1200 Surface OA Pressure and Obs
 weather, Temp, Dwp, Gusts



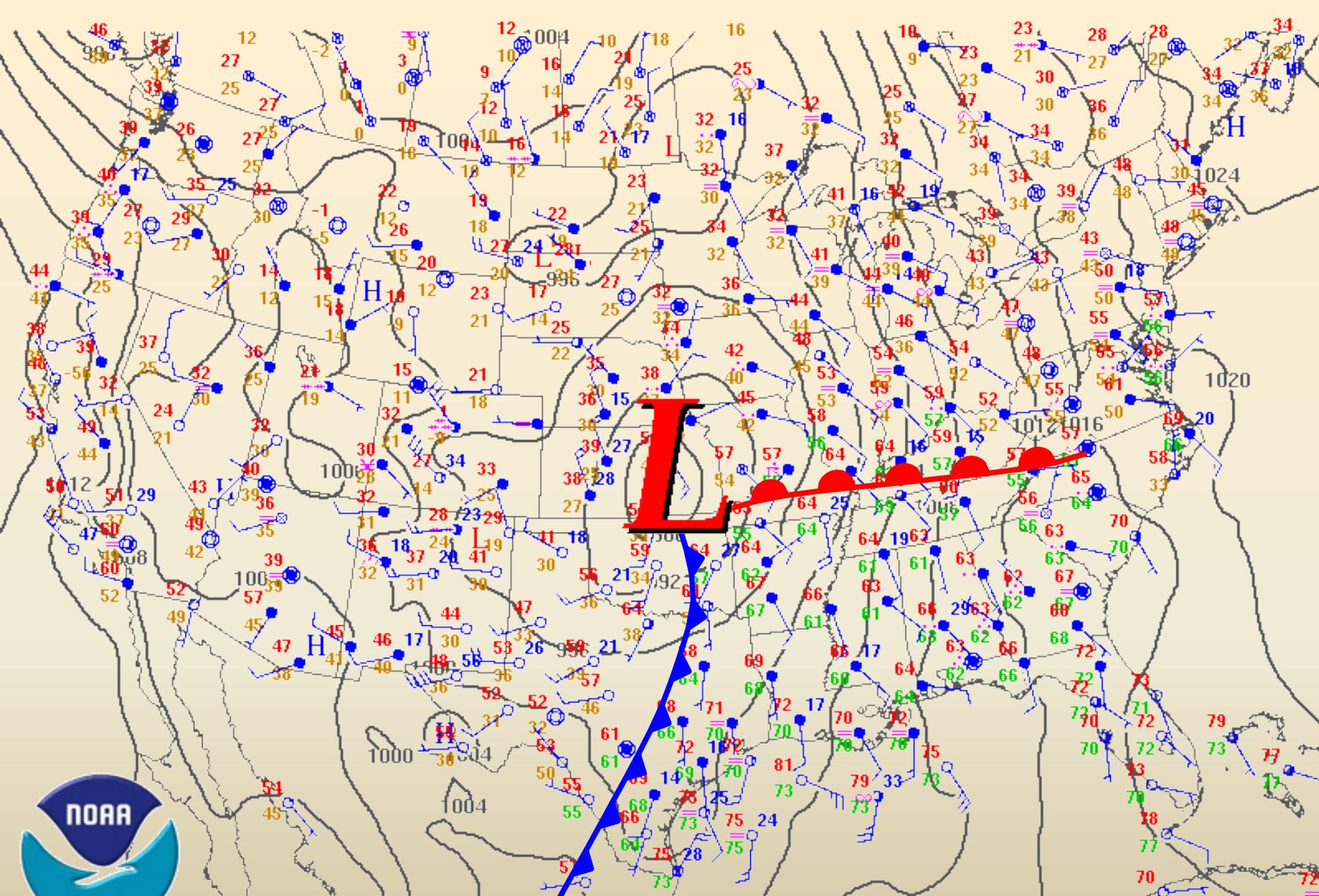
Neutrally Tilted Trough Axis



080110/1200 Surface OA Pressure and Obs
 weather, Temp, Dwp, Gusts



Negatively Tilted Trough Axis



151223/1200 Surface OA Pressure and Obs
 Weather, Temp, Dwp, Gusts



December 23, 2015 Tornado Outbreak

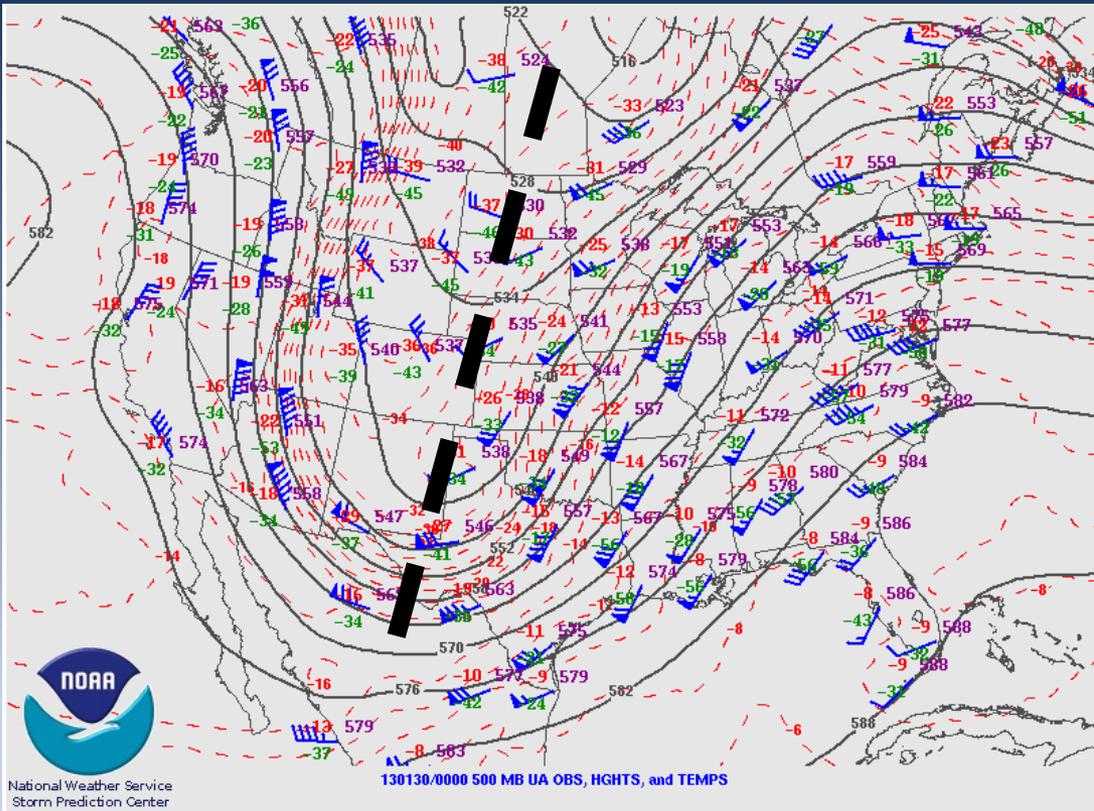




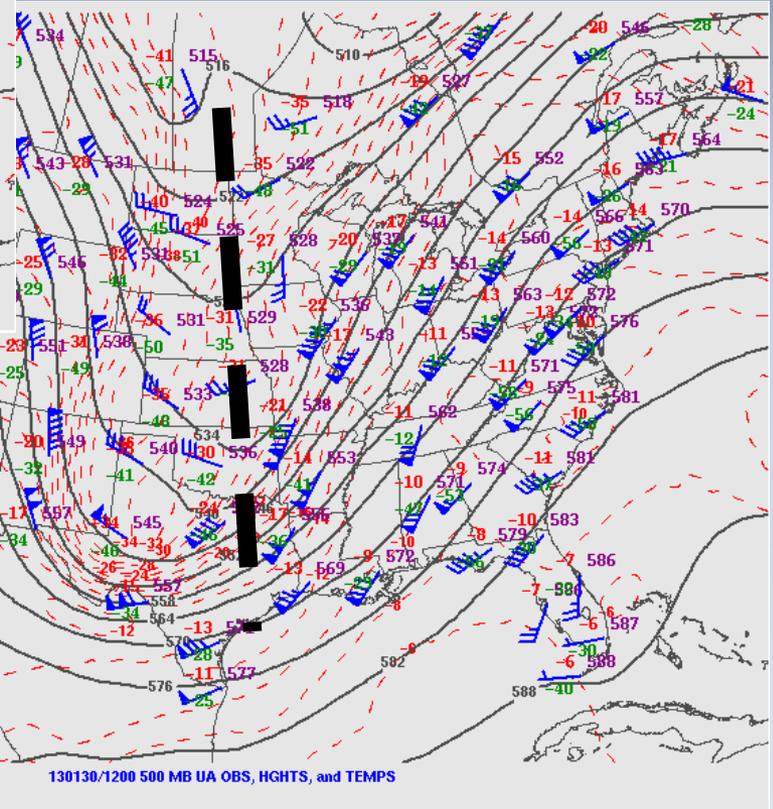

NWSNashville
weather.gov/Nashville

Tornado Statistics

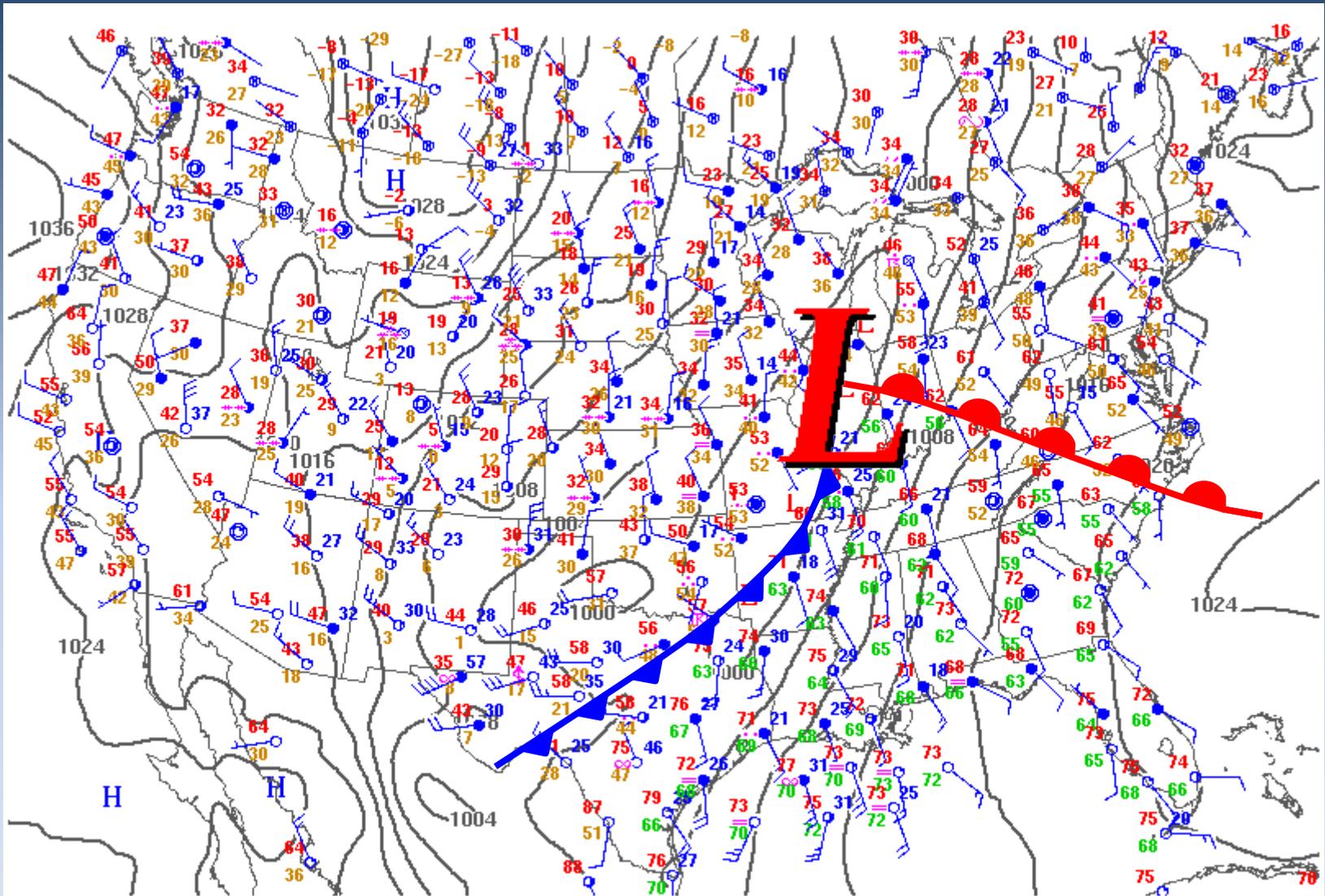
# Counties	Rating	Time (CST)	Length (miles)	Width (yards)	Fatalities	Injuries
1 Perry/Hickman	EF2	1818	13.95	500	2	0
2 Wayne/Lawrence/Lewis/Maury	EF3	1855	48.51	800	0	7
3 Lauderdale AL/Wayne	EF2/EF1	1900	11.0	400	0	0
4 DeKalb/Smith	EF2	2214	8.43	250	0	0



January 30th, 2013
7 am



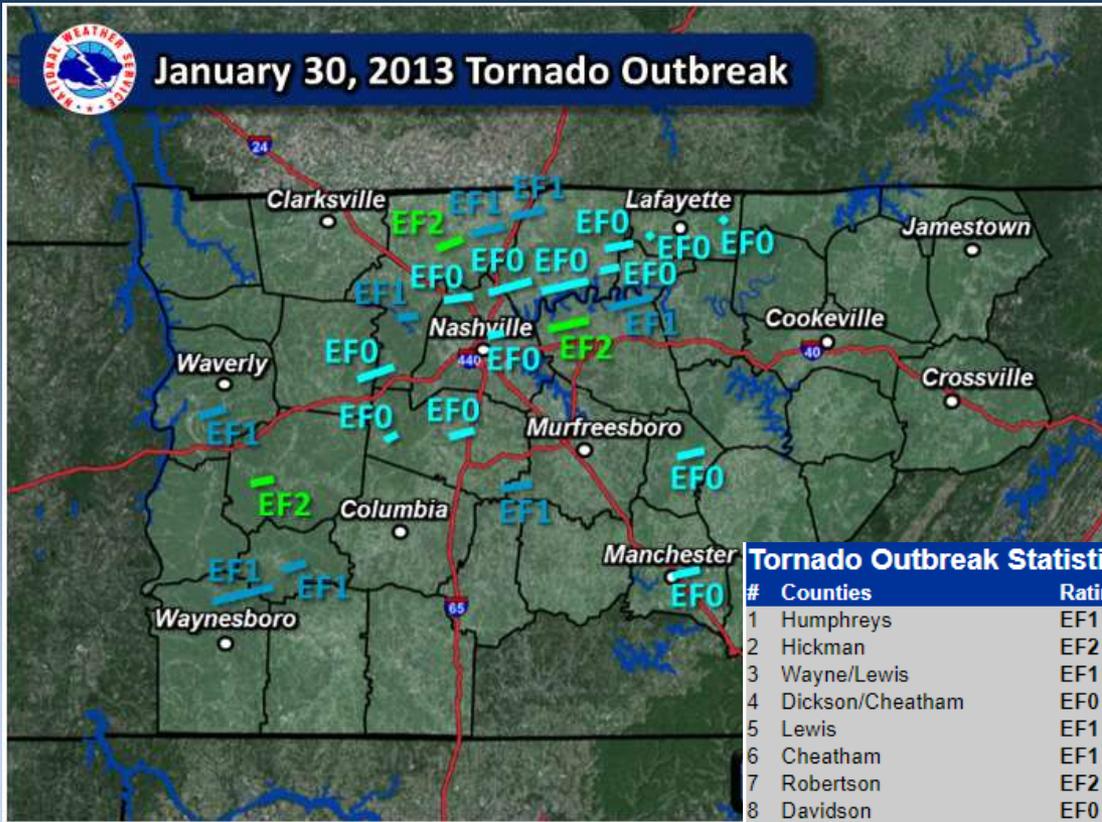
January 29th, 2013
7 pm



130130/0000 Surface OA Pressure and Obs
Weather, Temp, Dwpt, Gusts



January 30, 2013 Tornado Outbreak



Tornado Outbreak Statistics

#	Counties	Rating	Time (CST)	Length (miles)	Width (yards)	Fatalities	Injuries
1	Humphreys	EF1	0211	5.22	150	0	0
2	Hickman	EF2	0226	4.55	500	0	0
3	Wayne/Lewis	EF1	0232	9.17	100	0	0
4	Dickson/Cheatham	EF0	0245	7.10	10	0	0
5	Lewis	EF1	0246	3.74	200	0	0
6	Cheatham	EF1	0251	3.23	125	0	1
7	Robertson	EF2	0259	4.97	200	0	0
8	Davidson	EF0	0300	5.55	50	0	0
9	Williamson	EF0	0301	1.00	75	0	0
10	Robertson	EF1	0305	5.75	150	0	0
11	Davidson/Sumner	EF0	0310	13.00	75	0	0
12	Robertson/Sumner	EF1	0312	4.90	100	0	0
13	Davidson	EF0	0312	3.20	75	0	1
14	Williamson	EF0	0318	2.30	75	0	0
15	Sumner	EF0	0323	10.61	125	0	0
16	Wilson	EF2	0325	5.51	150	0	0
17	Sumner	EF0	0334	3.63	100	0	0
18	Sumner/Trousdale	EF0	0337	6.10	50	0	0
19	Wilson/Trousdale	EF1	0340	9.91	150	0	0
20	Williamson/Rutherford	EF1	0341	4.78	150	0	0
21	Macon	EF0	0347	0.97	50	0	0
22	Macon	EF0	0401	1.53	75	0	0
23	Cannon	EF0	0429	6.65	200	0	0
24	Coffee	EF0	0525	5.24	75	0	0

Upcoming classes

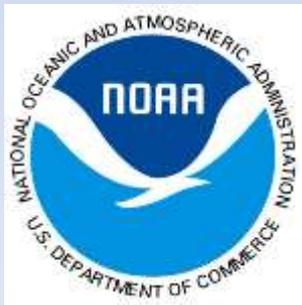
- Weather101
 - <https://www.weather.gov/ohx/weather101>
- Fall online spotter season:
October and November
- Spring online spotter season:
February and March
 - <https://www.weather.gov/ohx/skywarn>

Questions or Comments?

Email:

Scott Unger – scott.unger@noaa.gov

Please, send me an email with the number of people in attendance at your computer, if more than one



U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service – Nashville, TN

