

“Flash Freeze” Eastern MA After Snow/Sleet Had Changed to Plain Rain December 29, 2015 Wintry Mix

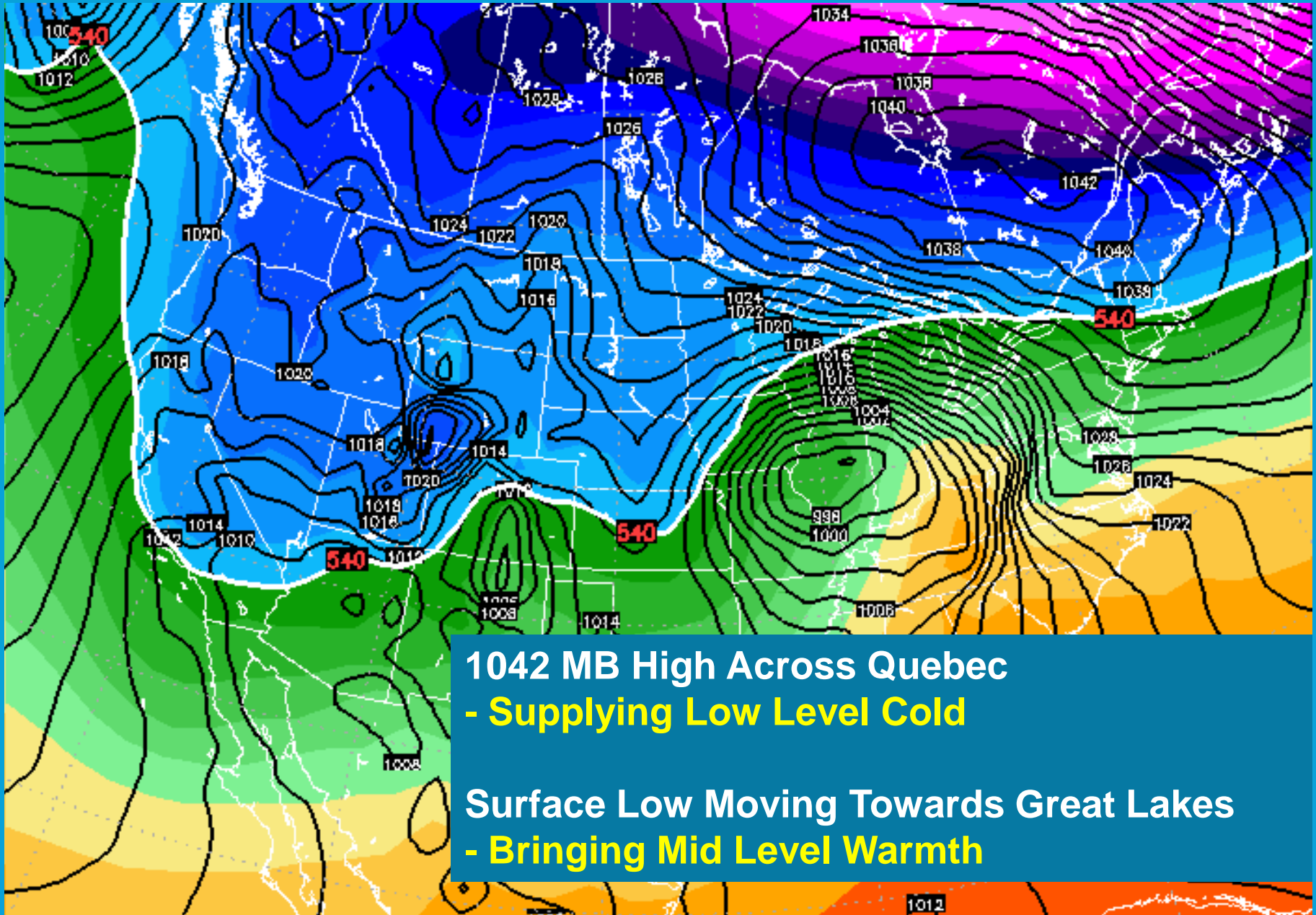
Hayden Frank
NOAA/National Weather Service
Taunton, MA



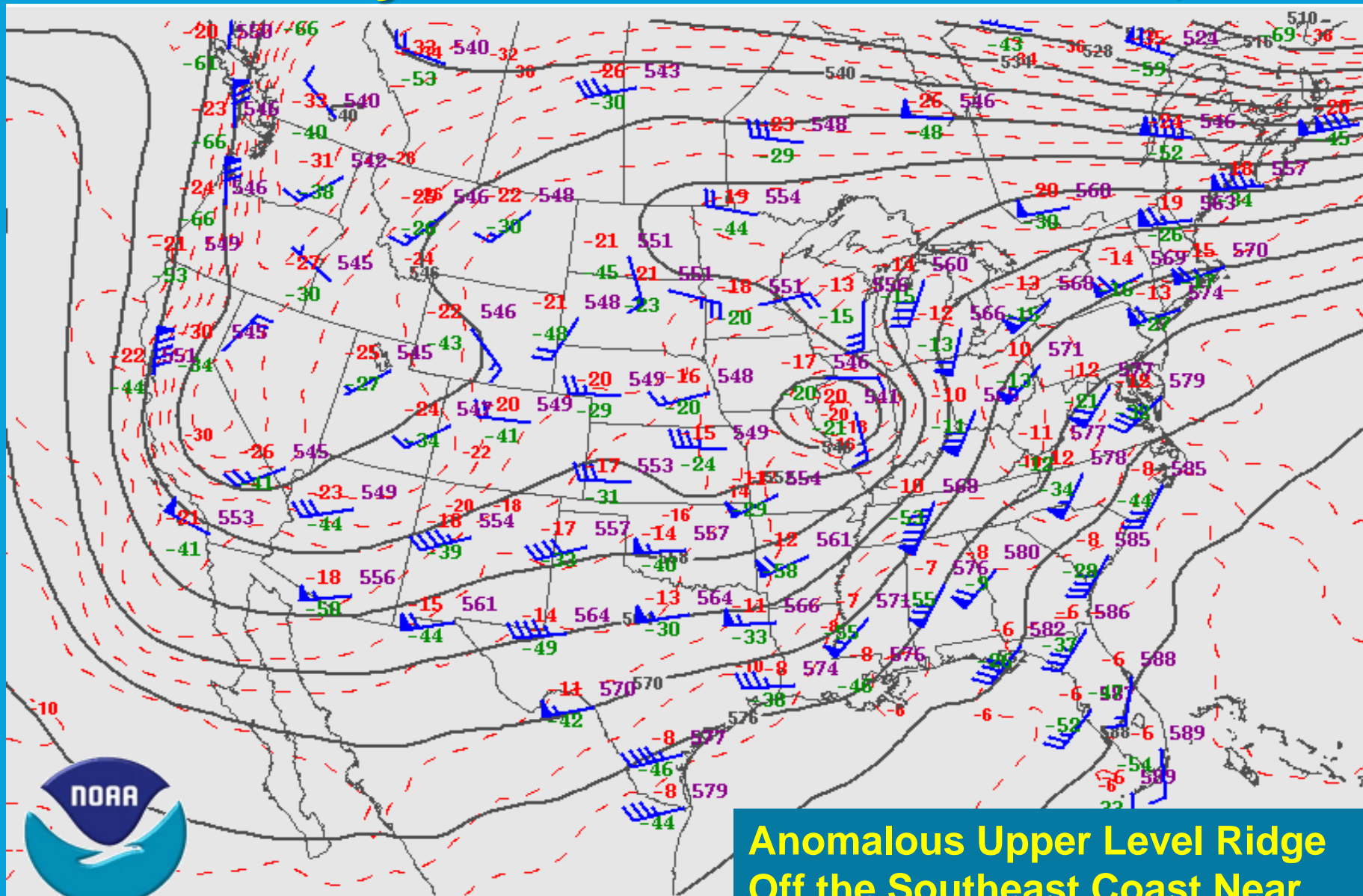
Classic Setup For A Wintry Mix In Southern New England

- 1) 1040+ MB High Built Into Eastern Canada Ahead Of Approaching Low Pressure System.
- 2) Strong High Pressure Centered To Our North Allowed Plenty of Low Level Cold Air To Work Into Southern New England.
- 3) Anomalous Upper Level Ridging Off The Southeast Coast Resulted in Abnormally High Height Fields, Along With A Warm Nose Between 700 And 800 MB.
- 4) The Result Of The Shallow Cold Air And Warm Mid Level Air Brought Mainly Sleet And Freezing Rain, But There Was A Swath Of 1 To 4 Inches Of Snow/Sleet North Of MA Turnpike.
- 5) Main Low Pressure Tracked Towards Great Lakes, Allowing Marine Layer To Change Coastal Plain Ptype To Rain By Late Morning.
- 6) Secondary Low Developed Near the South Coast. Allowed Low Level Cold Air to Move Back into Eastern MA, Resulting In A “Flash Freeze” Along With Lingering Freezing Drizzle Late In The Afternoon/Evening.

Surface Analysis: 12 UTC December 28, 2015



500 MB Analysis: 00 UTC December 29, 2015



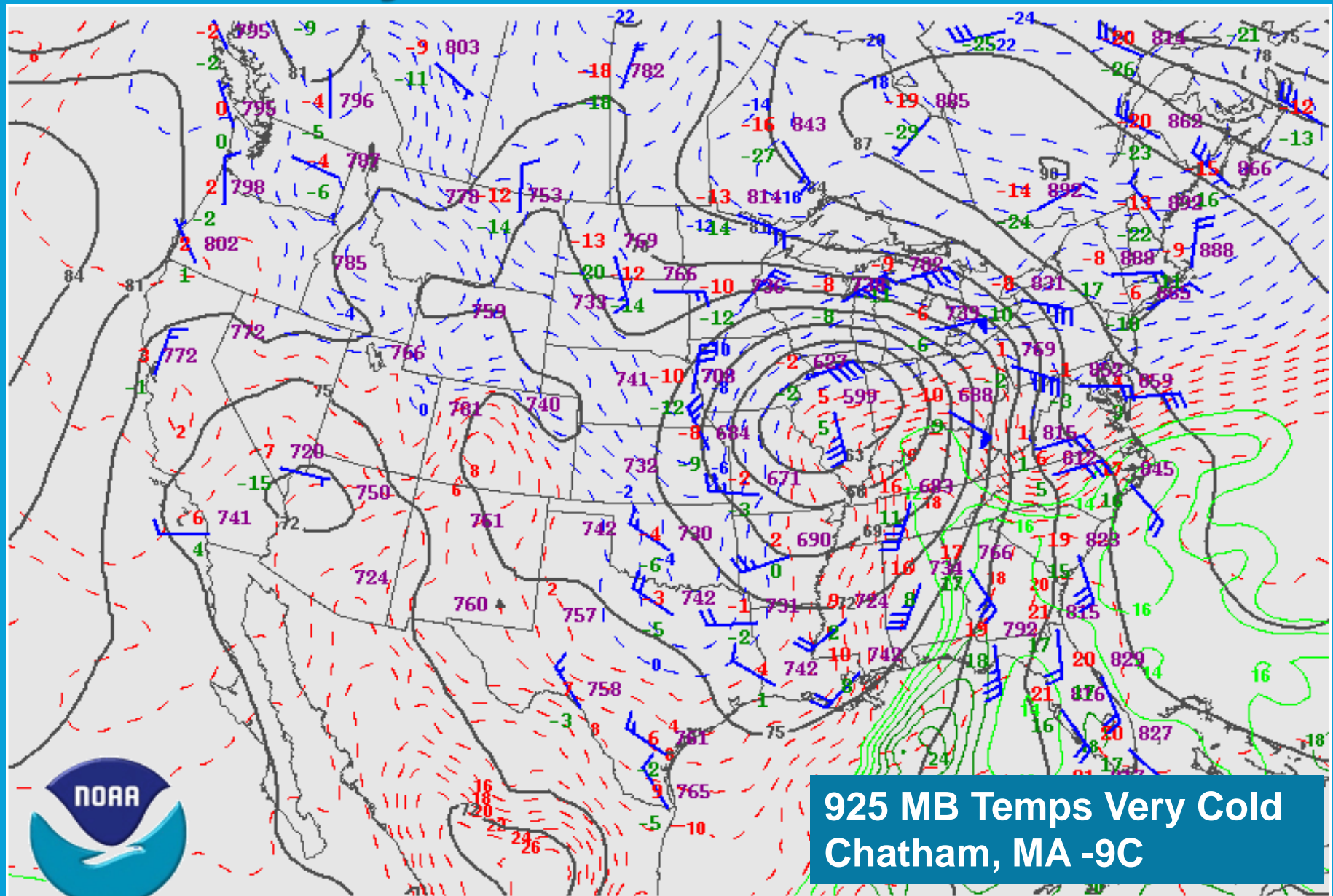
**Anomalous Upper Level Ridge
Off the Southeast Coast Near
588 Decameters**



National Weather Service
Storm Prediction Center

151229/0000 500 MB UA OBS,

925 MB Analysis: 00 UTC December 29, 2015

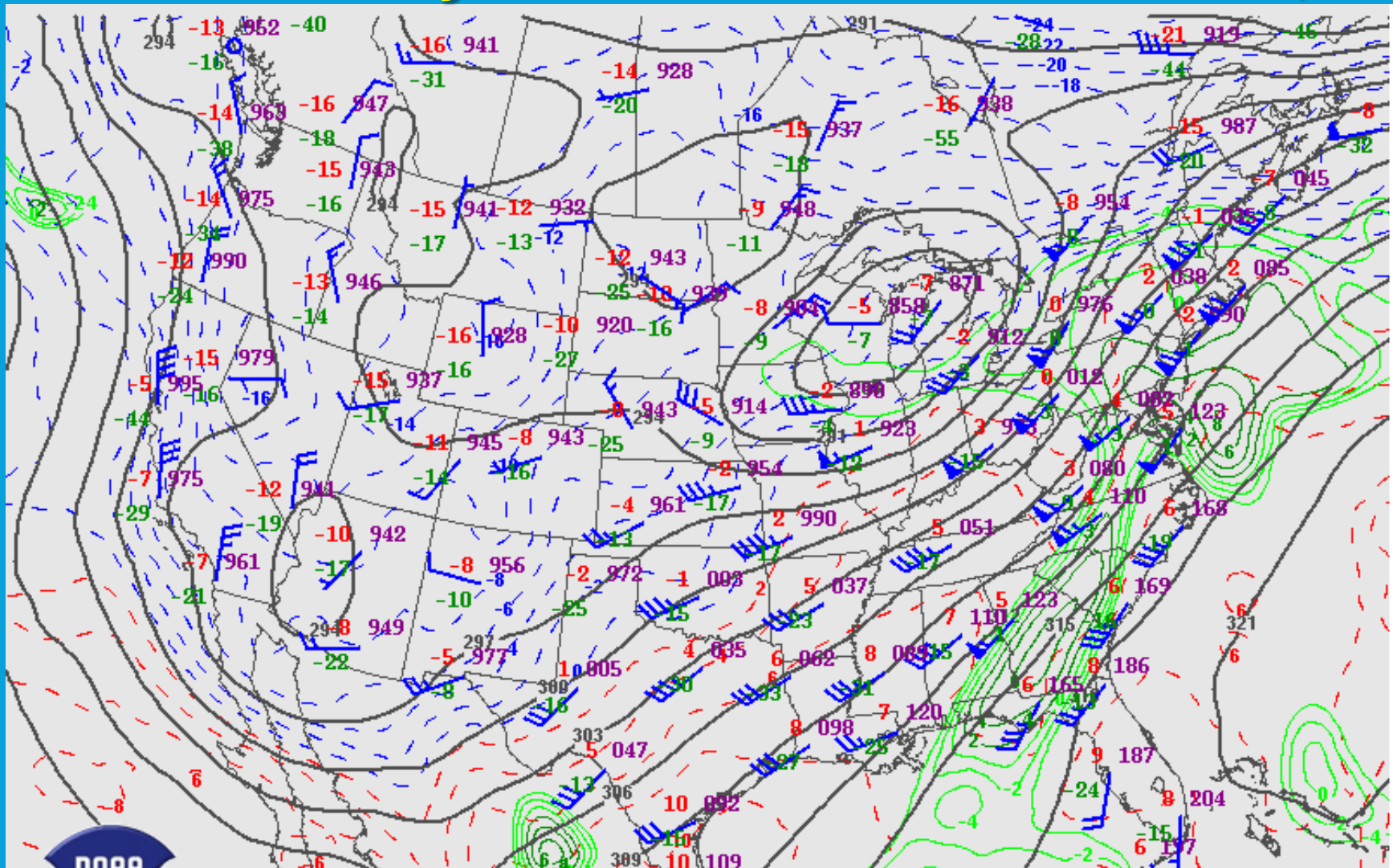


925 MB Temps Very Cold
Chatham, MA -9C

151229/0000 925 MB UA OBS, HGHTS, TEMPS, Td>=12



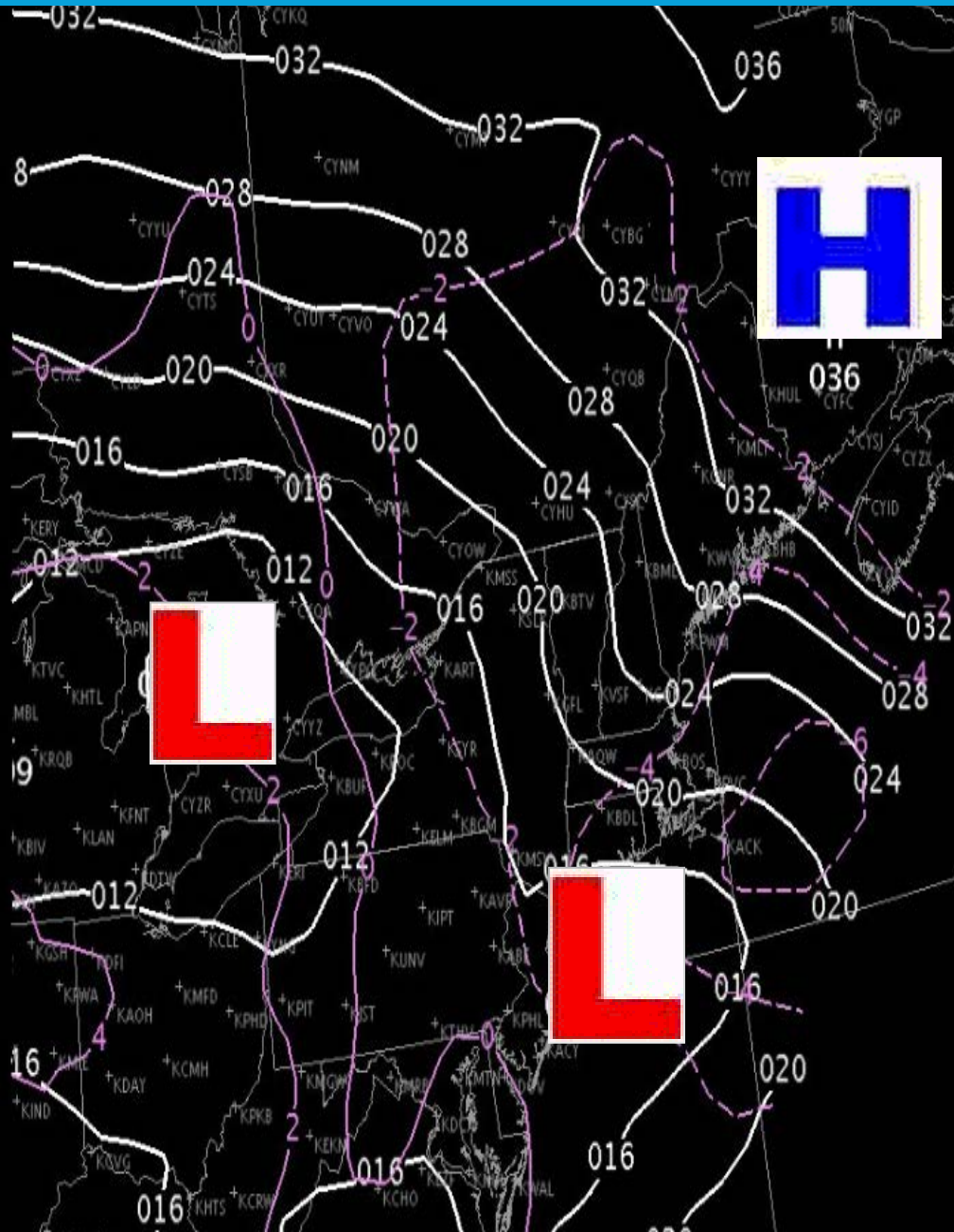
700 MB Analysis: 12 UTC December 29, 2015



National Weather Service
Storm Prediction Center

Anomalous Upper Level Ridge Off Southeast Coast
-700 MB Temps Already +2C at ALB and CQX
-Classic Sleet Sounding

16 UTC December 29, 2015



Strong High Pressure Still Over Canadian Maritimes.

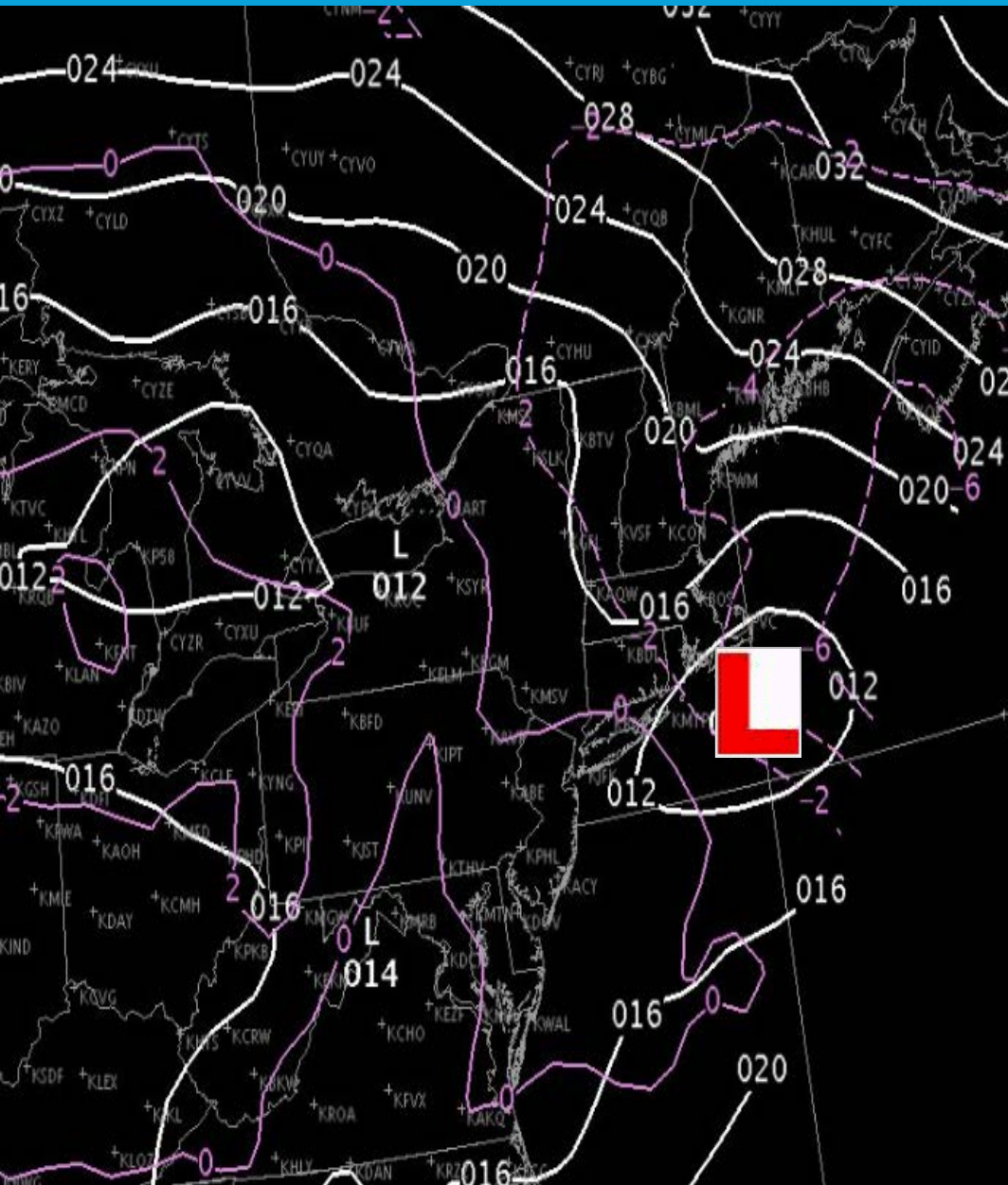
Main Low Pressure Headed Through Great Lakes.

- **Warm Mid Level Air Continues To Move North.**
- **Marine Layer Moves Onto Coastal Plain, Changing Sleet To Rain.**

Secondary Low Pressure Developing South of Long Island.

- **Keeps Shallow Cold Air Entrenched Across Much Of The Interior, With Sleet/Freezing Rain.**
- **6 MB Pressure Falls In Past 3 Hours Near South Coast.**

20 UTC December 29, 2015

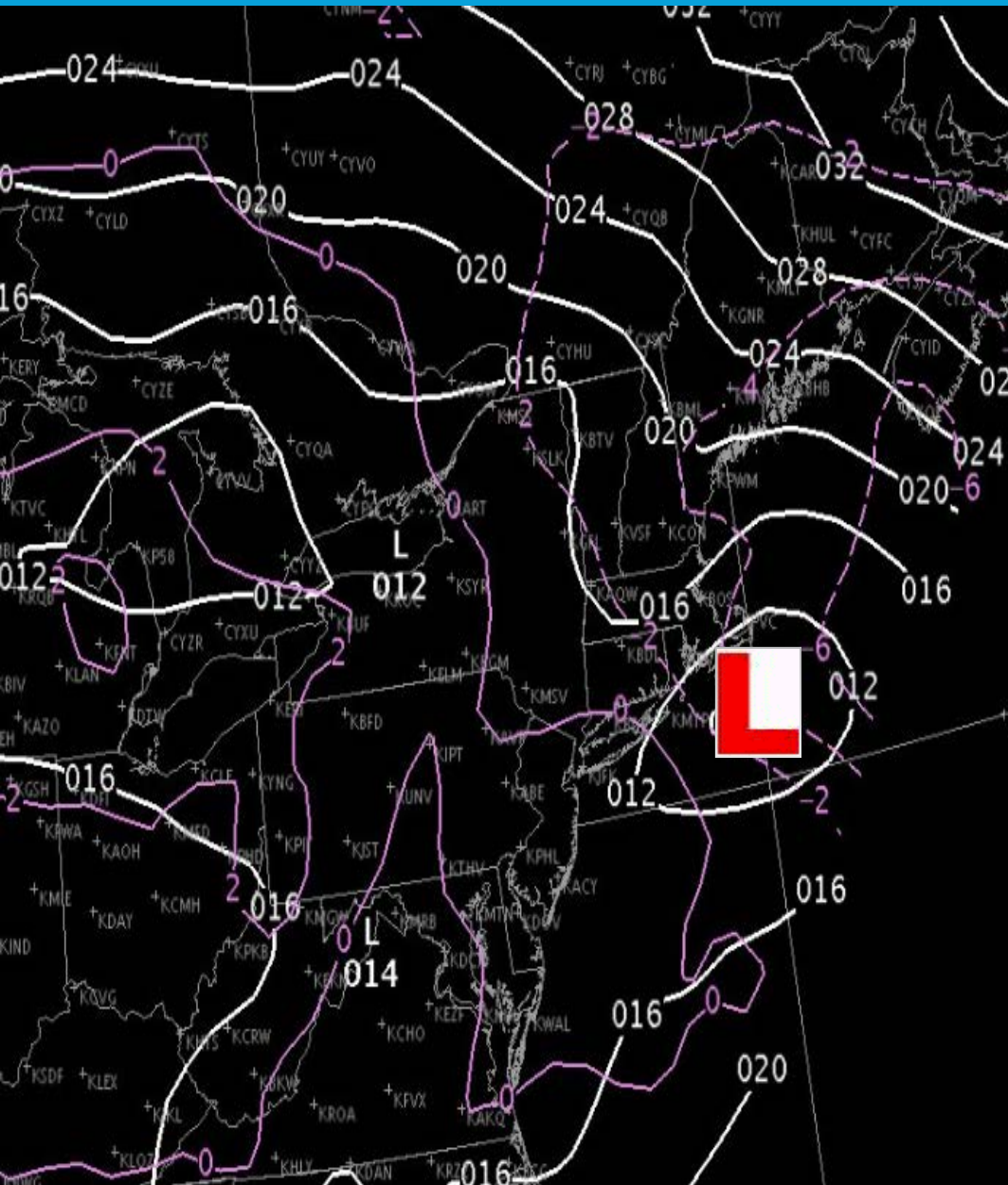


Secondary Low Pressure Moves East And Its South Of The Islands By 20z.

Best Pressure Falls Of 6 MB In Last 3 Hours, Now East of Cape/Islands.

- **Isallobaric component directs wind towards the greater pressure falls.**
- **This Allows An East or Northeast Wind To Shift To More Of A Northerly Direction. This Is The Main Reason For The Flash Freeze.**

20 UTC December 29, 2015

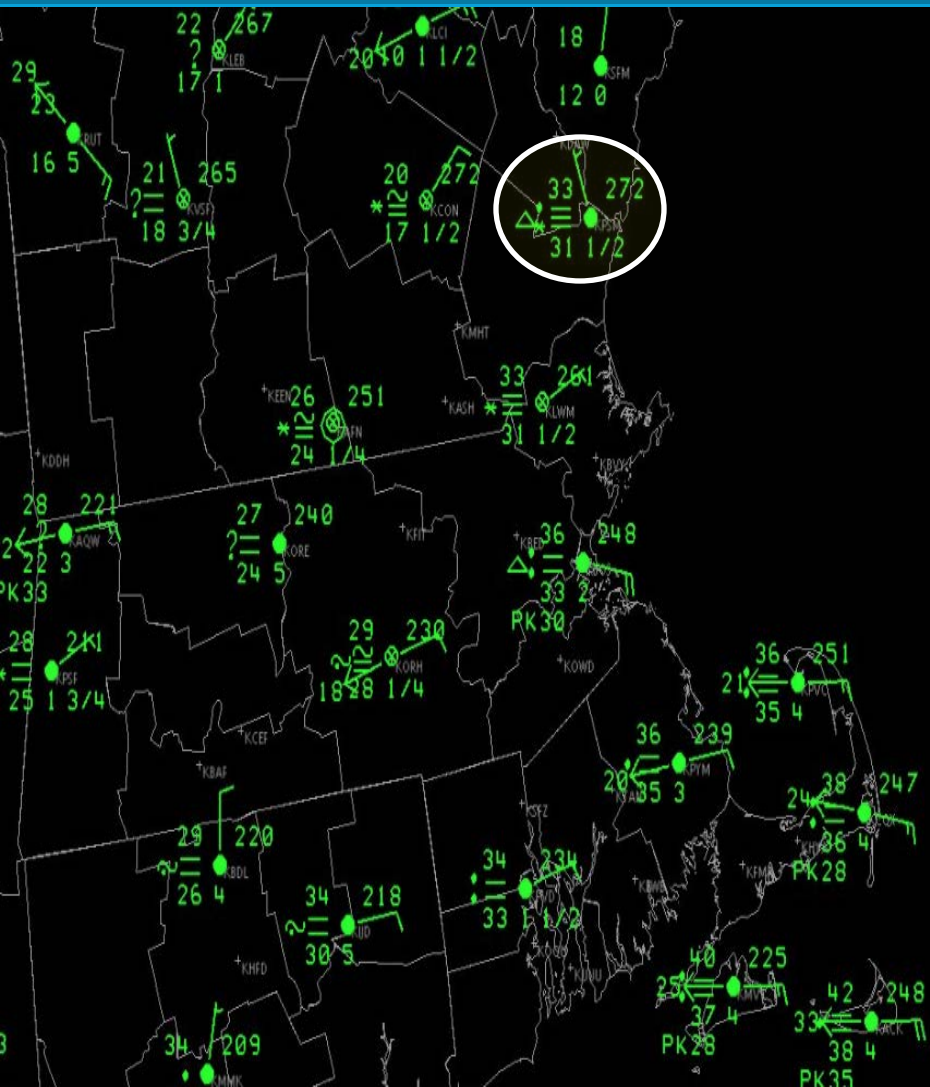


Secondary Low Pressure Moves Further East And Its South Of The Islands By 20z.

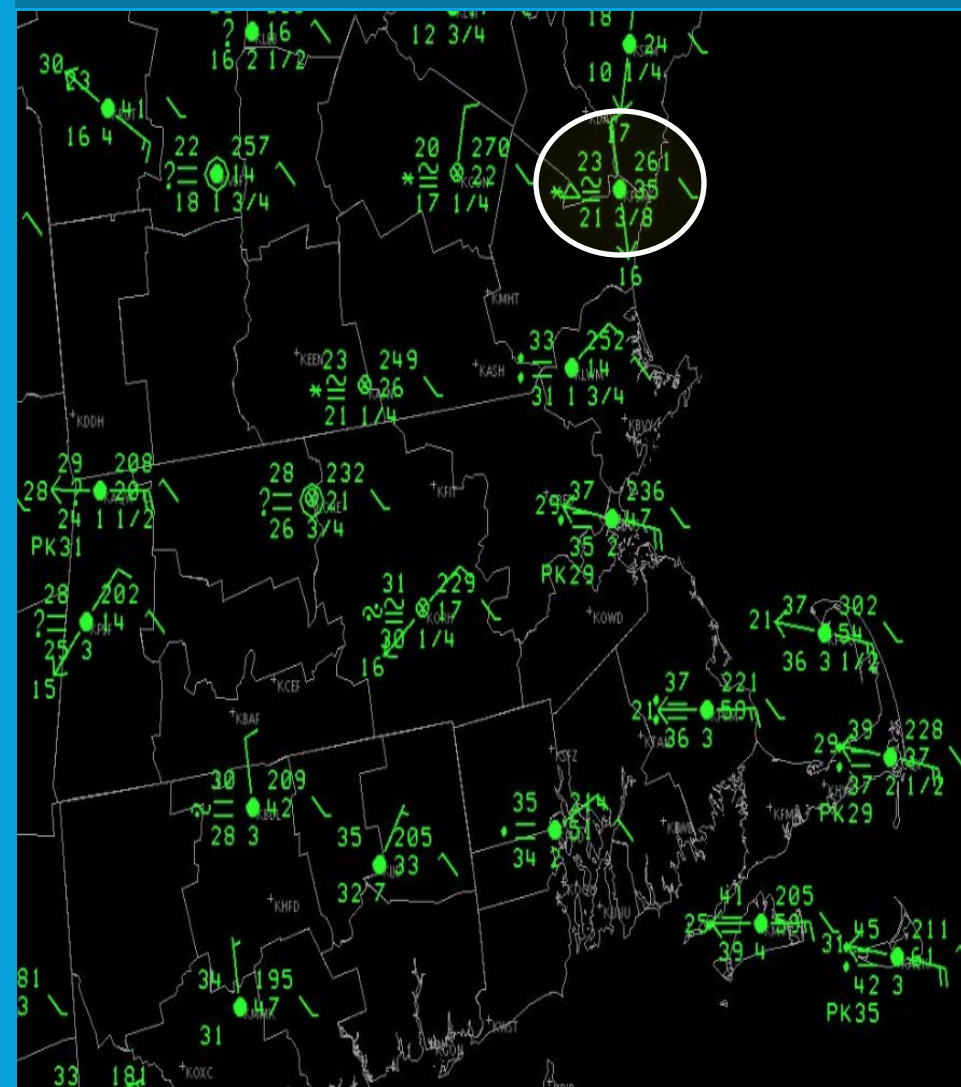
Best Pressure Falls Of 6 MB In Last 3 Hours, Now East of Cape/Islands.

- **Isallobaric component directs wind towards the greater pressure falls**
- **This Allows An East or Northeast Wind To Shift To More Of A Northerly Direction, When Larger Pressure Falls Move East Of The Islands.**

14 UTC Surface Observations



15 UTC Surface Observations

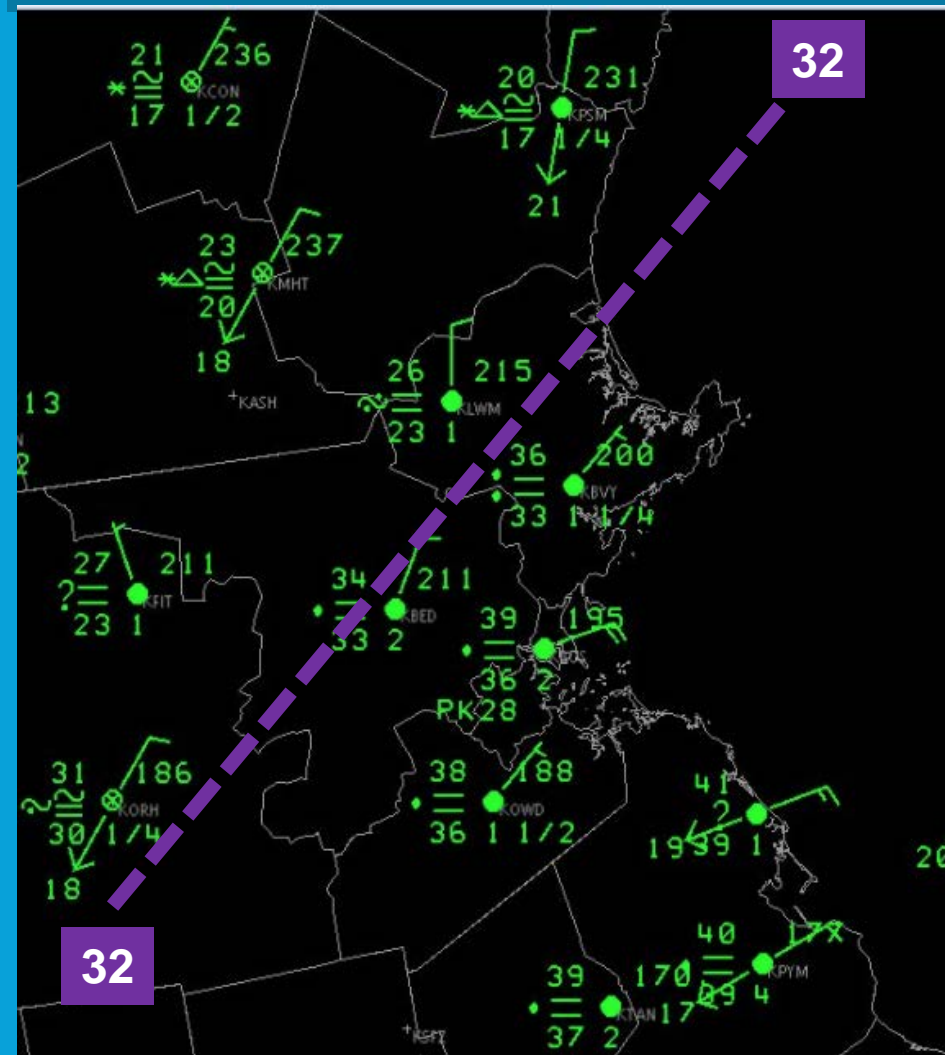


- Marine Layer Changed Sleet to Rain Along Coastal Plain By Late Morning.
- Portsmouth NH: Often Used As Potential Indicator For “Flash Freeze.”
- Note Temp Drop From 33 to 23 In Just One Hour at Portsmouth.
- SPS/Freezing Rain Advisory Sooner Rather Than Later For At Least NE MA

15 UTC Surface Observations

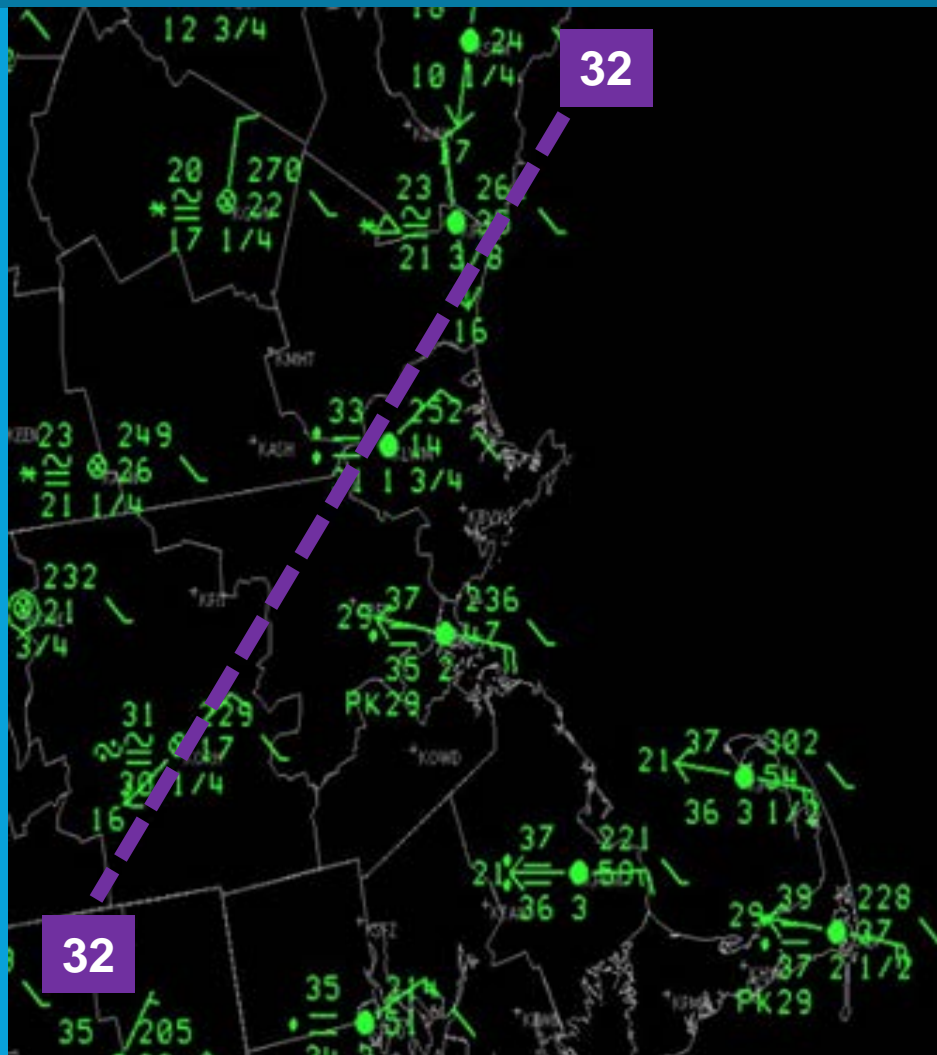


17 UTC Surface Observations

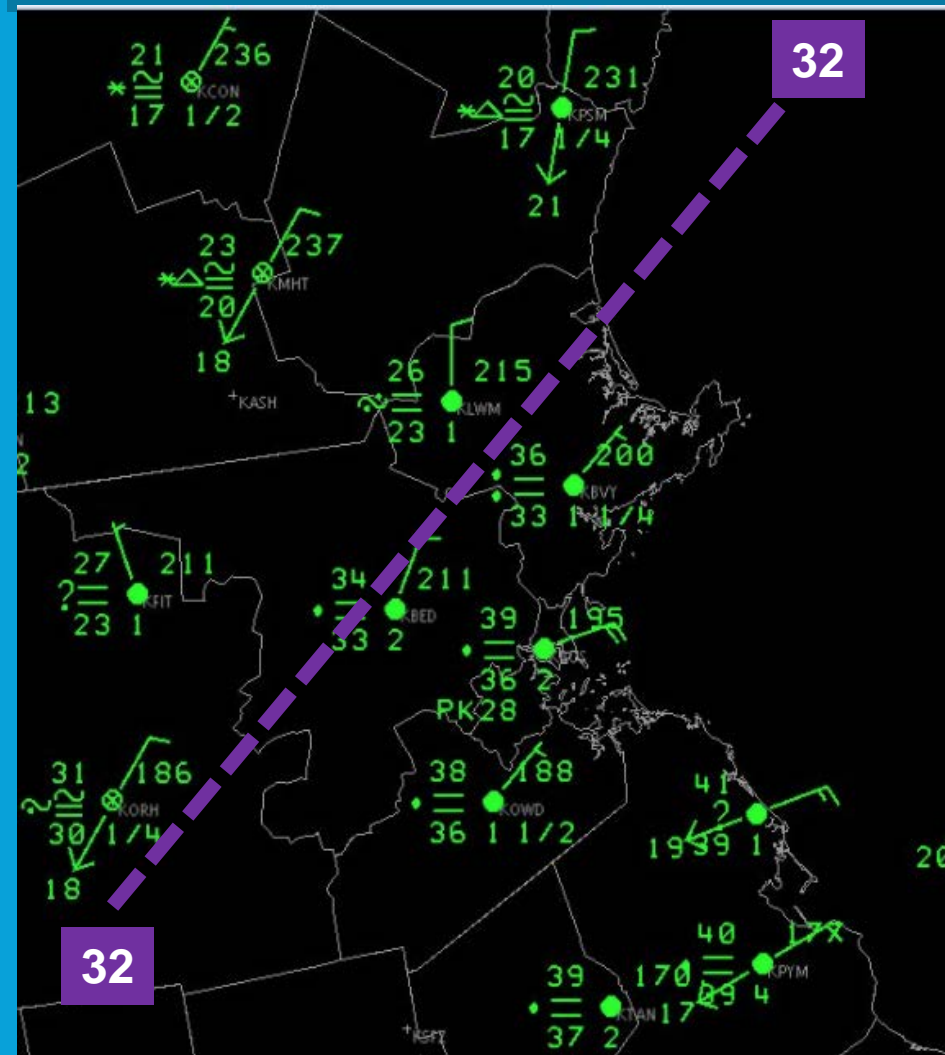


- Winds Shifting To The North As Pressure Falls Move East Of The Coast.
- Lawrence Dropped From 33 To 26 Degrees Between 15 and 17z.
- Flash Freeze Underway in Essex County.
- Numerous Accidents Occurred.

15 UTC Surface Observations

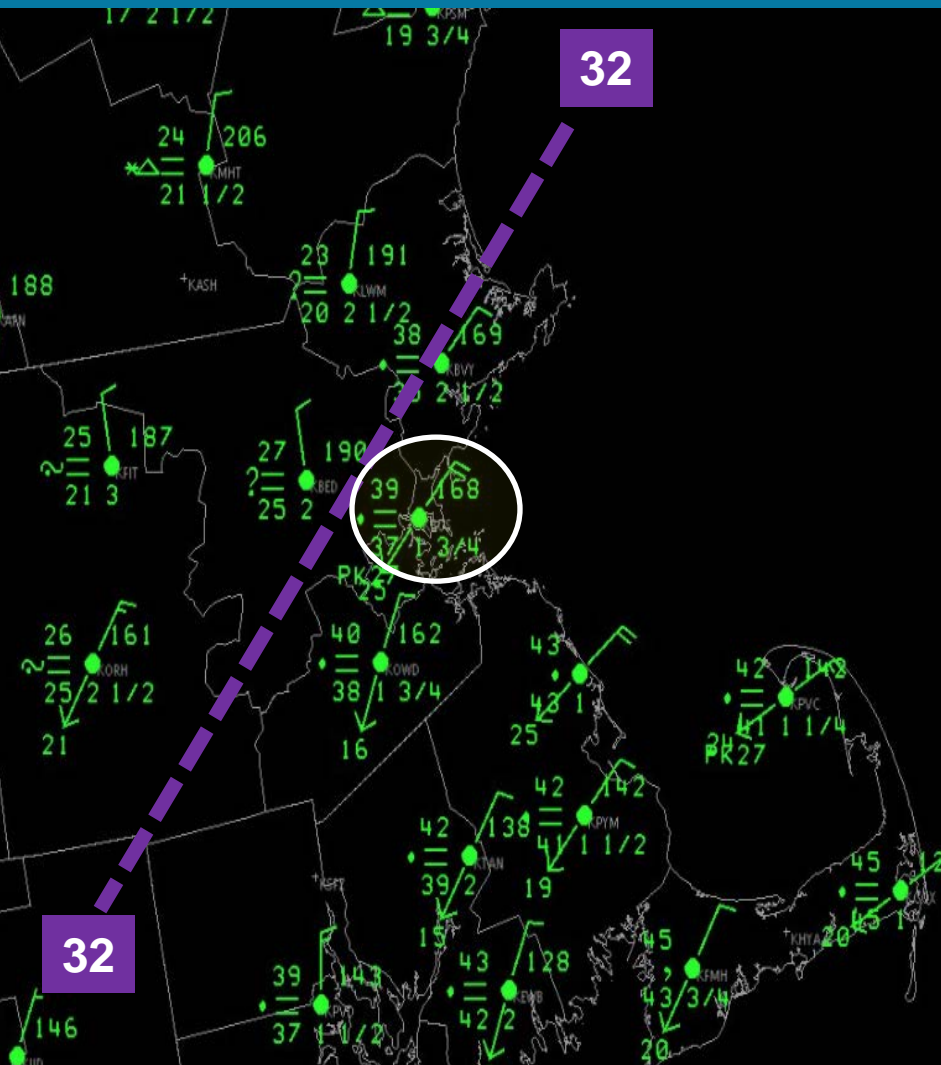


17 UTC Surface Observations

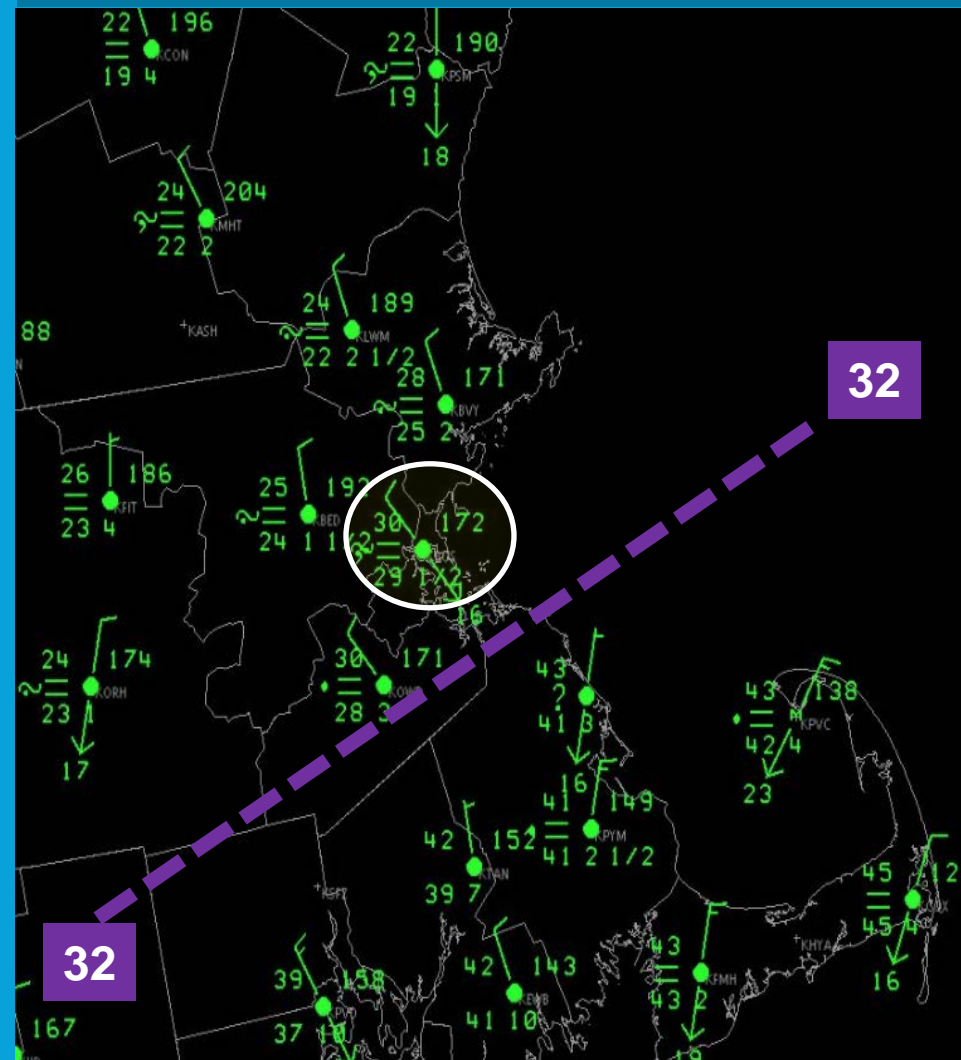


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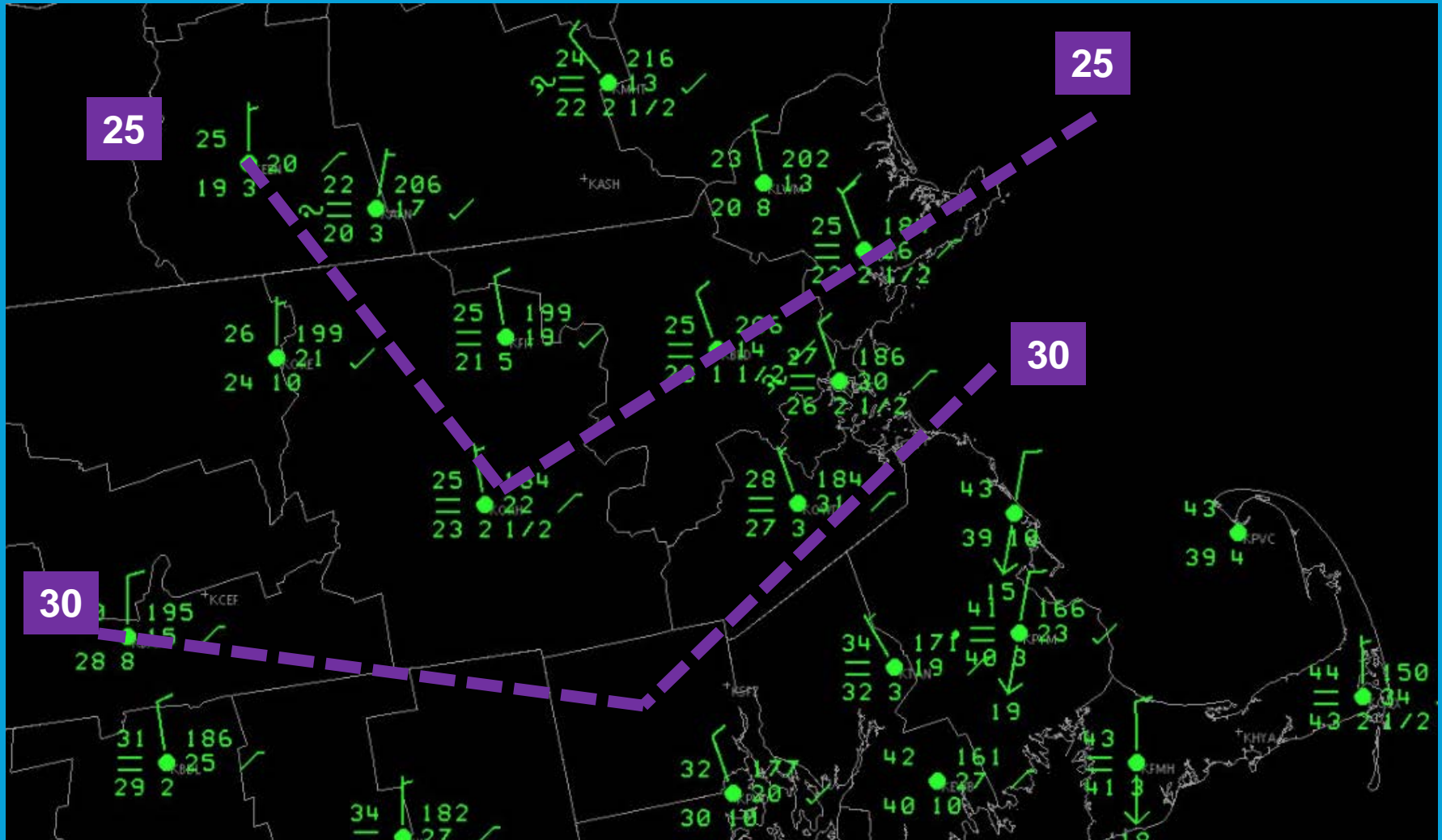


22 UTC Surface Observations



- Boston Drops From 39 To 30 Between 20z and 22z.
- Flash Freeze Develops During The Evening Rush Hour in Boston Metro.
- Freezing Drizzle With Temperatures In The 20s.
- High Impact On Roadways At Logan Airport For The Evening Push.

00 UTC December 30, 2015

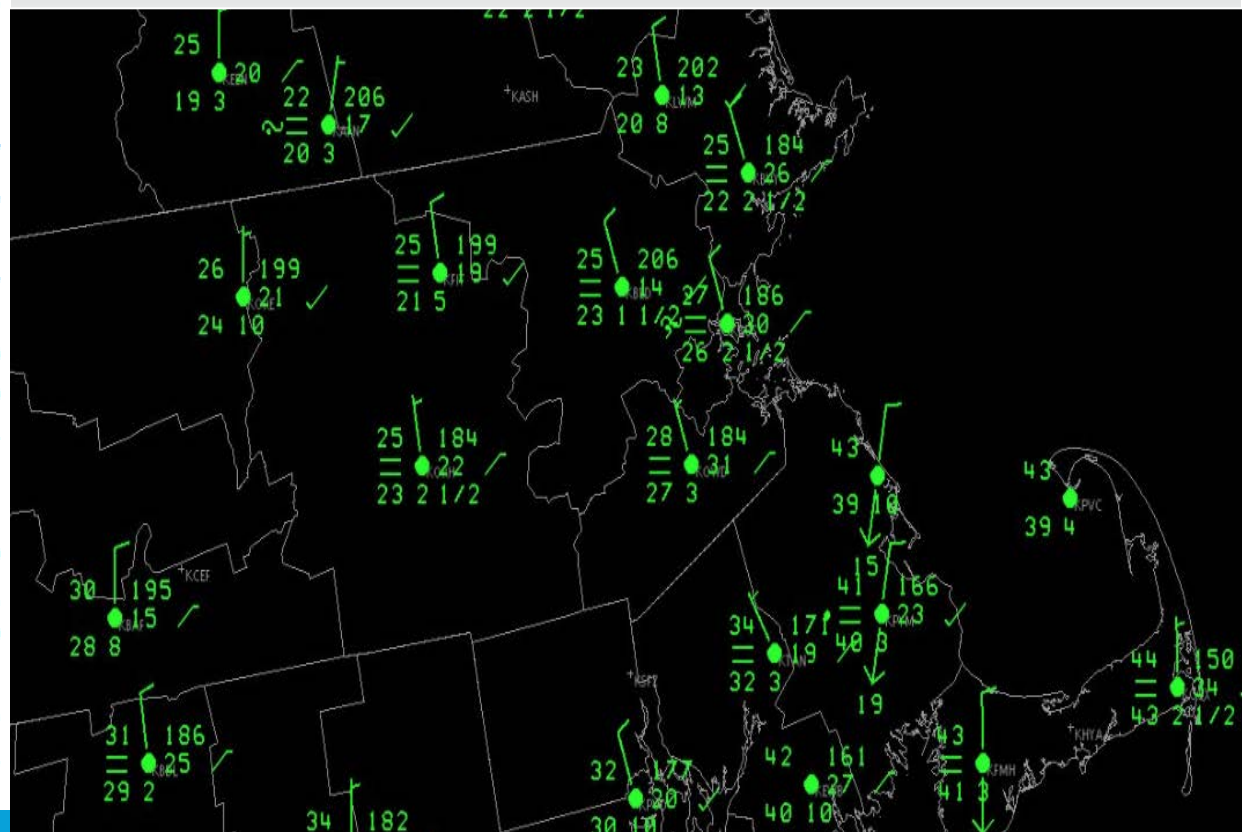


- Boston Down To 27 and Providence At 32 As Of 00Z
- Typical “Flash Freeze” Where Coldest Temps Are Sloped Toward Northeast MA

How Did MOS Guidance Handle Situation?

KBOS	GFS MOS GUIDANCE											12/29/2015		
DT /DEC	29						/DEC						30	
HR	06	09	12	15	18	21	00	03	06	09	12			
X/N												38	35	
TMP	30	30	32	35	36	37	38	38	39	37	37			
DPT	17	20	24	30	36	37	38	38	36	34	33			
CLD	OV	OV	OV	OV	OV	OV	OV	OV	BK	OV	OV			
WDR	07	07	08	09	07	06	04	01	33	34	34			
WSP	10	14	16	16	16	13	08	05	06	07	05			
P06	100		100		44		4		4					
P12	100						13							
Q06	3		4		1		0		0					
Q12	4						0							
T06	1/4		0/0		0/0		0/4		0/6					
T12	1/4				0/5									
POZ	9	15	26	17	8	5	2	1	2	4	5			
POS	87	85	74	36	10	3	1	1	1	3	0			
TYP	S	S	Z	S	R	R	R	R	R	R	R			
SNW	0													
CIG	5	3	2	2	2	3	3	2	1	2	3			
VIS	5	5	5	1	5	5	4	5	5	5	6			
OBV	BR	BR	BR	FG	BR	BR	FG	BR	BR	BR	BR			

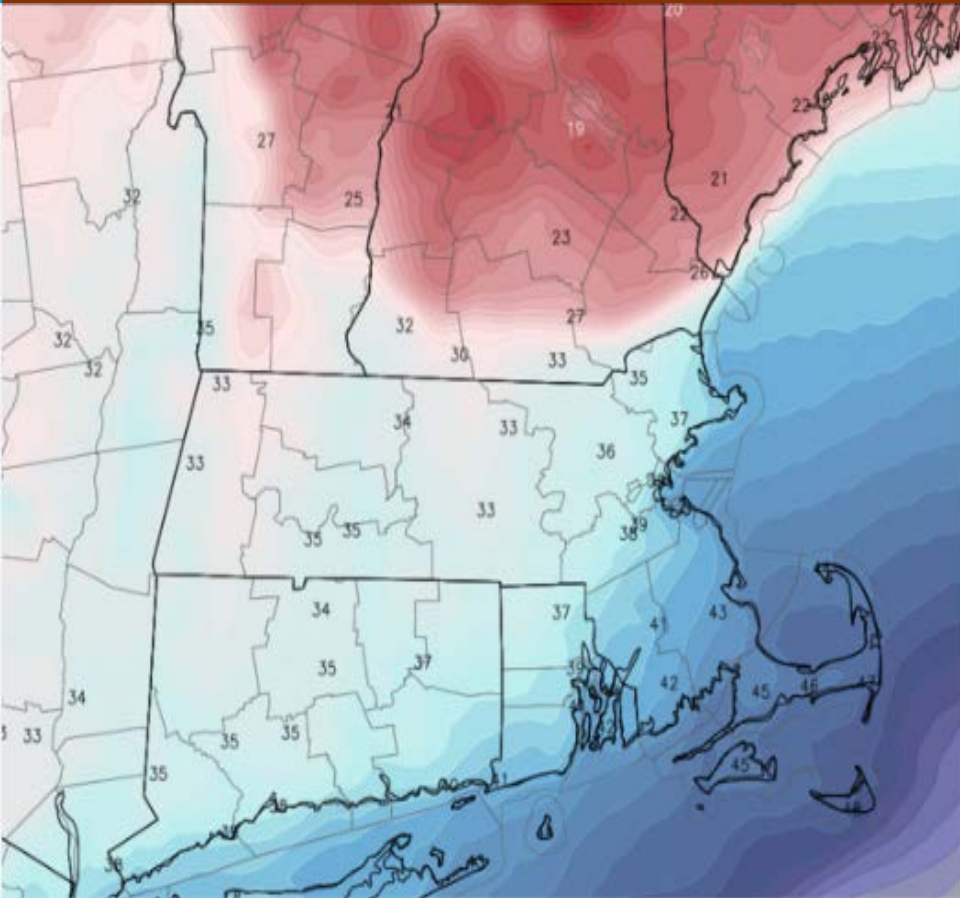
00 UTC December 30, 2015



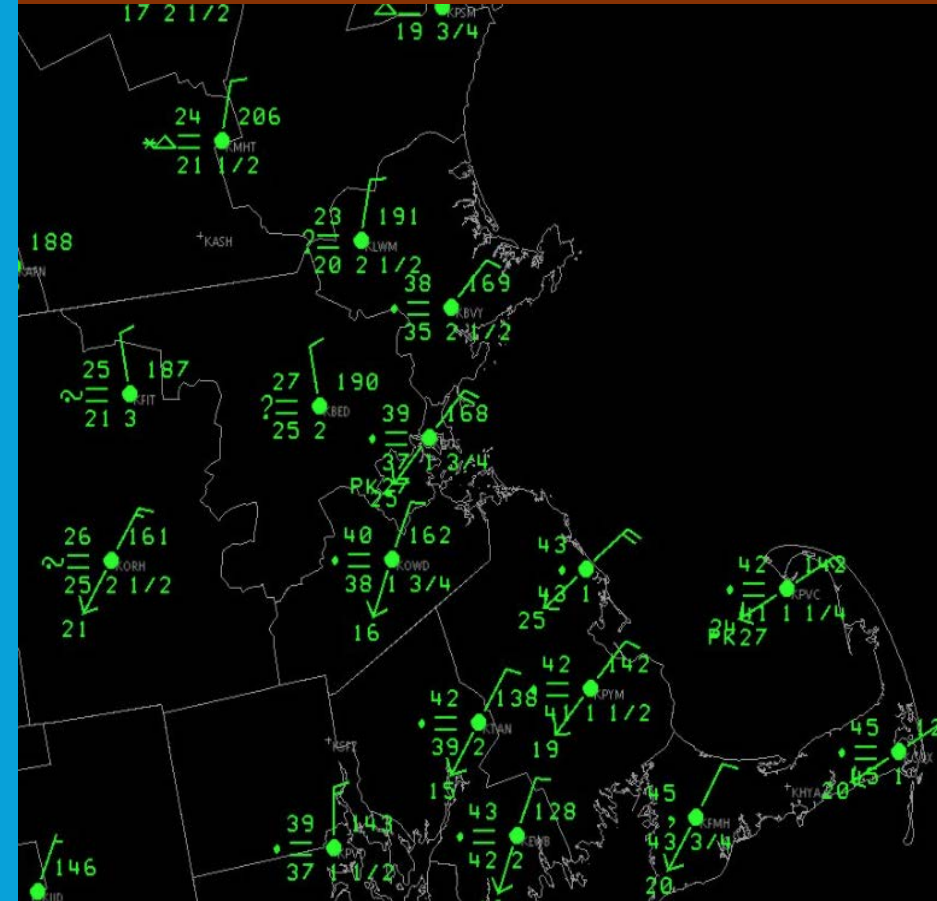
- MOS Guidance/Super Blend Did Not Handle The Situation Well.
- At 00z It Was 27 in Boston With Freezing Drizzle: MOS had 38.
- Did Not Even Drop Boston Below 35 All Night!
- MOS/Superblend Will Almost Always Perform Poorly With Shallow Cold Air Working Down The Coastal Plain.

How About The High Resolution Guidance?

4KM NAM Valid At 20z



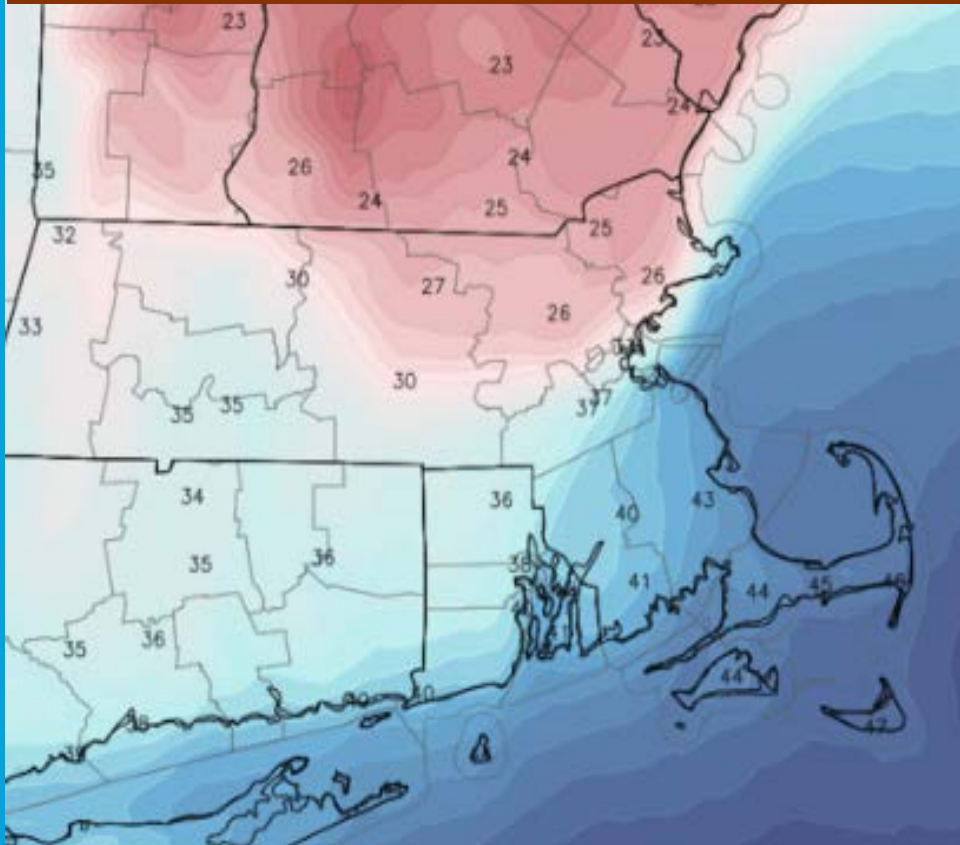
Actual Observations at 20z



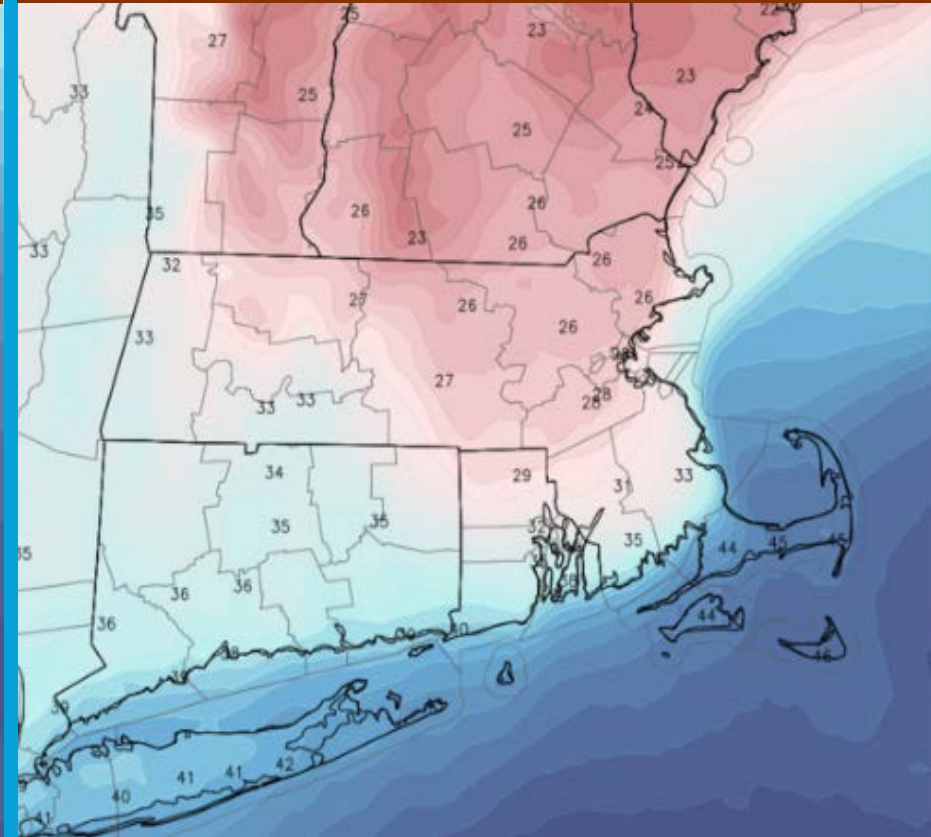
- High Resolution Guidance Better Than MOS, But Too Slow
- It was already 23 at Lawrence, while 4 KM NAM Had Temp At 35
- 4KM NAM Also 5 To 10 Degrees Too Warm In Central MA

More High Resolution Guidance

4KM NAM Valid At 00z



4KM NAM Valid At 03Z



High Resolution Guidance Had The Right Idea, But 3 To 6 Hours Too Slow.

Wind Often Shifts North Earlier Than Expected With Pressure Falls/Secondary Coastal Low And Very Shallow Cold Air To the North.

Ingredients That Often Lead To A Flash Freeze

1. Initially Cold Low Level Air Supplied By Strong Canadian High Pressure.
2. Marine Layer Temporarily Invades The Coastal Plain.
3. Pressure Falls East Of Our Location, Allows Winds To Shift From E or ENE Back To The North. Often Occurs Faster Than Even Mesoscale Models Depict.
4. **Keep A Close Eye On Portsmouth, NH For Quickly Falling Temperatures. Often Indicates "Flash Freeze" arriving in Northeast MA. Consider A Special Weather Statement/Freezing Drizzle Advisory.**
5. Bulk Of Precipitation Normally Over By The Time Flash Freeze Is Occurring, But Freezing Drizzle Often Continues For Several Hours.
6. **Flash Freezes Are High Impact Events And Often Catch People Off Guard Since Storm Is Winding Down. DSS Support Often Most Important During These Type Of Events.**
7. Superblend/MOS Guidance Will Not Handle These Situations Well. Look At The High Resolution Guidance, Especially 4 KM NAM, ARW, And NMM. These Models Often Have The Correct Idea, But Might Be 3 to 6 Hours Too Slow.