Weekly Weather Discussions
Administrative Procedures

Times: Student discussions will start October 3, and will be on Mondays after that excluding instructor absences and Midterm Exam date as noted on class website, with last one December 3. Total of six discussions. Can move discussions to TR in event of unforeseen schedule conflicts, illness.

Logistics: Two students per weather discussion. Will post sign in sheet on my office door available for sign-in. You must sign in for one date. I will arbitrarily assign you any remaining available date if you do not sign up.

Grading: Each team member will receive the same grade for the discussion. **There must be reasonable and clear demonstration of an equal division of labor, in both preparation and oral presentation. If it is obviously clear just one person has done all the work, both students will receive a zero.** Each discussion 10% of total final course grade.

Weekly Weather Discussions
Presentation Preparation

If it is your team's week to present the weather discussion…

Preparatory meeting: Both team members need to briefly meet with me Thursday or Friday afternoon (or other arranged time). Will agree to the scope of material to be included in the discussion. Should: 1) ideally be focused to a specific (and hopefully significant) weather event and 2) be related to concepts being concurrently presented in lecture.

In-class presentation: Presentations should be 15-20 minutes in length, depending on how "interesting" the weather is on a given day. Should be prepared Sunday afternoon, considering this time as "observations" or 0 hour in model forecasts. Must be Powerpoint or pdf presentations, with some brief commentary or demonstration of analysis on all data presented. Can access and real-time data or updated forecasts, if desired, via internet links on Monday of.

What to hand in: Electronic version of your presentation to post to course website and hard-copy version to grade (can be in color or b/w, just something I can make comments and give feedback on)

Weekly Weather Discussions
General Guidelines for Evaluation

Nature always comes first: The first part of the discussion should always focus on what is going on per the observed state of the atmosphere on the synoptic scale. This would include, for example, surface analyses, upper-air charts, and remotely sensed data (satellite or radar). You can consider model data for the 0 hour forecast, as these contain helpful derived products (e.g. vorticity)

Critical evaluation of models: In considering the short-term forecast (24-48h), you should ideally consider results from several different model and/or ensemble members. Differences or similarities in model solutions that have bearing on the forecast of significant weather should be emphasized (e.g. where does a surface low track, location of rain/snow line, etc.)

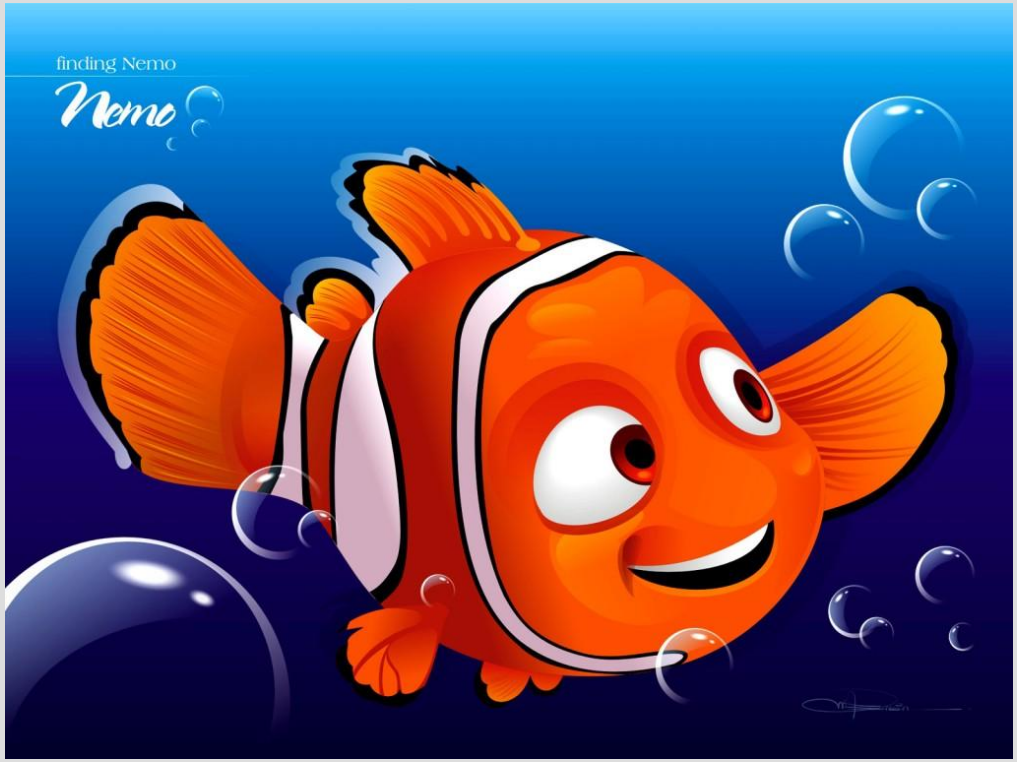
Consider yourselves professional meteorologists: All data used in discussion should be commiserate with sources used in operational practice by the National Weather Service, and not weather products oriented toward the general public (i.e. maps from the Weather Channel or local media forecasts are not acceptable as primary data sources).

It's NOT a forecasting contest: The emphasis should be relating concepts you are learning in this class (ideally concurrently) to intelligently analyzing synoptic-scale weather in real time. BUT, if there is a significant weather event that merits watches or warnings for protection of life and property, you should definitely talk about it.

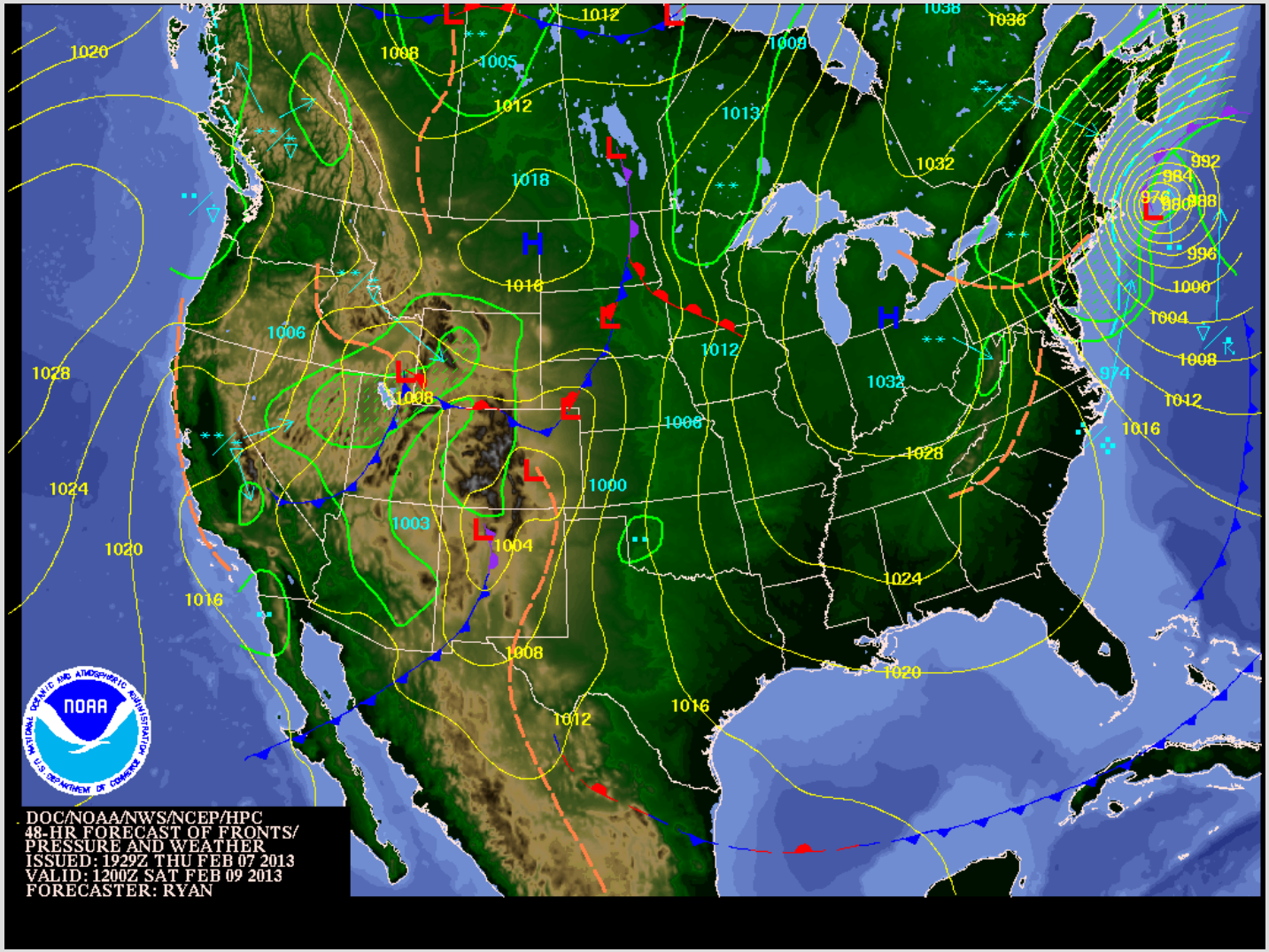
Example past discussion:

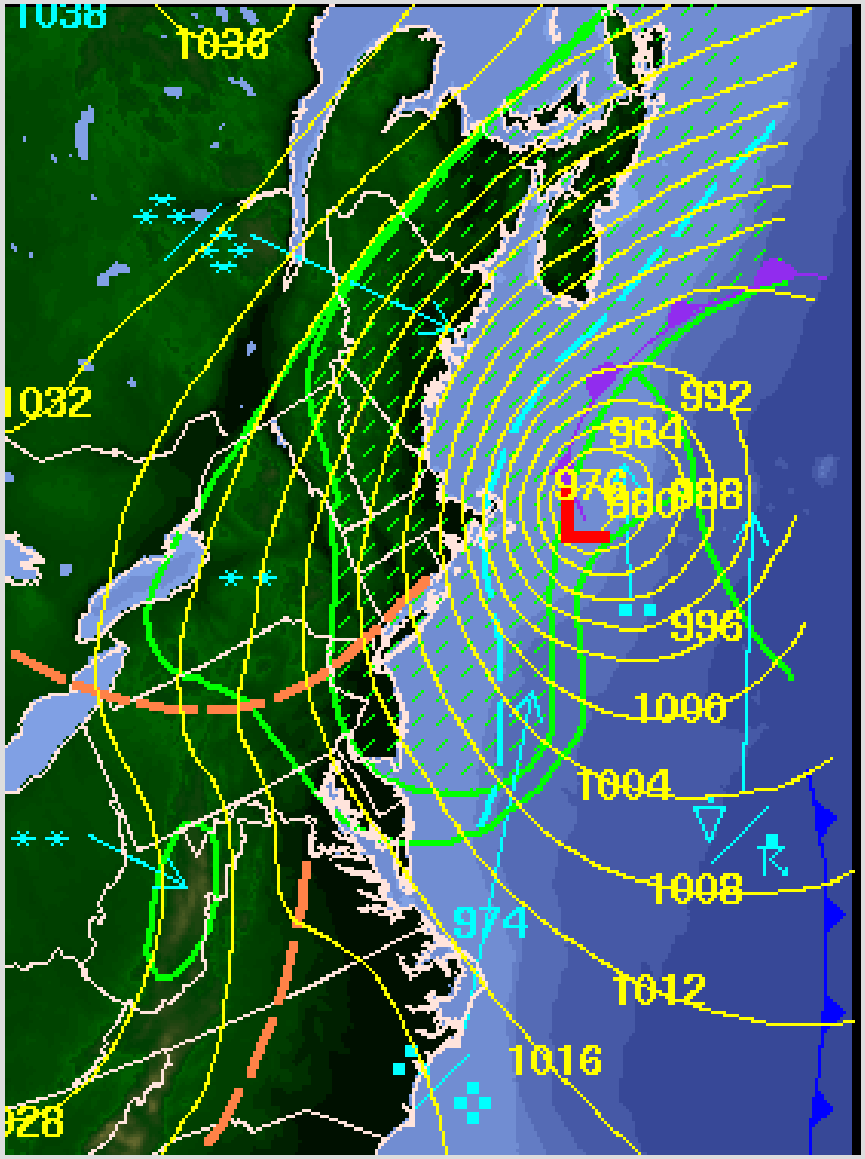
Winter storm “NEMO”

Great New England Blizzard of 2013???



HPC 48-h forecast map
Valid 12Z Feb. 9, 2013





Textbook Nor'easter!

Two upper-level weather disturbances from northern and southern branch of the jet stream combine (or phase)

+

Explosive cyclogenesis off the East Coast on Friday (as we'll see)

+

Surface low develops off Cape Hatteras and then moves up the eastern seaboard. Here, MSLP of 976-mb = Category 2 hurricane

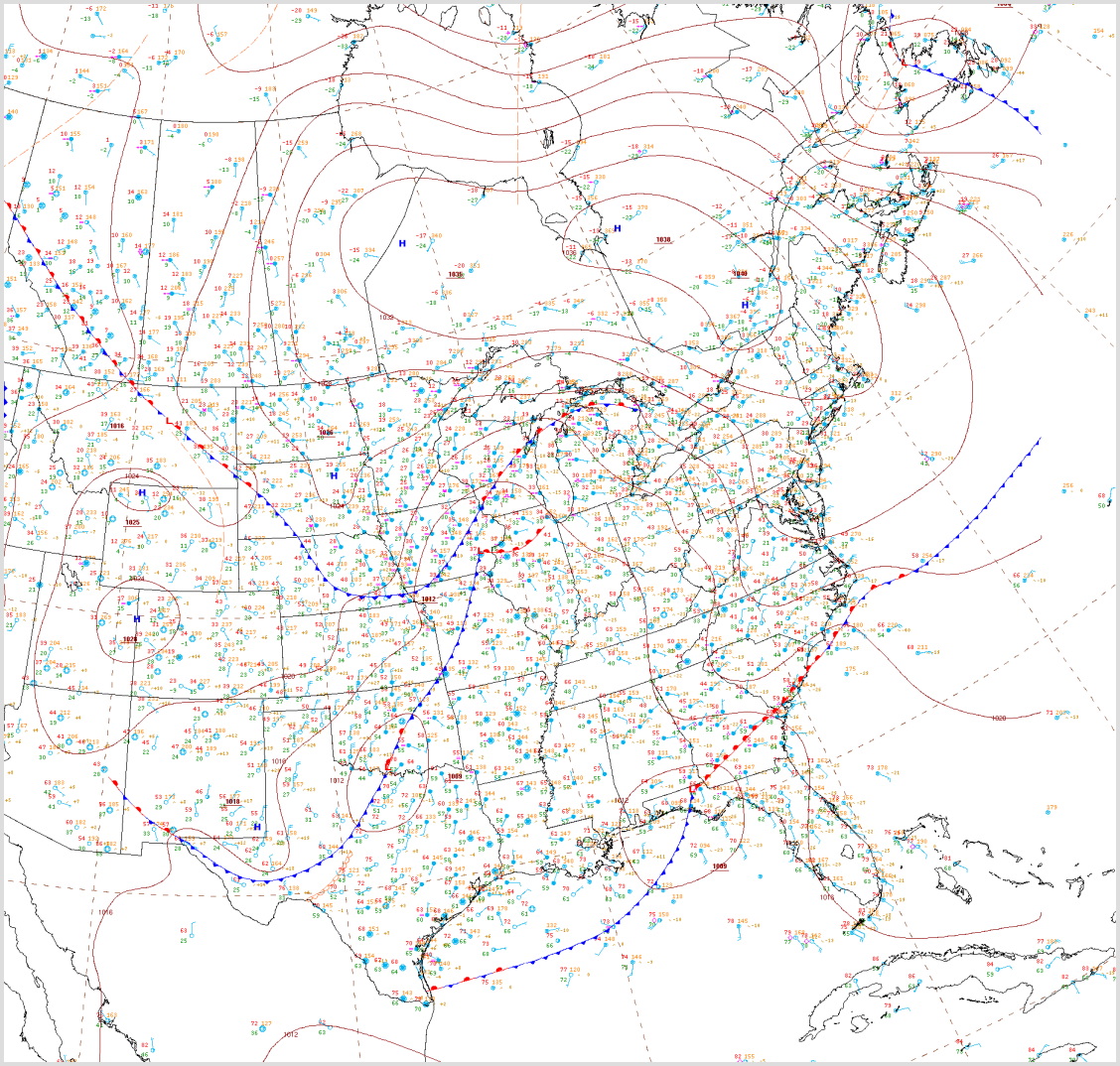
+

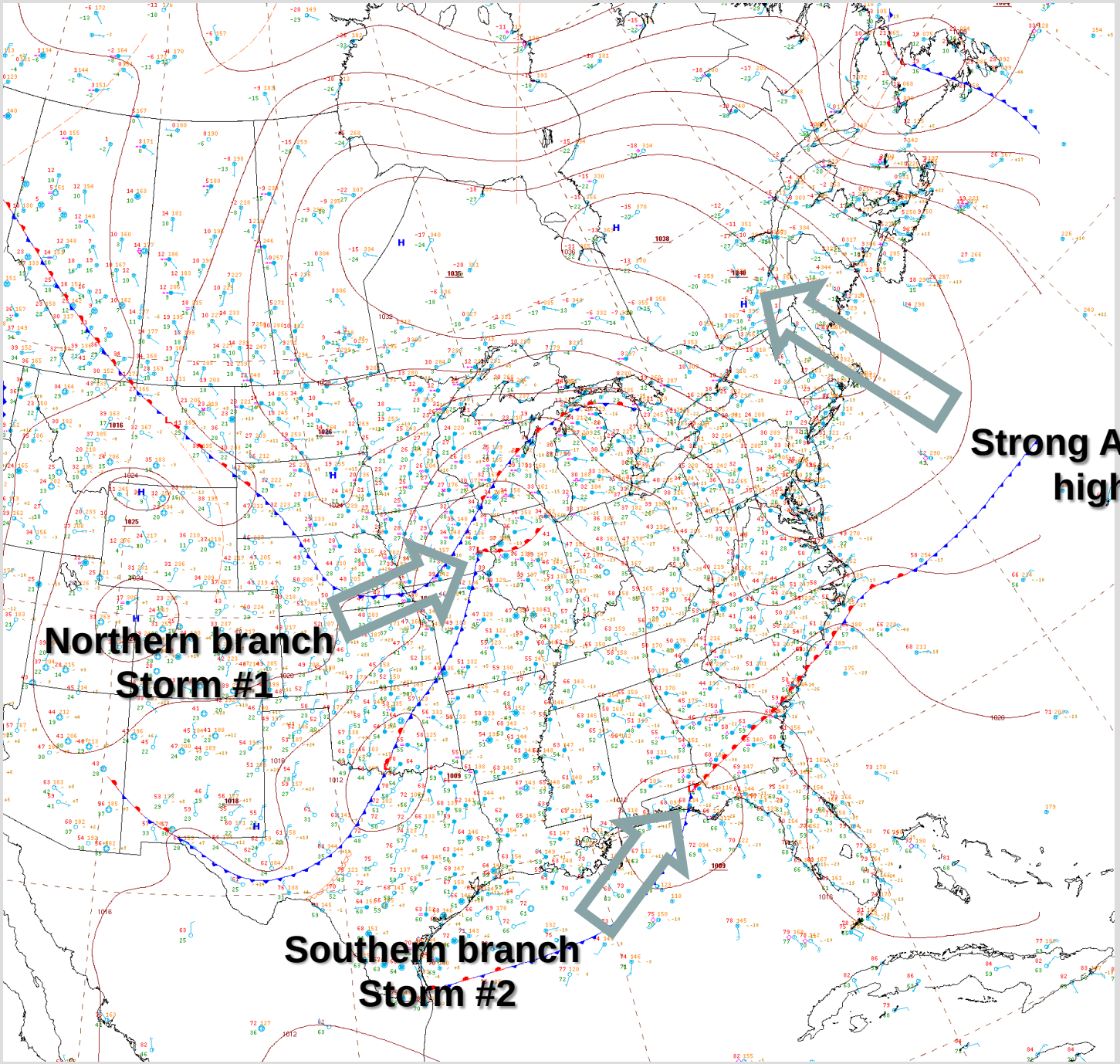
Southern New England is on the northwest side of the surface low track, the typical area favored for snow and blizzard conditions.

=

BOSTON WILL BE SLAMMED WITH A BLIZZARD OF EPIC PROPORTIONS

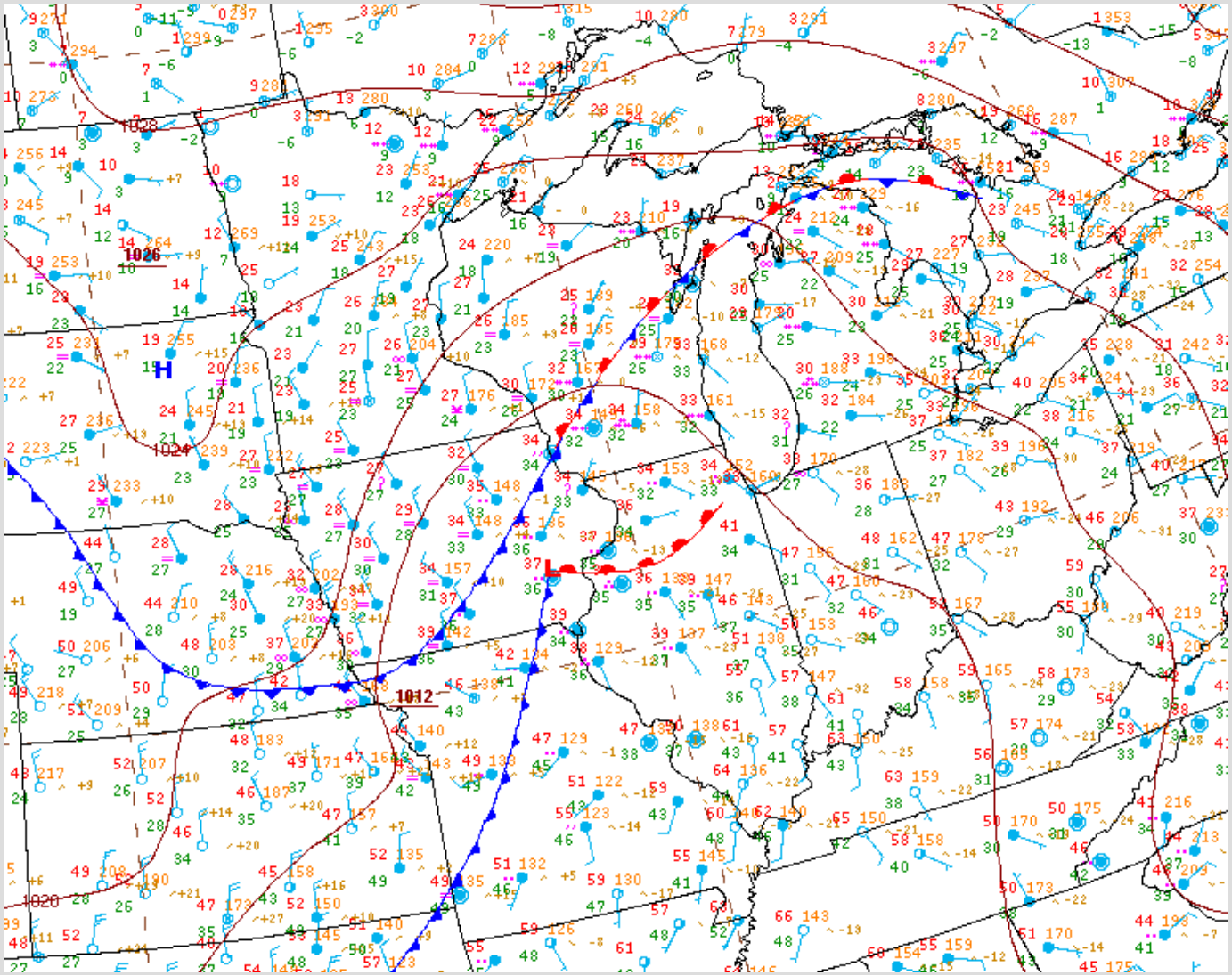
HPC Surface Analysis
0Z Feb. 7, 2013




Strong Arctic high
Northern branch Storm #1
Southern branch Storm #2

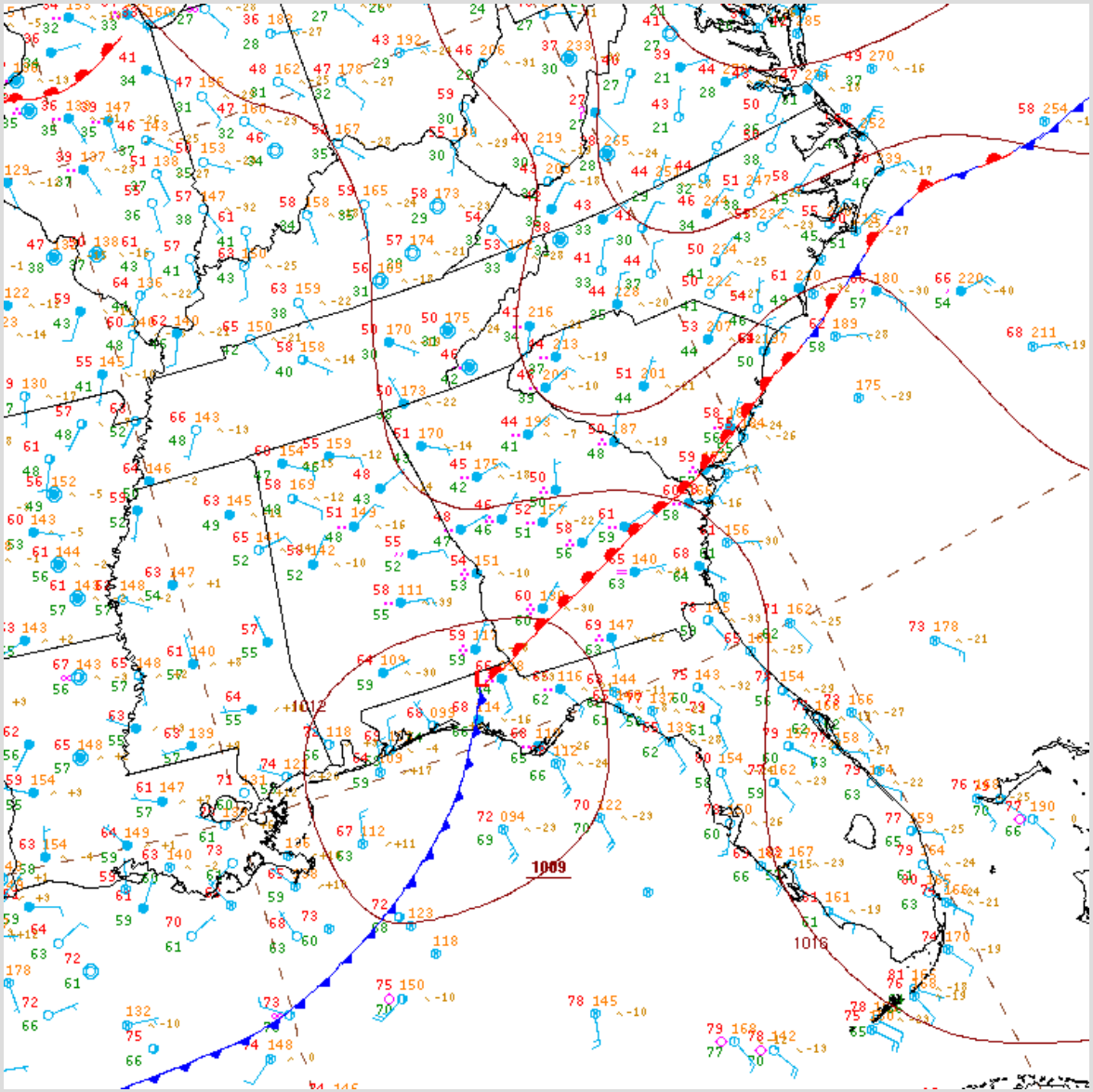
Northern branch storm:

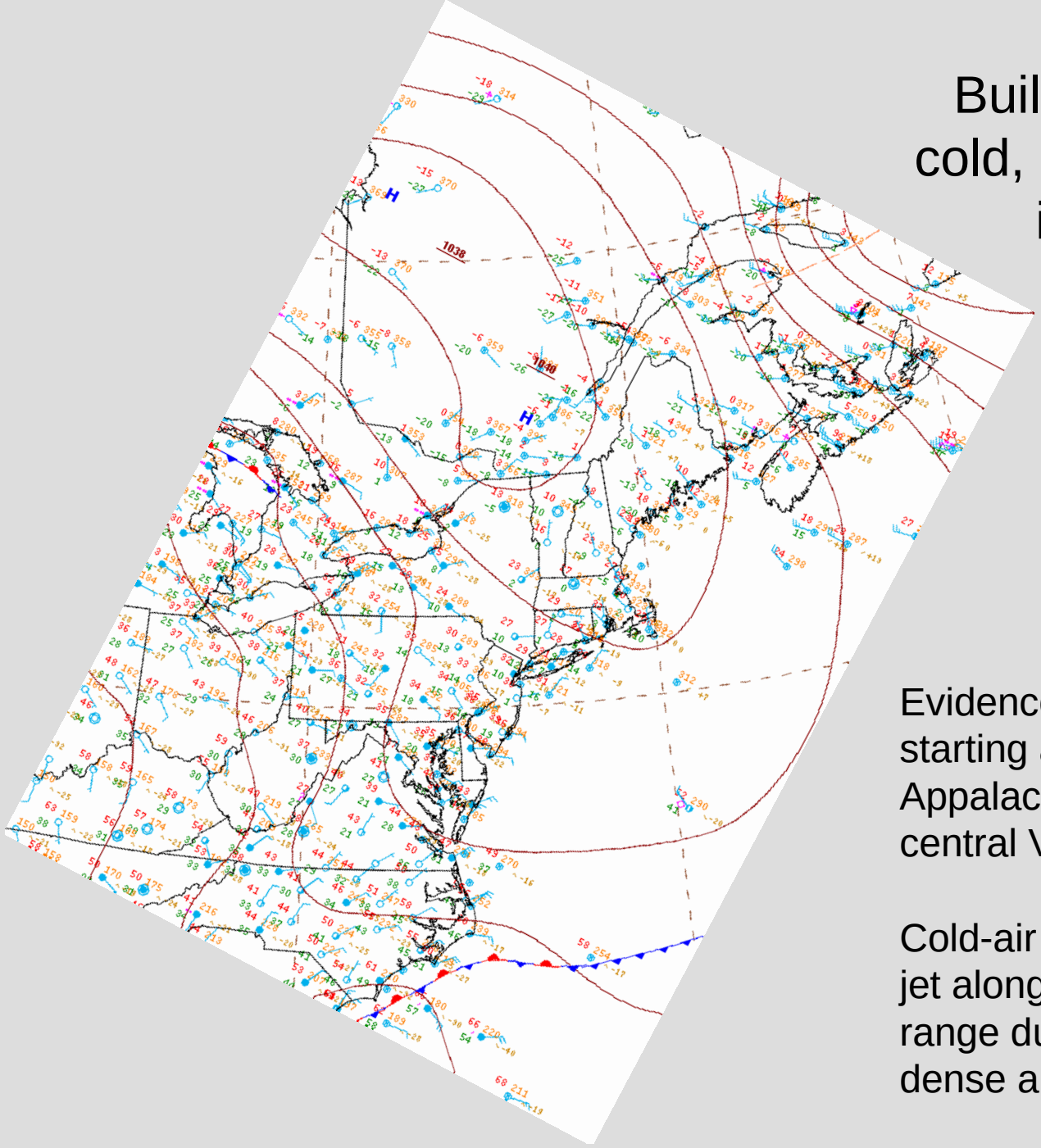
Alberta clipper with light to moderate rain at and ahead of warm front, with cold, dry Arctic air behind



Southern branch storm:

Gulf low with wide swath of steady rain ahead of the warm front



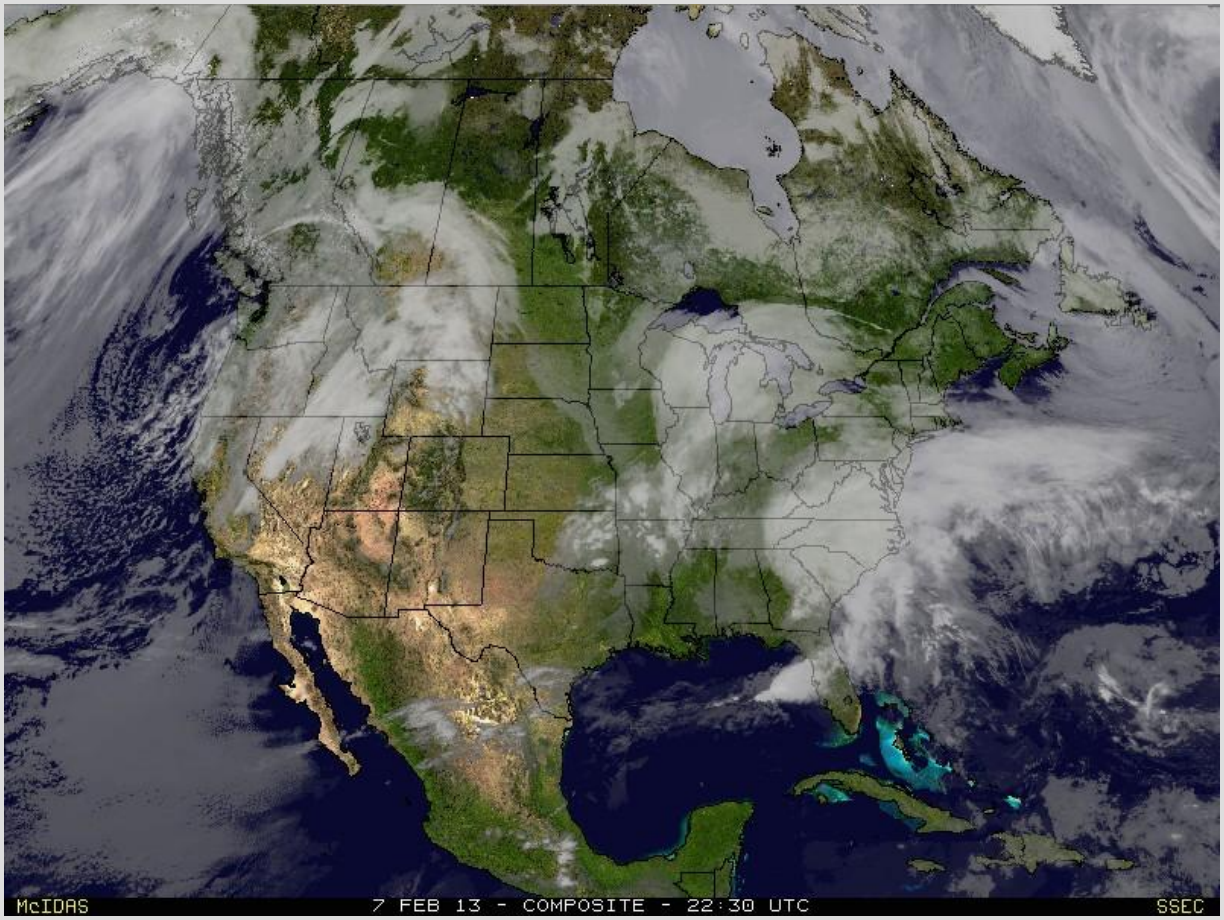


Arctic high:
Builds in deep layer of cold, dry air to overrun on its eastern side

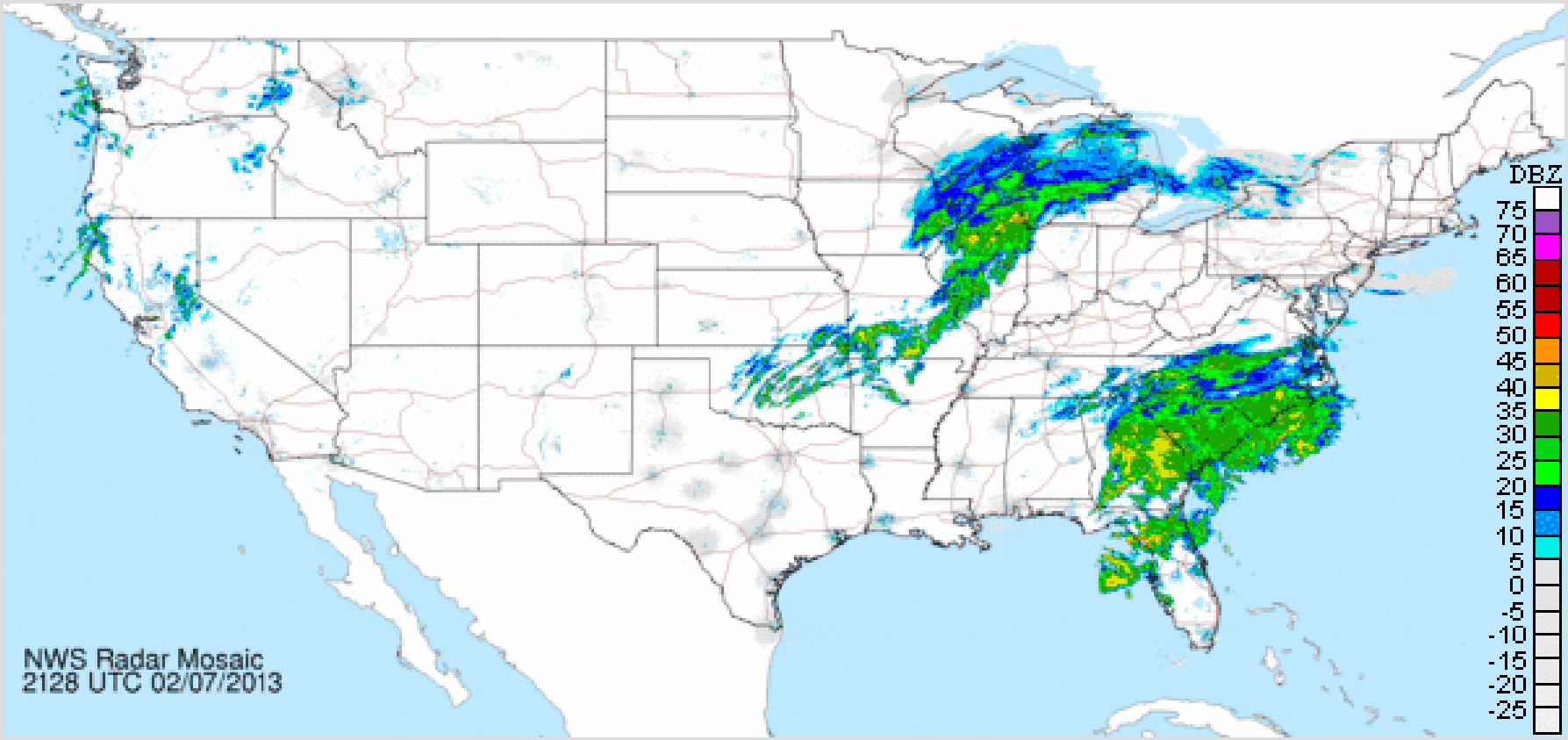
Evidence of cold-air damming just starting along the lee side of the Appalachians (e.g. winds in central VA and NC from NE)

Cold-air damming: Surface barrier jet along the lee side of mountain range due to shallow layer of cold, dense air (see Chapter 8)

Composite satellite imagery from SSEC, Univ. of Wisconsin



Both northern and southern branch storms are in the open wave to developing stage of cyclogenesis, per their appearance on satellite imagery and the surface analysis just shown.


NWS Radar Mosaic
2128 UTC 02/07/2013
DBZ
75
70
65
60
55
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-20
-25

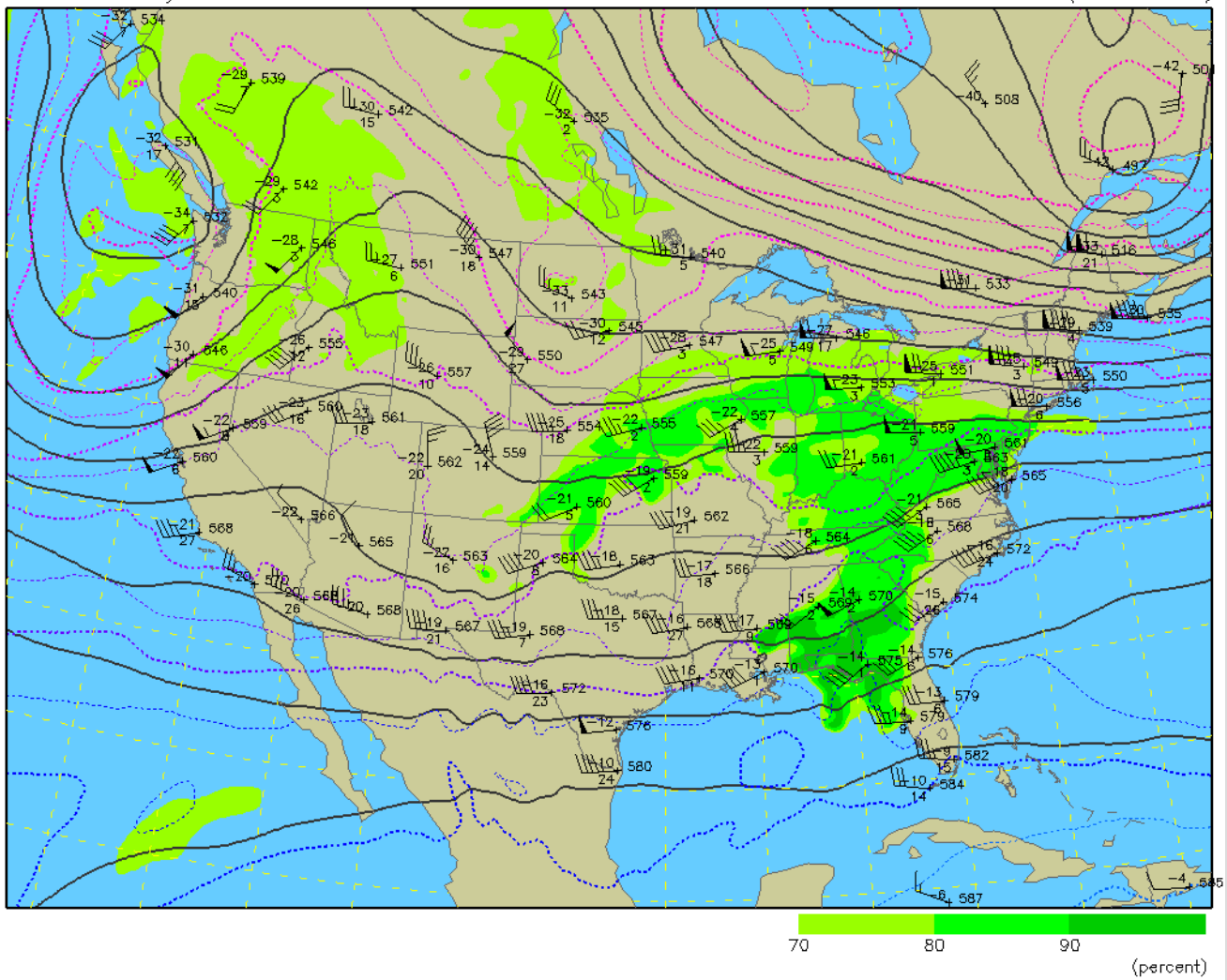
YOU DON’T EVEN NEED A COMPUTER MODEL TO TELL YOU A LOW WILL FORM OFF CAPE HATTERAS…

You can forecast it from the observed upper-air analysis data from a QG perspective!

500 mb rawinsonde data 12z Thu 07 Feb 2013

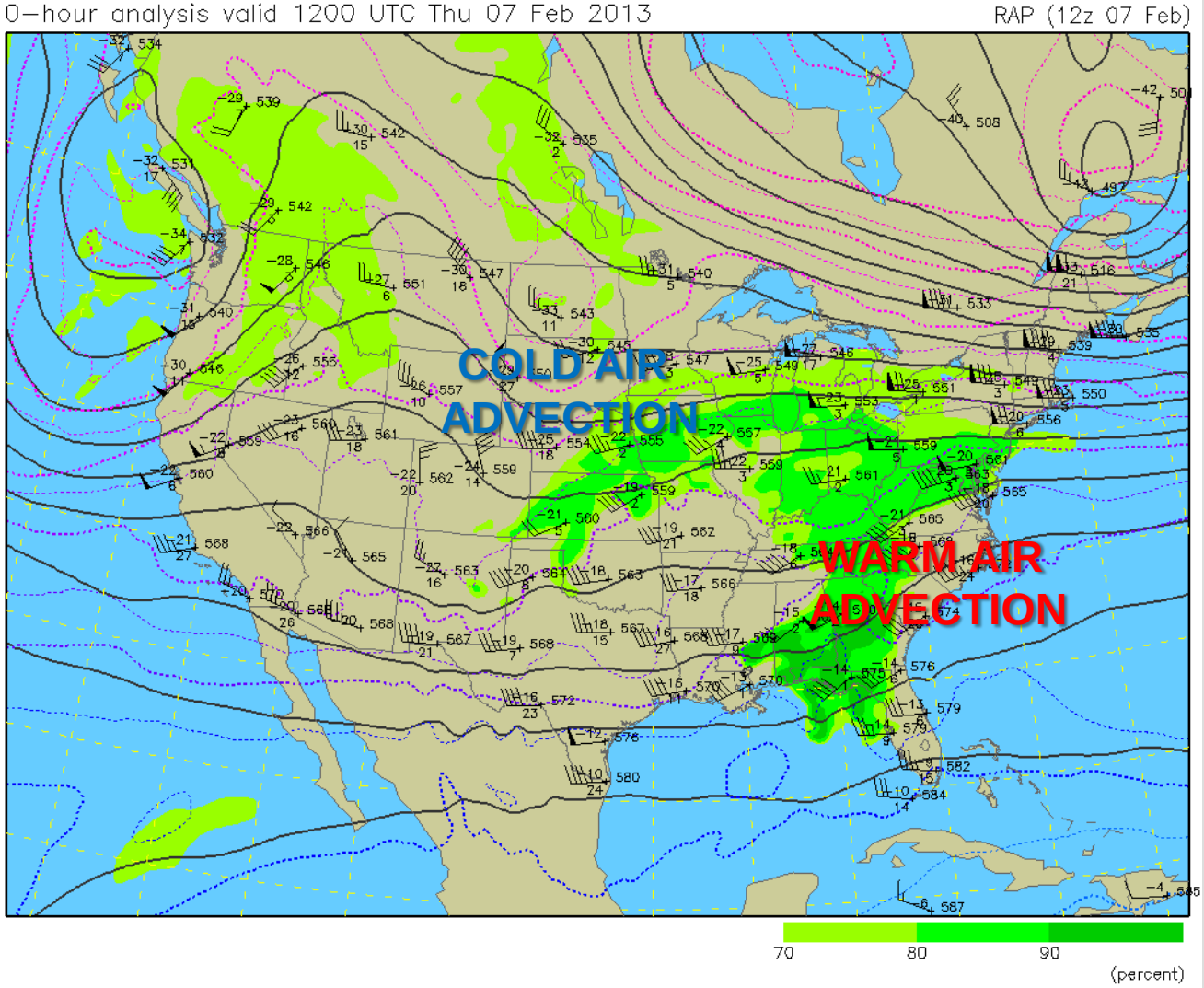
500 mb Heights (dm) / Temperature (°C) / Humidity (%)

0-hour analysis valid 1200 UTC Thu 07 Feb 2013 RAP (12z 07 Feb)

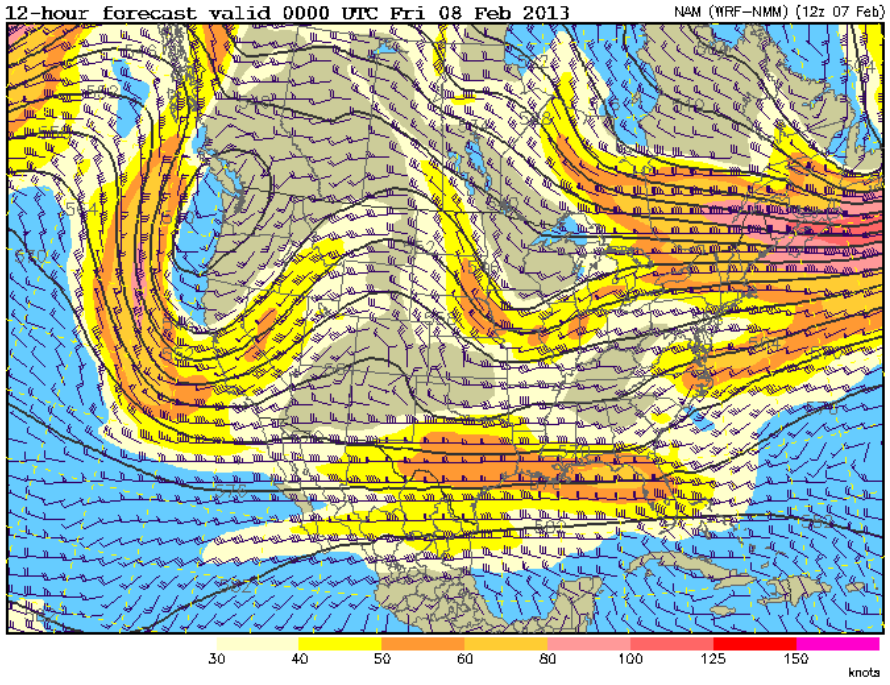


500 mb rawinsonde data 12z Thu 07 Feb 2013

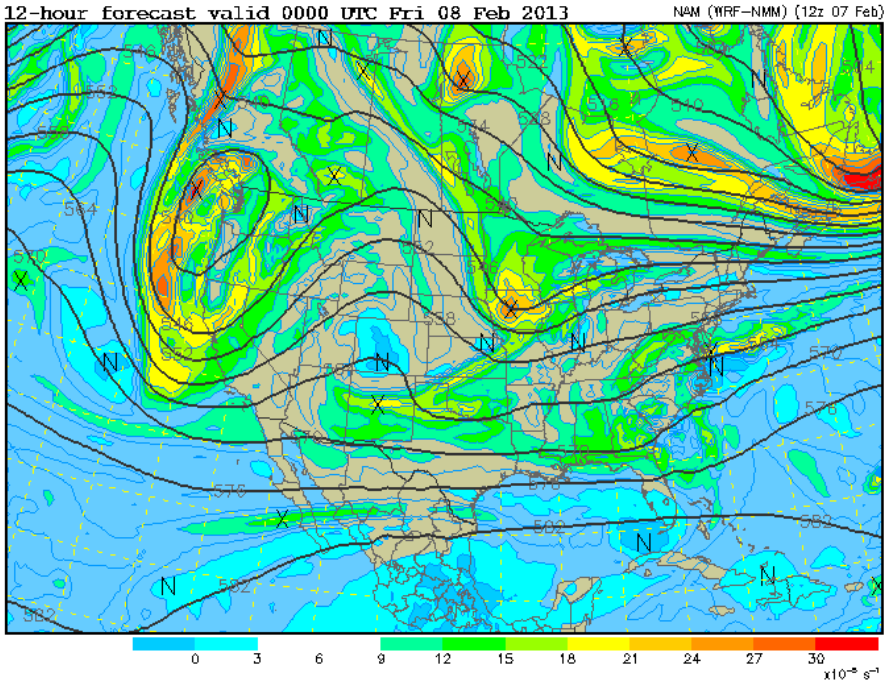
500 mb Heights (dm) / Temperature (°C) / Humidity (%)

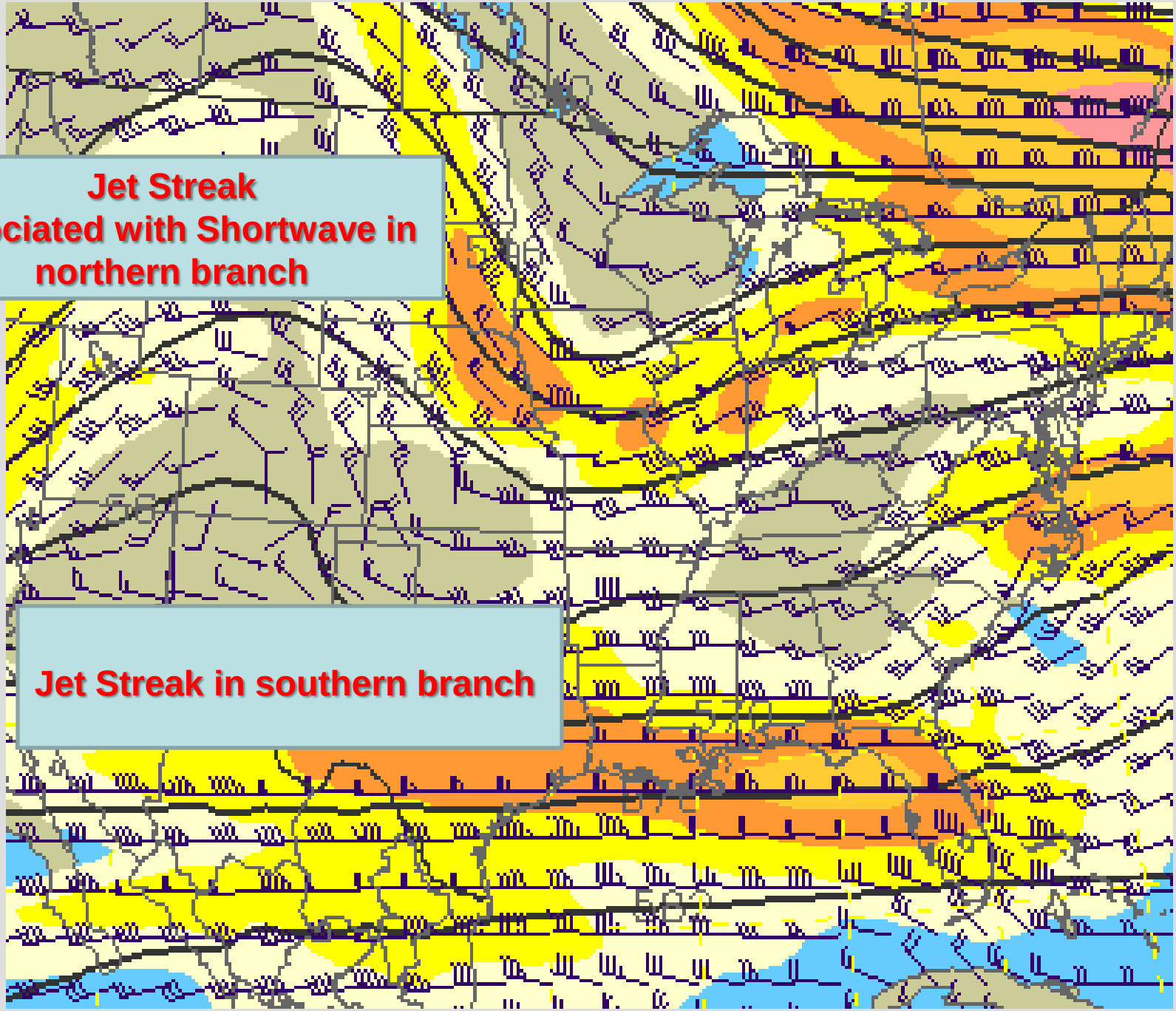


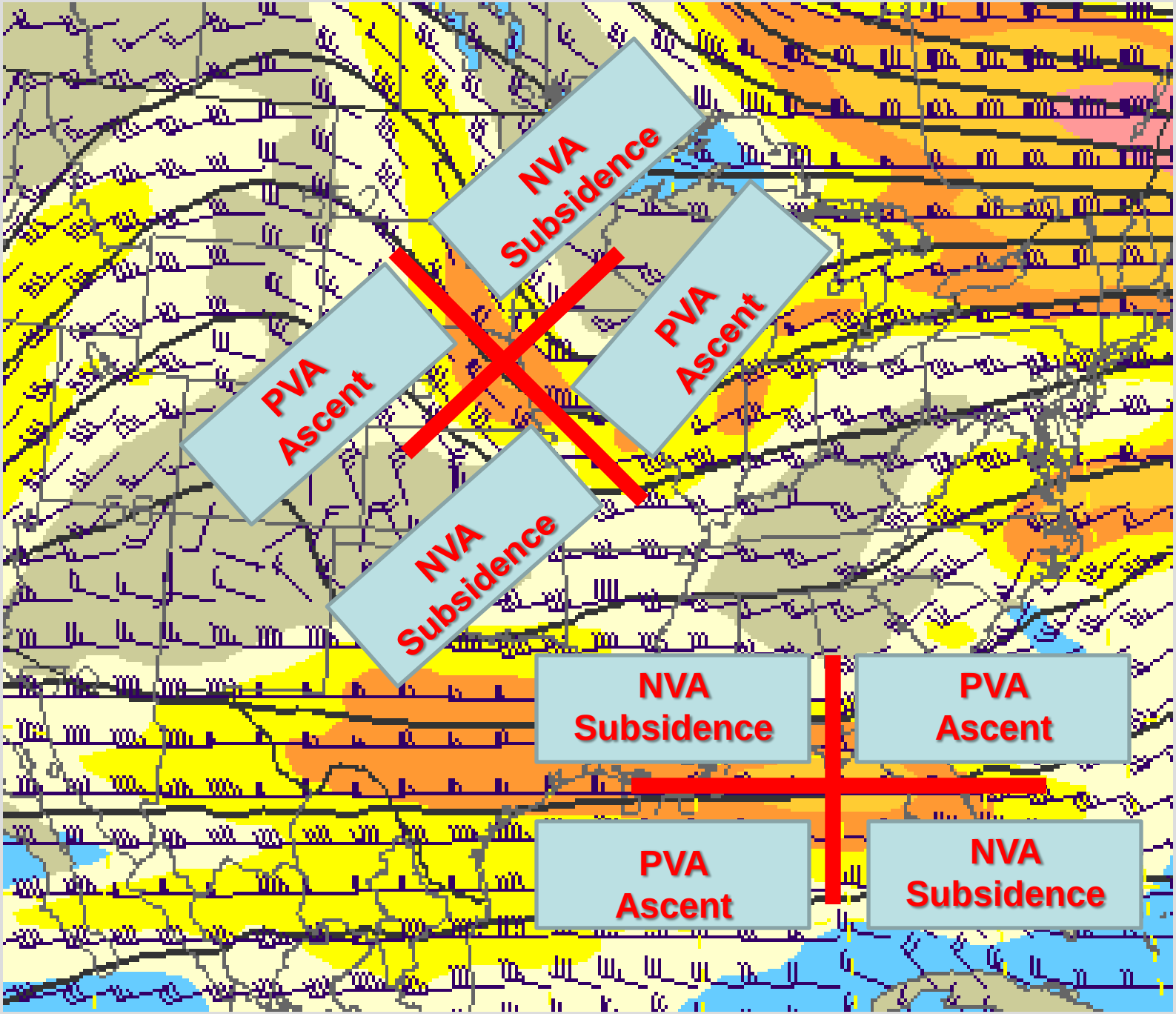
500 mb Heights (dm) / Isotachs (knots)



500 mb Heights (dm) / Abs. Vorticity (x10^{-5} s^{-1})




Jet Streak
Associated with Shortwave in
northern branch
Jet Streak in southern branch


NVA
Subsidence
PVA
Ascent
PVA
Ascent
NVA
Subsidence
NVA
Subsidence
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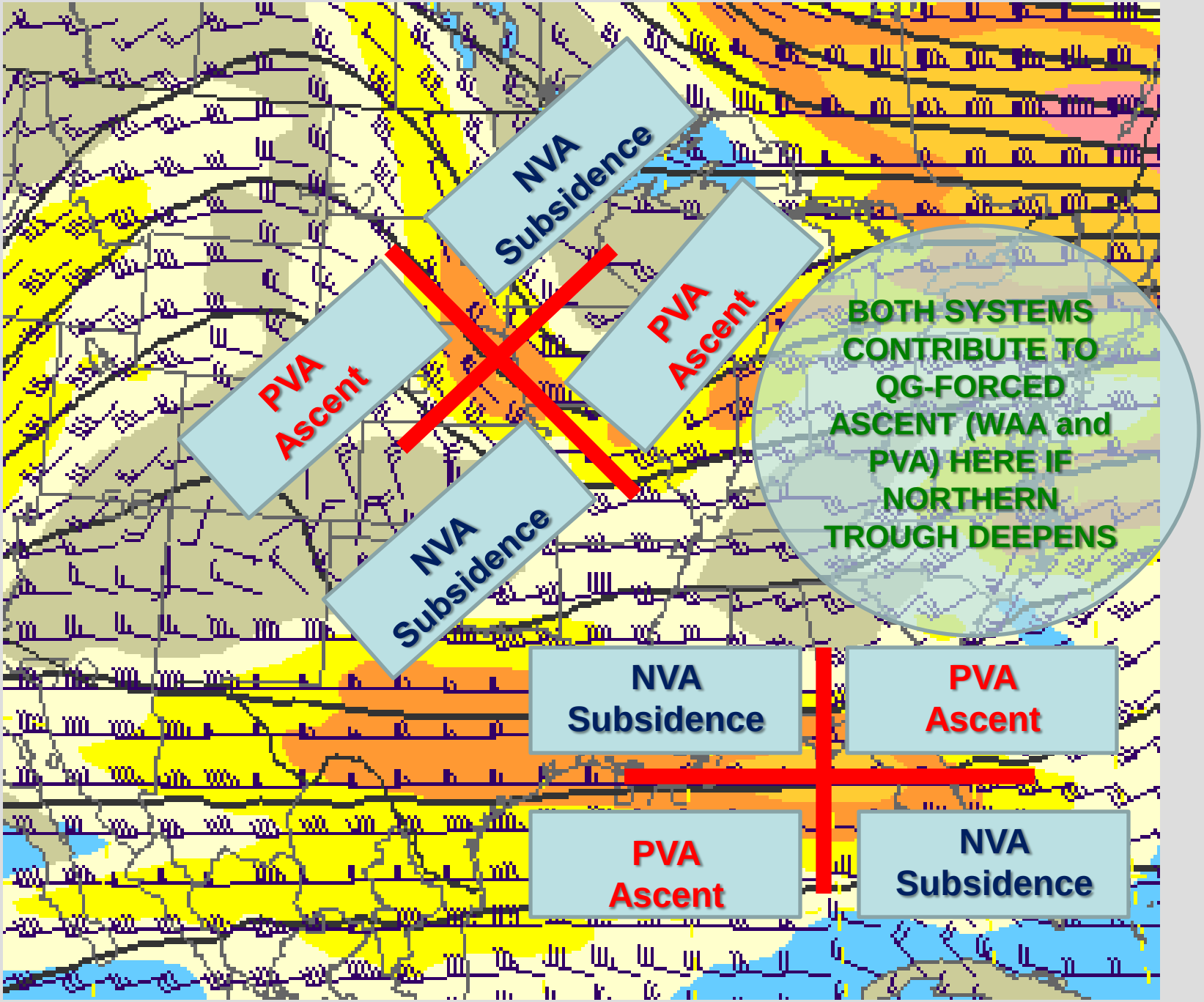
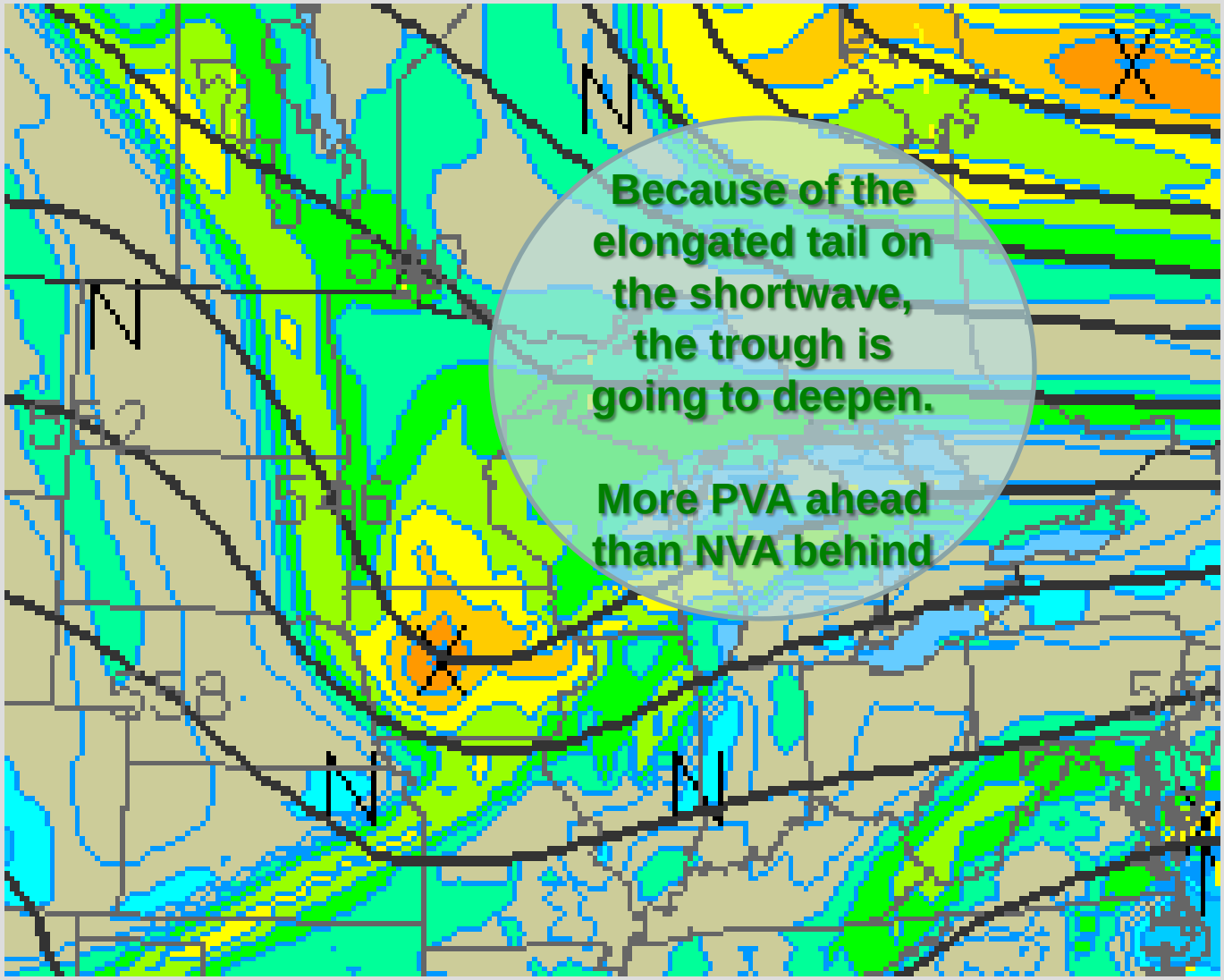
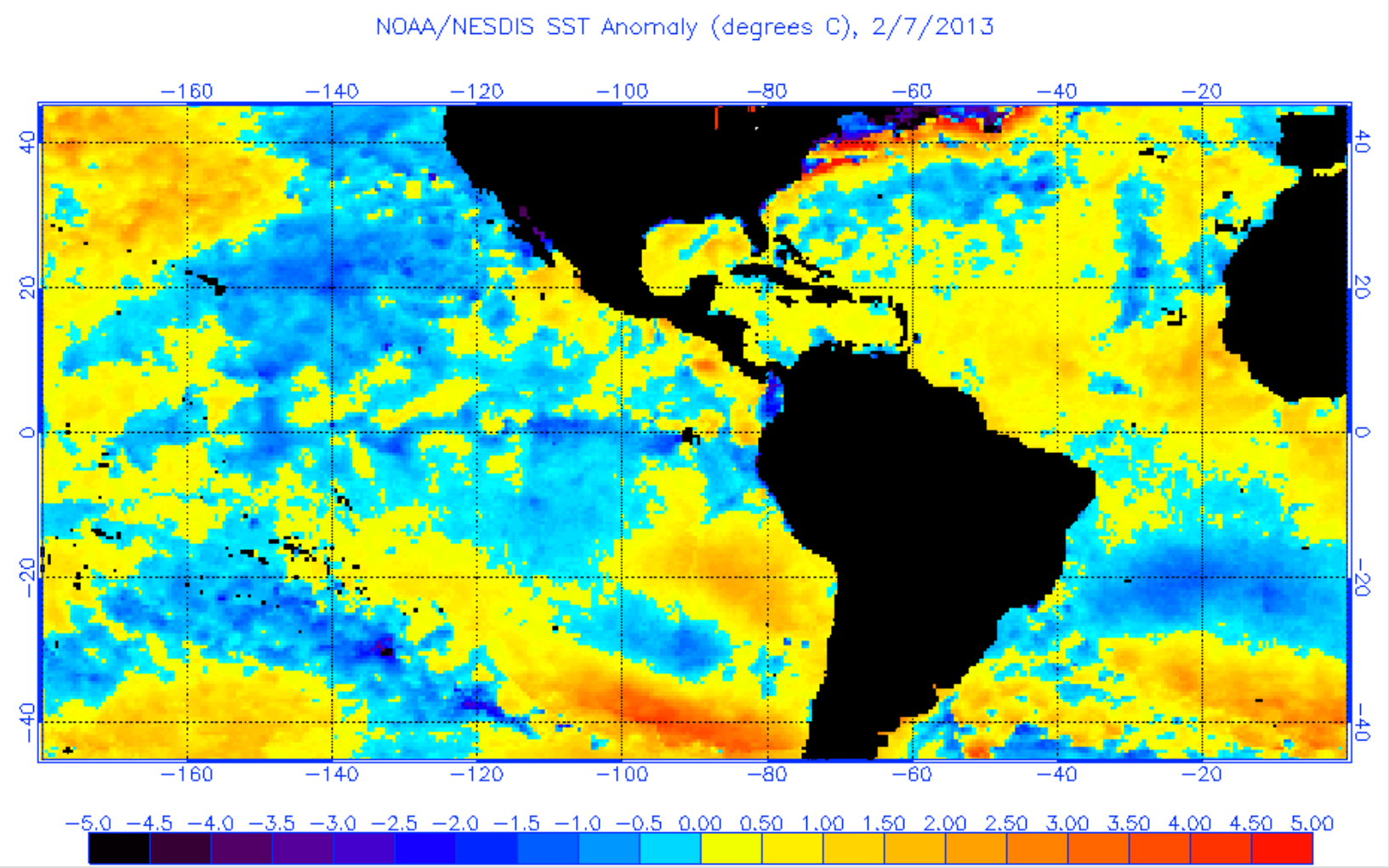
Ascent
PVA
Ascent
NVA
Subsidence

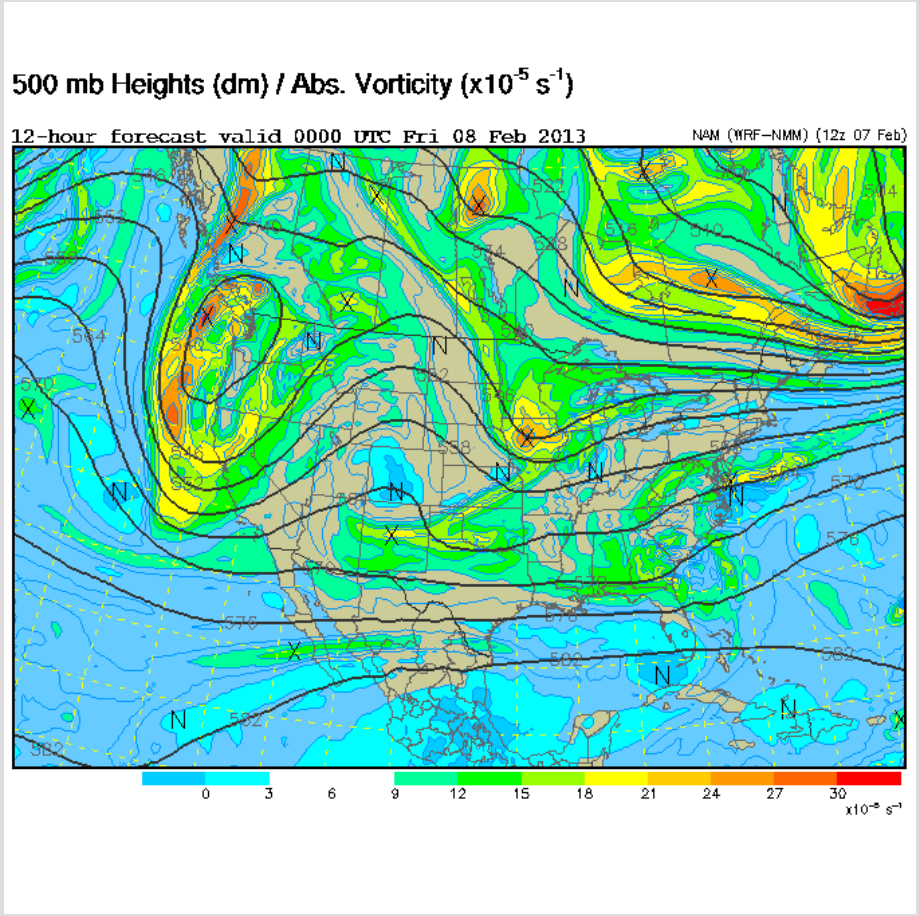

NVA Subsidence
PVA Ascent
PVA Ascent
NVA Subsidence
BOTH SYSTEMS CONTRIBUTE TO QG-FORCED ASCENT (WAA and PVA) HERE IF NORTHERN TROUGH DEEPENS
NVA Subsidence
PVA Ascent
PVA Ascent
NVA Subsidence

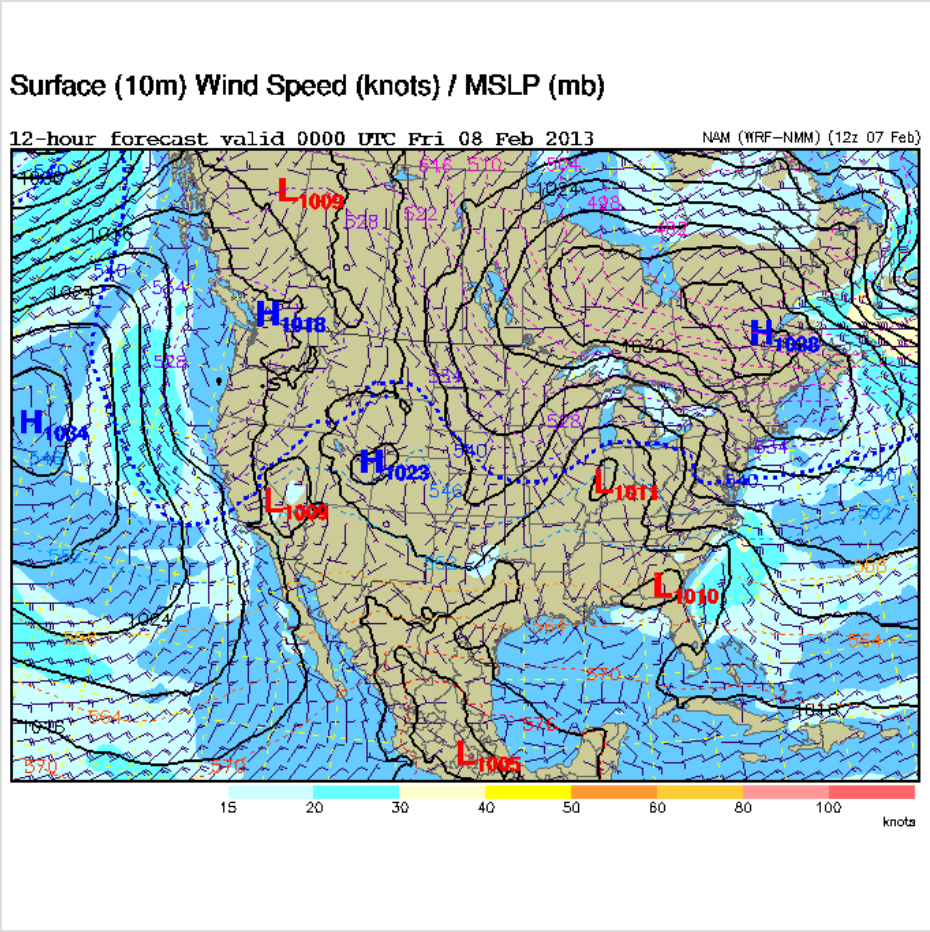

Because of the elongated tail on the shortwave, the trough is going to deepen.
More PVA ahead than NVA behind

Warm SST anomalies off the mid-Atlantic help provide diabatic heating contribution to ascent. Final contributing factor to explosive cyclogenesis

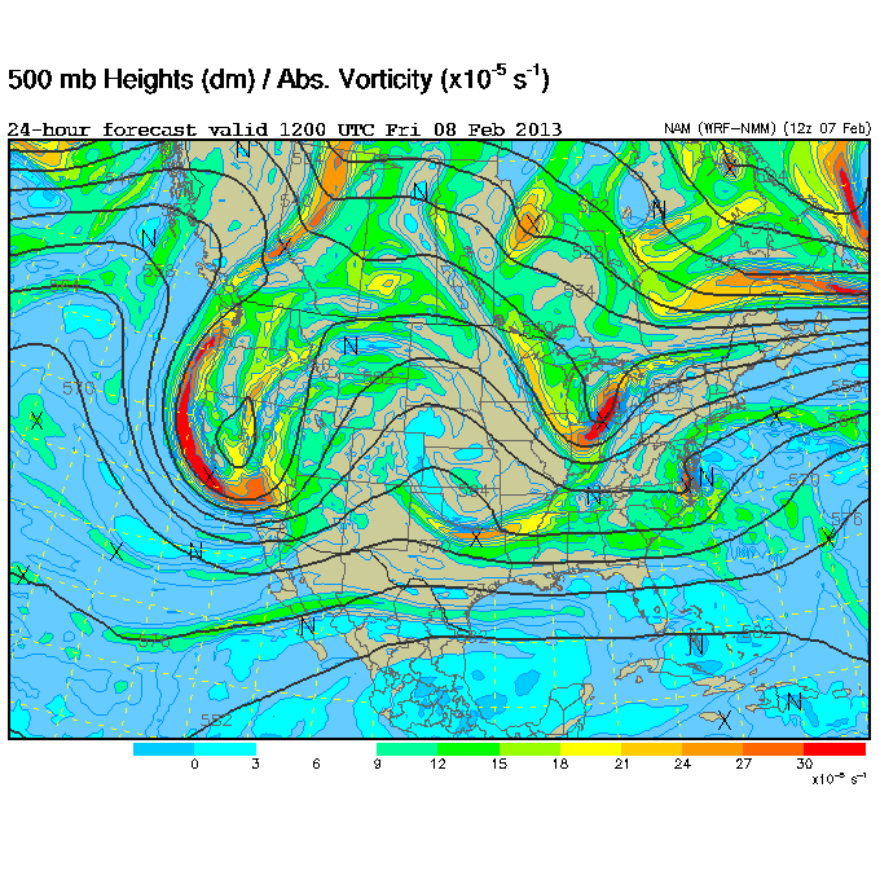


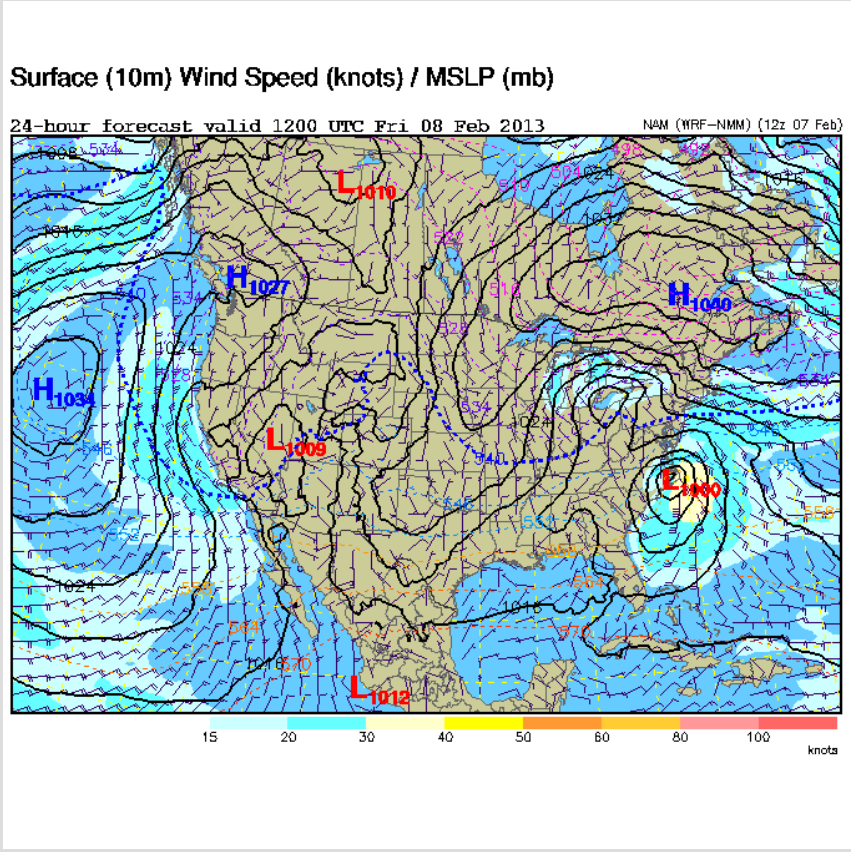
NAM Model Solution: 12 h



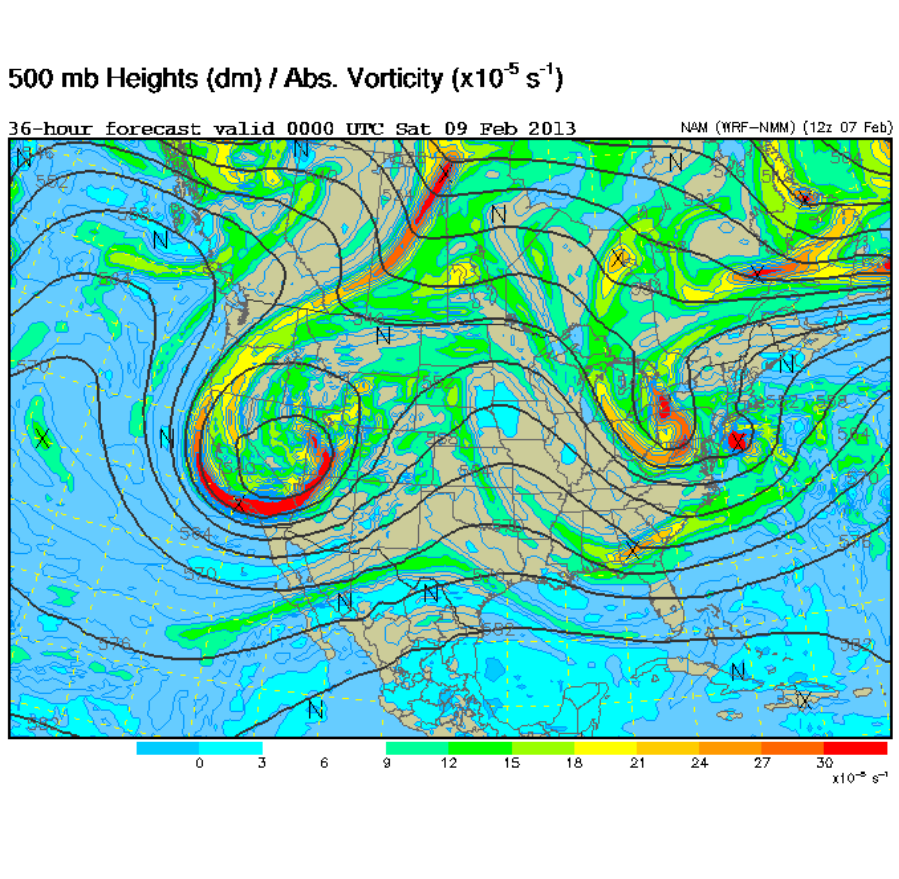


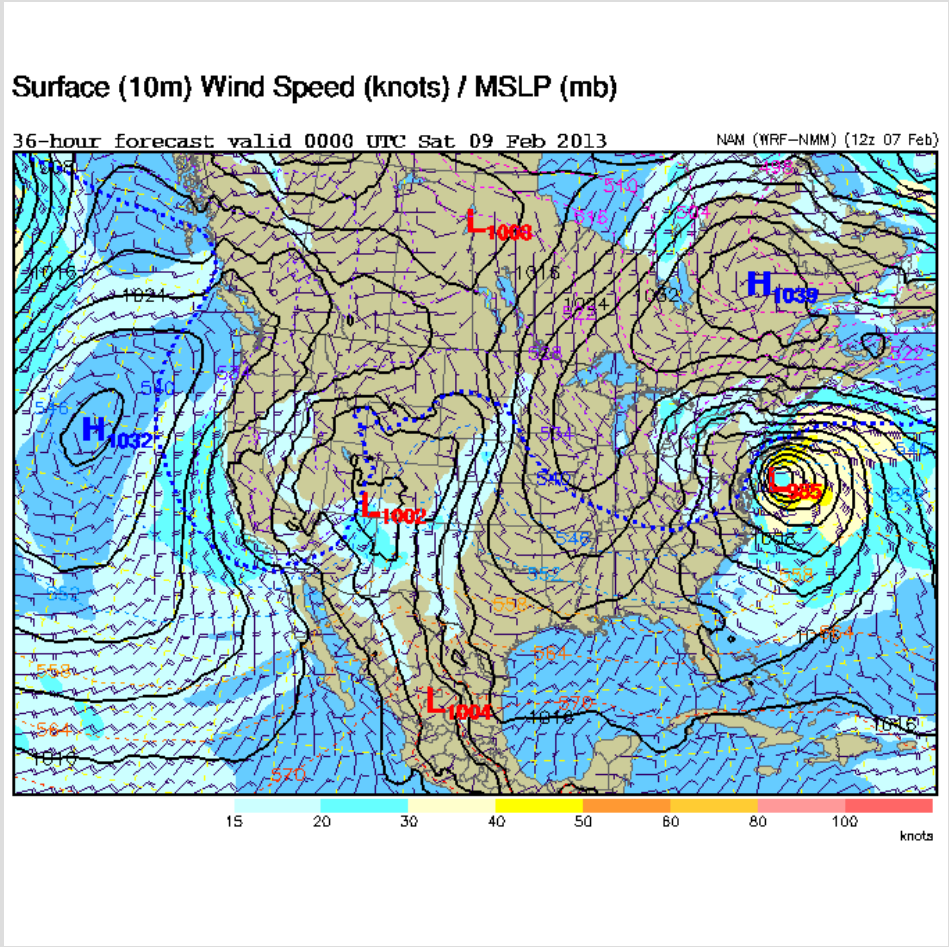
NAM Model Solution: 24h



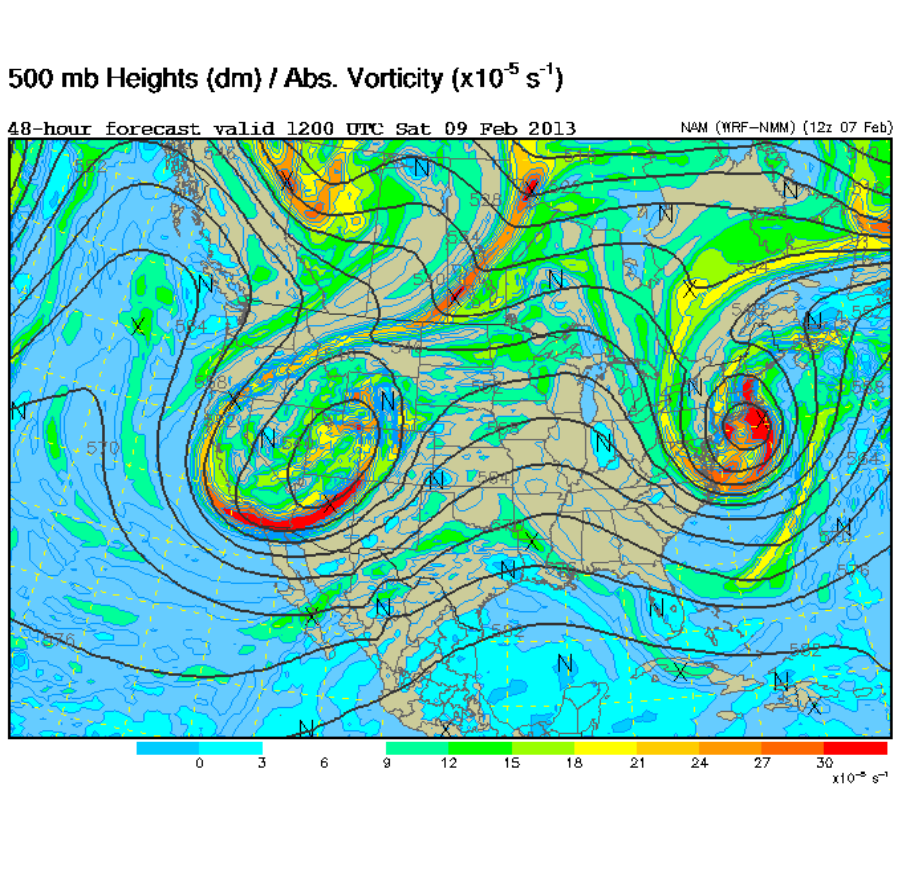


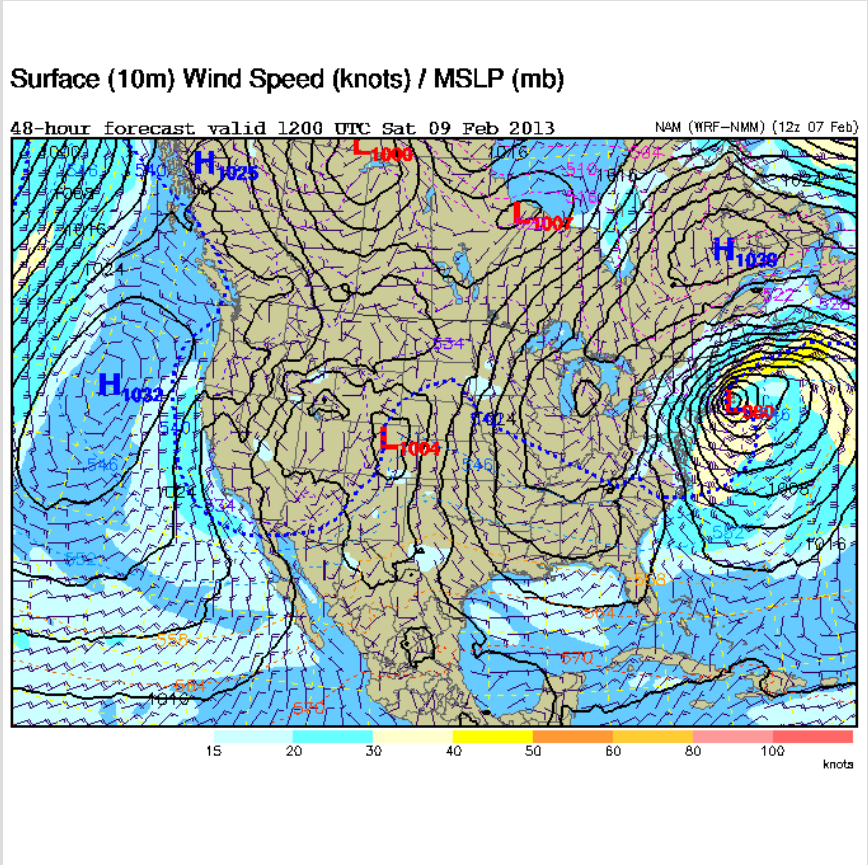
NAM Model Solution: 36h





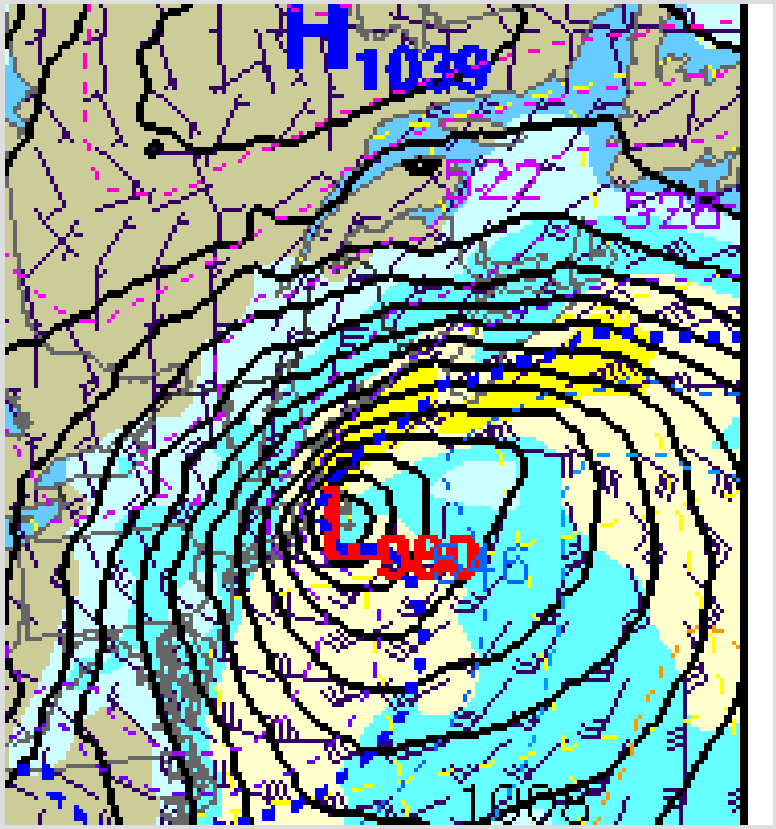
NAM Model Solution: 48h



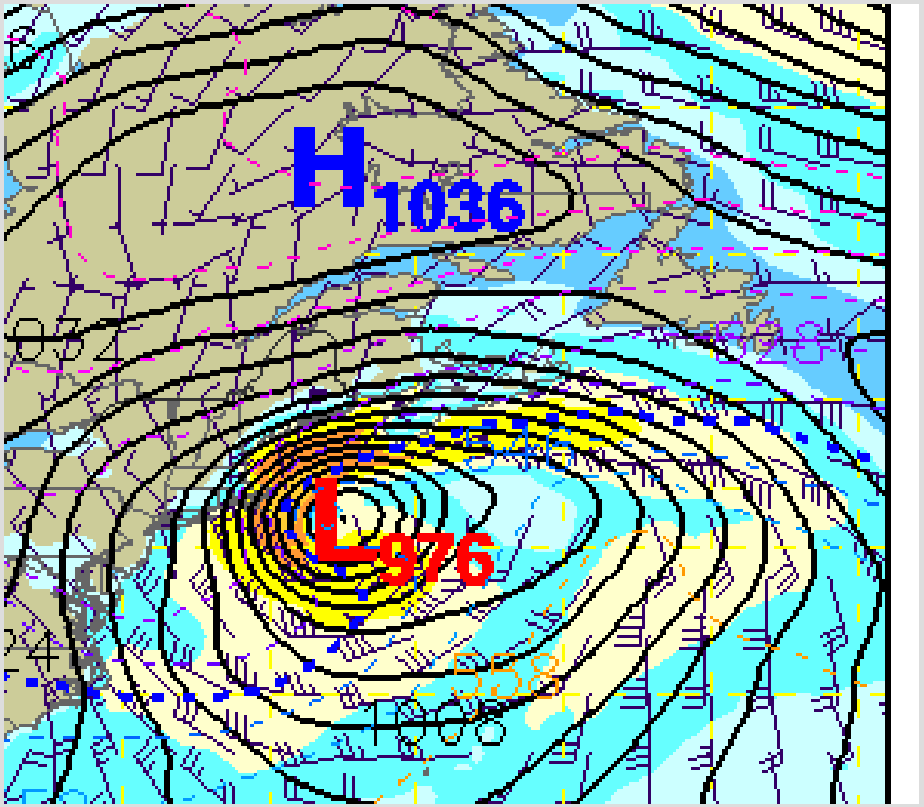


Variations in model solutions at 48h

WRF NAM

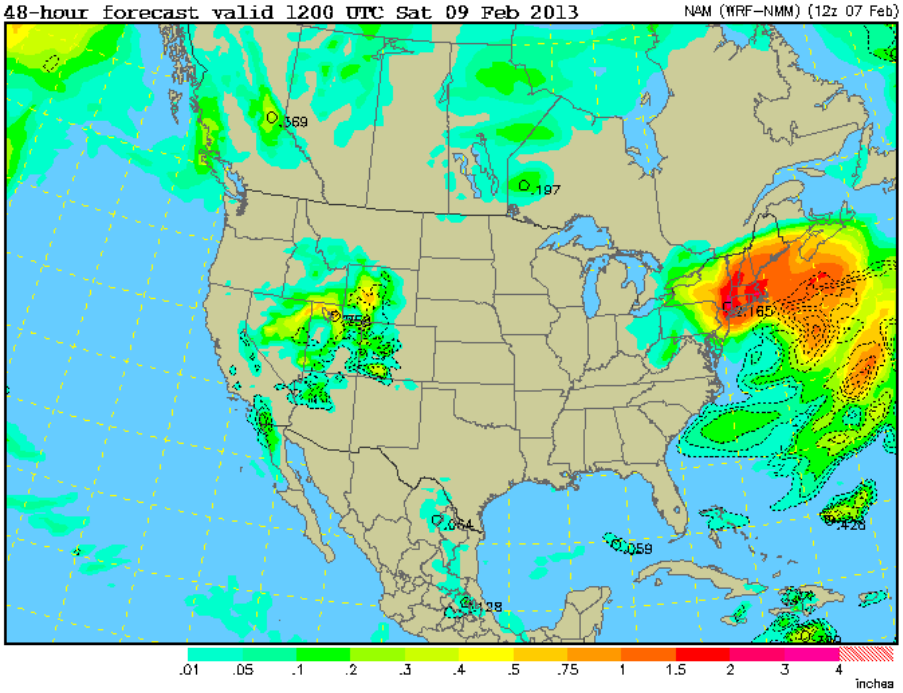


GFS

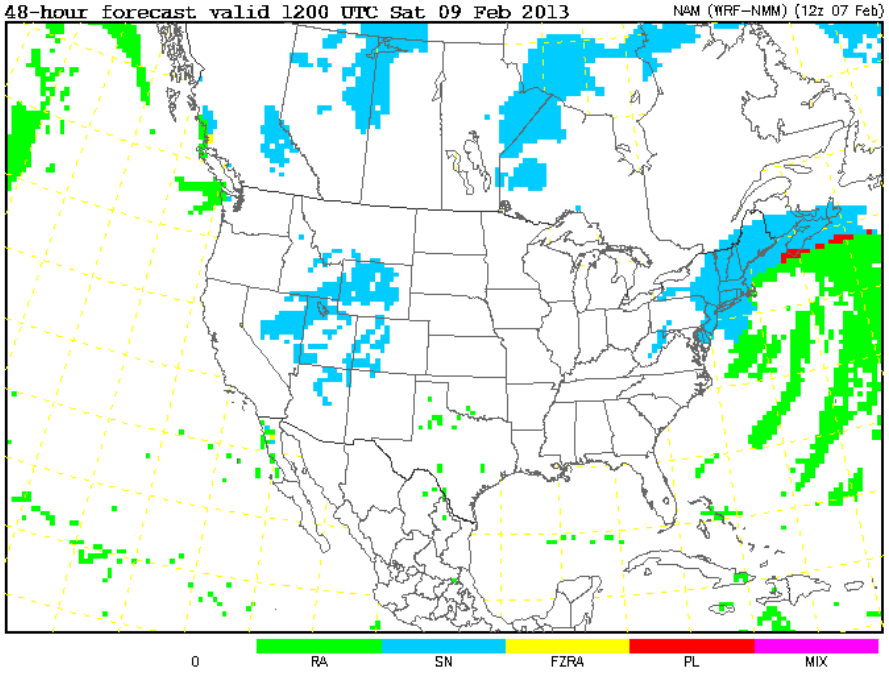


Basically, both models have similar track of surface low and intensity. So pretty confident that southern New England will be northwest of the low and in area for heavy snow and blizzard conditions. ECMWF about same as these too…

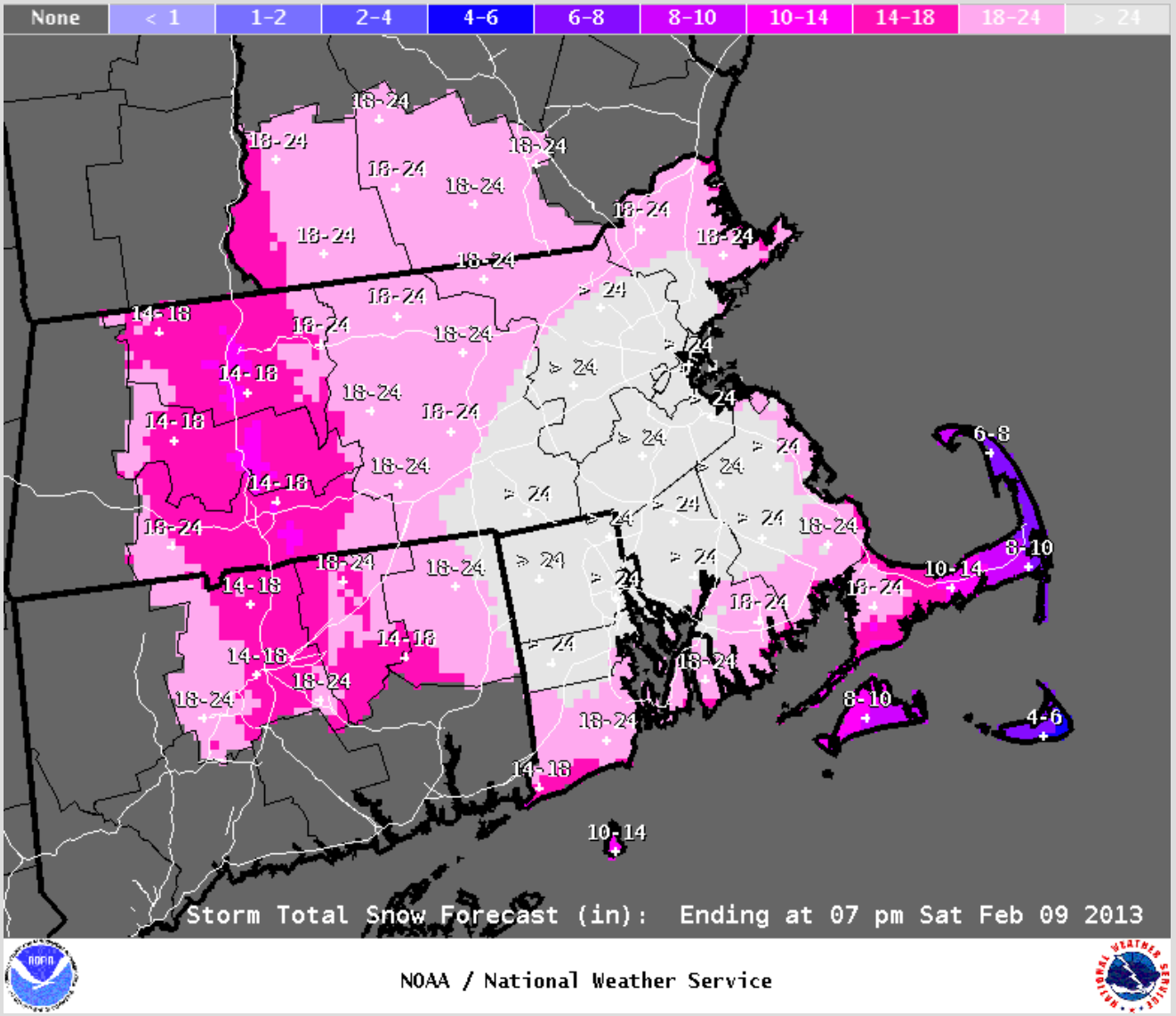
12-h accum precip (total-shaded; convect-dashed)



Precipitation Type



Snowfall forecast from Boston WSFO



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FXUS61 KBOX 072351
AFDBOX
AREA FORECAST DISCUSSION
NATIONAL WEATHER SERVICE TAUNTON MA
651 PM EST THU FEB 7 2013
.SYNOPSIS...
A HISTORIC WINTER STORM AND BLIZZARD IS ANTICIPATED FOR FRIDAY INTO SATURDAY...WITH AROUND 2 FEET OF SNOW POSSIBLE. THIS STORM SHOULD COME TO AN END LATER SATURDAY. DRY WEATHER RETURNS BY SUNDAY. A GREAT LAKES STORM WILL SWING A COLD FRONT THROUGH NEW ENGLAND ON MONDAY NIGHT...FOLLOWED BY DRY WEATHER TUESDAY.
&&
.NEAR TERM /UNTIL 6 AM FRIDAY MORNING/...
630 PM UPDATE...
1038 MB HIGH CENTERED OVER QUEBEC AND EXTENDS ACROSS NEW ENGLAND. PLENTY OF COLD DRY AIR WITH DEWPOINTS IN THE SINGLE NUMBERS ABOVE/BELOW ZERO. THE HIGH WILL SHIFT EAST A LITTLE OVERNIGHT...EXTENDING ALONG AN ARC FROM QUEBEC TO THE MARITIMES. THIS WILL BE A CLASSIC SETUP FOR THE WEATHER TO FOLLOW ON FRIDAY. THE COLD AIR WILL REMAIN OVER SOUTHERN NEW ENGLAND THROUGH THE NIGHT. CLOUDS HAVE MOVED ACROSS THE REGION AND WILL SLOWLY THICKEN AND LOWER THROUGH THE NIGHT AS WARM ADVECTION ALOFT INCREASES. ONLY SMALL AJUSTMENTS TO THE FORECAST TEMPS AND DEWPOINTS.

.SHORT TERM /6 AM FRIDAY MORNING THROUGH SATURDAY/...
HEADLINES /HIGH CONFIDENCE/...
* A POTENTIAL HISTORIC WINTER STORM/BLIZZARD WILL IMPACT SOUTHERN NEW ENGLAND FRIDAY INTO SATURDAY...WHICH WILL POSE THREATS TOWARDS LIFE AND PROPERTY.
* BLIZZARD WARNINGS IN EFFECT FOR ALL OF CT...RI...AND E/SE MA. WINTER STORM WARNINGS FOR ALL OTHER LOCALES.
* FOR THOSE AREAS WITHIN THE BLIZZARD WARNING...HIGH WIND WARNING CRITERIA IS INCLUSIVE. HIGH WINDS SHOULD BE ANTICIPATED WITH GUSTS OF AROUND 60 MPH.
* STORM SNOWFALL TOTALS BY STORMS END MAY BE IN THE ALL-TIME TOP 10 FOR VARIOUS CITIES...UP TO AROUND 2 TO 3 FEET POSSIBLE. BLOWING AND DRIFTING ANTICIPATED RESULTING IN DRIFTS UP TO AROUND 5 FEET.
* TRAVEL CONDITIONS WILL DETERIORATE QUICKLY THROUGH THE DAY FRIDAY...BECOMING NEARLY IMPOSSIBLE BY THE FRIDAY EVENING COMMUTE INTO SATURDAY.
*/MODEL CONSENSUS...
DETERMINISTIC MODEL SOLUTIONS ARE ALL IN FAIRLY GOOD AGREEMENT WITH THE CONSISTENT ECMWF. WILL LEAN WITH THE ECMWF CONSIDERING NOT ONLY THE LOCATION OF THE SURFACE LOW...BUT ALSO THE H85-7 LOW WITH REGARDS TO THE CONVEYOR BELT PROCESSES /WARM...COLD...DRY/. BOTH THE ECMWF/GFS LINE UP WELL WITH THE MID-LVL LOW WHEREAS THE NAM IS DISPLACED SLIGHTLY TO THE WEST.

*/SYNOPSIS...
SPLIT FLOW DISTURBANCES TRANSLATE INTO THE NORTHEASTERN CONUS DURING THE DAY FRIDAY...PHASING ACROSS THE S/E SHORELINES OF NEW ENGLAND AND OFFSHORE. THE NORTHERN STREAM IS USURPED INTO THE SOUTHERN STREAM DISTURBANCE INTO AN EXPLOSIVE DEEPENING SURFACE LOW OVER THE 40N/70W BENCHMARK. THE DEEPENING SYSTEM DRAWS DEEP MOIST FLOW FROM THE SOUTH PER STRONG /HURRICANE FORCE/ LOW-LVL FLOW. THE EXPECTATION IS FOR BLIZZARD CONDITIONS TO IMPACT MUCH OF EASTERN AND ALL OF SOUTHEASTERN NEW ENGLAND FRIDAY NIGHT INTO SATURDAY PRIOR TO THE STORM TAPERING OFF INTO SATURDAY NIGHT.
MESOSCALE DETAILS STILL REMAIN DIFFICULT TO PIN DOWN...BUT FEEL THE DETAILS BELOW CONVEY OUR BEST THINKING.
*/PRECIPITATION...
PRIOR TO THE PHASING AND BOMBING OF THE SURFACE LOW /DURING THE DAY FRIDAY/...ANTICIPATE WIDESPREAD AND LIGHT PRECIPITATION TO FALL ACROSS ALL OF SOUTHERN NEW ENGLAND MAINLY IN THE FORM OF LIGHT SNOW INCREASING IN INTENSITY INTO THE AFTERNOON HOURS. A MIX OF RAIN AND SNOW IS ANTICIPATED ACROSS THE S/SE COASTAL REGIONS OF NEW ENGLAND...WITH RAIN ACROSS THE MAJORITY OF THE CAPE AND NANTUCKET. AS THE LOW BOMBS TOWARDS THE 40N/70W BENCHMARK...ANTICIPATING THE LOW-MID LVL THERMAL FIELDS TO COLLAPSE...TIGHTENING WITH RESPECT TO THE SURFACE LOW. N/NE FLOW SHOULD DRAW DOWN COLD AIR ACROSS ALL OF SOUTHERN NEW ENGLAND AND OFFSHORE.
ANTICIPATING ANY AND ALL WET MIX TO CHANGE TO SNOW TOWARDS THE FRIDAY EVENING COMMUTE...THE INTENSITY OF WHICH WILL CONTINUE TO INCREASE DURING THIS TIME-FRAME. RAIN WILL CONTINUE TO LINGER ACROSS THE EASTERN CAPE AND NANTUCKET...GRADUALLY TRANSITIONING TO SNOW TOWARDS MIDNIGHT SATURDAY. COLDER AIR WILL CONTINUE TO DRAW SOUTH RESULTING IN SNOW ACROSS THE INTERIOR TOWARDS THE COAST BECOMING FLUFFIER.
MODERATE TO HEAVY SNOW WILL CONTINUE INTO MIDDAY SATURDAY... BECOMING LIGHTER INTO LATE MORNING HOURS SATURDAY...GRADUALLY TAPERING WEST TO EAST AS THE SURFACE LOW EXITS OUT INTO THE ATLANTIC INTO SATURDAY NIGHT.

*/SNOWFALL AMOUNTS...
SW-NE SNOW-BANDING IS ANTICIPATED ALONG AND PIVOTING WITH THE NW QUADRANT OF THE MID-LVL LOW COINCIDENT WITH FAVORABLE ISENTROPIC TROWALING OF THETAE...MID-LVL FRONTOGENESIS...AND DEEP-LAYER ENHANCED ASCENT.
IT IS WITHIN THESE REGIONS THAT 3 INCH/HR SNOWFALL RATES WILL BE QUITE POSSIBLE. BANDS MAY BE ONLY 5 TO 10 MILES IN WIDTH...AND WITH THE DYNAMICLY DEEP NATURE OF THE STORM IT IS NOT OUT OF THE QUESTION WE MAY SEE THUNDER-SNOW. BUT THE KEY IS THE LOCATION OF THE H85-7 LOW AS THE PLACEMENT OF WHICH AND THE ATTENDANT DYNAMICS WILL DETERMINE WHO SEES THE HEAVIEST OF SNOWS. THERE REMAINS AN UNCERTAINTY AS DETERMINISTIC SOLNS VARY TO SLIGHT DEGREES IN PLACEMENT OF THE H85-7 LOW.
ASIDE...WITH MORE FAVORABILITY TOWARDS THE ECMWF...A LOW-MID LVL BAND SETUP IS ANTICIPATED ACROSS SE NEW ENGLAND COINCIDENT WITH THE BETTER DEFORMATION ZONE OF THE LOW /PARALLEL AND LIKELY ALONG THE I-95 CORRIDOR BETWEEN BOSTON AND PROVIDENCE/. NO SURPRISE...AS CLIMATOLOGICALLY WITH A SURFACE LOW CROSSING OVER THE 40N/70W BENCHMARK THE HEAVIEST SNOWS ARE ORIENTED ALONG AND ACROSS THE I-95 CORRIDOR. WILL SET MY SIGHTS OF HEAVIEST SNOWFALL AMOUNTS IN THIS VICINITY.
A MORE MID-LVL BANDING SETUP APPEARS LIKELY FROM THE SOUTHERN HUDSON RIVER VALLEY ACROSS W MA TOWARDS THE SHORELINE OF MAINE.
A MAJORITY OF THE BANDING WILL OCCUR BEGINNING AROUND THE FRIDAY EVENING COMMUTE INTO SATURDAY MORNING.
WILL KEEP THE HEAVIEST SNOWS ACROSS E/SE NEW ENGLAND WITH THE EXPECTATION OF WHITE OUT CONDITIONS UNDER HIGH WIND CRITERIA. ANTICIPATING A LULL IN SNOW AMOUNTS ACROSS THE CONNECTICUT VALLEY BETWEEN THE TWO AFOREMENTIONED BANDING SIGNATURES. LESSER AMOUNTS OVER THE EASTERN CAPE AND TOWARDS THE ISLANDS DUE TO THE INITIAL MIXING WITH RAIN.
HAVE GONE WITH BLIZZARD WARNINGS FOR CT/RI AND E/SE MA EXCLUDING NANTUCKET. ALL OTHER LOCATIONS UNDER A WINTER STORM WARNING. WILL SET THE TIMING FROM FRIDAY MORNING INTO SATURDAY...WITH THE EXPECTATION OF THE WORST OF THE CONDITIONS FRIDAY NIGHT INTO SATURDAY.

*/WINDS...
STRONGEST WINDS CENTER AROUND FRIDAY NIGHT INTO SATURDAY OUT OF THE NORTH-NORTHEAST. RULES OF THUMB...HALVING THE H85 FLOW NETS AN ESTIMATE OF EXPECTED SURFACE WINDS OF AROUND 45 TO 50 MPH...WHILE AN EVALUATION OF THE SURFACE PRESSURE DIFFERENTIAL NETS AN ESTIMATE OF AROUND 60 MPH.
CONSIDERING LOCAL CASE STUDIES AND CLIMATOLOGY BASED ON PRESSURE DIFFERENTIALS AND H925/85 WINDS...WE WILL HIT HIGH WIND WARNING CRITERIA FOR A MAJORITY OF EASTERN AND ALL OF SOUTHEASTERN NEW ENGLAND.
CONSIDERING THE PROXIMITY OF THE SURFACE LOW...PRECIPITATION DRAG PROCESSES...AND A MOIST-ADIABATIC VERTICAL PROFILE UP TO H925 WHERE N/NE WINDS MAX UP TO AROUND 90 MPH...AM EXPECTING GUSTS AROUND 30 MPH FOR FAR NW MA...INCREASING SOUTH AND EAST WITH GUSTS ACROSS SE MA INCLUDING THE CAPE/ISLANDS AND ADJACENT WATERS OF AROUND 80 MPH.
CLIMATOLOGICALLY...BASED ON THE LOW PASSING OVER THE 40N/70W BENCH-MARK...THE STRONGEST WINDS ARE EXPECTED AROUND THE I-95 CORRIDOR SOUTHEASTWARD ACROSS THE CAPE/ISLANDS AND ADJACENT WATERS.
AS MENTIONED EARLIER...DRAW DOWN OF COLDER AIR WILL MAKE THE SNOW FLUFFIER IN NATURE. ANTICIPATING BLOWING AND DRIFTING SNOW RESULTING IN DRIFTS OF AROUND 5 FEET.
IN AREAS WHERE THE BLIZZARD WARNING IS IN EFFECT...THE GENERAL PUBLIC SHOULD BE AWARE THAT HIGH WIND CRITERIA ARE INCLUSIVE NOT REQUIRING THE ISSUANCE OF A HIGH WIND WARNING. THE GREATEST POTENTIAL OF HIGH WINDS WILL BE ACROSS E/SE MA INTO RI...THE STRONGEST ALONG THE IMMEDIATE SHORES.
HURRICANE FORCE WIND WARNINGS FOR THE OUTER WATERS...WITH STORM WARNINGS FOR THE INNER WATERS.