Dec. 8, 2008

Aviation Post Mortem for Lafayette 1-1-08

Or

TROWAL Terrorizes Tippy TAF

By John Kwiatkowski

Following is a listing of hourly visibilities and weather for the Lafayette airport from 10Z to 23Z January 1, 2008:

10Z	2 1/2SM	-SN BR
11Z	1 1/2SM	-SN BR
12Z	2 1/2SM	BR
13Z	2 1/2SM	-SN
14Z	1 1/4SM	-SN
15Z	1 SM	-SN
16Z	2SM	-SN
17Z	2SM	-SN
18Z	2SM	-SN
19Z	2 1/2SM	-SN
20Z	3/4SM	-SN
21Z	1SM	-SN
22Z	1 3/4SM	-SN
23Z	2 1/2SM	-SN

Ceilings for the entire period were MFVR. Winds were constantly from either 280 or 290 degrees with speeds of 10-20 knots. For most of the period there were gusts of 20-30 knots, but gusts were not reported at 13Z or 14Z.

Using AvnFPS climatology tools, I checked frequency of IFR visibilities in Lafayette in January. Given the wind is west-northwest, such visibilities occur only 8 percent of the time. For technical reasons, I could not directly use AvnFPS to get the chance of IFR visibilities for 13 hours continuously. However, I could get an **upper** bound for the chance of this. That upper bound was 0.5 percent.

I didn't have the guidance for this day, but the TAFs for 06Z and 12Z were much too optimistic, as shown below:

KLAF 010520Z 010606 29022G32KT 4SM -SN SCT007 OVC015
TEMPO 0608 1 1/2SM -SN BKN007 OVC015
FM0900 29020G30KT P6SM OVC015
FM1400 29018G28KT P6SM SCT015 OVC025
FM2100 30018G28KT 3SM -SN BKN015 OVC025
FM0200 31018G28KT 6SM -SN SCT015 OVC025
AMD LTD TO CLD VIS AND WIND TIL 14Z=

KLAF 011120Z 011212 28018G27KT 4SM -SN OVC015
TEMPO 1214 1 1/2SM -SN
FM1600 29018G28KT P6SM OVC015
FM2100 30018G28KT 3SM -SN BKN015 OVC025
FM0200 31018G28KT 6SM -SN SCT015 OVC025
FM0500 30015G25KT P6SM OVC015
AMD LTD TO CLD VIS AND WIND TIL 14Z=

Figures 1, 2, and 3 show NAM80 MSLP plots from the 06Z run January 1, 2008. (Initialization at 06Z, forecasts for 18Z and 24Z.) A low passes east of Indiana and cold west to northwest flow develops over the area.

As everybody with experience in this area knows, such a pattern normally brings long-lived MVFR ceilings with unrestricted visibilities. The exception is lower conditions may occur if lake effect snow develops. However the observed winds of 280 or 290 degrees do not give Lafayette a fetch off the Lakes.

So what caused persistent IFR visibilities? Close examination of Figures 1-3 indicates a fairly well defined trough (and high humidities) from upper New York State to northern Indiana through January 1. The size of the trough suggests there was synoptic scale forcing involved.

The argument for synoptic forcing is supported by Figures 4 and 5. There is a well defined TROWAL (yellow dashed line) from near the Michigan-Indiana border to northeast Ohio. The TROWAL indicated synoptic scale processes were occurring. (TROWAL effects could have been reinforced by lake effects.)

TROWALS have greatest impact downstream of their main axis—which is where the surface trough was. You can't draw firm conclusions from one case, but here is what I think happened:

In some ways this was a typical northwest surface flow situation. That is, a situation where you would expect MVFR ceilings and good visibilities after the surface low departed. If there was precipitation at all, it would be too light to affect visibility much. What made this case different was the TROWAL supporting a surface trough. The trough probably caused upward atmospheric motion in the Lafayette area. Cyclonic flow with the trough also meant air that crossed Lake Michigan could be deflected to arrive in Lafayette from 280 to 290 degrees. In that case, a wind direction that normally brought dry weather could be associated with lake effect.

Considering distances involved, Lafayette may not have been **strongly** affected by the TROWAL. But only weak TROWAL effects would explain the observations. Most of the time visibilities were 2 miles or more, so the snow was generally quite light—but still enough to cause IFR.

The moral is a TROWAL in the vicinity of a TAF site could have a big impact on aviation. Even a weak TROWAL or a TROWAL at some distance might still produce enough snow to cause a lot of IFR.

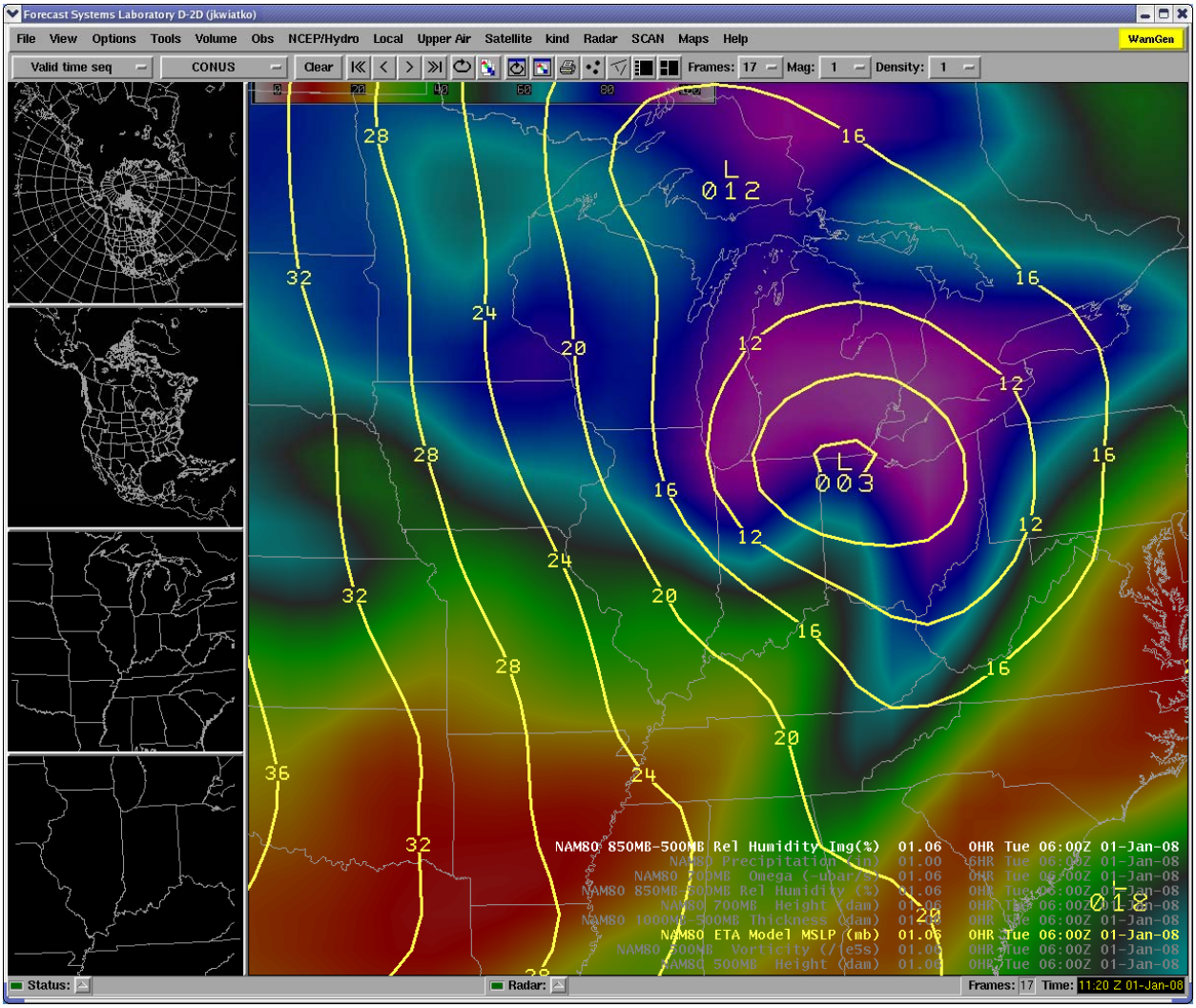
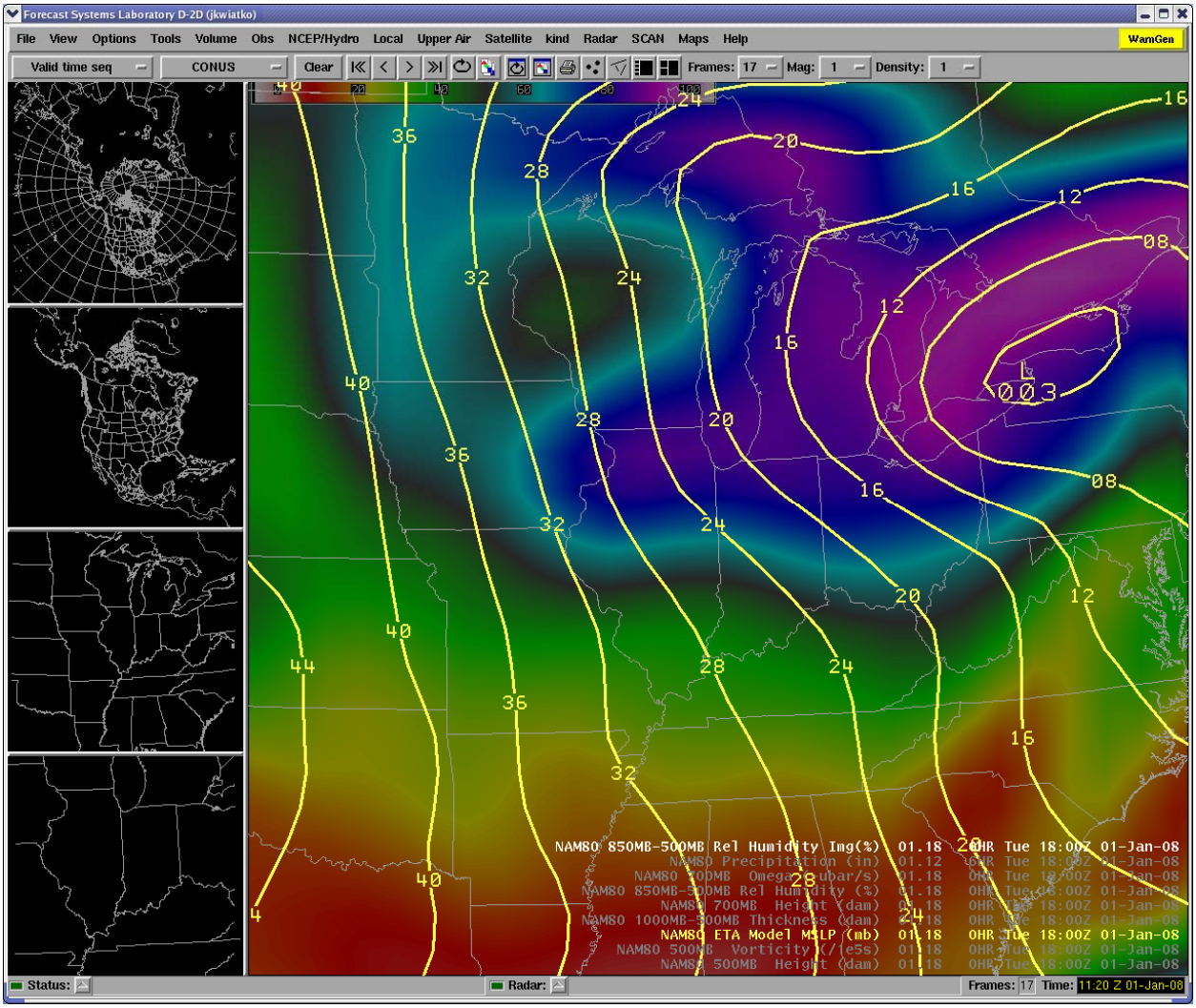

Forecast Systems Laboratory D-2D (jkwiatko)
File View Options Tools Volume Obs NCEP/Hydro Local Upper Air Satellite kind Radar SCAN Maps Help
WarnGen
Valid time seq
CONUS
Clear
Frames: 17
Mag: 1
Density: 1
L 012
L 003
NAM80 850MB-500MB Rel Humidity Img(%) 01.06 0HR Tue 06:00Z 01-Jan-08
NAM80 Precipitation (in) 01.00 6HR Tue 06:00Z 01-Jan-08
NAM80 700MB Omega (-ubar/s) 01.06 0HR Tue 06:00Z 01-Jan-08
NAM80 850MB-500MB Rel Humidity (%) 01.06 0HR Tue 06:00Z 01-Jan-08
NAM80 700MB Height (dam) 01.06 0HR Tue 06:00Z 01-Jan-08
NAM80 1000MB-500MB Thickness (dam) 01.06 0HR Tue 06:00Z 01-Jan-08
NAM80 ETA Model MSLP (mb) 01.06 0HR Tue 06:00Z 01-Jan-08
NAM80 500MB Vorticity (/(e5s) 01.06 0HR Tue 06:00Z 01-Jan-08
NAM80 500MB Height (dam) 01.06 0HR Tue 06:00Z 01-Jan-08
Status:
Radar:
Frames: 17 Time: 11:20 Z 01-Jan-08

Figure 1.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File View Options Tools Volume Obs NCEP/Hydro Local Upper Air Satellite kind Radar SCAN Maps Help
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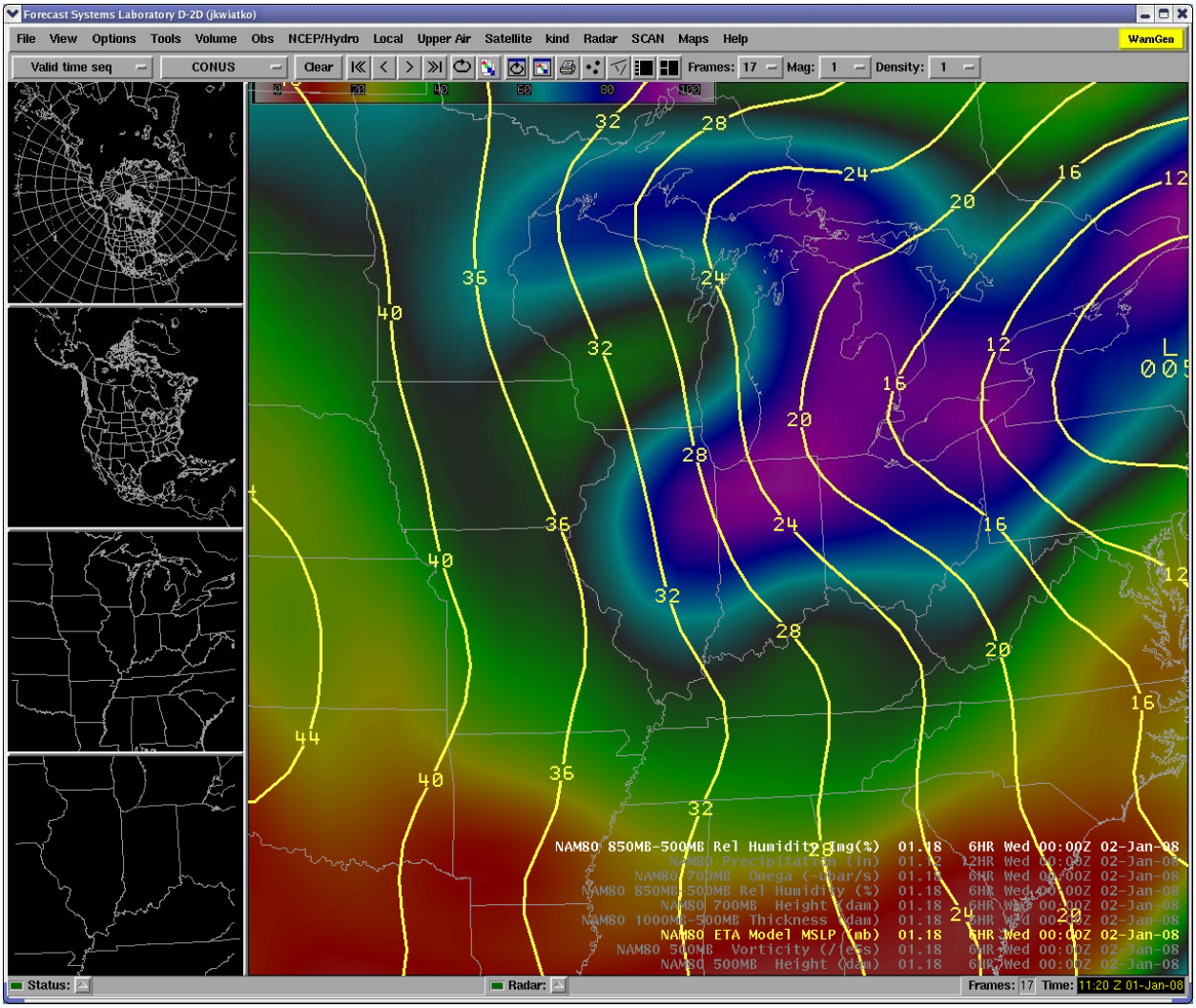
NAM80 500MB Height (dam) 01.18 0HR Tue 18:00Z 01-Jan-08
Status:
Radar:
Frames: 17 Time: 11:20 Z 01-Jan-08

Figure 2.


Forecast Systems Laboratory D-2D (jkwiatko)
File View Options Tools Volume Obs NCEP/Hydro Local Upper Air Satellite kind Radar SCAN Maps Help
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Frames: 17
Mag: 1
Density: 1
NAM80 850MB-500MB Rel Humidity (%) 01.18 6HR Wed 00:00Z 02-Jan-08
NAM80 Precipitation (in) 01.18 12HR Wed 00:00Z 02-Jan-08
NAM80 700MB Omega (-dPa/s) 01.18 6HR Wed 00:00Z 02-Jan-08
NAM80 850MB-500MB Rel Humidity (%) 01.18 6HR Wed 00:00Z 02-Jan-08
NAM80 700MB Height (dam) 01.18 6HR Wed 00:00Z 02-Jan-08
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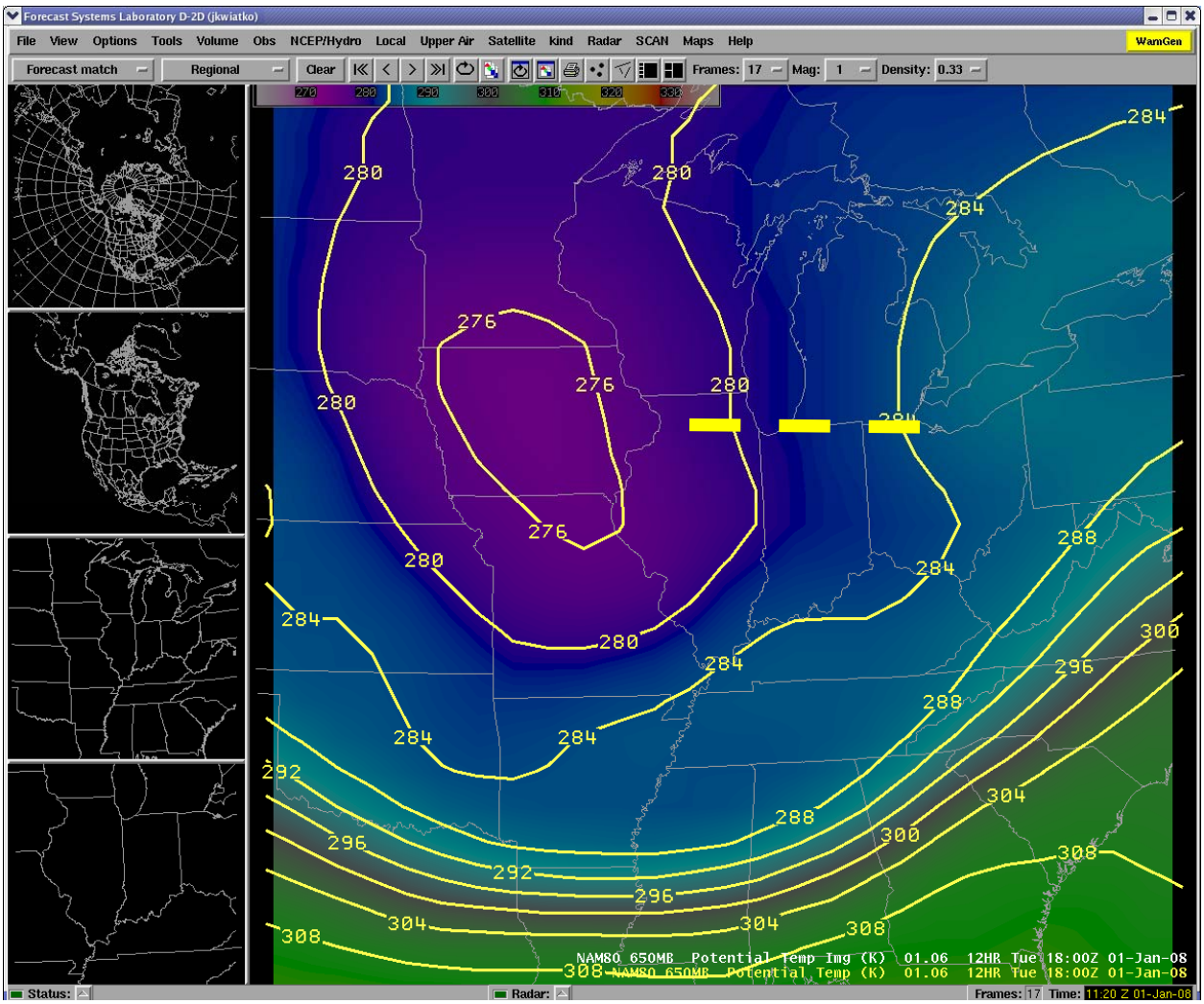
Radar:
Frames: 17
Time: 11:20 Z 01-Jan-08

Figure 3.


Forecast Systems Laboratory D-2D (jkwiatko)
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Forecast match
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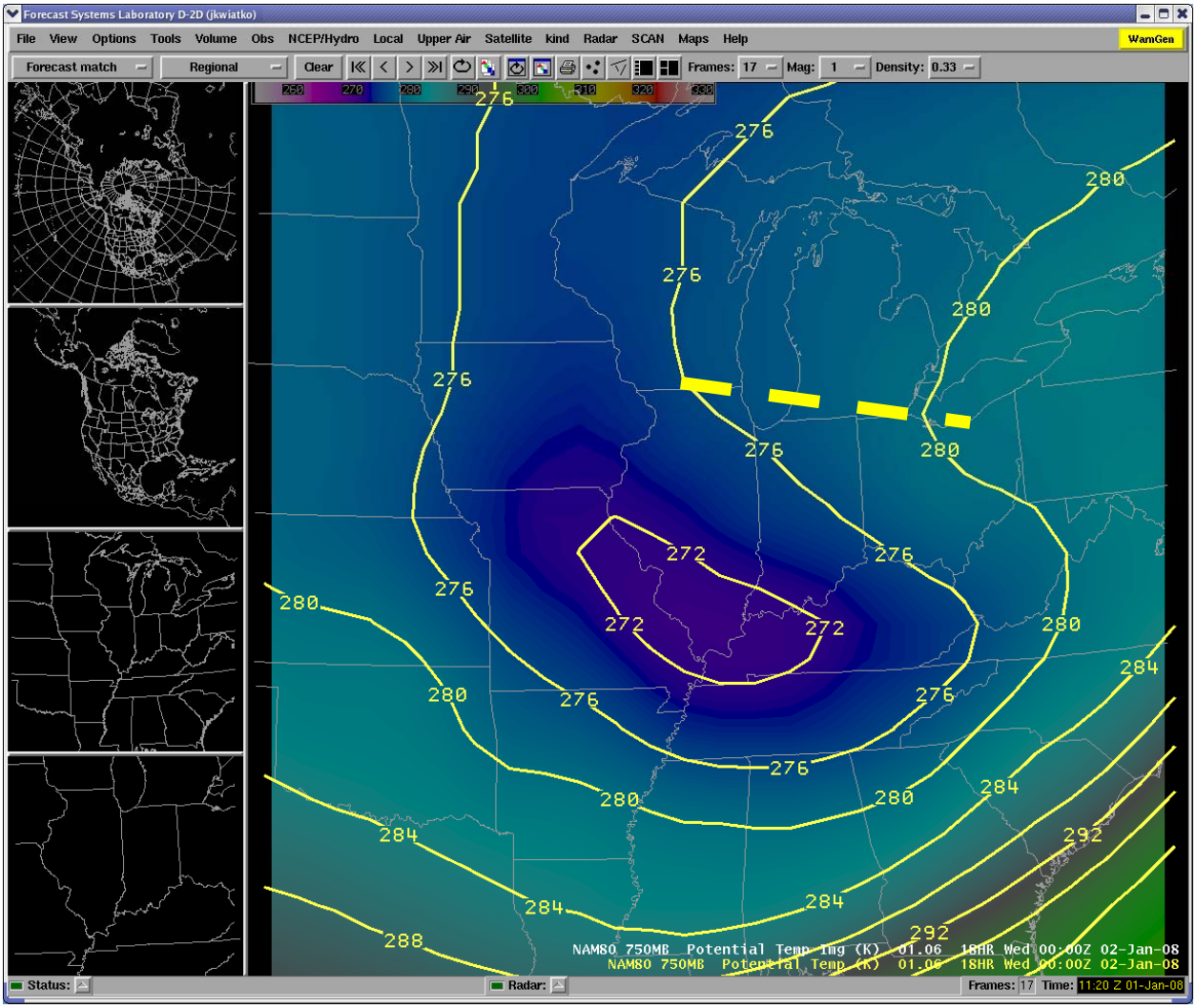
Mag: 1
Density: 0.33
NAM80 650MB Potential Temp Img (K) 01.06 12HR Tue 18:00Z 01-Jan-08
Status:
Radar:
Frames: 17
Time: 11:20 Z 01-Jan-08

Figure 4.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File View Options Tools Volume Obs NCEP/Hydro Local Upper Air Satellite kind Radar SCAN Maps Help
WarnGen
Forecast match
Regional
Clear
Frames: 17
Mag: 1
Density: 0.33
NAM80 750MB Potential Temp (K) 01.06 18HR Wed 00:00Z 02-Jan-08
Status:
Radar:
Frames: 17
Time: 11:20 Z 01-Jan-08

Figure 5.