

Post-Mortem Review of the 15 February 2004 Snow Event
by
Bill Schaub, June 2004

Contributing authors:
Tom Bradshaw, Brian Carcione, Steve Shumway, and Kurt Weber

1. Introduction

During the early morning hours of Sunday, 15 February 2004, a relatively narrow swath of heavy snow developed rapidly over parts of northeast Mississippi, southern Tennessee, and parts of far northern Alabama near the Tennessee border. The band remained intense for several hours as it expanded east-northeastward across southern Tennessee. The heaviest snow of nearly a foot fell in parts of southern middle Tennessee. Figures 1 and 2 on the next page show the swath of heavy snow and track of the upper low, respectively.

Leading up to the event, the GFS model was the coldest and indicated that the upper low would arrive over southern Alabama early on 15 February, with a vertical temperature profile below freezing over the Huntsville county warning area. In contrast, the ETA model indicated that the upper low would arrive over the Birmingham area at the same time, and that it would be warmer over northern Alabama. Both models consistently gave a QPF of 0.25 to 0.50 inch for the 15th.

The GFS was the model preferred by the HPC from the start. Their initial conference call and outlook, issued on 13 February, called for 2-4 inches in our area, as well as in parts of the Birmingham, Jackson, Memphis, and Nashville areas. This influenced all of our forecasts at the outset. We leaned toward the GFS model, but tempered its forecast with a realization that the ETA solution could also be correct. Our initial outlook indicated the potential for 1 to 2 inches of snow over our whole area, and changes to this as the event unfolded did not exceed that range of snowfall.

After the event, Tom suggested that frontogenetic forcing was responsible for the rapid development and intensity of the snow band. This mesoscale process was not handled well by the models, although the ETA did hint at it by showing a banded structure in its QPF. More study and training are needed so that the Huntsville forecasting staff will have a better idea of what to look for next time a similar weather pattern presents itself.

This review will include a timeline of events leading up to the snow, along with comments from people who worked the shifts prior to and during the snowstorm. There will be discussion of operational efficiency, lessons learned, and areas that could use improvement.

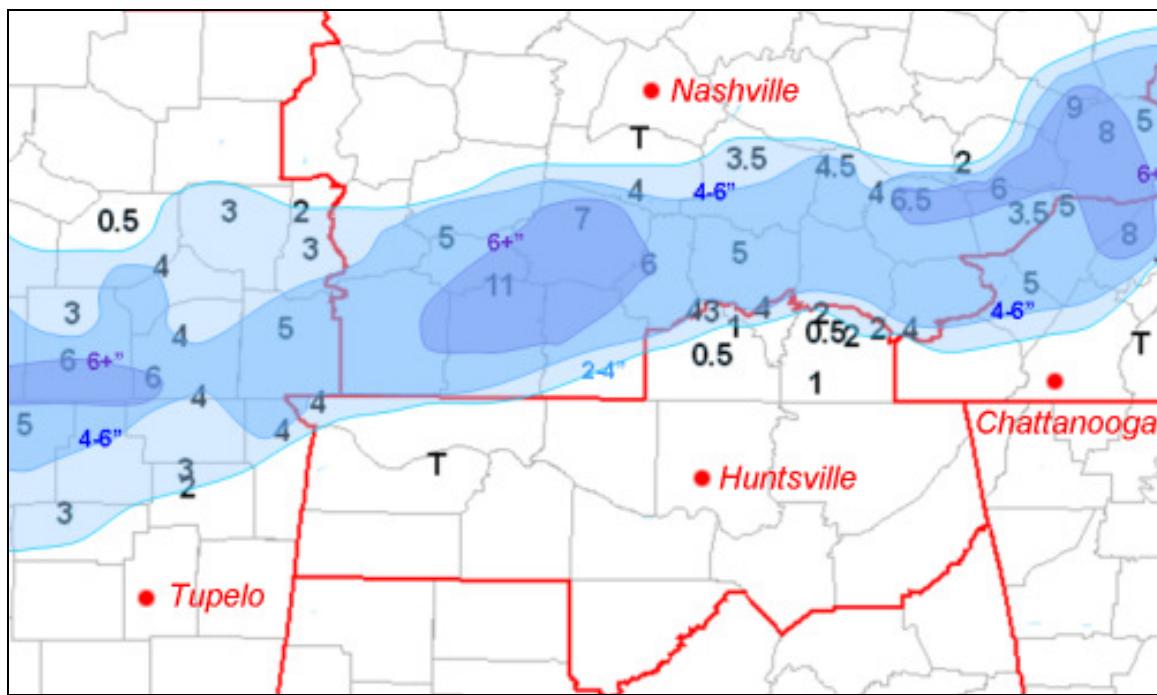


Fig. 1. Swath of maximum snow depths from the heavy snowstorm of 15 Feb 2004.
Courtesy of Brian Carcione.

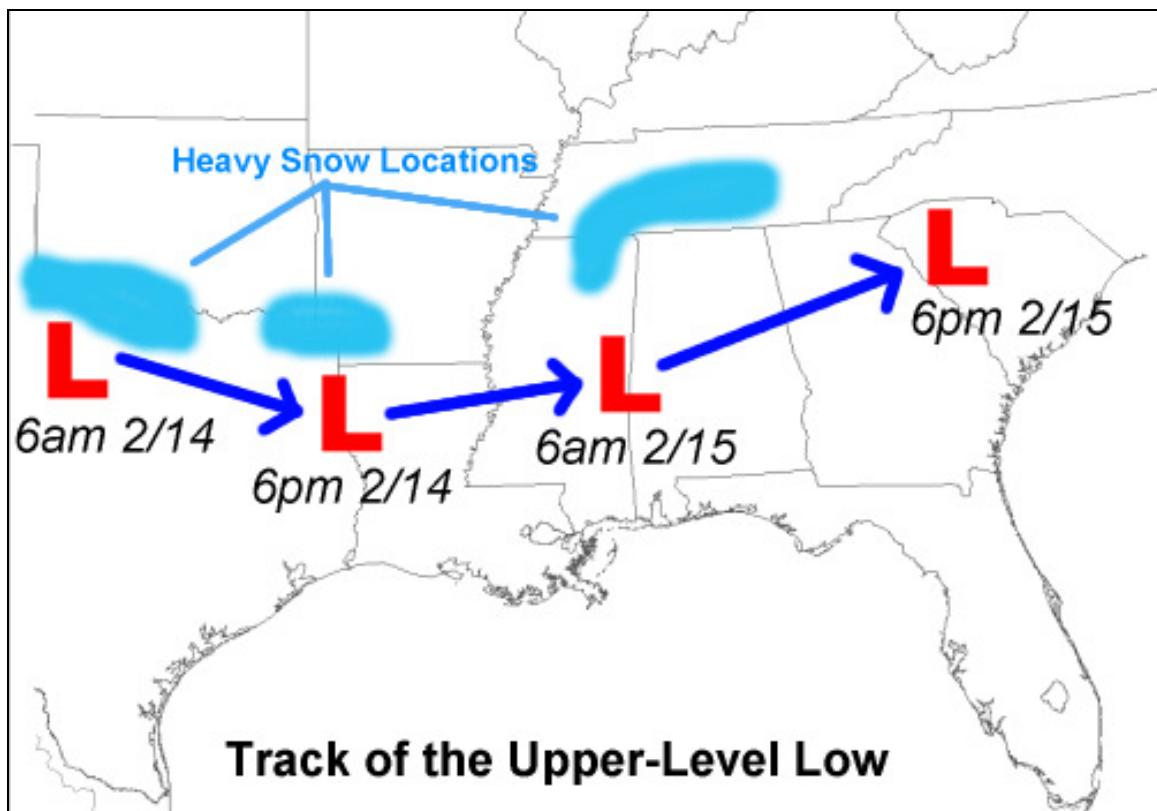


Fig. 2. Upper low track - heavy snowstorm of 15 Feb 2004. Courtesy of Brian Carcione.

2. Days Prior to Feb 15th

a. Friday, Feb 13th day shift

The 12Z runs of the NGM, ETA, and GFS depicted a split upper flow over the western states with a cutoff low over the southwest. The cutoff low was forecasted to be over the central border area of Mississippi and Alabama by 12z on Feb 15th. A quick look at the 1,000- to 850-mb thickness values showed that all three models indicated snow was possible in northwest Alabama, starting in the late Feb 14th or early Feb 15th time frame. This was a little more definite than the rain and snow mixed scenario that the 13/00Z runs indicated. The ETA QPF for the Huntsville CWA was 0.25 to 0.50 inch. The ETA model, however, remained relatively warm compared to the others.

A Winter Weather Experiment (WWE) conference call was organized. The call started at 1230 pm with HPC, MEM, JAN and HUN on the line. The HPC moderator expressed confidence in the GFS model, since this one usually does a better job with southern stream cutoff lows. His graphic placed most of the Huntsville CWA in a 2- to 4-inch snow area for Sunday, Feb 15th.

Following the WWE conference call, the office conducted a 800MHz briefing which took place around 2 pm. The forecasters then collaborated on how much snow might occur. It was decided to go with a Winter Weather Outlook (SPS). It was drafted and issued around 330 pm. The thrust of the SPS was that the potential existed for 1 to 2 inches of snow. It was also emphasized that a great deal of uncertainty still existed, and that due to relatively warm surface temperatures, any snow accumulation would be mainly on grassy and elevated surfaces.

b. Friday, Feb 13th evening shift

No changes were made to the outlook or forecasts for the 15th on this shift.

c. Saturday, Feb 14th midnight shift

Forecasters did not have a WWE conference call on this shift. They stayed with the GFS model. The ETA model was still showing warmer low-level temperatures, and its 1000- to 850-mb thickness values for the 15th were warmer than those in the GFS model. The original estimates of 1 to 2 inches of snow Sunday, mainly on grassy and elevated surfaces, looked reasonable.

d. Saturday, Feb 14th day shift

An 800 MHz briefing was conducted at 11 am, and EMA officials were briefed at times throughout the day. A WWE conference call halfway through the shift indicated an HPC forecast of 1 to 2 inches of snow for us on Sunday. This was down considerably from their forecast 24 hours earlier. The HPC and surrounding offices were still inclined to stay with the GFS forecast.

Forecasters noted that the 14/12Z GFS and ETA model runs were still different. The ETA forecasted the upper low to be over Birmingham Sunday morning, with a much warmer boundary layer profile over our area. In contrast, the GFS placed the low over the Montgomery area with an entirely subfreezing vertical profile over our area.

The team decided that either solution was possible, but that the GFS might have a cold bias. For accumulating snow to occur in the ETA scenario, the precipitation would have to be fast and heavy enough to cool down the boundary layer. This in turn depended on the location of the upper low. Since neither solution could be entirely ruled out, and in consideration of continuity, a compromise snow forecast was made. An SPS and the afternoon zone forecasts mentioned accumulating snow around an inch across most of our area, with 1 to 2 inches possible in the Tennessee counties.

A final note...the 14/18Z Mesoeta model showed a banded structure in its QPF, and placed the band over southern middle Tennessee Sunday. Forecasters thought that Nashville might have more to worry about than us.

e. Saturday, Feb 14th evening shift

During the shift change briefing from the day shift, a day shift forecaster described the continued differences in the models and the rationale for the forecast. He added that, depending on what the 15/00Z runs show, we might want to decrease or increase the snowfall forecasts.

Since the current SPS and zones already had snow amounts in them, and our area was bounded to the west and north with winter weather advisories, there was a lot of inertia to overcome regarding a decrease in the forecast. Actually, with advisory criteria snow amounts and high probabilities of precipitation in the zones for the 15th, an advisory was implied.

This shift was faced with three options: dropping the snow forecast, sticking with persistence, or increasing the snow forecast. The initial thinking was to formalize the current forecast by issuing a snow advisory, unless later data indicated otherwise.

A surface analysis at 15/00Z showed a relatively small, kidney bean-shaped area of snow, with temperatures in the lower 30s, over the area where Oklahoma, Arkansas, Louisiana and Texas share borders. The 500-mb chart for the same time showed the upper low over northwest Louisiana with a -24°C core. The current height falls, and continuity from the 14/12Z 500-mb chart suggested a track toward the east-southeast to over southern Alabama by 15/12Z.

A surface chart at 15/02Z showed that the snow area had grown and expanded 30 to 40 miles farther east while maintaining the same shape. Mental extrapolation showed that the snow area could indeed reach northwest Alabama around daybreak Sunday. This reinforced the idea of issuing a snow advisory.

As the 15/00Z ETA model data arrived, it was soon obvious that it continued to be on the warm side for 15/12Z. It was puzzling that it had initialized with a 1000- to 850-mb thickness of less than 1300 m exactly over the snow area at 15/00Z, yet showed that same thickness above 1300 m over northwest Alabama by 15/12Z. It was counter-intuitive to what was happening at the present. It also showed that the upper low would be over the Birmingham area by 15/12Z, which implied more of an east-northeast track compared to the 500-mb low track trends noted above.

It was decided to issue a snow advisory that matched the wording in the SPS and zones. A page was sent to all EMAs around 930 pm to inform them of the advisory. When the snow advisory was issued, it failed to go to CRS from the NWR browser. Subsequent problems that developed with CRS will be discussed more in section 3.

f. Sunday, Feb 15th midnight shift

The shift change briefing emphasized the snow area to the west that was making steady progress eastward, as well as the persistent differences in the ETA and GFS models.

One forecaster said that he still leaned more toward the GFS solution than the ETA. It seemed logical to him that the snow to the west was on a track for our area. Also, with Sunday morning lows expected to be in the mid to upper 30s, snow accumulations of 1 to 2 inches at the most were reasonable, unless the snow were to fall at a very fast rate due to the strength of the upper low.

During the first part of the shift, a forecaster noted that Memphis came close to canceling their snow advisory because the snow appeared to let up for a while. They changed their mind when snow was reported around 230 am in northern Mississippi.

When it came time to update our snow advisory before 4 am, it was decided to downplay the advisory a bit by mentioning around an inch of snow accumulation possible for the whole area. This was based mostly on observations which indicated light snow. Also, most of the snow was to the west and north of our area, and local Mesoeta forecast soundings were looking warm.

The other forecaster mentioned that snow started in northwest Alabama around 6 am, with the surface low located in the Birmingham area and moving northeast. He surmised that the position and track of the surface low ultimately influenced the fall of snow mostly to the west and north of our area.

g. Sunday, Feb 15th day shift

It was already snowing along the northeast Mississippi and northwest Alabama border when the day shift began to arrive. A short time later, news came from Memphis that

several inches of snow had fallen in northeast Mississippi and western Tennessee. Power lines were down and roads were closed in places.

A forecaster contacted the Lauderdale county EMA, who reported that snow was accumulating fast along the Mississippi and Tennessee state lines. It was also learned that around an inch of snow was on the ground in far northwest Alabama, and 2 to 4 inches were on the ground along the Tennessee line there. Also, by now nearly every reporting station in our area of responsibility was reporting at least a rain and snow mix. Based on all of this, the team decided to update the Winter Weather Advisory for 1 to 2 inches of snow accumulation in northwest Alabama and southern middle Tennessee, while keeping the 1-inch amounts for the rest of the area.

An 800 MHz briefing was conducted at 9 am, and the team worked hard to provide short-term forecasts and updates as the storm evolved. As the rest of the morning progressed, it became obvious that most of the wintry precipitation had moved into Tennessee. Even though Lauderdale county was getting snow on their west and north borders, a changeover to all snow was not occurring in the Muscle Shoals area. Elsewhere, reports from our local TV media via instant Messenger indicated that heavy snow in Giles county Tennessee had forced the closing of I-65 in places. Probing calls to the Lincoln county Tennessee EMA found that only light rain or non-accumulating light snow was occurring.

Near noontime, the team discussed the situation, and it was decided that the advisory could be lifted for northern Alabama. The winter weather advisory was cancelled around 1230 pm for all but the Tennessee counties. Ground truth reports were aggressively sought throughout the event.

Snow actually continued in Franklin county Tennessee for a while past 4 pm. Overall, the greatest snow depths in our area of responsibility were over far northwest Alabama, Moore county Tennessee, and parts of northern Lincoln and Franklin counties.

3. Comments about 13-15 Feb

a. What went well

- **A snow advisory was issued with several hours of lead time for our Tennessee counties.** The advisory called for 1 to 2 inches of snow accumulation, which verified for the most part, except in far northern parts of the counties where 2 to 4 inches fell.
- **Communications with EMAs and other county officials seemed good.** There were three formal briefings to EMAs, one on each day shift of 13-15 Feb, and frequent contacts with county officials and the public during the actual snow event. Discussions with the Tennessee county officials on the day shifts of the 14th and 15th went particularly well. They were provided with the most likely outcome, along with two alternate scenarios: 1) there might be no snow

accumulation (certainly possible), or 2) that snow accumulations might be a little more than forecast (less likely). It was stressed that snow would accumulate mainly on the grass, and that road problems would be minor.