Right but Still Wrong: A Difficult Winter Event

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Introduction

Forecasters are all too familiar with major numerical model disagreements. Often, the forecast challenge is to decide which model depicts the most likely outcome. All forecasters have, at one time or another, made the wrong choice. What if the forecaster makes the right choice, but is still wrong? A difficult winter weather forecast event manifested itself over southeast Idaho on 13 Nov 2003. Initially appearing to be a rain event in the Snake River Plain, guidance from numerical models began to conflict the night before the event. Forecasters were faced with deciding which scenario to follow; the colder solution with accumulating snow, or the warmer rain event. The decision was to follow the colder solution. This was the correct assumption, but the outcome was unexpected. This paper will look at the conflicting guidance, and attempt to explain the outcome.

1. The Problem

The midnight shift on 13 Nov inherited an initial forecast for the lower Snake River Plain (which included Pocatello) of rain with maximum temperatures in the middle to upper 40s (F) on the 13th. MOS (both ETA and GFS) temperatures from the 00 UTC run also projected temperatures in the middle to upper 40s. The evening shift forecasters had noticed that the ETA BUFR sounding for Pocatello (KPIH) was telling a different story than the ETA MOS. The ETA BUFR sounding was showing the lower levels beginning their diurnal warming, but abruptly stopping when they reached saturation. This was presumed to be due to the onset of precipitation. The temperature rise at the surface halted at 32 F to 34 F, and remained fairly steady through the event (Fig 1a - ETA BUFR 13/12 UTC and 1b - ETA BUFR 13/18 UTC). Should this be the case, the precipitation would remain frozen. Since there was no indication of a warm (> 32 F) layer aloft, liquid precipitation was ruled out. Here lies the problem. The ETA BUFR forecast was running about 13 degrees F below the ETA MOS forecast. The 06 UTC run of the GFS MOS also forecast temperatures in the middle 40s.

2. The Decision

Early in the forecast decision process, both the ETA BUFR and the ETA MOS were reasonably close to observed conditions. Surface temperatures were in the upper 20s, with dewpoints in the lower 20s. The ETA BUFR solution seemed reasonable, so if precipitation began early in the diurnal temperature rise, evaporational cooling could significantly retard the warming process. Radar trends backed up this scenario, as rain over northern Utah progressed steadily northward with expected arrival in the lower Snake River Plain at 0800 MST. The decision was to lean toward the ETA BUFR temperatures and forecast snow accumulation of 1 to 3 inches in the lower Snake River Plain. This would be the first significant snowfall of the season for the Pocatello area. The maximum temperature forecast was reduced by 10 degrees F to the middle 30s, which was sufficient for snow as long as temperatures above the surface remained below 32 F.

3. The Outcome

Light snow began as expected (around 0800 MST) and the surface temperature rise stopped as suggested by the ETA BUFR sounding. In fact, surface temperatures were very close to the ETA BUFR forecast, and 3 degrees F cooler than the compromise temperature in the issued forecast. In the end, the ETA BUFR temperatures were accurate, while the ETA and GFS MOS were nearly 15 degrees F too warm. Precipitation continued through the day, with liquid water amounts accumulating as expected. Later in the morning, the snow changed to rain and the surface temperature remained steady at 34 F through the afternoon.

4. The Reason

Obviously in this event, warm air was present above the surface causing the precipitation to melt. Since temperatures at the surface were above 32 F, there was no chance for the precipitation to refreeze. The warm layer could have advected in on winds which were from the south in the lower levels above the surface, or it could have been due to downslope flow from the higher terrain to the south of the lower Snake River Plain. How could this have been forseen? The warm layer did show up on LAPS (Local Analysis and Prediction System) soundings around 800mbs (Fig 2a - LAPS Sounding 13/12 UTC and 2b - LAPS Sounding 13/18 UTC). LAPS soundings are produced every hour, and provide real-time diagnostic capability. Prognostic capability is somewhat limited, ***unless*** one compares it to model output to evaluate model performance. A forecaster can then make adjustments to model output if departures are noted. Figure 3 shows the 06 UTC ETA 800mb temperature field valid 18 UTC on the 13th. Notice that it shows subfreezing air over the lower Snake River Plain, while the LAPS sounding (Fig 2) revealed otherwise.

5. Conclusion

Model inaccuracy is nothing new to forecasters. This, however is compounded when the same model produces two completely different solutions. In this case, the ETA MOS and the ETA BUFR displayed a large surface temperature discrepancy. The forecasters were able to evaluate the situation and make a correct decision on the temperature forecast. Unfortunately, in this case a warm layer above the surface moved over the forecast area resulting in liquid rather than frozen precipitation. Although the warm layer was detectable in the observed LAPS soundings, there was no indication of this in the model output when the forecast decision was required. It could be argued that later evaluations of the LAPS soundings could have alerted forecasters that the temperatures above the surface were unexpectedly warming. The forecast could then could have been amended to more accurately reflect the eventual outcome.

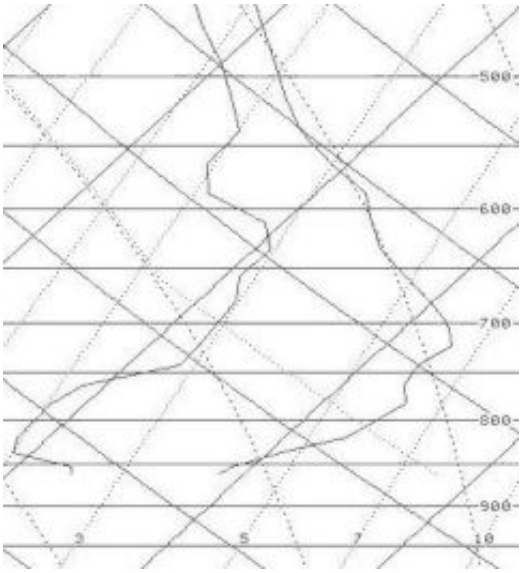


Figure 2a

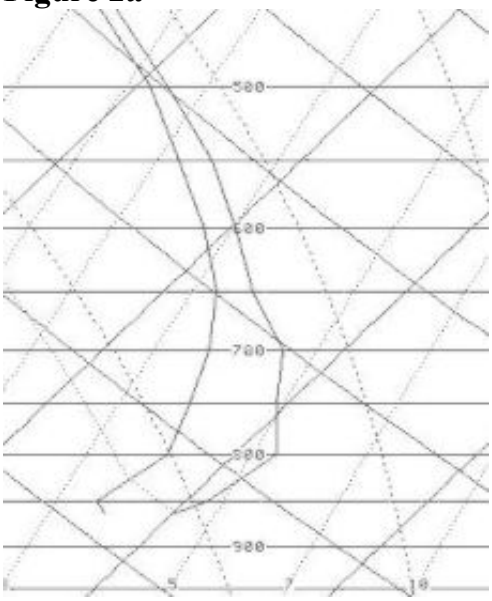
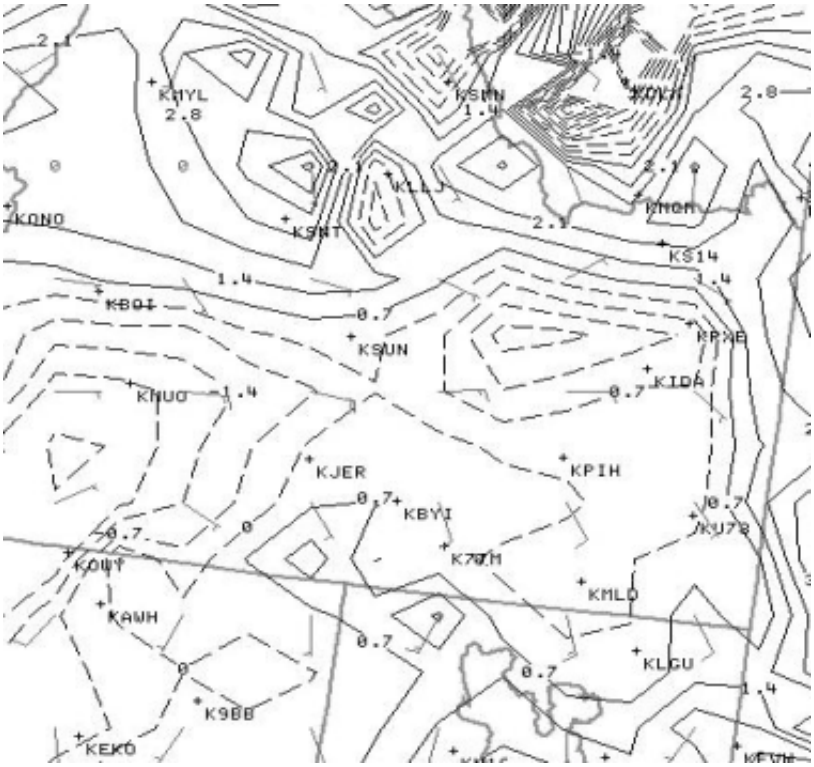


Figure 3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