WESTERN REGION TECHNICAL ATTACHMENT
NO. 87-38
September 29, 1987

AN OBVIOUS CASE OF POOR INITIALIZATION

It is 14Z. You are seated at the forecast desk in the Cheyenne, WY forecast office. The morning LFM run is starting to come in. You look at the initial 500 mb height and vorticity analyses (Figure 1). They appear to fit the plotted upper air observations quite well. No significant dynamics are upstream under northeasterly flow. You move on, calling up the initial mean-layer relative humidity analysis (Figure 2). It shows an area in southwestern South Dakota of greater than 70% RH and a tongue of relatively high RH which extends east to west across the South Dakota/Nebraska border. You are surprised to see so much moisture upstream and decide to investigate further.

Visible satellite imagery at 1331Z (Figure 3) shows clouds extending across southwestern Minnesota toward Sioux Falls, SD, but no low clouds across South Dakota or Nebraska. Could it be that the satellite pictures deceive you, and that moisture across southern South Dakota is all vapor? The Rapid City surface observations indicate clear skies with a temperature near 60^{O}F and a dew point near 35^{O}F. You think that seems rather dry considering the mean-layer RH, so you wonder what the raob looks like (Figure 4). You notice that, aside from the surface dew point depression, no depressions exist aloft in the observation. You ask how the model can put a relative humidity maximum over Rapid City with no dew point depression observations there, seriously question the analysis, and check to see if there were any prior indications of this feature. You ultimately (correctly) decide to throw out the upstream RH analysis.

As it turns out, the 12-hour LFM RH field decreased the maximum RH associated with this erroneous analysis to less than 50% (Figure 5), due to the strongly subsident synoptic regime where the misanalysis occurred. The model took care of the analysis problem by itself in this case. (The NGM initial analysis and model run was very similar with respect to this feature). It was apparently so obvious to the forecasters that the analysis was bad that not one SFD mentioned the problem (or else no one noticed it because it "dried out" so fast).

What if, however, the synoptics were such that the localized atmosphere was not so stable, with synoptic scale upward motion and higher relative humidities in general around the bad raob? In such a case, heavy precipitation and strong cyclone development would be possible as a result of the bad observation. An example of such a case was described in WRTA 86-31. In that case, like this one, there was a problem with the radiosonde hygristor. But why should there be such a high RH in this case when no depressions existed on the sounding? The reason was that the Figure 4 data were corrections. The original observation sent around the AFOS circuit was nearly saturated (Figure 6). Apparently, this was the observation that was ingested in the NMC analyses; they did not input the correction (as they may not have received it in time). Note the remarkably similar structure of this raob to the case in WRTA 86-31, with near-saturation aloft, decreasing only slightly with altitude. This is the typical response that is received when the hygristor electrical contacts remain open, whether due to a damaged or misplaced hygristor.

While this attachment describes a situation in the NWS Central Region, it has application at all sites. Western Region forecasters should be well aware of the problems associated with analyses over the data-void eastern Pacific. Likewise, a forecaster should not assume that model initial analyses are always "good enough" over land, since they can be problematic to the forecaster, whether it is due to poor analysis of vorticity centers or axes, bad or missing raobs, or too much smoothing of significant small-scale features. The point of this attachment should be clear - it is always important to diagnose the situation before looking at the model output. In so doing, errors which may crop up in the model runs will become more obvious and cause less problems for the forecaster.

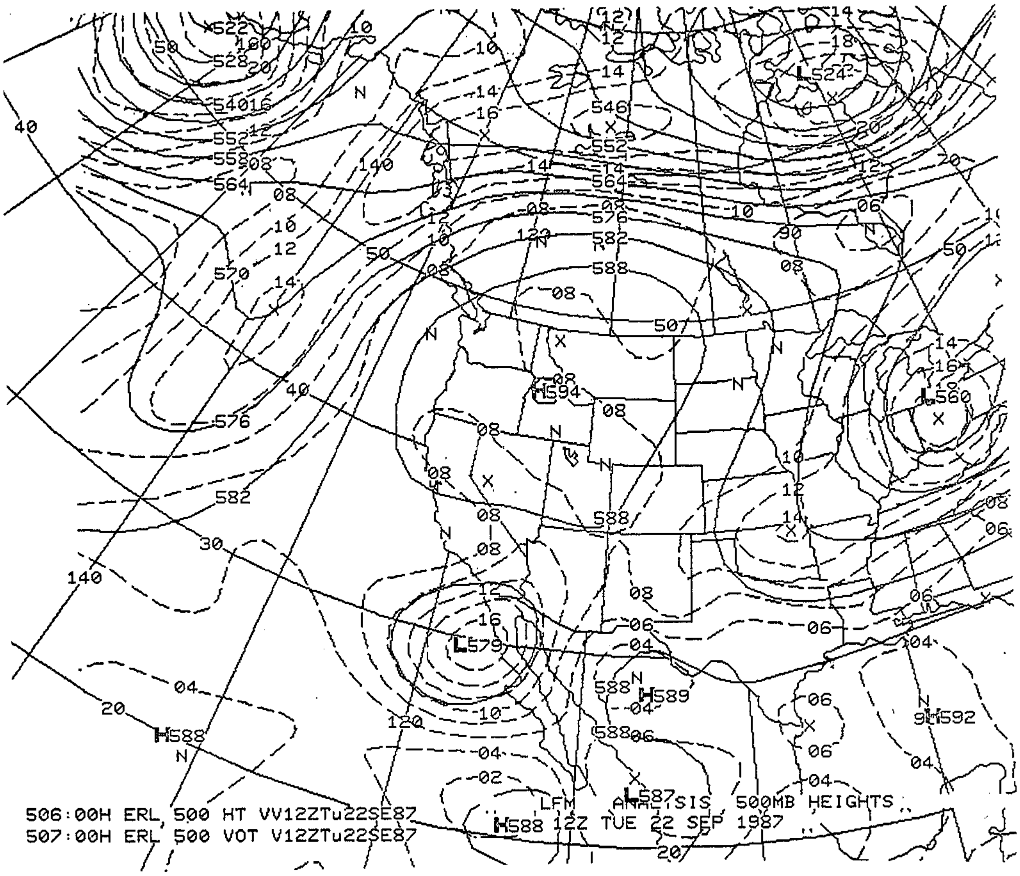

Figure 1. Initial LFM 500 mb height and vorticity analyses 12Z 22 Sept 1987.

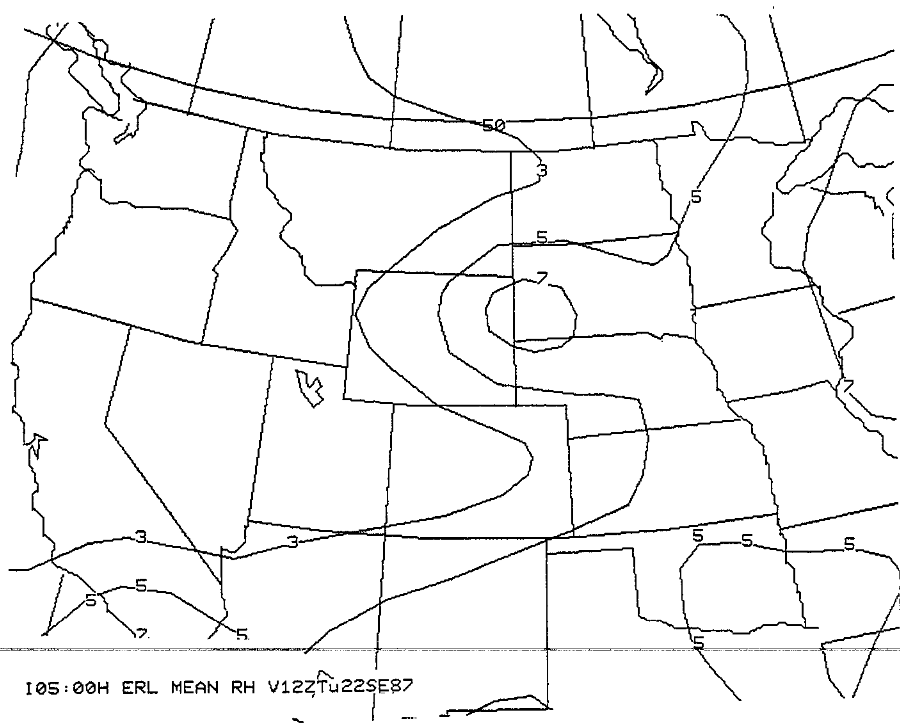

Figure 2. Initial LFM mean-layer RH 12Z 22 Sept 1987.

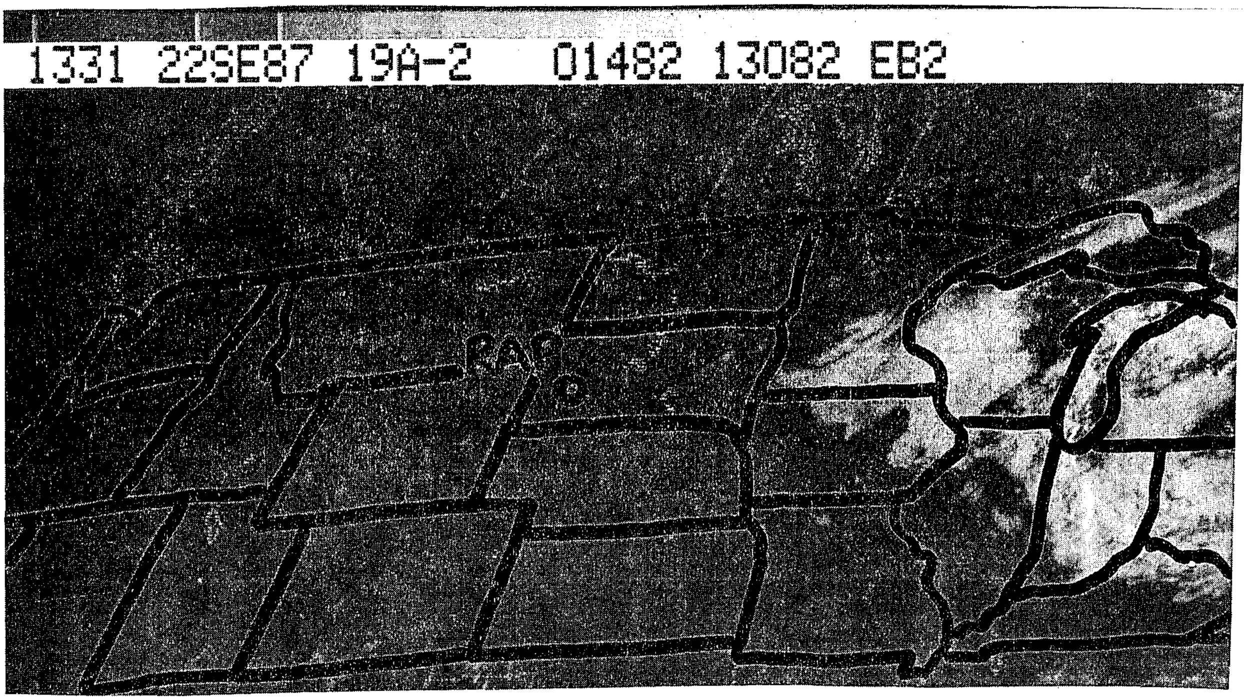

Figure 3. GOES-East visible satellite image 1331Z 22 Sept 1987.

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04035 9503/ 04033 04026=
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Figure 4. Rapid City, SD sounding data 12Z 22 Sept 1987.

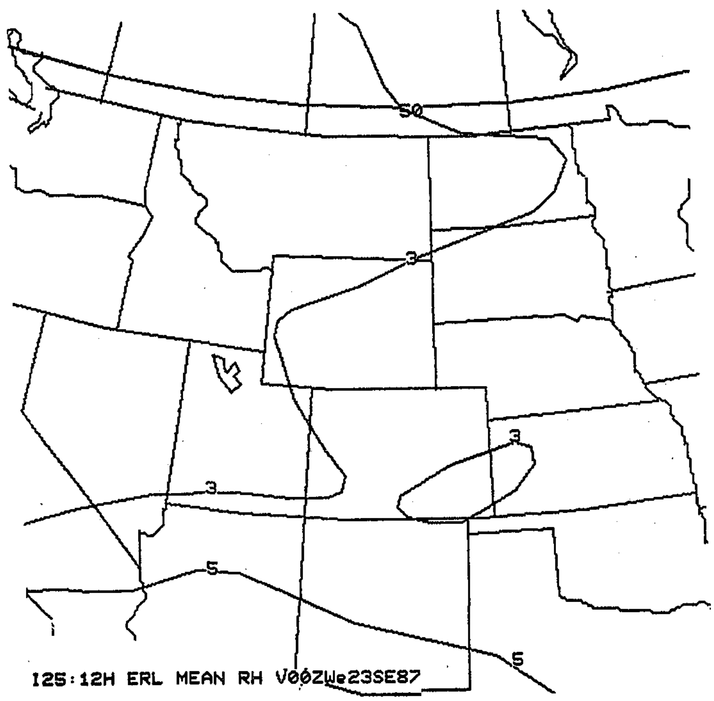

Figure 5. 12-hour LFM mean-layer RH forecast valid 00Z 23 Sept 1987.

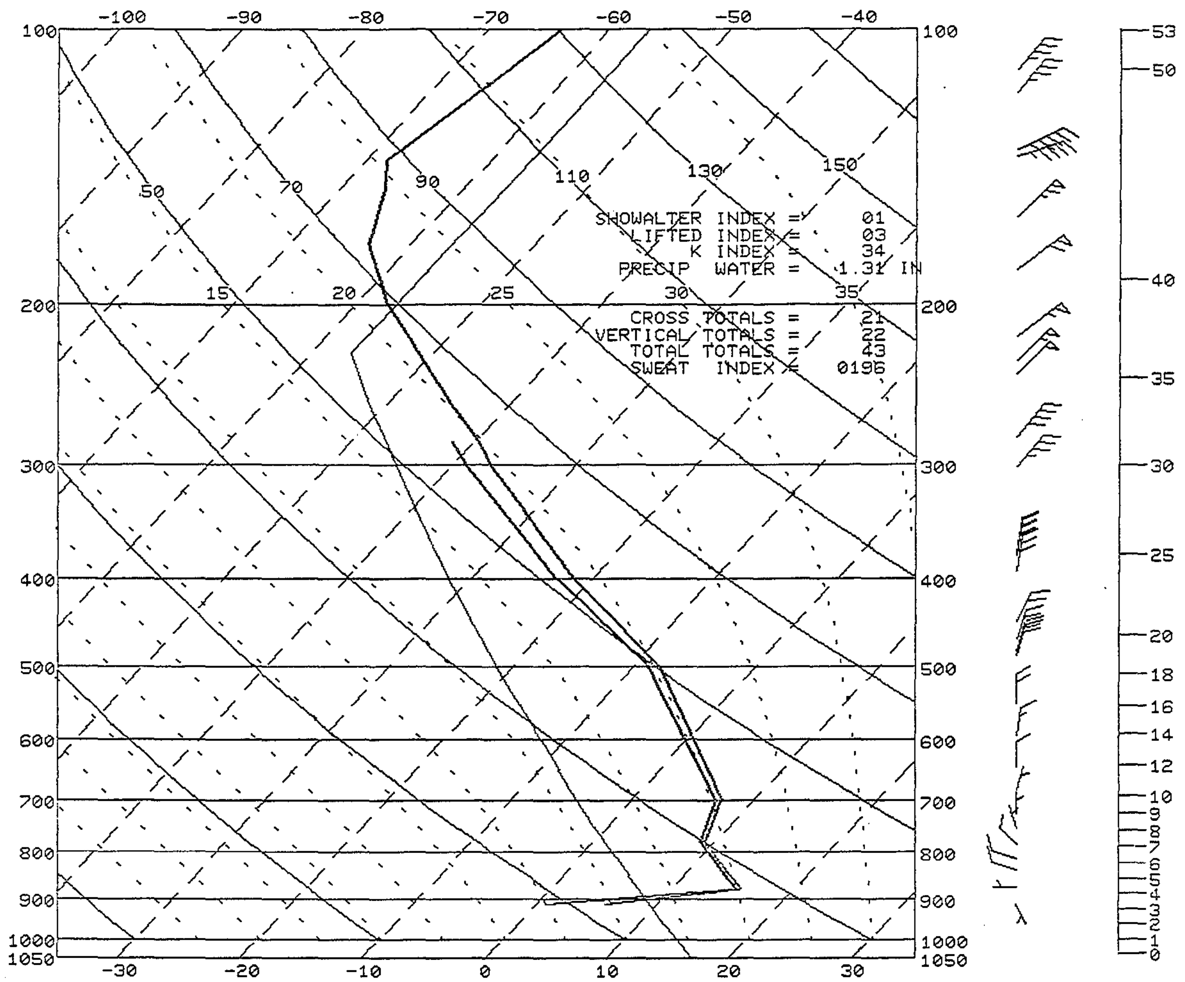


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Figure 6. Data and plot of the first transmission of the Rapid City, SD raob observation 12Z 22 Sept 1987.