WESTERN REGION TECHNICAL ATTACHMENT
NO. 86-31
October 28, 1986

WHAT YOU SEE IS NOT NECESSARILY WHAT YOU GET!

The attached Technical Attachment was recently published by Southern Region. It makes a very important point -- forecasters and observers need to carefully monitor upper air observations for inaccurate data. Southern Region suspects this case of an overly moist sounding may not be an isolated incident. They are investigating further. Pending the outcome and correction of any problem if there is one, forecasters and observers should monitor data carefully.

Technical Attachment

What You See is not Necessarily What You Get!

Scientific Services Division, SRH

The 12-hour RAFS (NGM) precip forecast valid at 12Z on September 26th contained a surprise. Note the heavy rain "bomb" over northern Arkansas and southern Missouri in Fig.1. A 3" center was forecast with coincident strong upward vertical velocities. By itself this might not be so surprising, but a brief look at other data reveals no obvious support for the precip center. From the 12-hour RAFS height, vorticity and thickness fields (Figs. 2-3) it appears that weak NVA is forecast over the area of concern! There seems to be no low level thermal support at all.

One would expect that at least the initial and forecast moisture fields would support such a rain event. In fact, they do to an extent. The initial (00Z/26th) mean RH field (Fig. 4) shows a large 70% center over northeast Texas and Arkansas. The 12-hour prog (Fig. 5) advects this to a small 90% center coincident with the precip/UVV maxima over Arkansas and Missouri. Even so, this does not explain what presumably converted the moisture to rainfall.

What about the LFM...does it offer any help? No figures will be shown, but a check of the above fields from the same LFM run showed a similar, but much less pronounced result. A 0.8" precip center was forecast over Arkansas. This is not an inconsiderable amount for the LFM, but again, supporting dynamics were absent from its other forecast fields.

At this point, most forecasters would probably be about ready to reject the model guidance altogether. Probably not a bad idea, in fact. The problem is, even though the RAFS has shown some tendencies to go overboard, NMC has implemented what they believe are fixes to a number of the problems. The RAFS <u>has</u> shown a tendency to catch some significant events. We want to be careful about throwing the baby out with the bathwater! Maybe we should look a little deeper.

Obviously, the RAFS - and the LFM, for that matter - must think there's a <u>lot</u> of moisture somewhere... probably more than is reflected by the 70% center at 00Z and apparently enough to produce convective instability and heavy rain without any noticable dynamic forcing from the synoptic scale. Where's the moisture? The model gets its information about the atmosphere from the same source forecasters use...the data. In this case, upper air data. The heavy rain was forecast in the 00Z-12Z period. What did upstream RAOBS from 00Z look like? The first one we examined was Longview, Texas (Fig. 6). Case closed! From the saturated sounding it appears the flight went right through a thunderstorm. A glance at the satellite images (Fig. 7) seems to confirm this.

Why didn't the initial RH graphic, at least, reflect the sounding at Longview? Most likely because the saturated "point" was smoothed when the data were initialized to the RAFS grid. In producing the AFOS graphics,

RAFS grid point data are first extrapolated to the LFM grid (smoothed again), then output to the contouring routine (smoothed for the third time!). Even with all this smoothing, keep in mind the model still ingested the moisture in its gridded data. Then the RAFS quickly advected and dumped the moisture over Arkansas. Recent adjustments to the model (see Tech Attachment to Administrative Notes 9/9/86) might explain why the explosive release of precipitation was not reflected in vorticity or other fields. Effects of the single saturated RAOB were more pronounced in the NGM than the LFM because of resolution. (Recall the NGM uses sig level data as well.) We have asked NMC to look into this case further. It is worth noting that both LIT and NMC forecasters recognized the apparent source of trouble. Note their comments in Fig. 8.

So the mystery is solved and the moral is clear...before you reject guidance out of hand, try to track down the source of a suspected problem. This often means look at the data. But wait a minute...let's look a little closer at Longview's sounding in this case. Does this really look like a sounding through a thunderstorm? Why are the winds so smooth? Why would the operator have launched in a thunderstorm anyway!

Even though satellite pictures suggest that was the problem, surface observations from Longview (Fig. 9) say otherwise. The moisture sounding was most likely never affected by the storm. In fact, we doubt there ever was a moisture sounding! The data suggest a mechanical problem affecting the hygristor. A check with the WSMO confirmed this. Unfortunately, it was not possible to correct the problem in real time, so Longview's "thunderstorm" flooded northern Arkansas several hours later!

This brings us to the main point of our discussion. Even though it makes no difference in the RAFS forecast why the sounding was saturated, this case illustrates clearly the effect a single upper air observation can have on model performance. Granted, this was an extreme case, but consider how misleading more subtle effects could be. Especially with the new ARTSONDES, where operators are no longer directly involved in working up the sounding, close attention is needed to make sure accurate data are transmitted. Computers might not be able to tell the difference, but humans can!

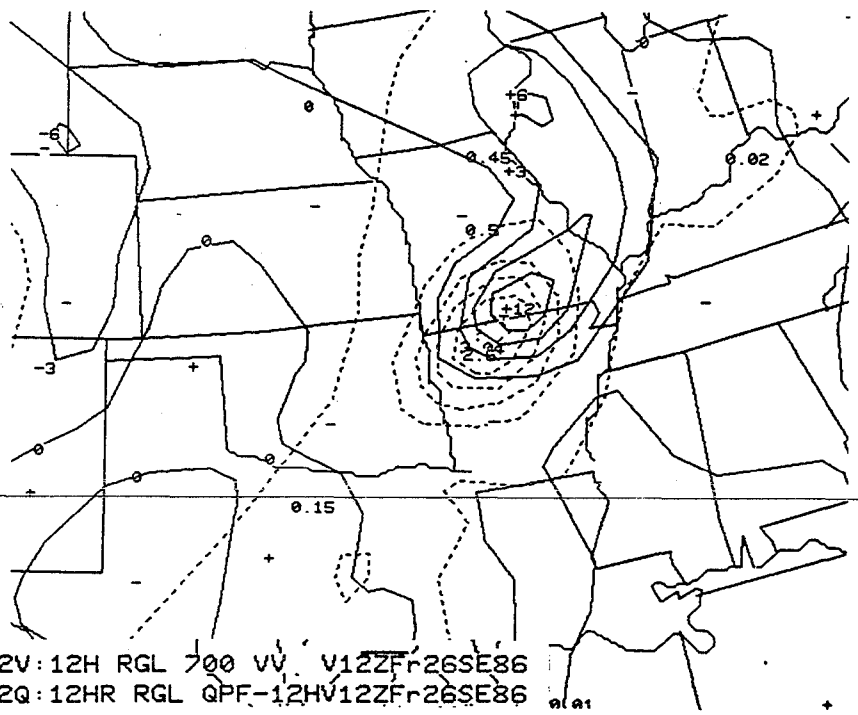


Figure 1. RAFS precip and vertical velocity forecasts, valid 12Z 9/26/86.

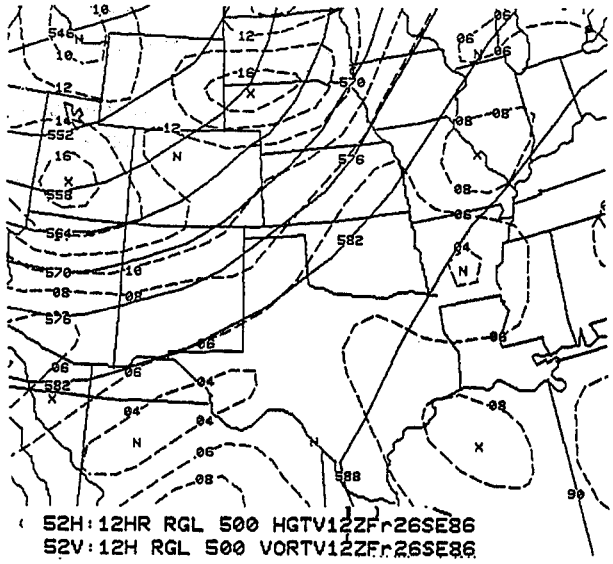
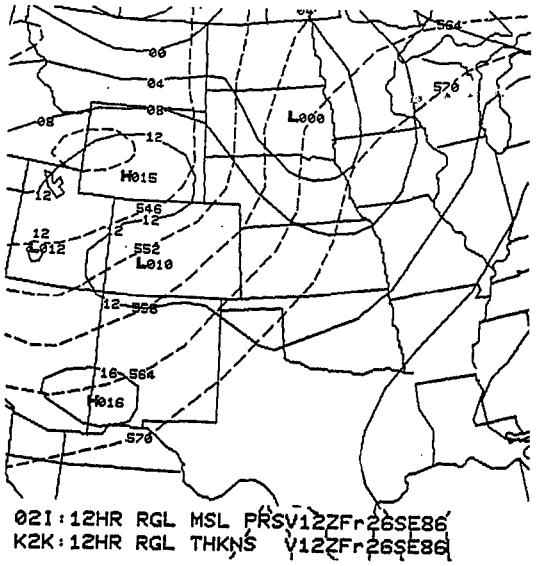


Figure 2

Figure 3



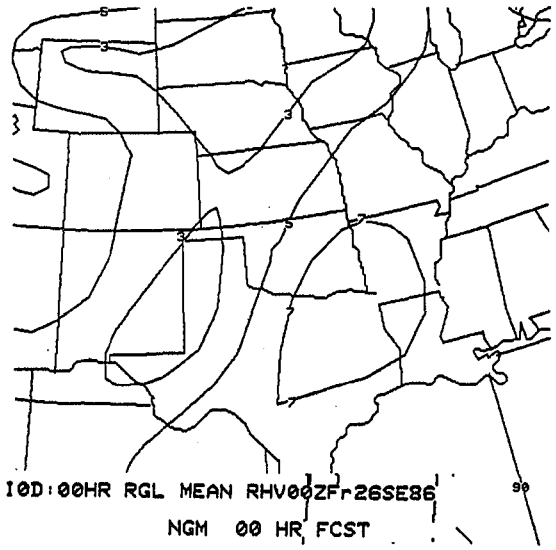
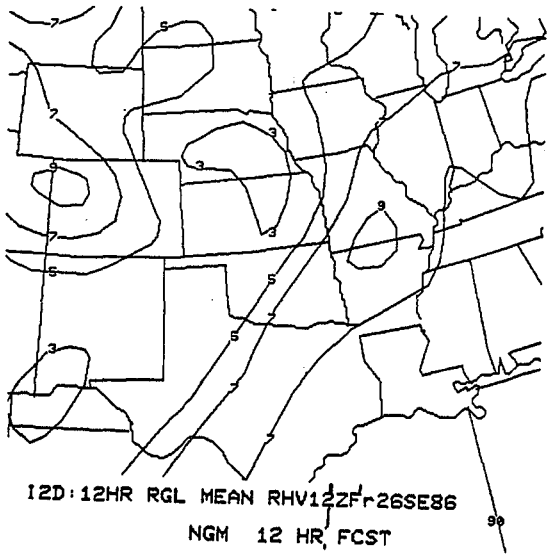


Figure 4

Figure 5



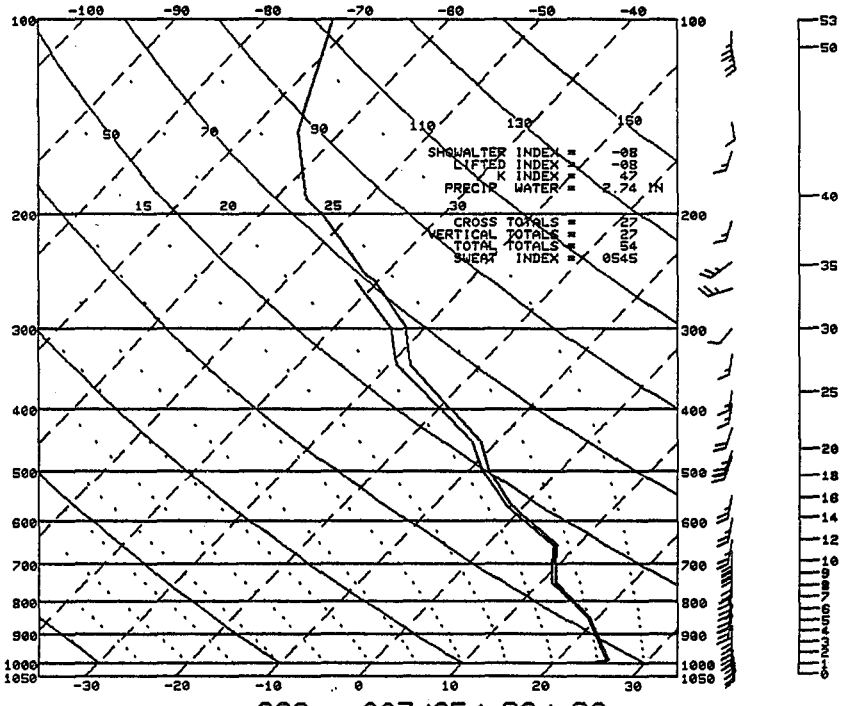


Figure 6. Longview sounding 00Z 9/26/86.

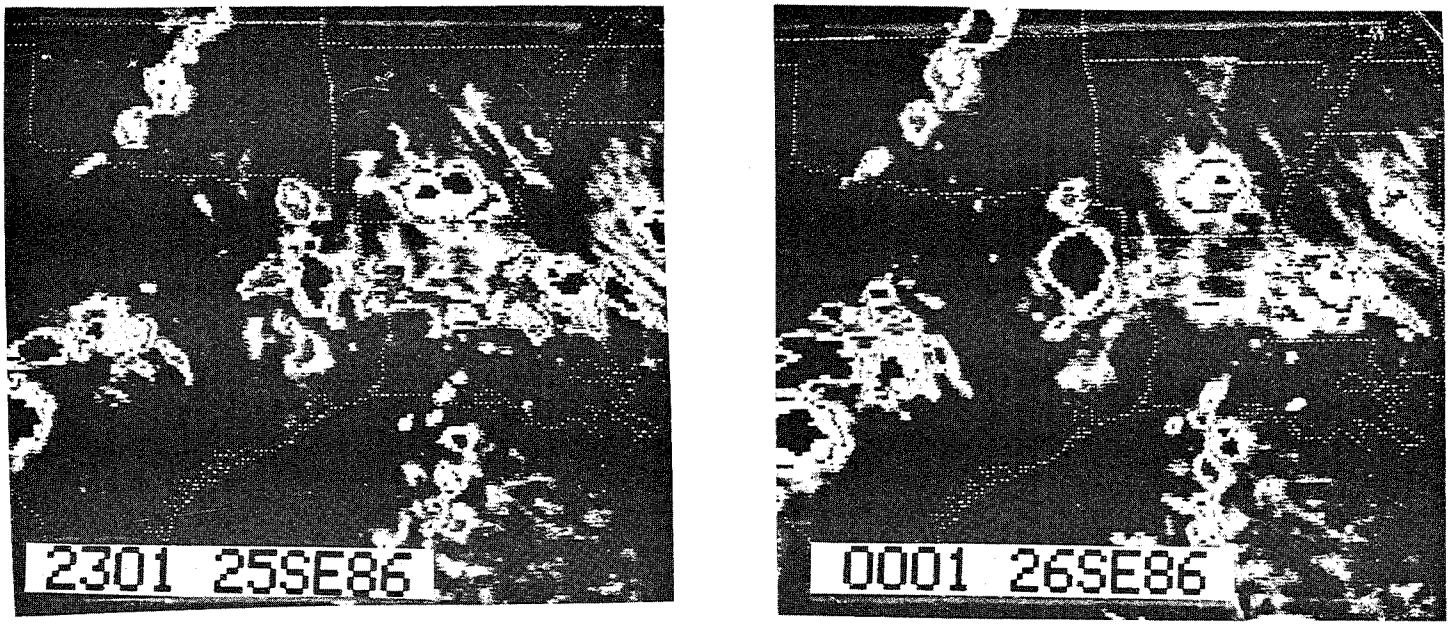


Figure 7. Satellite imagery around time of 00Z RAOB observation. Note convection in the vicinity of Longview, Texas.

STATE FORECAST DISCUSSION
NATIONAL WEATHER SERVICE LITTLE ROCK AR
400 AM CDT FRI SEP 26 1986

LTL CHG IN GENL PATTERN INDICATED FOR AR THRU SAT AS STATE CONTS ON WRN EDGE OF HI PRES SFC AND ALF. SHORT WVS ARND MAJOR UPR LOW SHD STAY NW OF AR. ISOLTD TO WDLY SCT AFTN SHWRS/TSHWRS HAVE DVLPD ACRS MSTLY SRN AR PAST TWO DAYS LKLY FM HTG ON XTRMLY MOIST AND CONDLY UNSTABLE AIR. LOOKS LIKE THERE WILL BE A REPEAT TDA SO WILL HAVE 20 PCT POPS ACRS ALL BUT NRN AR. ACTIVITY IN N, IF ANY, SHD BE ISOLTD. NO ACTIVITY FM W CST INTO AR YDA, SO CANNOT SEE IT TDA. CANNOT FIGURE XTRM UVV AND RAFL GENERATED BY RGL IN N CNTRL AR THIS MRNG...COULD BE CONTAMINATION FM CONVECTION THAT MAY HAVE AFFECTED A ROAB OR TWO. SHWRS SHD DCRS BY ERY EVE AND WILL NOT MENTION POPS FOR TNGT. FOR SAT, RGL AND SPM DO SHOW SOME VORT IN AR AREA WHICH MAY CAUSE INCR IN AFTN TSHWRS. WILL HAVE SCT TSHWRS SAT IN MOST OF STATE WITH WDLY SCT IN N. WILL GENLY FOLLOW PERSISTENCE ... SAT. GRAD LOOKS A LTL LESS

WSFO Little Rock SFD

Figure 8.

NFDQPFERD
TTAA00 KNFD 260733
EXCESSIVE RAINFALL POTENTIAL OUTLOOK...REF AFOS GRAPHIC 94E
VALID 261200 TO 271200

NMC QPF Discussion

LONGVIEW TX SOUNDING TAKEN IN THUNDERSTORM ACTIVITY APPEARS TO HAVE AFFECTED MODEL INITIAL ANALYSIS WITH A S/WV RIDGE AND DOWNSTREAM S/WV TROF GENERATED ESPECIALLY IN VORTICITY FIELD. BOTH NGM AND LFM ADVECT THESE FEATURES AND PRODUCE HVY RAFL AMTS IN CTRL MISS VLY AND LOWER OHIO VLY TDY. EXPECT MODEL QPF OVERDONE AS PER 94Q FCSTS.

GGG SA-8446 CLR 7 76/72/1608/000/ W..
GGG SA 8350 250 -BKN 7 77/72/1406/003/ OFF ARPT OBS NO SPL
GGG SA-8350 250 -BKN 7 77/72/1406/003/ OFF ARPT OBS NOSPL
GGG SA 8246 70 SCT E150 OVC 20 80/71/1604/000
GGG SA 8146 70 SCT E150 BKN 20 80/72/1505/998
GGG SA 8046 70 SCT E150 BKN 20 82/722004/996/1E41 LTGCCCG NW
GGG SP 8010 E50 BKN 100 BKN 20T 1806/996/TB10
GGG SA 2346 50 SCT E100 BKN 250 BKN 20 85/70/1507/994/TCU W-NW MOVG N LTGCG /// 92
GGG SA 2246 50 SCT 100 SCT 250 -BKN 35 89/70/1507/992/TCU SW-W
GGG SA 2146 50 SCT E100 BKN 250 BKN 35 91/70/1511/993
GGG SA 2046 E50 BKN 200 BKN 35 91/71/1811/993
GGG SA 1946 E35 ... 98/71/1708/994
GGG SP ... S-SW

Figure 9. Surface observations, WSMO Longview 9/25-26/86.