WESTERN REGION TECHNICAL ATTACHMENT
NO. 87-29
August 18, 1987

WATER VAPOR IMAGERY AND LIGHTNING STRIKE DATA PROVIDED BEST CLUES AUGUST 13, 1987

On the evening and morning of August 12-13, 1987, little weather was expected over northern Utah. However, between 0800-0930Z, an isolated thundershower developed southwest of the Great Salt Lake and traveled northeastward. The airport at Salt Lake City (SLC) registered 19 minutes of showers (0.01 in) and wind gusts to 29 kts. Although the storm had little impact on the local area, clues to its development and detection can be applied to more significant convective outbreaks.

There was little reason to expect much convective activity during the night time hours. As shown in Figure 1, the SLC sounding at 00Z was very dry. There was a short wave trough embedded in the westerlies to the north (Figure 2) with weak PVA across eastern Idaho and Montana. There was also a vorticity center associated with the remnants of Hurricane Hilary off the south central coast of California. As shown in Figure 3, the southern portions of Utah and Nevada and most of Arizona and New Mexico were affected by considerable convective activity during the 24-hour period August 12-13 (12Z-12Z). The areas of enhanced activity over southern Utah and Nevada were the result of a deformation zone through those regions. Monsoon circulation dominated Arizona and New Mexico. However, this had been the pattern for the previous couple of days, and the dry westerly flow over northern Utah (Figure 1) was expected to preclude the northward extension of moisture and instability.

The water vapor image at 2315Z, 12 August (Figure 4), showed a distinct border between moisture left over from Hilary and the dry tongue from central California northeastward into northern Utah. Thunderstorms do not develop randomly but usually along some discontinuity. It has often been observed that thunderstorms will form along a border of mid and upper level moisture as is often depicted on the water vapor imagery.

The half-hour lightning strike accumulation chart showed that by 07Z, August 13, most of the thunderstorms in the Western Region had dissipated (Figure 5a), but note the contoured areas just southwest of the Great Salt Lake (GSL). This was a new area. The enhanced IR imagery at 0745Z (Figure 6a) gave little reason to be concerned, although a very small warm-top cell was apparent just south of the GSL. The 0735Z radar chart (Figure 7a) showed nothing.

The sequence of half hourly lightning charts from 0715-0945Z (Figures 5a-e) show how the thunderstorm tracked northeastward across the southern portion of the GSL (and SLC Airport). By 0845Z, the enhanced IR image (Figure 6b) showed a small enhanced cell southeast of the GSL; the 0835Z radar showed an echo northwest of the GSL (Figure 7b) and then nothing at 0935Z (Figure 7c).

Summary and Conclusion

The dynamics resulting in the isolated thundershower over northern Utah are not clear. Figure 6b shows a weakly organized line of convective activity, extending from southern Nevada through western North Dakota, along the water vapor image boundary as noted earlier. The triggering mechanism may have been weak PVA or a weak surface/low level trough or convergence axis associated with the short-wave trough to the north, or perhaps the dynamics associated with the deformation zone.

Observational information at the time of the thunderstorm was inadequate to determine what the triggering mechanism was for sure.

The water vapor imagery provided information on where to focus attention. The Automatic Lightning Detection System (ALDS) provided the first alert that a thunderstorm had developed and then continued to provide the best continuity on this system.

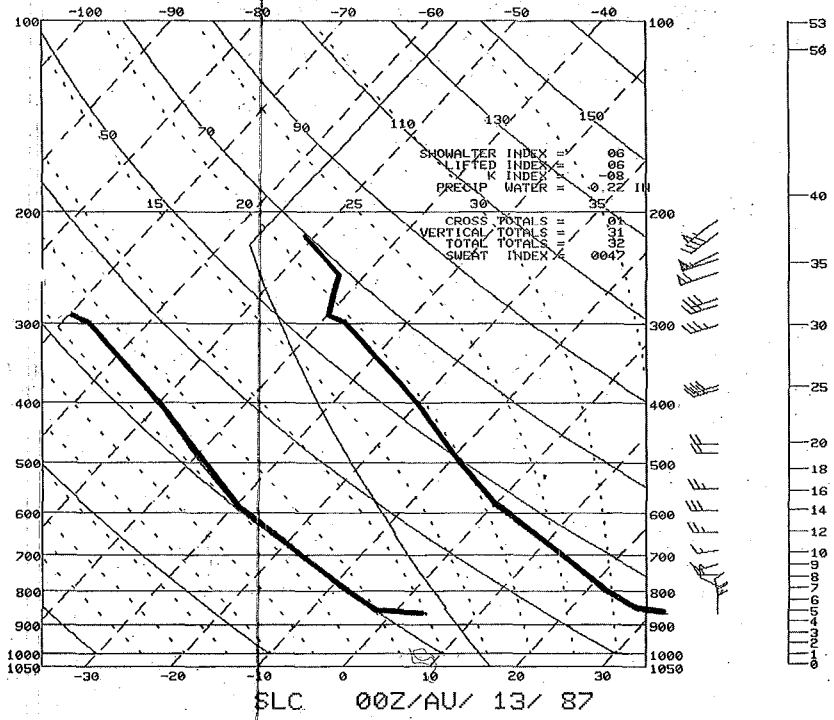


FIGURE 1.

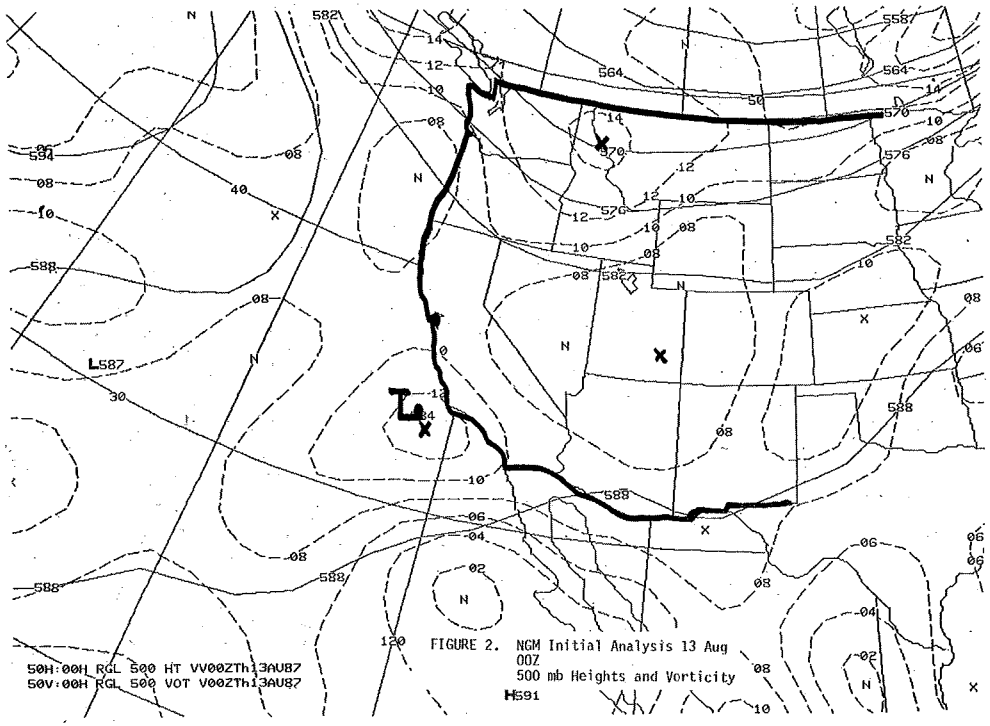


FIGURE 2. NGM Initial Analysis 13 Aug 00Z
500 mb Heights and Vorticity

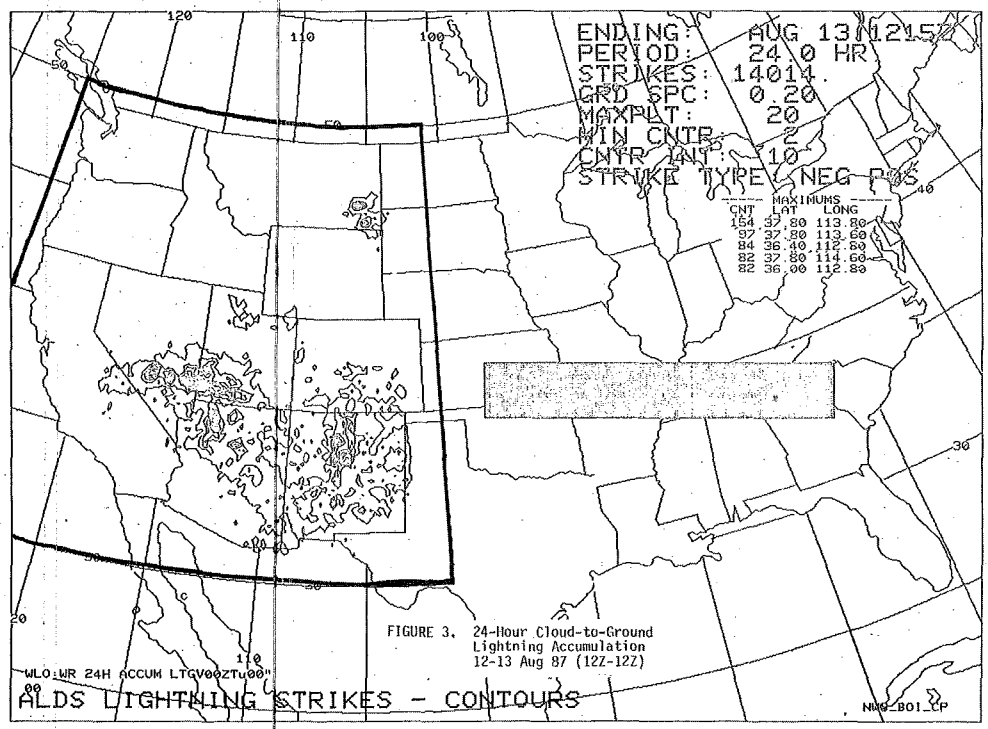


FIGURE 3. 24-Hour Cloud-to-Ground Lightning Accumulation 12-13 Aug 87 (12Z-12Z)

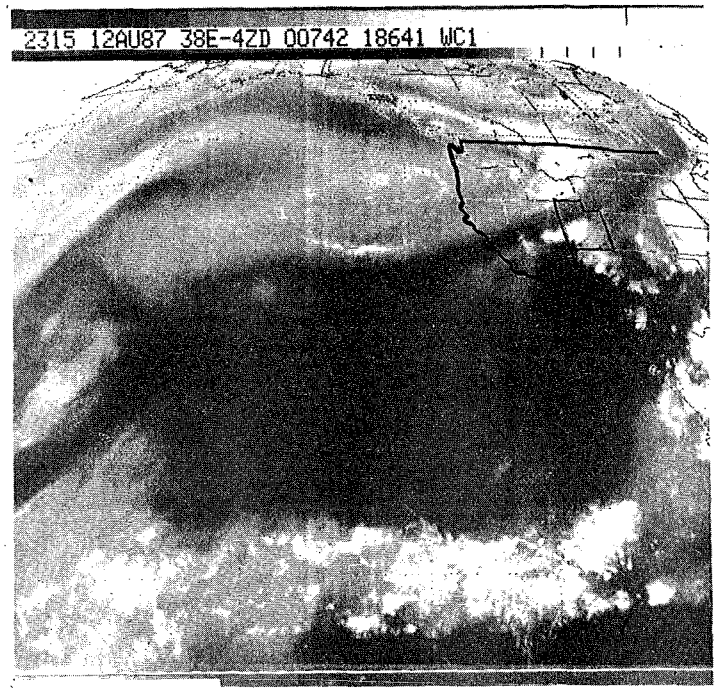


FIGURE 4. 12 Aug 87 2315Z Water Vapor

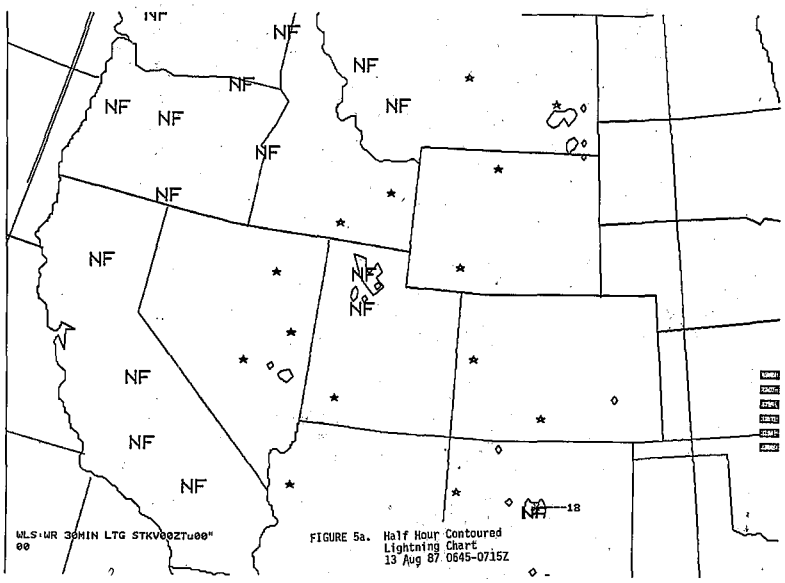


FIGURE 5a. Half Hour Contoured Lightning Chart 13 Aug 87 0645-0715Z

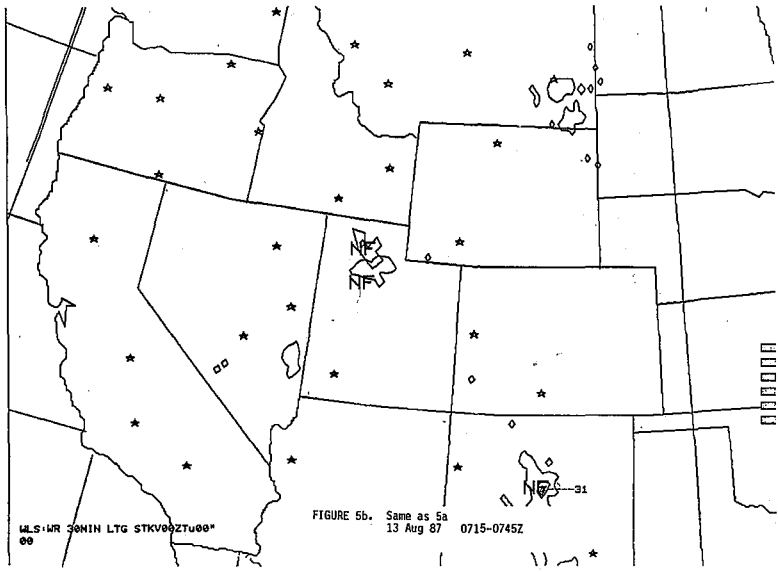


FIGURE 5b. Same as 5a 13 Aug 87 0715-0745Z

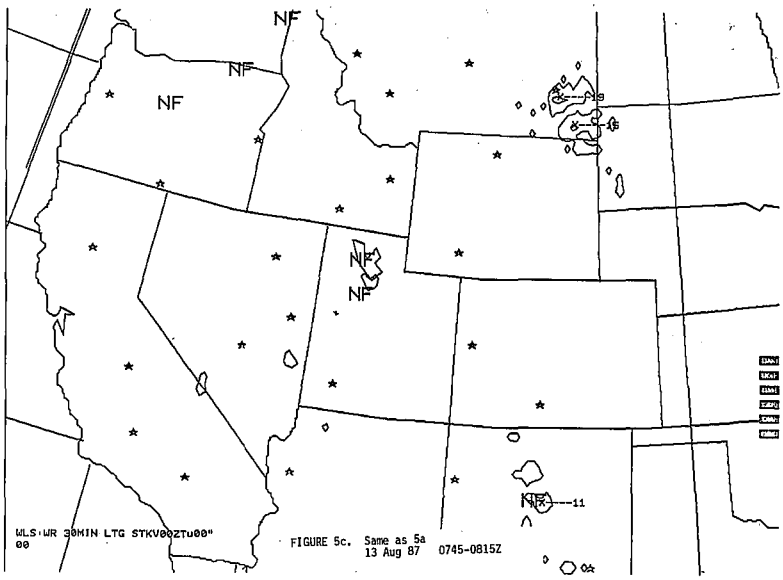


FIGURE 5c. Same as 5a 13 Aug 87 0745-0815Z

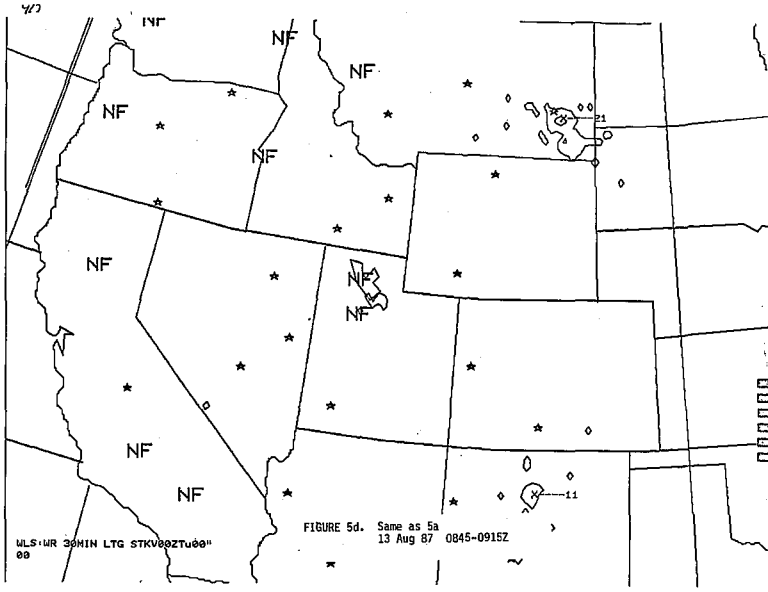


FIGURE 5d. Same as 5a 13 Aug 87 0845-0915Z

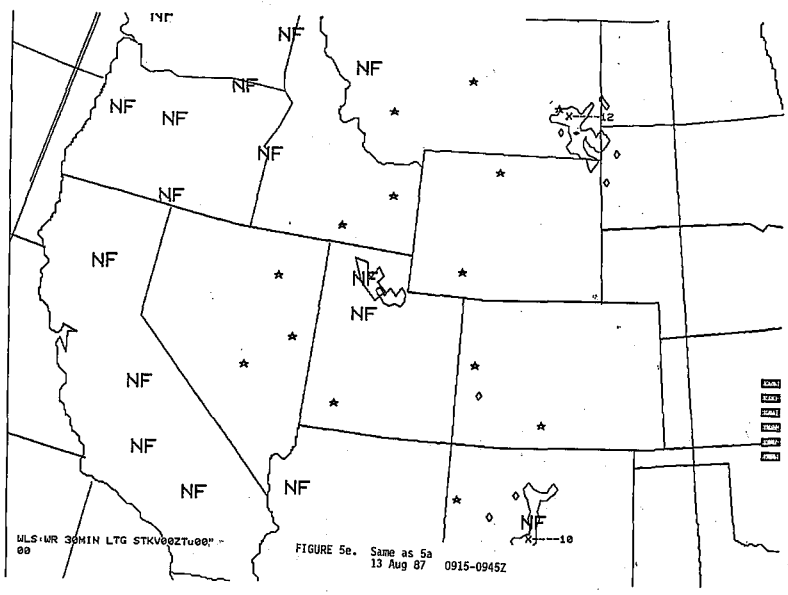


FIGURE 5e. Same as 5a 13 Aug 87 0915-0945Z

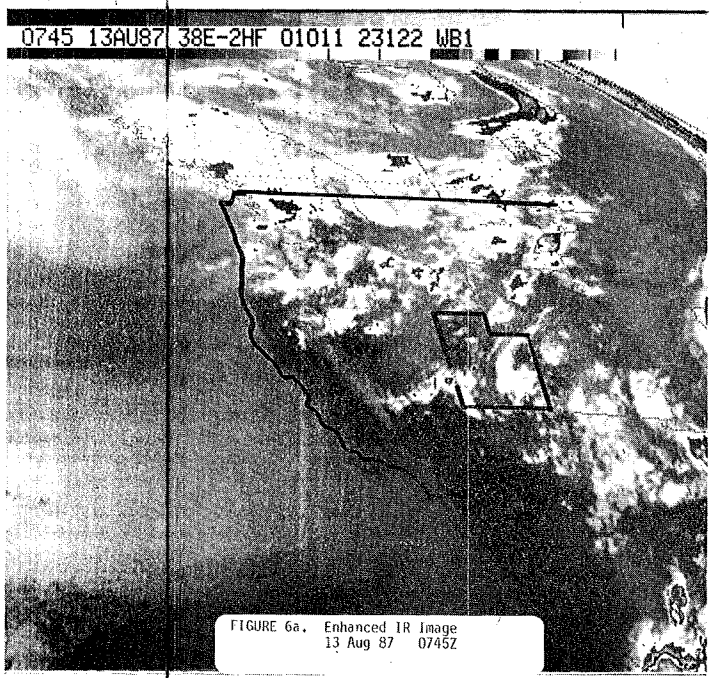


FIGURE 6a. Enhanced IR Image
13 Aug 87 0745Z

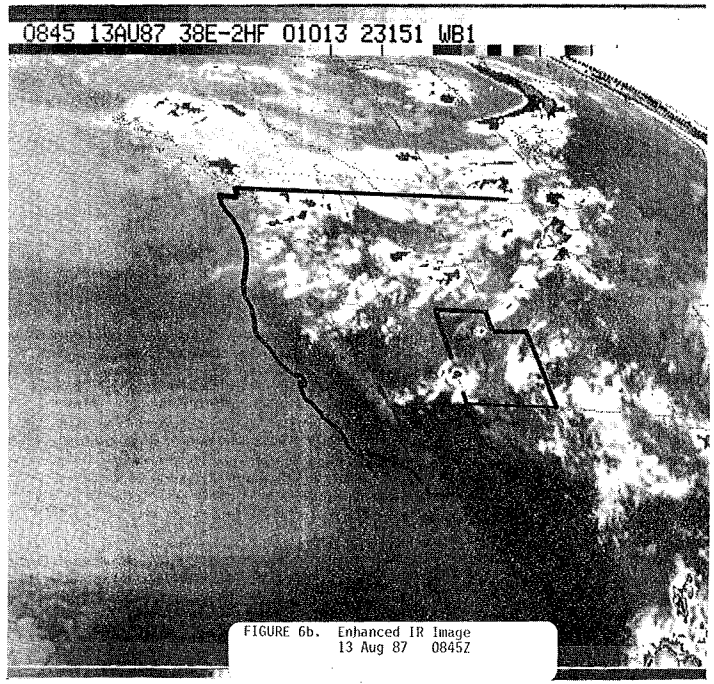


FIGURE 6b. Enhanced IR Image
13 Aug 87 0845Z

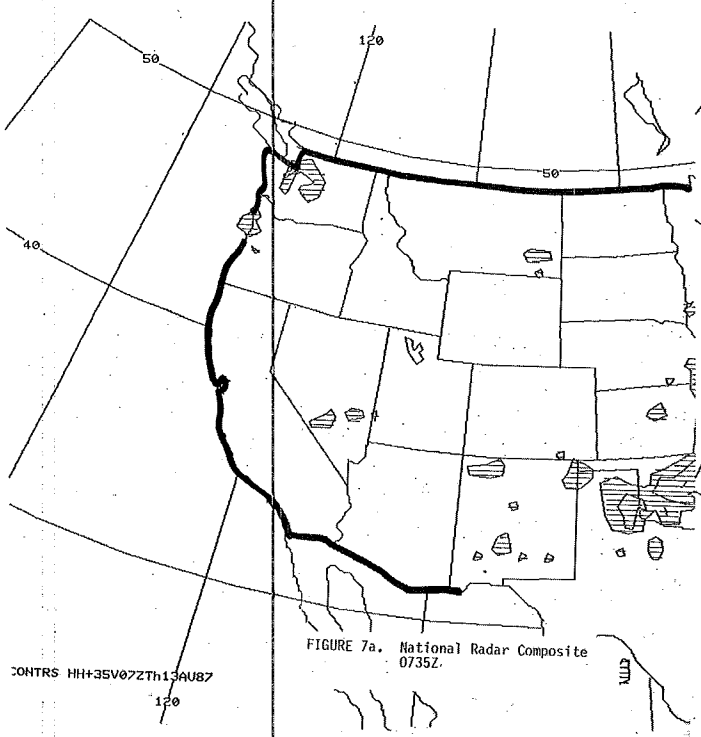
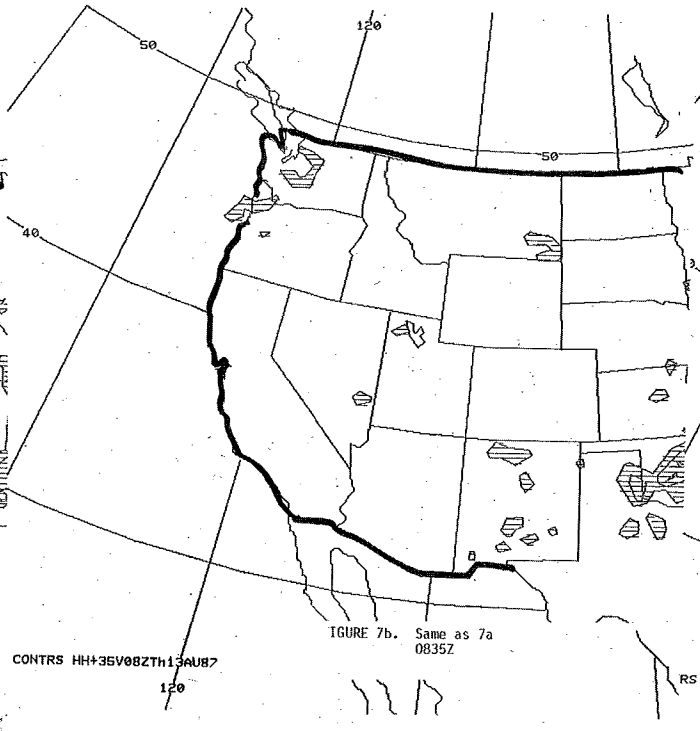


FIGURE 7a. National Radar Composite
0735Z



IGURE 7b. Same as 7a
0835Z

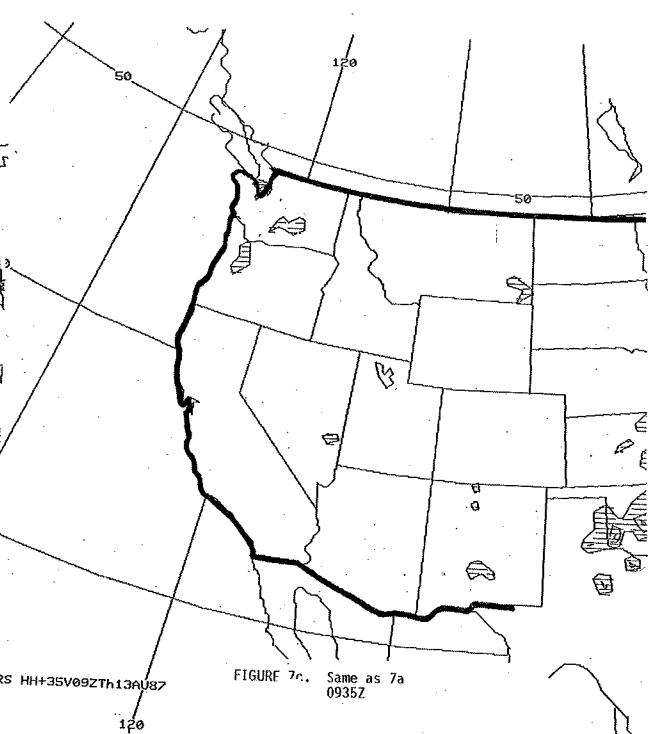


FIGURE 7c. Same as 7a
0935Z