

CRH SSD  
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## CENTRAL REGION TECHNICAL ATTACHMENT 86-16

## WHY DON'T THEY ALL GO SEVERE?

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One of the greatest boons to radar-based severe weather warnings hit the operational community in 1977. The "Lemon Technique" is an excellent way of recognizing developing severe/potentially severe storms (Lemon, 1977, 1980). Nature keeps the meteorological community humble by throwing wrenches into the gears every now and then, however.

The evening of June 7, 1986 saw strong convection develop across the Dakotas and Minnesota. SELS had issued several severe weather watches across much of South Dakota and into west and south Minnesota during the late afternoon and evening hours. Although South Dakota was the area of prime concern, very strong convection developed over southeast and east-central North Dakota as well.

One particular cluster of cells developed north of Jamestown, North Dakota late the afternoon of the 7th. Radar indicated a multicell non-severe complex. Surface reports showed very heavy rain (over one inch in less than 1/2 hour), wind gusts of 30 to 40 mph with no observed hail. As the cluster of cells continued its eastward movement, it went through the classic multicell non-severe metamorphosis. However, by 0100Z the cluster had converged into one large cell. DVIP gradients, both aloft and in the lower levels were slowly tightening. The maximum top of the cell rapidly and repeatedly fluctuated between 35,000 and 41,000 feet above MSL. The DVIP 2-4 level gradient in the lower levels was tightening more to the inflow side of the cell (Fig. 1).

By 0130Z a DVIP 5 level had developed aloft between 5,000 and 20,000 ft. The maximum top had stabilized around 40,000 ft but was still over the center of the cell. At 0157Z the 2-5 DVIP level portion of the cell had formed a definite "V" on the front (downwind) side of the cell. Approximately 10 km of mid-level overhang (at 20,000 ft) was observed on the inflow side of the cell while the maximum top had shifted to over the inflow side. The top of the DVIP 5 level was now up to 30,000 ft, while the base had reached the surface. A small DVIP 6 level was observed from 5,000 to 15,000 ft. The cell was beginning to "bow" on the inflow side suggesting a developing Bounded Weak Echo Region (BWER) (Figs. 2 and 3).

Based on radar indications, all of the Lemon criteria were met and a severe thunderstorm warning was issued for Traill County, North Dakota and Norman County, Minnesota.

At 0222Z, a classic BWER was observed near Perley, Minnesota. The large DVIP 5 level core (previously suspended between 10,000 and 30,000 ft) was collapsing to the ground. The cell maintained the classic "V" notch and the curl on the southwest corner, and had begun to turn to the right. The cell was penetrated by both sheriff's deputy and Skywarn spotters through much of its "severe" life cycle. Only heavy rain was observed.

Unfortunately (or fortunately) the warning was a bust. Was it wrong to have warned? Possibly, but conditions were ripe, both synoptically and from a radar standpoint, for severe weather.

What happened? Unknown. One possible explanation is that too much moisture was available; that is, no mid-level dry punch. Precipitable water values were over an inch and the K Indices were in the upper 20's to mid 30's. But severe weather was reported over a large area, especially South Dakota and Minnesota.

Numerous undocumented instances are on hand of stronger looking convection producing only very heavy rain while benign appearing cells produce a tornado.

Does this mean we abandon the Lemon Technique? By no means! It is an excellent tool by which the radar operator can rapidly assess the potential of severe weather. In this job, a few misses are expected, right?

#### References

Lemon, L.R., 1977: Severe Thunderstorm Identification Techniques and Warning Criteria: A Preliminary Report. NOAA Technical Memorandum NWS NSSFC-1, July 1977.

Lemon, L.R., 1980: Severe Thunderstorm Identification Techniques and Warning Criteria. NOAA Technical Memorandum NWS NSSFC-3, April 1980.



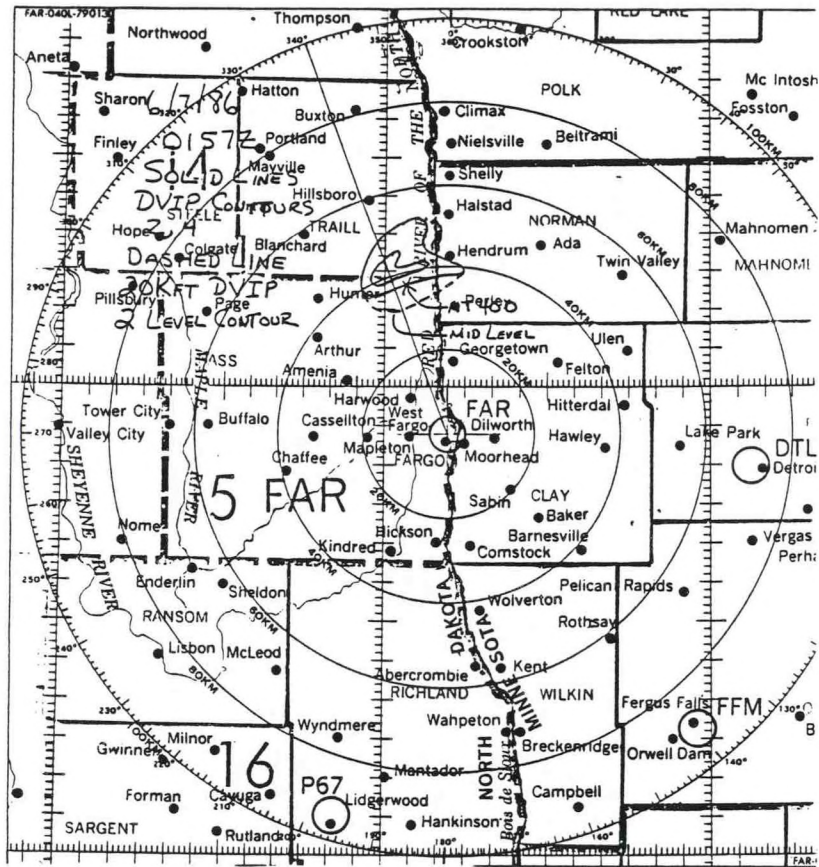


Figure 1

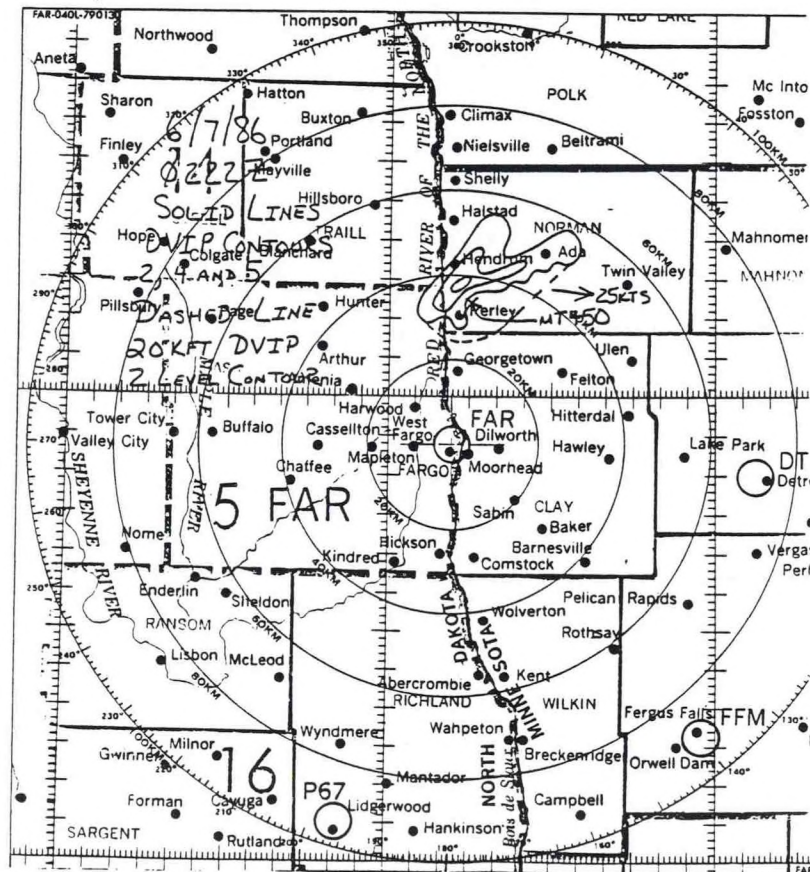


Figure 2

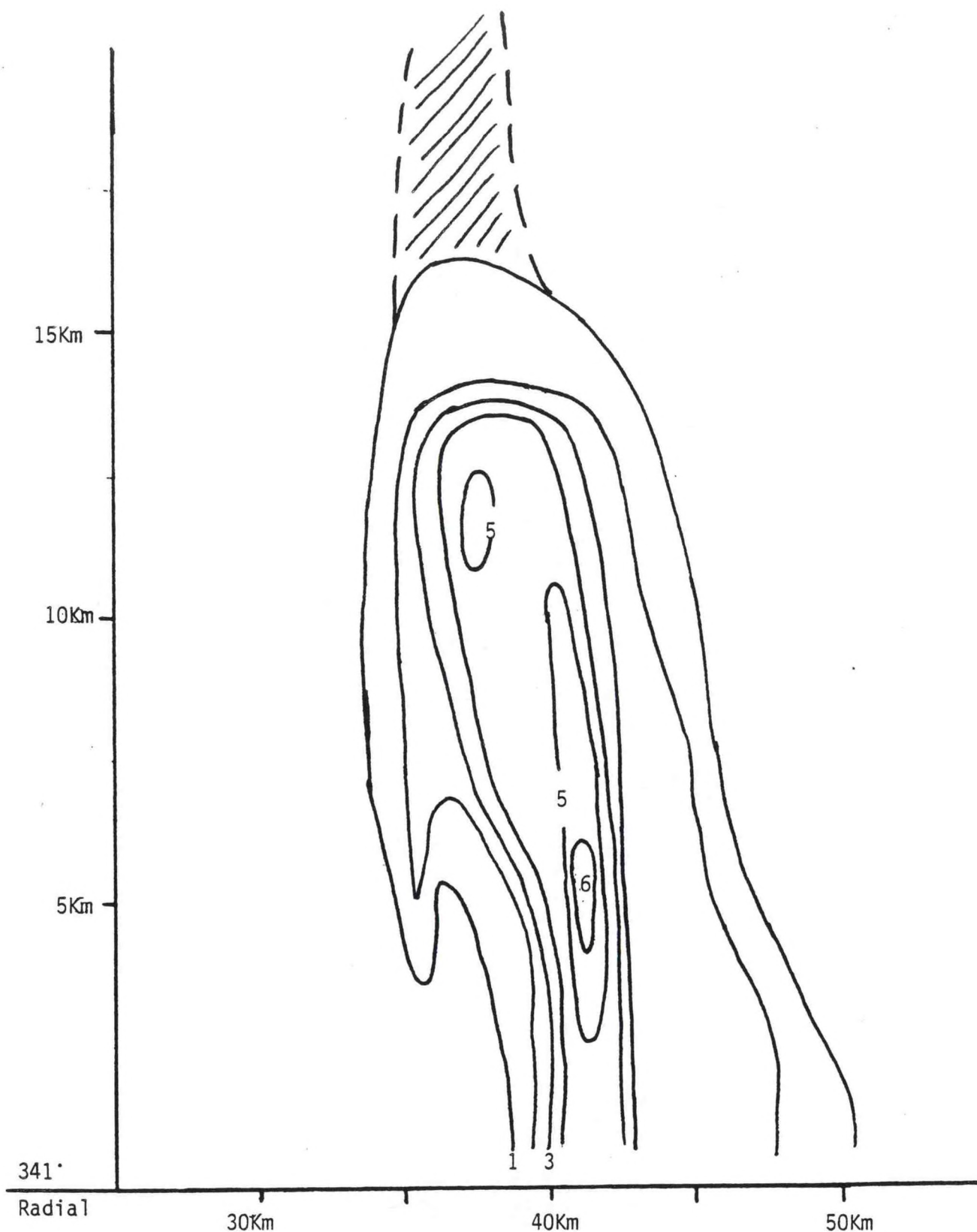


Figure 3 Graphic re-creation of WSO FAR RHI 0157Z, Jun 7 1986. Distance and height in Kilometers (Km). Distance vs height greatly exaggerated. Solid lines DVIP contours; stippled area on top of cell "Hail Shaft"