Western Region Technical Attachment
No. 93-35
December 14, 1993

WSR-88D PRECIPITATION RINGS

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The Precipitation Processing Subsystem of the WSR-88D contains four separate modules:

Precipitation **preprocessing** algorithm
Precipitation **rate** algorithm
Precipitation **accumulation** algorithm
Precipitation **adjustment** algorithm

This Technical Attachment discusses some aspects of the first module, the preprocessing algorithm, and how it can affect your final precipitation product.

The precipitation preprocessing algorithm uses base reflectivity data from the lowest four elevation scan angles as input. Five quality control steps are performed on these data to correct for:

1. Radar beam blockage
2. Isolated reflectivity values
3. Unrealistically high reflectivity values
4. Ground clutter
5. Beam elevation increasing with range

This last control check tries to maintain an elevation of 3000 feet AGL through the four scan angles. Figure 1 illustrates this point. For radials without significant blockage, reflectivity data from the 3.5° scan is used in the 0 to 11 nm range. The 2.5° scan from 11 to 19 nm; 1.5°

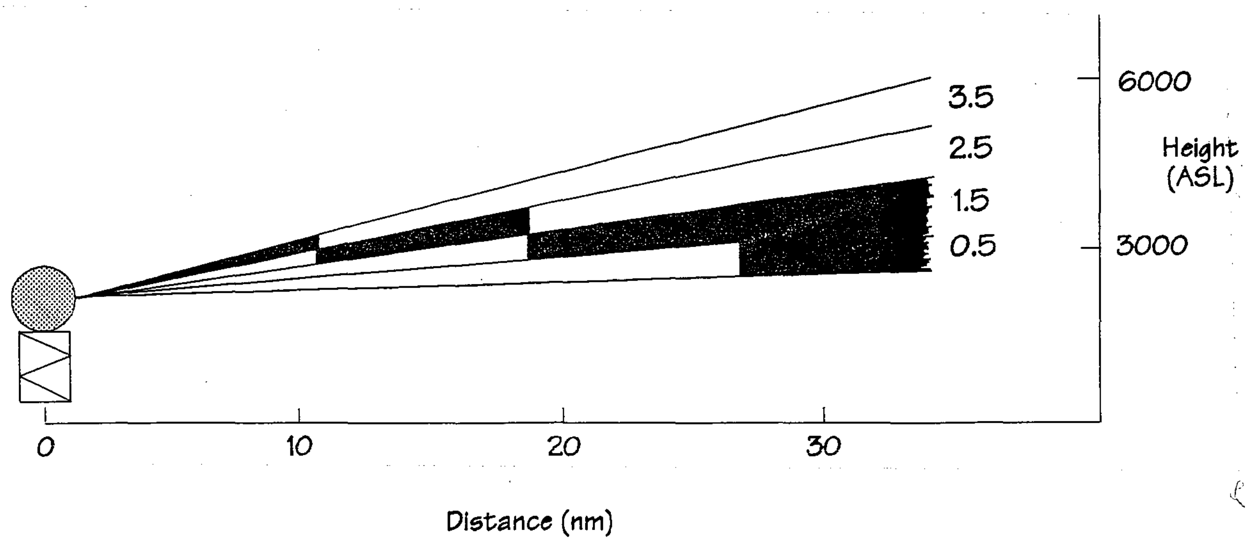

Figure 1 - Hybrid scan technique used in the precipitation algorithm for Phoenix, AZ (KIWA).

scan from 19 to 27 nm and either the 0.5° or 1.5° angle from 27 to 124 nm. Beyond 27 nm, a Bi-Scan Maximization technique selects the highest reflectivity values from either of the two lowest scans.

A recent precipitation event in Arizona highlights the effects of this hybrid scan technique. Figure 2 is a storm total precipitation product for four days from November 11 to 15, 1993. Three precipitation rings exist near 11 nm, 19 nm, and 30 nm due largely to the different scan angles employed in the algorithm. Each scan angle change causes a substantial drop in elevation, and a corresponding change in reflectivity values. The ring distances were obtained by reading the cursor location when positioned on the ring.

Bright band contamination also exists from west to north of the radar. This contamination highlights the northern edge of the rings, and is likely the primary cause of the third ring. Figure 3 contains two Winslow, Arizona soundings for November 12 and 15. The freezing level for this time period is near 6000 feet MSL, so north of the radar the bright band should be slightly below this elevation. Reading the cursor elevations for the corresponding reflectivity products at 11 nm, 19 nm and 30 nm gives the following:

11 nm ring elevation (3.5°)	5300 feet MSL
19 nm ring elevation (2.4°)	6500 feet MSL
30 nm ring elevation (1.5°)	6400 feet MSL

The north edge of the innermost ring is only slightly contaminated, so the freezing level near Phoenix was probably slightly above 6500 feet for this time period. Precipitation around Phoenix for this time period was about three inches. The precipitation algorithm estimate of ten inches was overdone, as is expected with bright band contamination.

Reference

Operations Training Branch, 1993: WSR-88D Operations Course Materials. Operational Support Facility; Norman, OK.

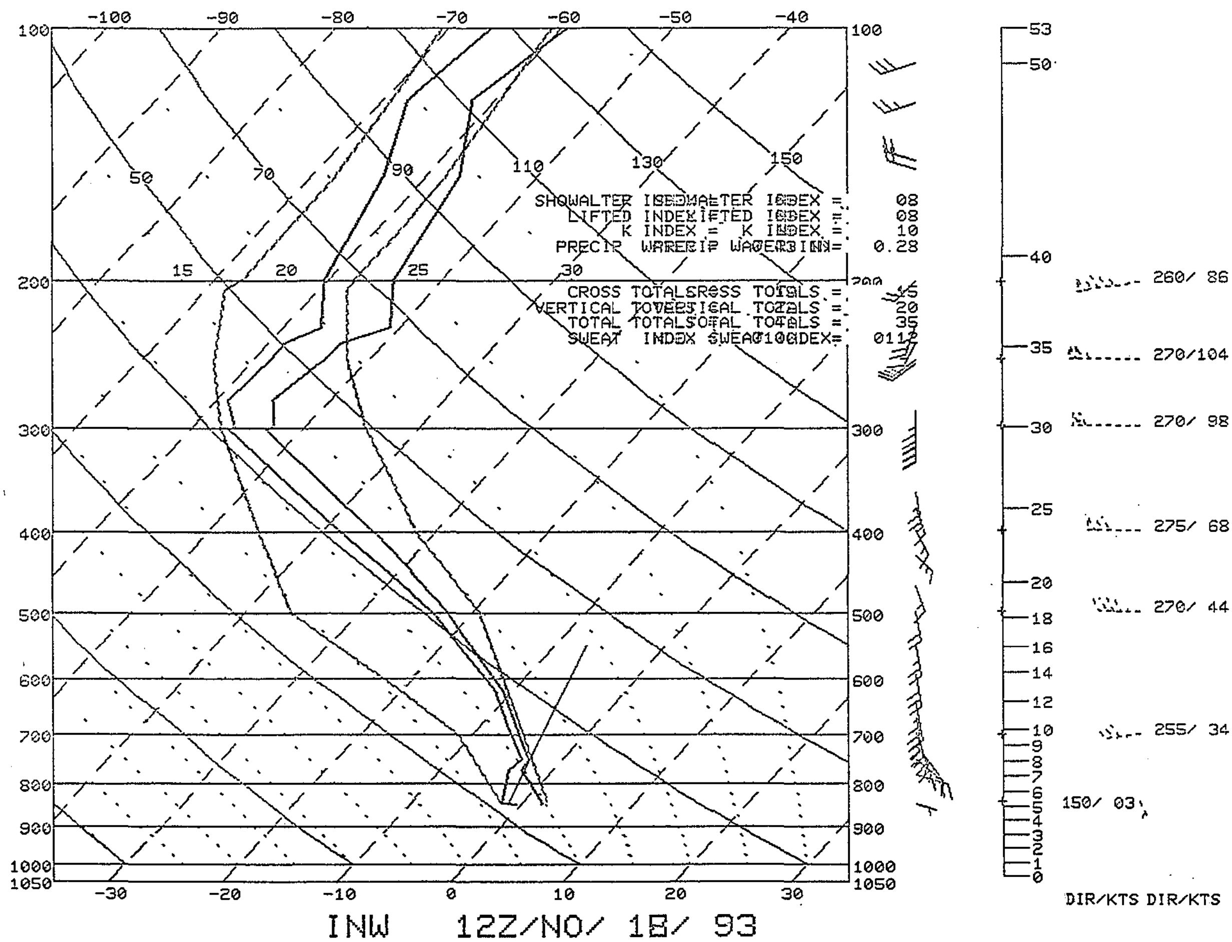

Figure 3. Winslow, AZ soundings for 11/12/93 (dashed) and 11/15/93 (solid) at 1200 UTC.