Interpretation of composite reflectivity

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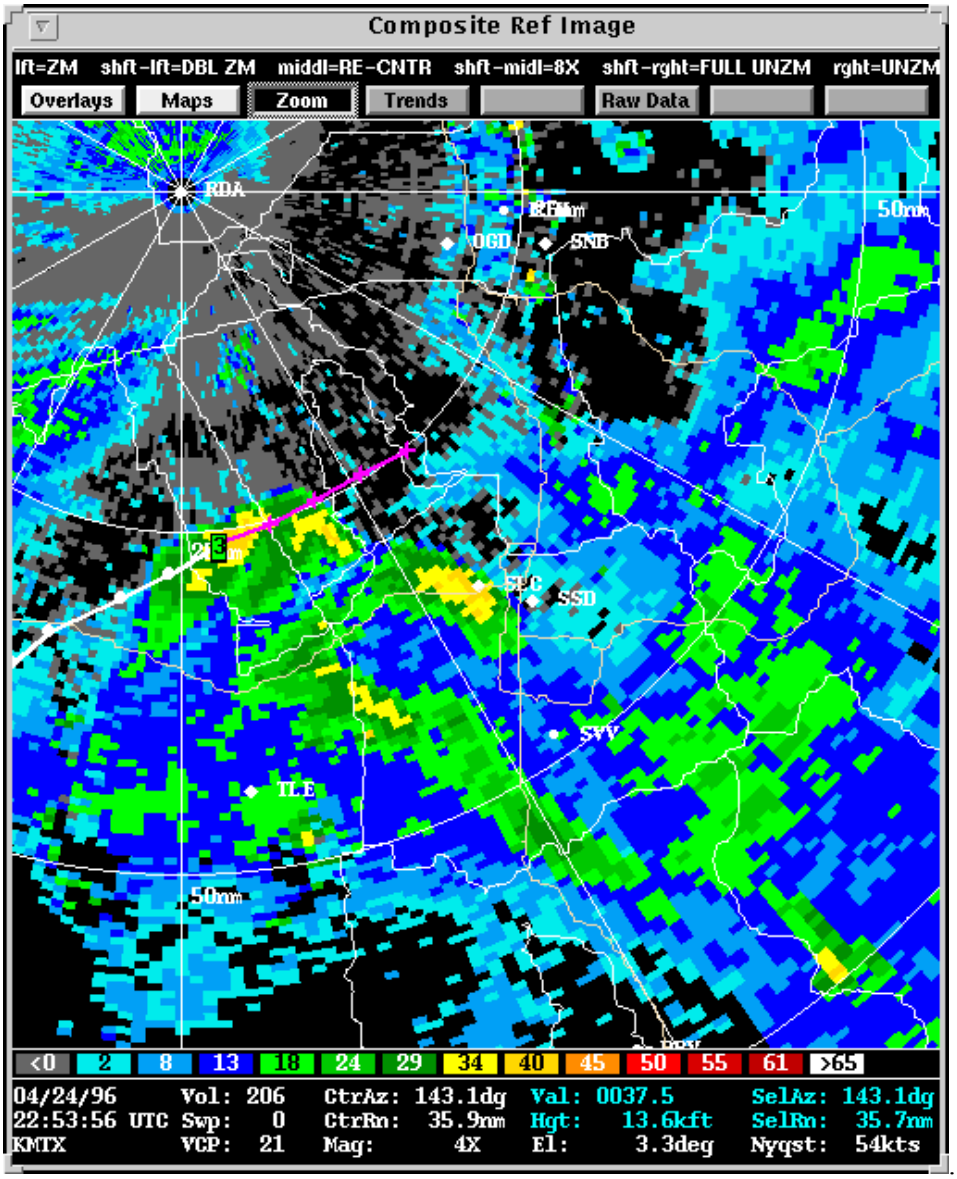
1. Introduction

Effective use of the composite reflectivity product from the WSR-88D often requires examination of the vertical structure of the radar echo. Data from the KMTX WSR-88D in northern Utah are used in conjunction with a 12 Z sounding on 24 April 1996 to illustrate the vertical structure of a 42-dBZ cell which produced no measurable precipitation.

2. Data

The composite reflectivity at 2253 UTC (Fig. 1) shows a 42 dBZ cell over the Salt Lake City WFO (center of image). At this time the author observed virga with only a few scattered rain drops hitting the ground.

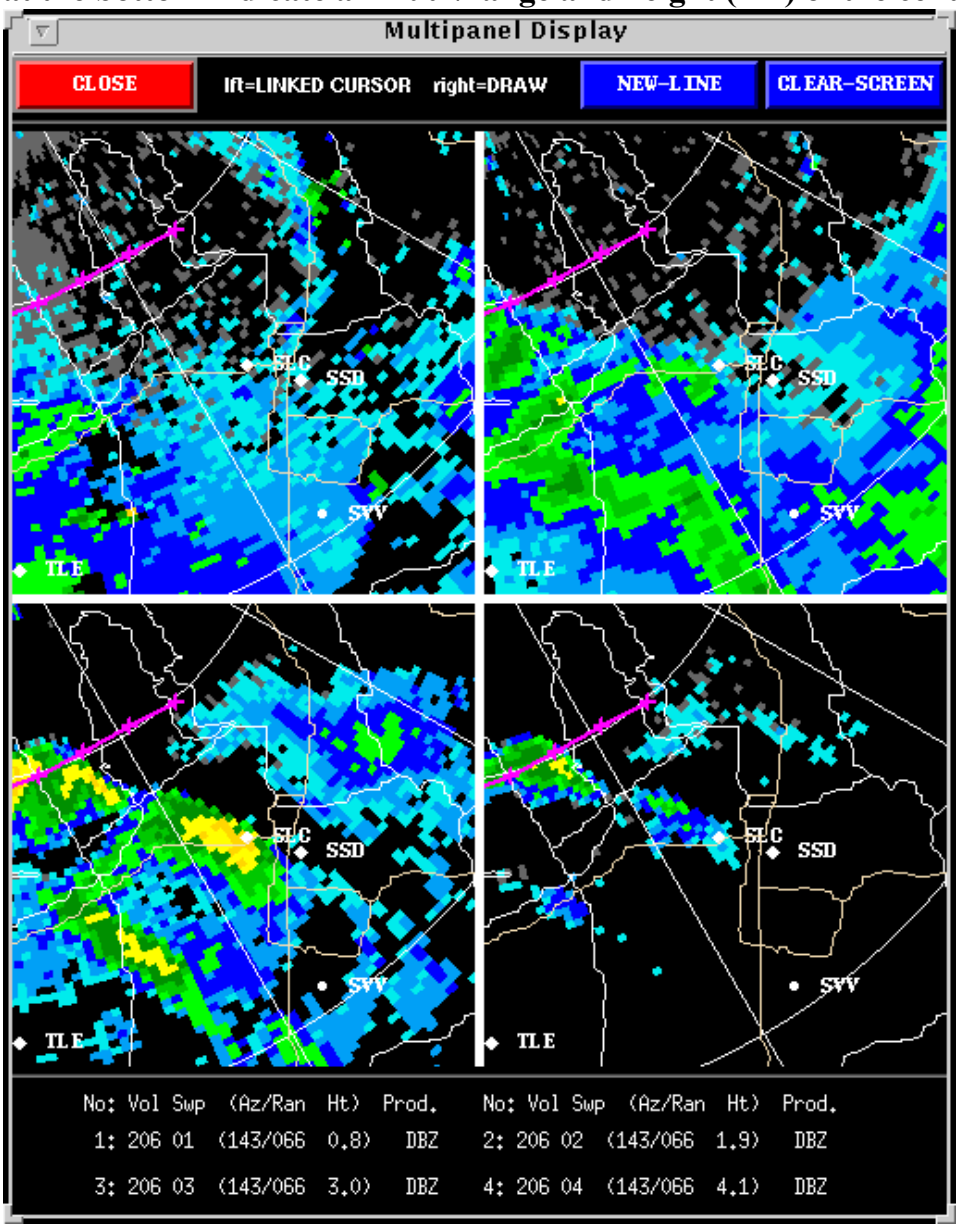
Figure 1. Composite reflectivity image at 2253 UTC on 24 April 1996.



A 4-panel display of reflectivity at 0.5 deg (top-left), 1.45 deg (top right), 2.4 deg (bottom left), and 3.35 deg (bottom right) is shown in Fig. 2. Most of the echo is limited to the 2.4 degree tilt indicating the very shallow nature of the cell.

Very weak reflectivity is present at the lowest lilt.

Figure 2. 4-panel at 2253 UTC showing reflectivity at 0.5, 1.45, 2.4 and 3.35 degrees. The numbers at the bottom indicate azimuth/range and height (km) of the center of each image window.

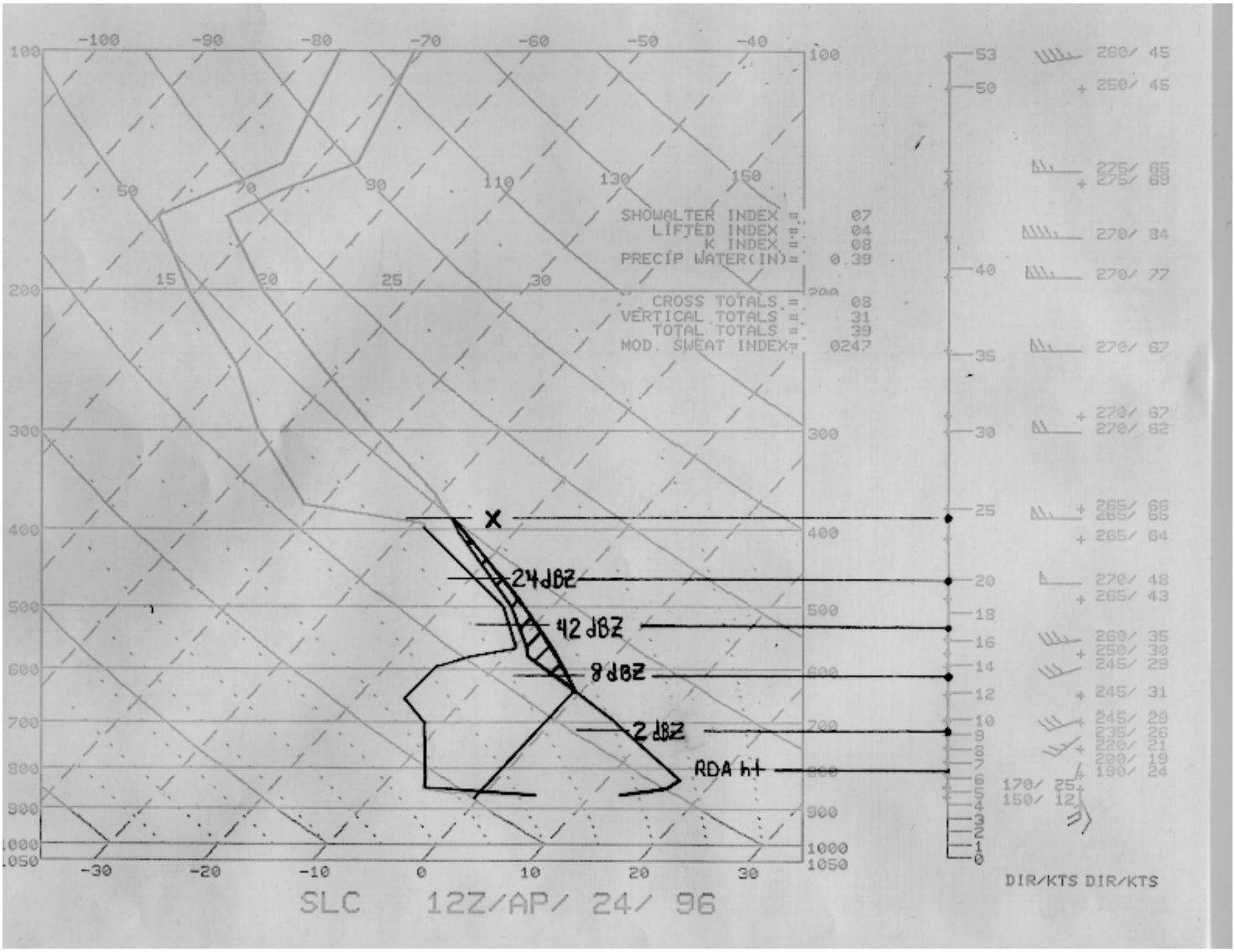


The 12 Z sounding (Fig.3) indicated little or no potential for convection. During the day, a shallow cold front moved through the area bringing lower-altitude moisture with it. The resultant convective available potential energy (CAPE) was estimated by using a near-zero degree dewpoint based on the 00Z sounding.

The radar reflectivity values for the cell in question at 2253 Z are overlaid at their respective heights. The radar location is about 6500 ft MSL and 2400 ft above the Great Salt Lake. The 42 dBZ echo maximum at 17 kft MSL is just above the maximum temperature difference between the convective air parcel and the environment. Reflectivity near cloud base is 8 dBZ with only 2 dBZ at the lowest tilt which is below cloud base. The "X" indicates that the radar saw no echo at the height just above the hatched area. In fact, one could argue that the CAPE area should be less, depending on the cell's vertical velocity (which is of course not known).

Figure 3. 12 Z sounding from 4/24/96. The hatched area indicates the convective available potential energy determined from the evening sounding moisture profile. Reflectivity values from

the radar at 2253 Z have been overlaid.



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3. Discussion

Composite reflectivity must be interpreted with caution. The vertical structure of a storm yields clues as to whether or not precipitation is reaching the ground.

Furthermore, knowledge of the storm's environment should be used in conjunction with the radar data. In this case, the use of the evening sounding validated the radar observations as the morning sounding indicated little or no potential for convection. Visaversa, the radar data can used to estimate the correct moisture and temperature values for use in determining convective parameters.

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