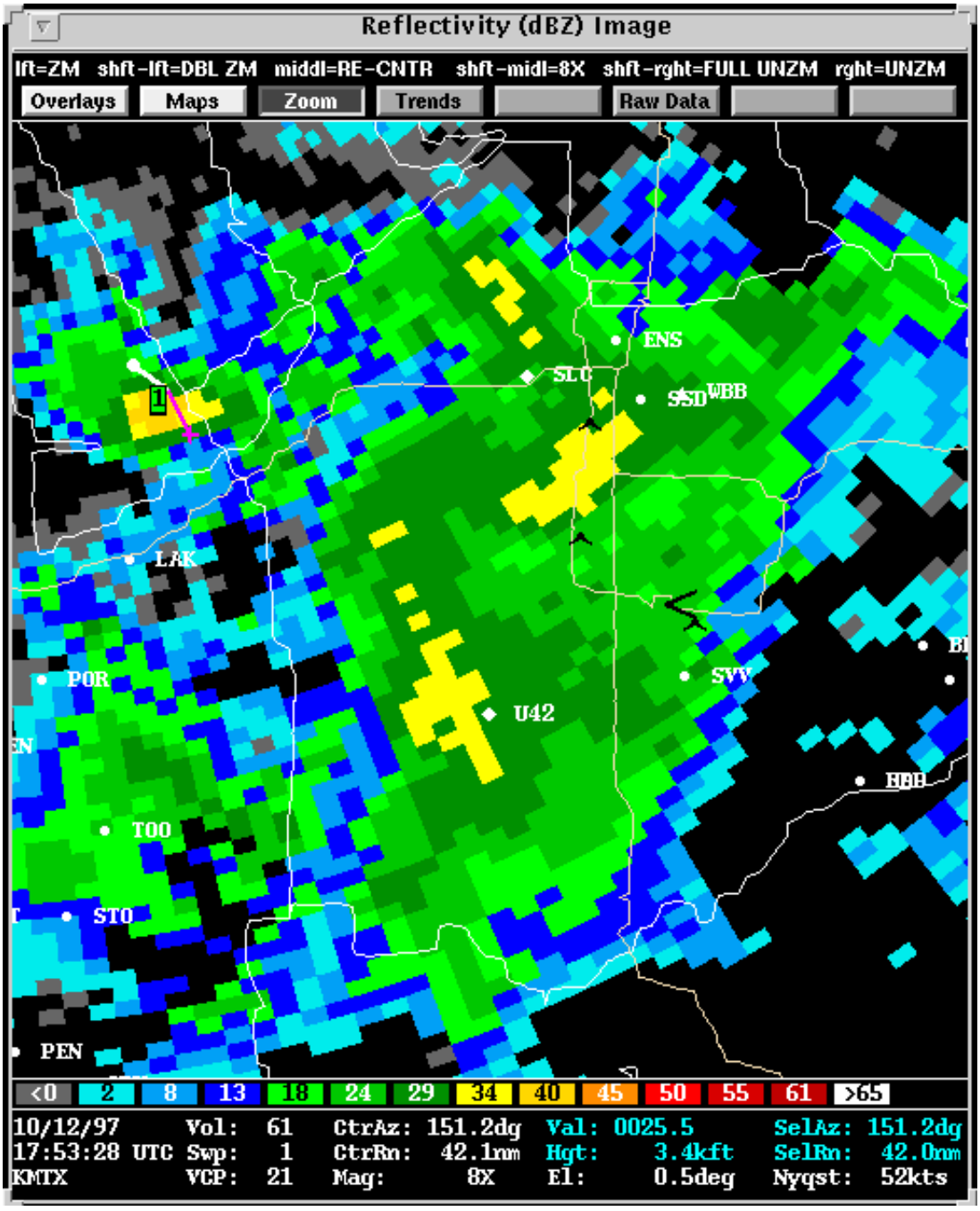
Mixed phase and radar reflectivity/rainfall rate

by Steve Vasiloff

This case illustrates the complexity of determining the correct coefficient and exponent for the Z-R(S) relation Z = aR^b. The default values in the WSR-88D system for rain are a = 200 and b = 1.6. Values for snow are much more variable and depend on many factors (Vasiloff 1997). However, when there is snow mixed with rain, no one set of numbers can be used for the entire radar domain. Of course, complex terrain makes things even more difficult.



On Sunday 12 October 1997, snow showers advected off the Great Salt Lake to the southeast over the Salt Lake City area (Fig. 1). The author drove along I-215 (black arrows) northward through the large 34+ dBZ echo just to the southeast of SLC, the NWS WFO. Along the way, light-to-moderate rain was encountered beneath the 24-29 dBZ areas. The precipitation changed to sleet briefly before becoming very heavy snow with large aggregates under the highest reflectivity areas. Surface temperatures in the area were just above freezing. Thus, only in the more convective echoes was snow able to reach the ground before melting.

A potential solution in situations like this would be to use one Z-R(S) for the convective elements and another for stratiform echoes.

References

Vasiloff, S., 1997: Interpretation of radar data during snow events in mountainous terrain. NWS WR TA97-35.