Western Region Technical Attachment
No. 90-17
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MESOSCALE FORECAST EVENT IN OREGON

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Low-level, air-mass boundaries and mesoscale features are often difficult to identify in the Western U.S. due to terrain influences and large distances between observing sites. Such was not the case in Oregon on April 16, 1990. Both diagnostic techniques and NGM model fields enabled the forecaster to properly apply mesoscale theory to the forecast.

A 308K isentropic analysis was made using 12Z April 16 raob data (Figure 1). This type of analysis is not usually helpful on the West Coast, where no raob sites are available to the West. On this occasion, it was of use due to the easterly component to the flow across the state. The analysis showed rising motion across most of Oregon and northern California (shaded area in figure). This induced convection through the night into the morning hours. A satellite picture early that morning (Figure 2) showed convection across most of eastern Oregon and in extreme southwest Oregon. The problem to be addressed in the forecast that day was whether convection would continue through the day and if so, where.

A number of 12-hour forecast charts from the morning NGM model pointed to convective potential in south-central Oregon. The 700 mb vertical velocity (Figure 3), low-level moisture convergence (Figure 4) and convergence shown in the boundary level winds (Figure 5) all pointed toward that area. This area also coincided with the clear area on the morning satellite picture--an area where differential heating would be available to initiate convection. These items gave the forecaster confidence in targeting significant convection for that afternoon in south-central Oregon.

By mid-afternoon, convection began as expected in the favored area (Figure 6). Convection was further aided by easterly low-level winds which, in that area, are upslope to the Cascades. A few hours later, a few large cells had developed on the south Cascades (Figure 7). Dew points were rather low that day and no heavy rainfall was expected. However, RAWS data and spotter reports (not shown) indicated that a large part of the area received between .5" and .8" during the afternoon and evening hours.

It is not often that numerical models catch such mesoscale events in the West or that smaller scale analysis techniques are as revealing as this one. In this case however, hand analysis and model output led to a good forecast of what otherwise would have been another "broad-brush" forecast.

Reference

Snellman, Leonard W., Use of Isentropic Charts in the 1980s, Western Region Technical Attachment 86-09.

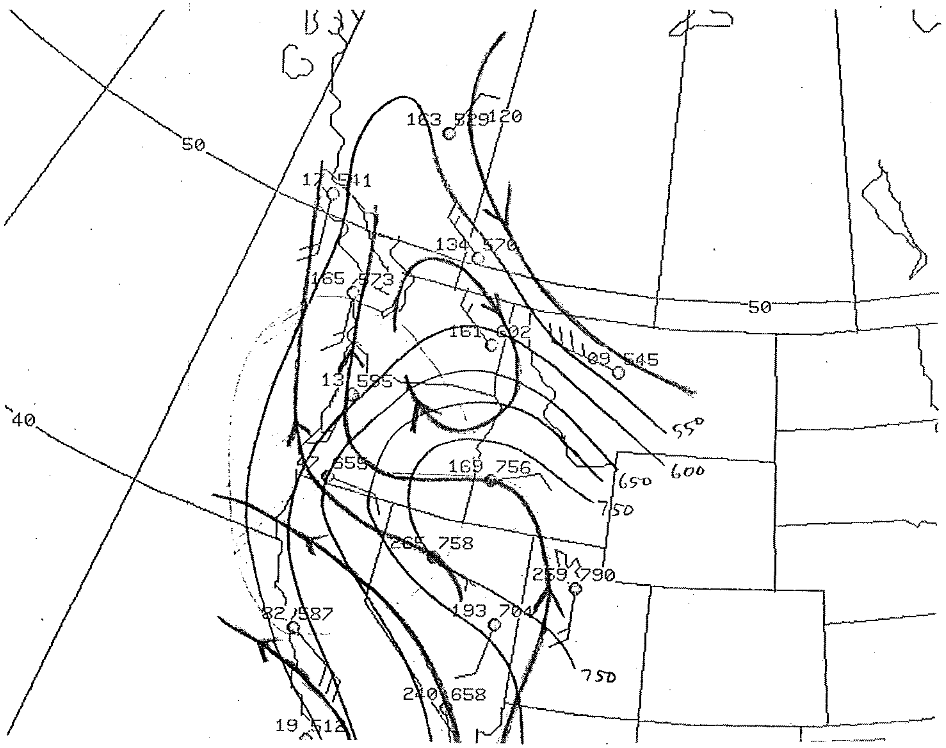

Figure 1. 308K isentropic analysis for 12Z Apr 16, 1990. Pressure contours thin lines, streamlines heavy lines. Station plot has pressure level of 308K surface in upper right and number of millibars of additional lift needed to reach saturation in upper left.

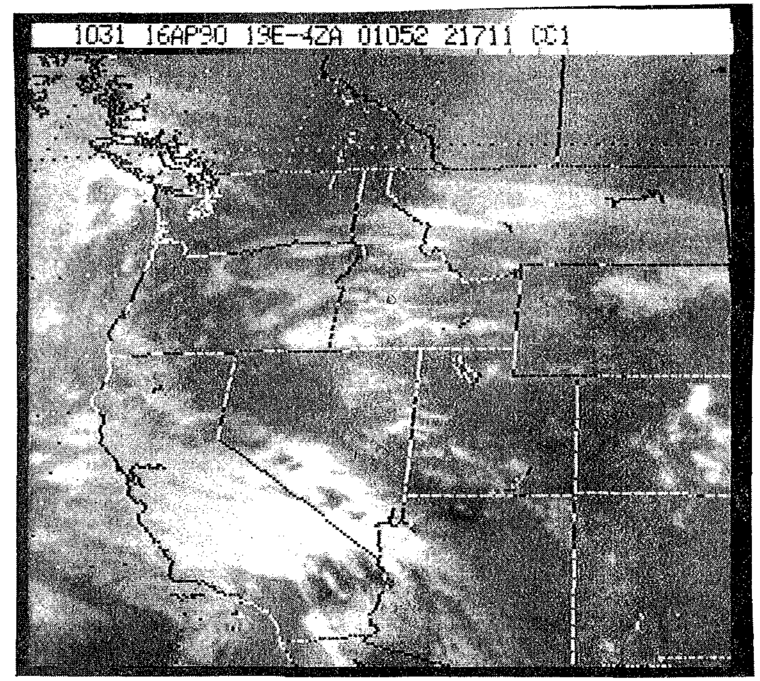

Figure 2. IR satellite image for 1031Z Apr 19, 1990.

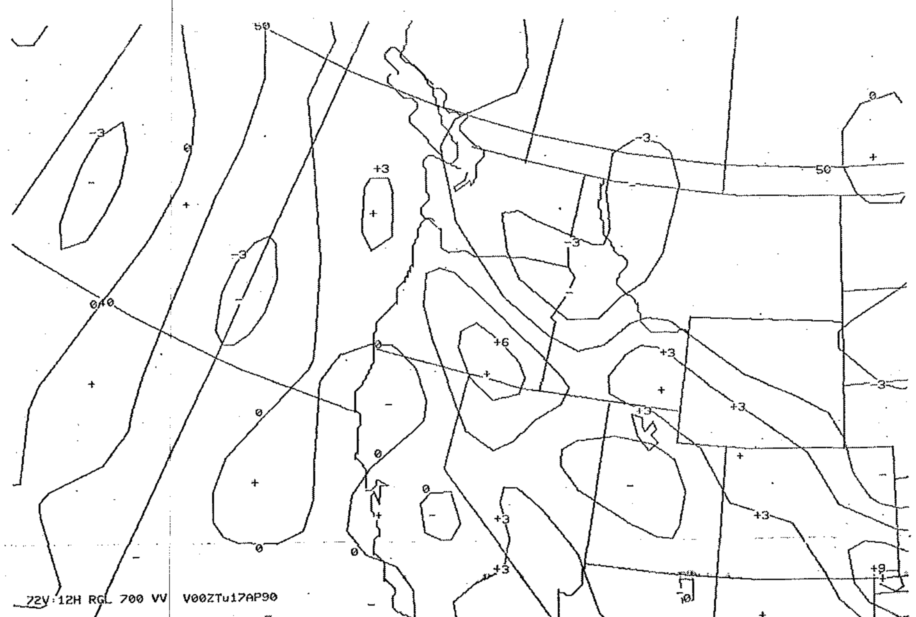

Figure 3. NGM 700mb vertical velocity (microbars/sec) for 00Z Apr 17, 1990.

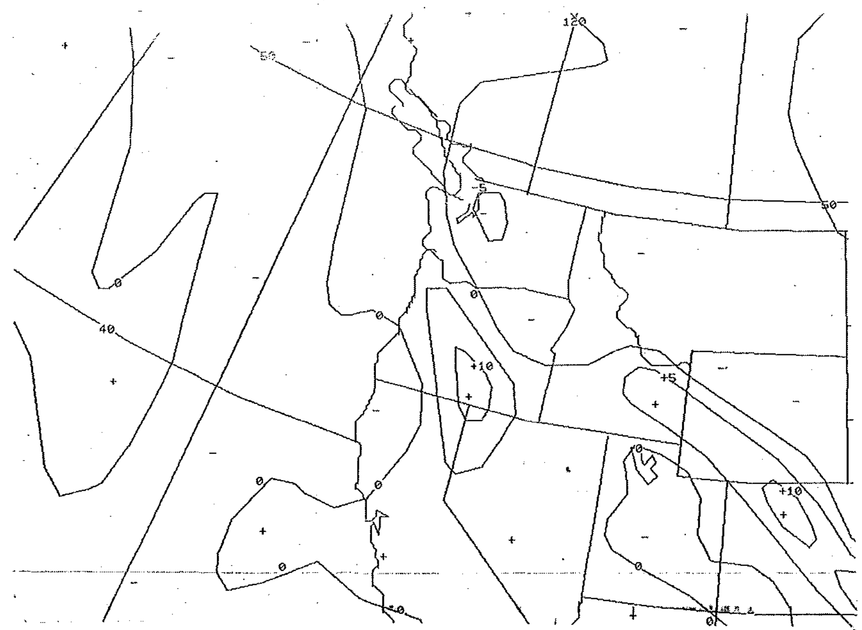

Figure 4. NGM low level moisture convergence for 00Z Apr 17, 1990.

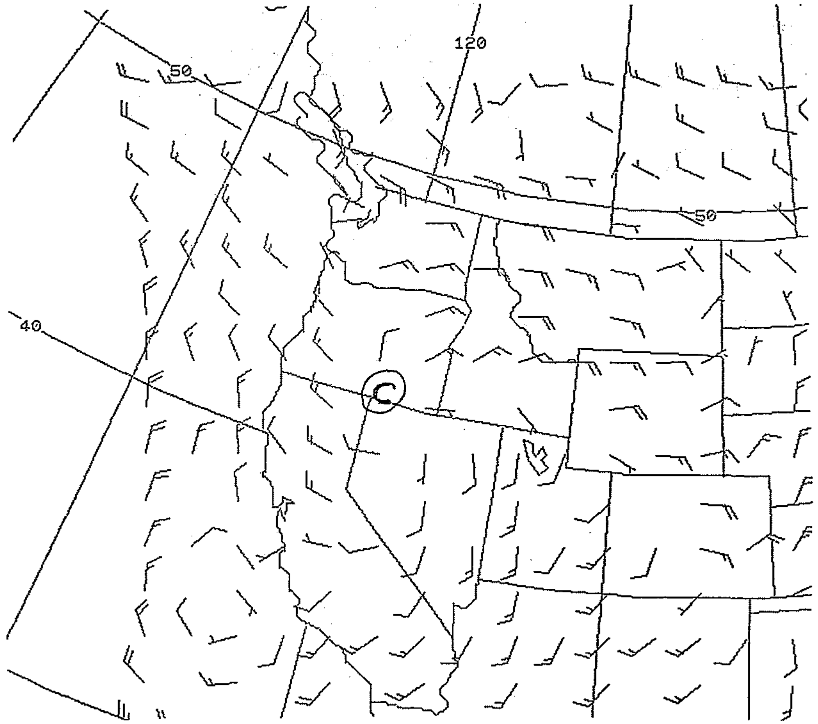

Figure 5. NGM boundary layer winds for 00z Apr 17, 1990.

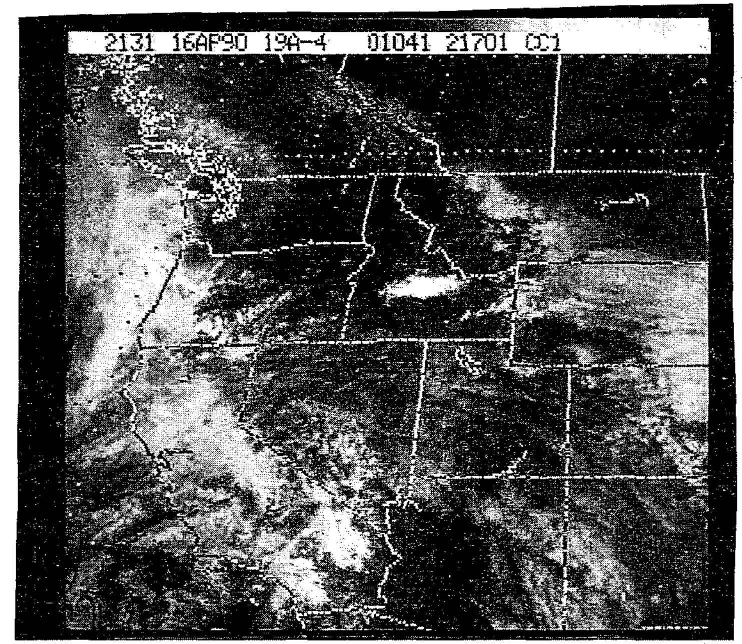

Figure 6. Visible satellite image for 2131Z Apr 16, 1990.

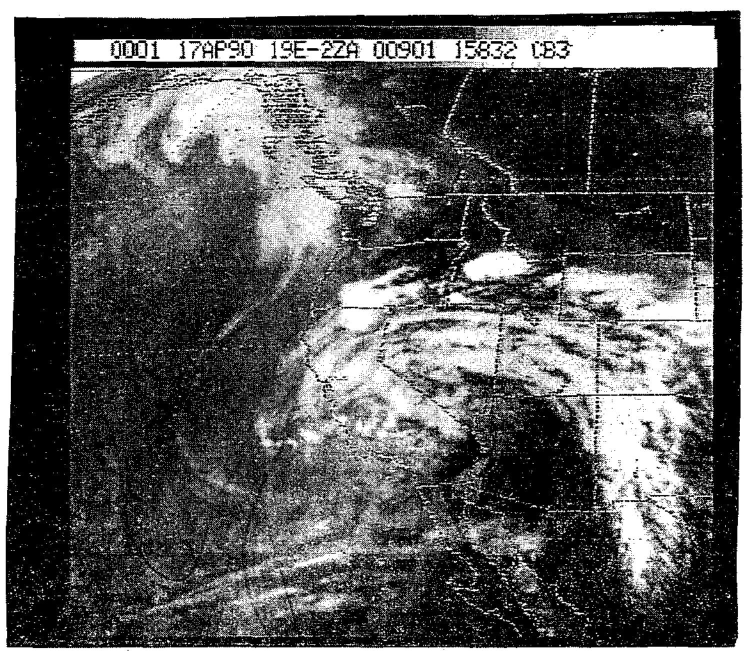

Figure 7. IR satellite image for 0001Z Apr 17, 1990.