WESTERN REGION TECHNICAL ATTACHMENT
NO. 98-19
May 5, 1998

DEFICIENCIES IN THE AWIPS MODEL DATA-SET

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Introduction

The Western Region (WR) Wide Area Network (WAN) has been used since 1995 to transfer model data from the Office of Systems Operations (OSO) Server in Washington D.C. to the 24 WR forecast offices. At first, only AWIPS data were available, i.e., those grids and parameters listed in the AWIPS Appendix K. Beginning in 1995, several deficiencies in the AWIPS data-set were noted. NCEP models produce scientifically better and more operationally useful data than is transmitted on AWIPS. Requests from the field to correct these deficiencies were collected by the SOO/SAC Coordinator, Peggy Bruehl, and are listed on a SOO/SAC web page (for address, see below). Fortunately, an "experimental side" of the OSO server was created in 1996 which allowed NCEP to provide enhanced data sets that better represent the capabilities of the models.

Regional WANs use both the operational and experimental side of the OSO server, while the AWIPS network uses only data from the operational side. The experimental side provides the capability to test new data before making it operational. This Technical Attachment will show that several important data-sets on the experimental side of the OSO server need to be made available in AWIPS.

A Comparison Of Data Available From The WR WAN And AWIPS

1. The 32-km Eta model is available on a 40 km output grid, AWIPS has only an 80 km output grid. (This 40 km data is currently being tested on the WR WAN and will be transmitted to all 24 WR forecast offices in the near future.)
2. The 32-km Eta is available at 3-hour forecast intervals, AWIPS has only 6-hour intervals.
3. The WR WAN has 1-hour interval data for point locations (the BUFR Model Sounding Files) from the Eta and NGM models, AWIPS does not.
4. MRF Ensemble data is available from the WR WAN but not AWIPS.
5. The 40-km RUC model is available (a limited set) on a 40-km grid, AWIPS continues to use an 80-km grid.

6. RAWS observations are included in both data-sets, but are not plotted by AWIPS.
7. NOGAPS model output is available from the WR WAN but not AWIPS.
8. The Eta-10 "Nest in the West" is available on a 10-km grid from the WR WAN, but is not available from AWIPS.

The following examples illustrate the importance of these differences.

Example 1 - Eta Model Output

AWIPS workstations display the 32-km Eta model on an 80-km output grid, and as a result, important information is lost. For example, fig.1 compares a 24-hour forecast of precipitable water (PW) plotted on an 80-km grid and on the 40-km grid available from the WR WAN. The increased detail available from the 40 km grid is striking. For example, the model is forecasting high PW values in the northern Central Valley of California (fig. 1b). This level of detail is possible because the 32-km Eta resolves the narrow inlet between the coastal mountains and hence can allow marine air to enter the Central Valley. (Most operational models do not resolve the Central Valley at all.) Note also the dry PW values east of the Sierra Nevada Mountains in Owens Valley and Death Valley. Unfortunately, these detailed PW values have been smoothed out on the 80-km grid available on AWIPS (fig. 1a). An AWIPS user is given no hint that the 32-km Eta model can provide this detailed information.

Example 2 - The BUFR Model Sounding Files

The BUFR Model Sounding Files provide high resolution vertical model data at single point locations with hourly temporal resolution. These files can be critical to a forecaster because of improved information about the vertical structure of the model atmosphere. The AWIPS data-set provides, in most cases, only 6-hour temporal resolution and limited vertical resolution. Consider figures 2 and 3, comparing Boise, Idaho time-height-section plots created using the BUFR files (fig. 2) and the AWIPS files (fig. 3). (AWIPS workstation settings were checked to be sure the highest possible resolution was plotted.) The following deficiencies in the AWIPS plot are evident:

1. Because the lowest level is missing from the AWIPS data, the AWIPS plot shows a gradual wind shift in the lowest levels, while the BUFR data reveals the model's lowest level wind shifted sharply at 1600 UTC from southeasterly to northwesterly.
2. The directional shear at 0000 UTC on the 11th is much stronger in the BUFR plot. Directional shear is critical in determining the nature of convection.
3. The BUFR plot relative humidity values near 550 mb shows three periods of moistening/drying produced by weak shortwaves. The AWIPS plot shows only a gradual drying with time.

4. The vertical motion plot from the BUFR data (fig. 2b) shows a distinct maxima of upward motion at 0300 UTC. The AWIPS plot (fig. 3b), on the other hand, which has to interpolate between 6-hourly intervals, incorrectly shows the maxima at 0600 UTC and the values are weaker and spread out over time.

A forecaster looking only at the AWIPS data-set would not know the model was forecasting these potentially important atmospheric processes, which in some cases could affect the forecast.

Discussion

Without doubt, AWIPS provides forecasters with a superior way to analyze data. AWIPS empowers forecasters to think scientifically because the system can integrate various data-sets, i.e., model, radar, satellite and observed data. However, as described here, improvements are needed to the AWIPS model data-set transmitted over the Satellite Broadcast Network (SBN) to fully utilize the NCEP numerical models.

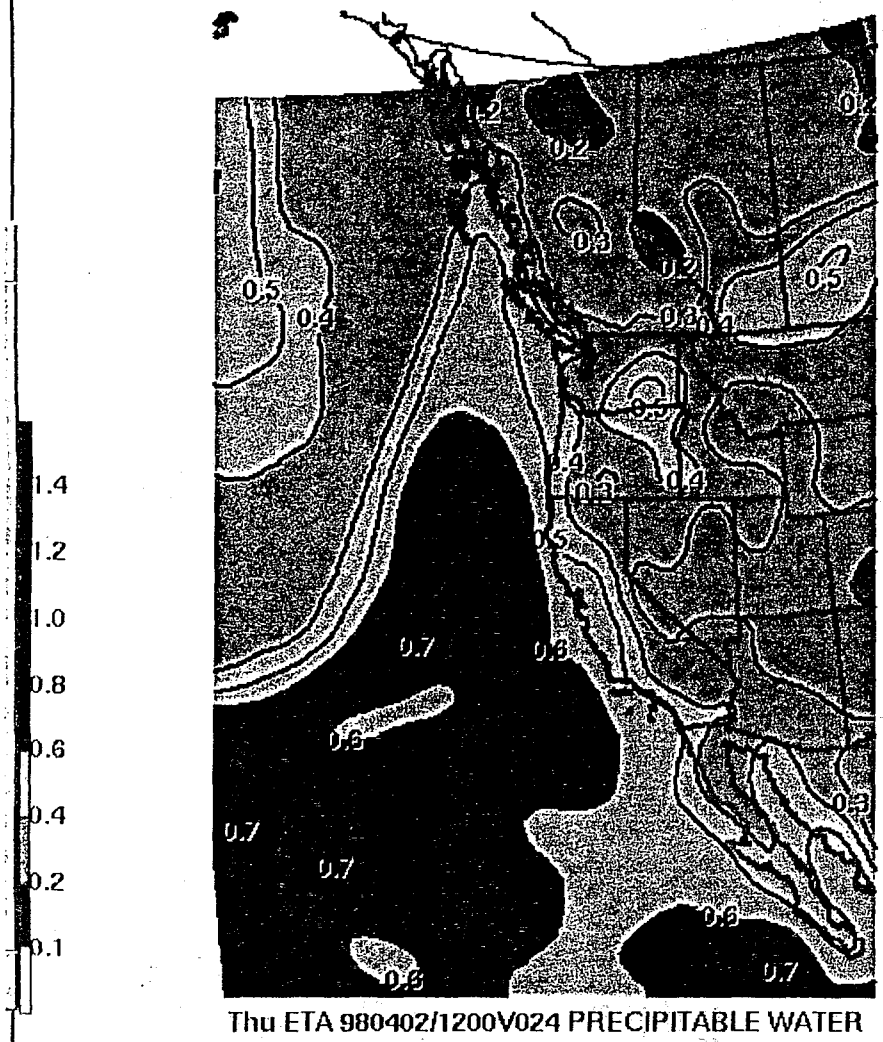
Web Page References

An excellent description of the data available from the OSO server, as well as a list of field requests, can be found at the SOO/SAC homepage:
www.comet.ucar.edu/pub_html/sac_html

Several web pages provide information on the AWIPS program, a good place to start is the WR homepage: www.wrh.noaa.gov

The AWIPS appendix K can be downloaded from
www.nws.noaa.gov/noaaport/html/refs.shtml

Figure 1. Eta-32 Precipitable Water 24-hour forecasts valid at 02 April 1998 1200 UTC plotted on (a) an 80-km output grid and (b) a 40-km output grid. Values in inches are indicated by the color bar.



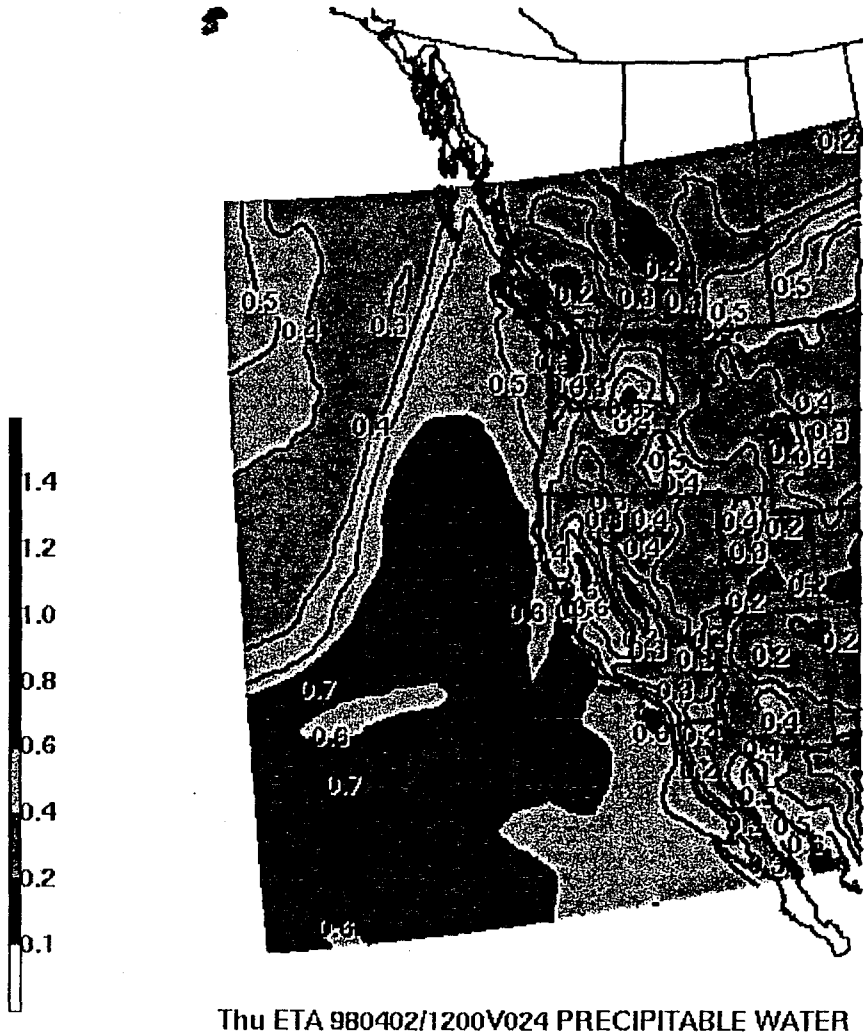
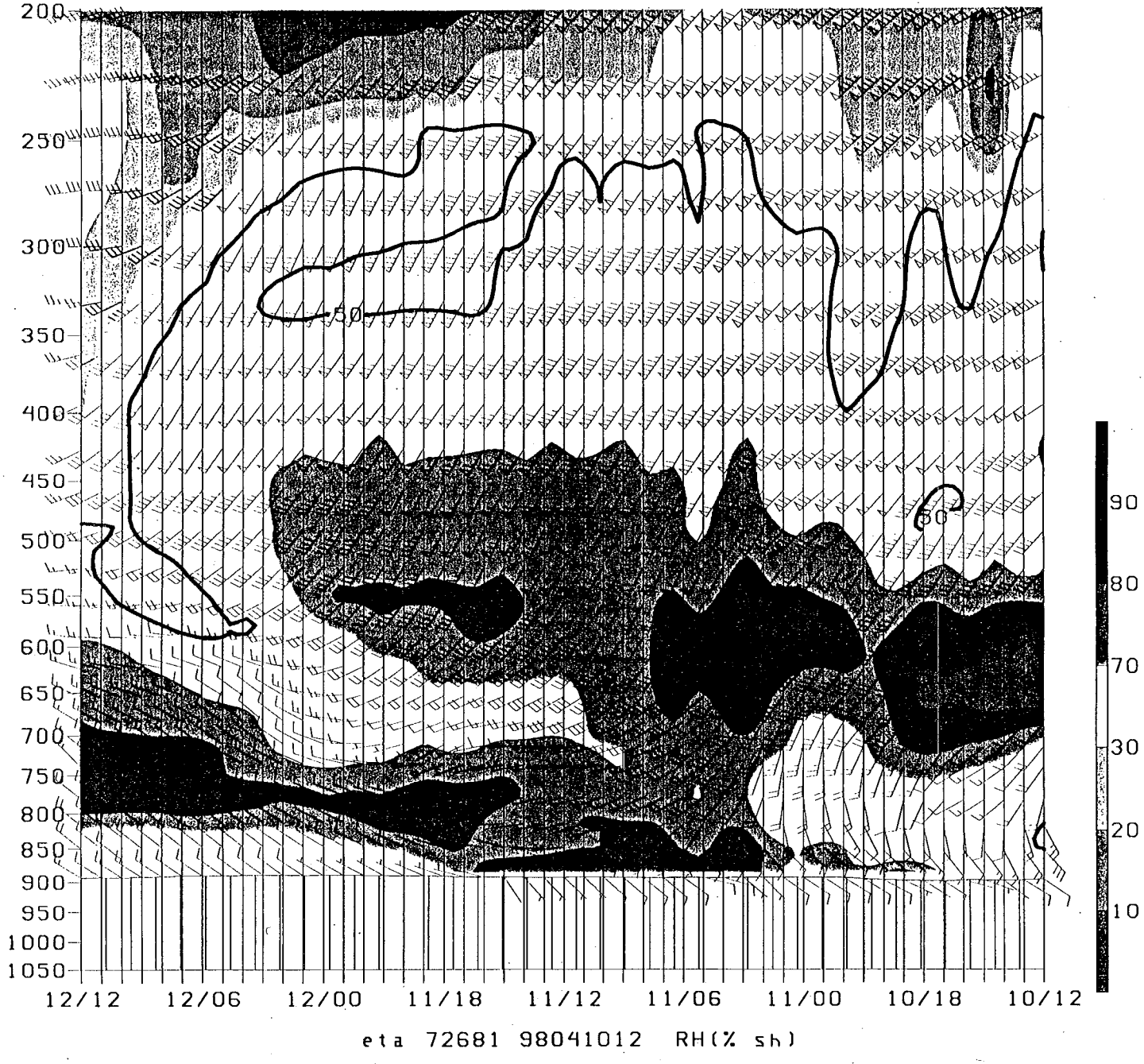


Figure 2. Time height cross section created from the BUFR Model Sounding File from the Eta-32 run initialized at 10 April 1998 1200 UTC for Boise, Idaho. Figure 2a displays Relative Humidity and winds in knots. Figure 2b displays vertical motion in microbars per second, dashed lines indicate rising motion.



2 (b)

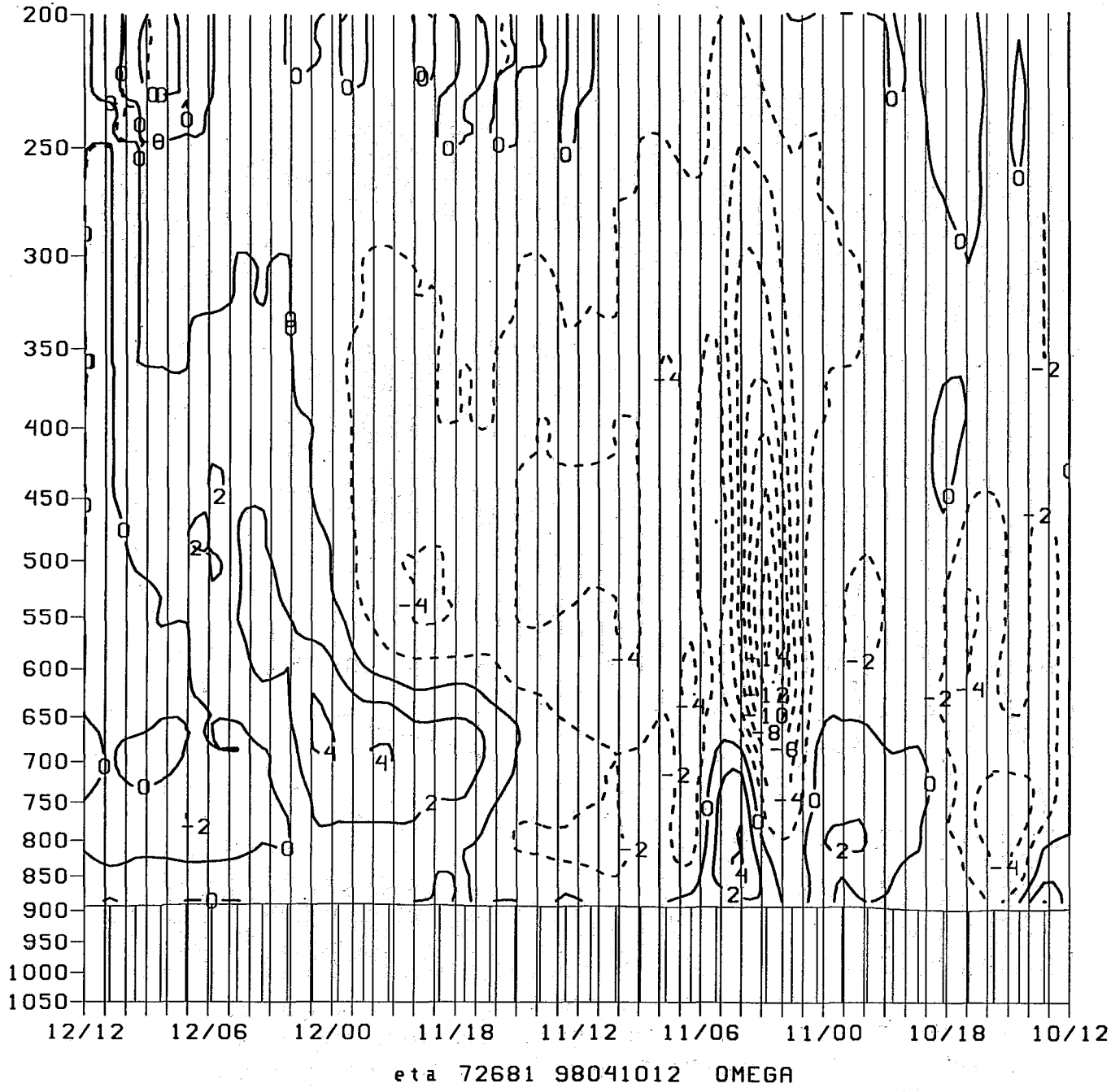

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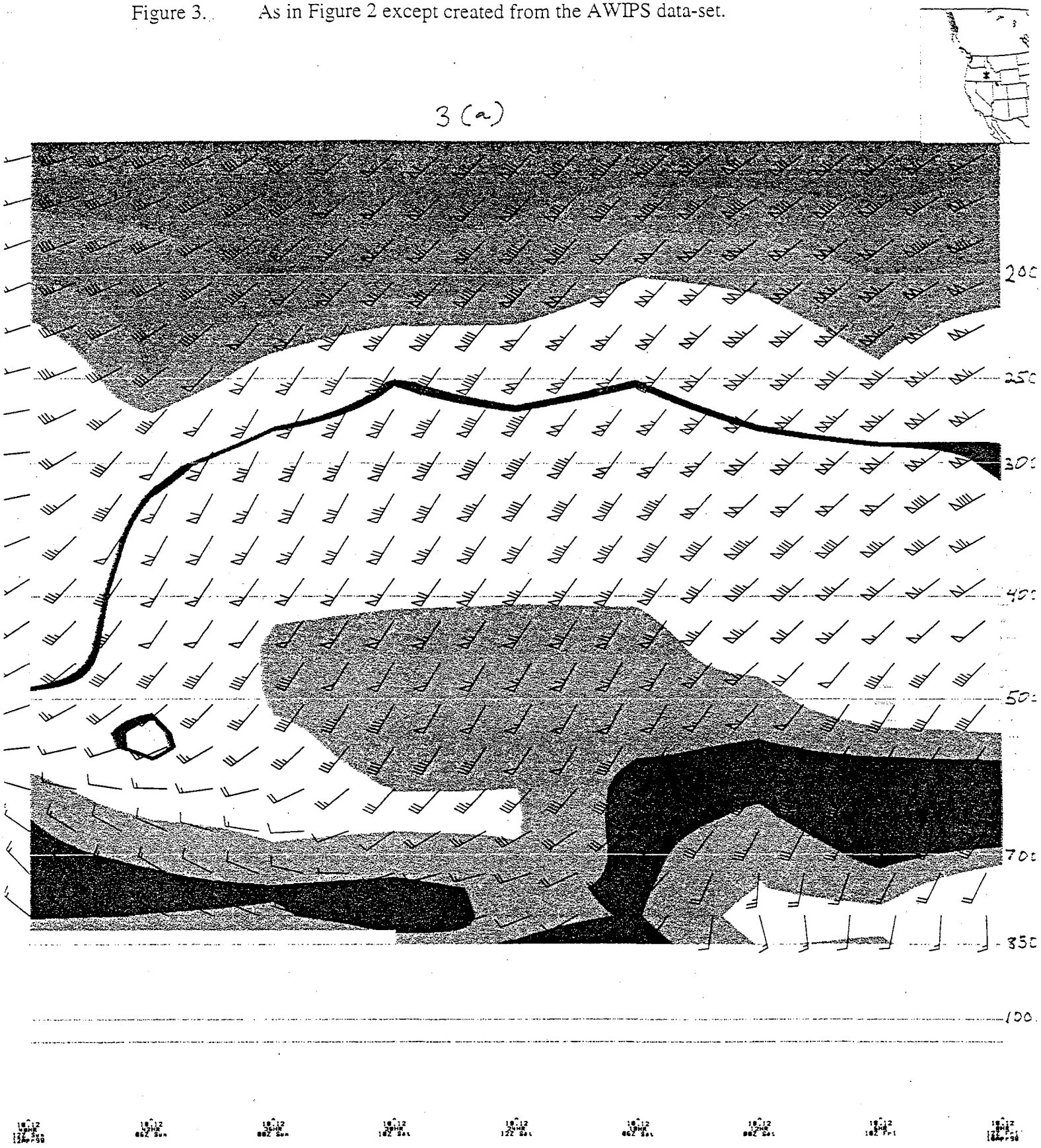
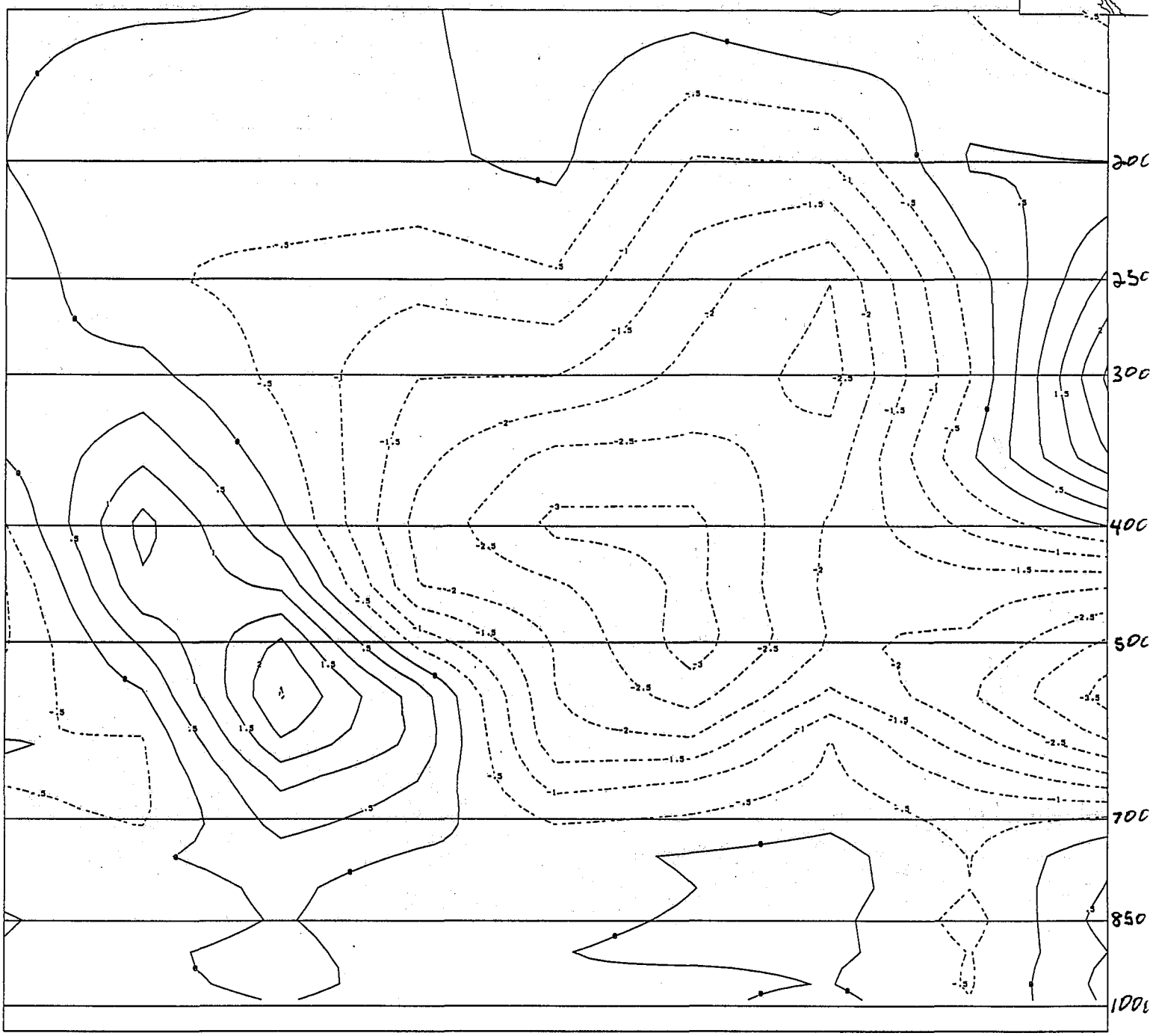
Figure 3. As in Figure 2 except created from the AWIPS data-set.



ETA point-I Rel Humidity Img(%)

3 (b)



ETA point-I Omega (ubar/s)