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USING GRIDDED MODEL OUTPUT TO CRITIQUE THE INITIAL ANALYSIS

Lawrence B. Dunn - WSFO Salt Lake City, UT

Introduction

A careful critique of the initial analysis is a fundamental activity every forecaster must go through as part of the intelligent use of Numerical Weather Prediction. Along with evaluation of the planetary-scale pattern and knowledge of model characteristic errors, a critique of the initial analysis is one element of the triad that is the basis for selection of one model solution over the others on any given day. The most common method for evaluation of the initial analysis is to compare satellite imagery with the analysis of 500 mb absolute vorticity. Particularly over data sparse regions such as the eastern Pacific, this will often tell the forecaster whether the model has the main synoptic-scale features correctly located. Access to gridded model output offers some other possibilities for evaluation of the model's initial analysis. An example from 24 January 1994 is presented in this brief Technical Attachment.

Case Study

A major trough was located off the West Coast on the morning of 24 January, with a frontal band moving onshore through California and Oregon. Figure 1 shows an infrared satellite image from 1000 UTC. A number of small comma-shaped clouds are rotating around a circulation center near 45°N/130°W, with a ridge axis upstream near 150°W. A comparison of the ERL and RGL 500 mb initial absolute vorticity fields, taken from the full-resolution gridded output available via FAIS (Fig. 2), reveals the models are in the ballpark, but not well located on the exact positions of the multiple vorticity centers found in the trough. The locations of the centers are quite similar in both models. It would be quite difficult to choose one model over the other based on this evaluation of the initial analysis, since both models are more similar to each other than they are to the reality depicted by the satellite imagery. Unfortunately, this is often the case.

The 24 hour forecasts of absolute vorticity are shown in Fig. 3. Although the initial locations of the vorticity centers were similar, by 24 hours, the ERL has a strong center located just offshore of Los Angeles, while the RGL places the center near Las Vegas. Other differences are also apparent. As might be expected, there are considerable differences in the timing and location of weather associated with the two predictions. The difference could be ascribed to either characteristic errors of the models, differences in the initial analysis, or a combination of both. Given the similarity in the initial vorticity fields, one might be tempted to choose the first of these as the primary reason. If this were true, the forecaster is then faced with choosing one model over the other based on our limited knowledge of the characteristic errors of the models (of course, this is a moving target in the Eta model).

The initial 250 mb isotach field (at full 80 km resolution) from both models can be viewed using FAIS. This is not possible with AFOS graphics since only the RGL 250 mb isotachs are available, and furthermore, the graphic is smoothed since it is derived from data interpolated to the 190 km resolution LFM grid. Figure 4 shows the initial 250 mb isotach fields for 1200 UTC 24 January. The ERL has a 125 knot jet maximum with a large area of greater than 100 knots. The RGL has a much weaker and less concentrated jet maximum in the same location. A much greater difference between the models is noted in this field than in the 500 mb vorticity analysis. Figure 5 shows the observations near 250 mb. The RGL would appear to fit the data much better than the ERL. A call to the SDM at NMC confirmed that the ERL data-cutoff generally precludes it from incorporating the 1200 UTC AIREPS in the eastern Pacific, and this was the case on this day. Thus, it appears that differences in the initial analysis are the cause for the discrepancies in the 24 hour forecasts.

The verifying 500 mb absolute vorticity analyses from the two models are shown in Fig. 6. While no clear winner can be declared, the vorticity center over southeast California is closest to the pattern depicted by the RGL 24 hour forecast.

Summary

Access to full-resolution gridded fields offers forecasters the opportunity to critique the model initial analysis in ways beyond the traditional comparison of 500 mb vorticity and satellite imagery. Comparison of wind and temperature fields with observations at multiple levels is difficult with the limited number of low-resolution AFOS graphics available, but is greatly facilitated by use of the gridded output in FAIS or PCGRIDS. The early data-cutoff time of the Eta model should be considered, particularly when features of interest are in the eastern Pacific.

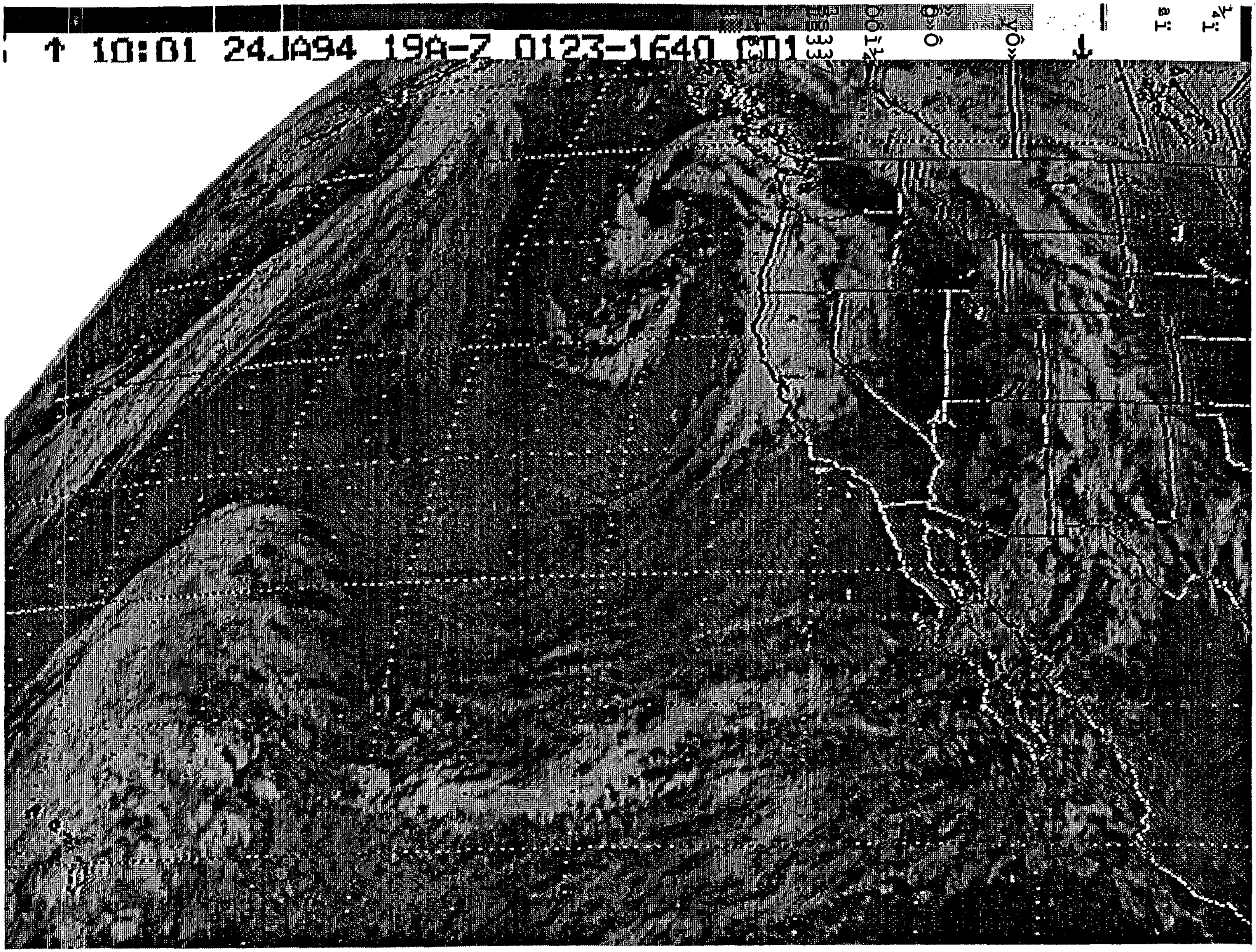

Figure 1. IR satellite image for 1001 UTC 24 January 1994.

A.

B.

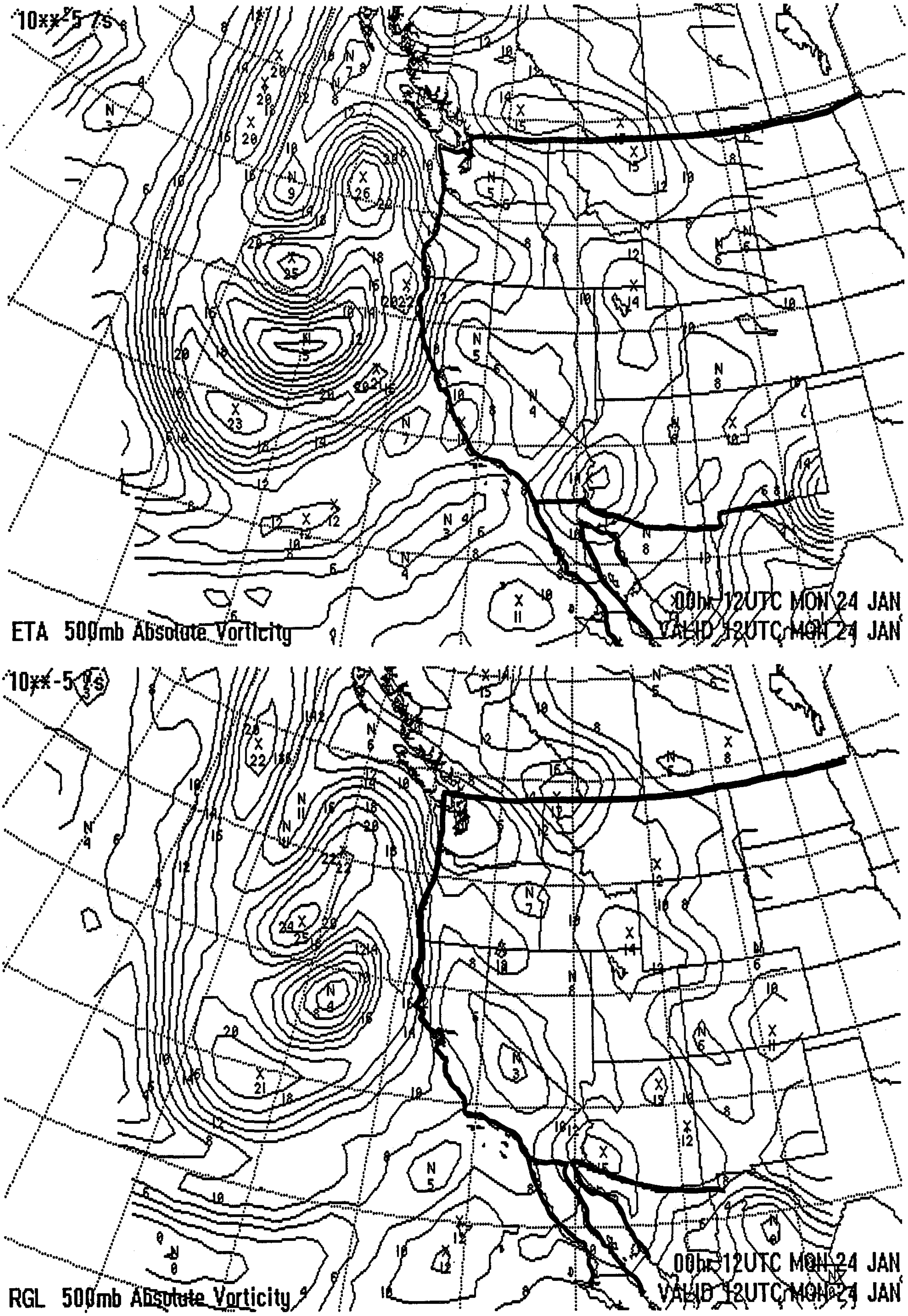

Figure 2. (a) 500 mb absolute vorticity initial analysis at 1200 UTC 24 January 1994 from the Eta/ERL model. (b) Same as (a) but for the NGM/RGL.

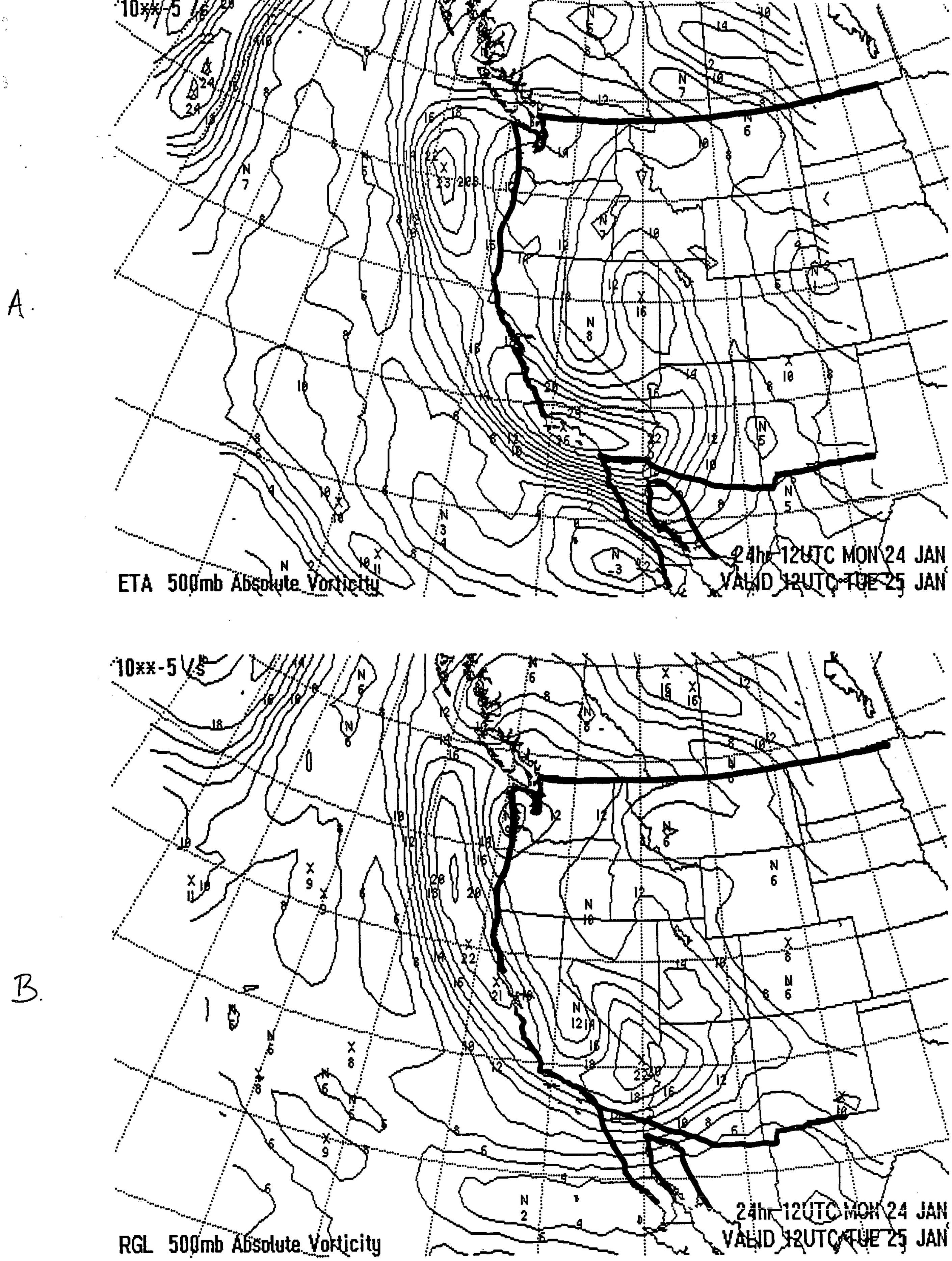

Figure 3. (a) 500 mb absolute vorticity 24-h forecast valid at 1200 UTC 25 January 1994 from the Eta/ERL model. (b) Same as (a) but for the NGM/RGL.

A.

B.

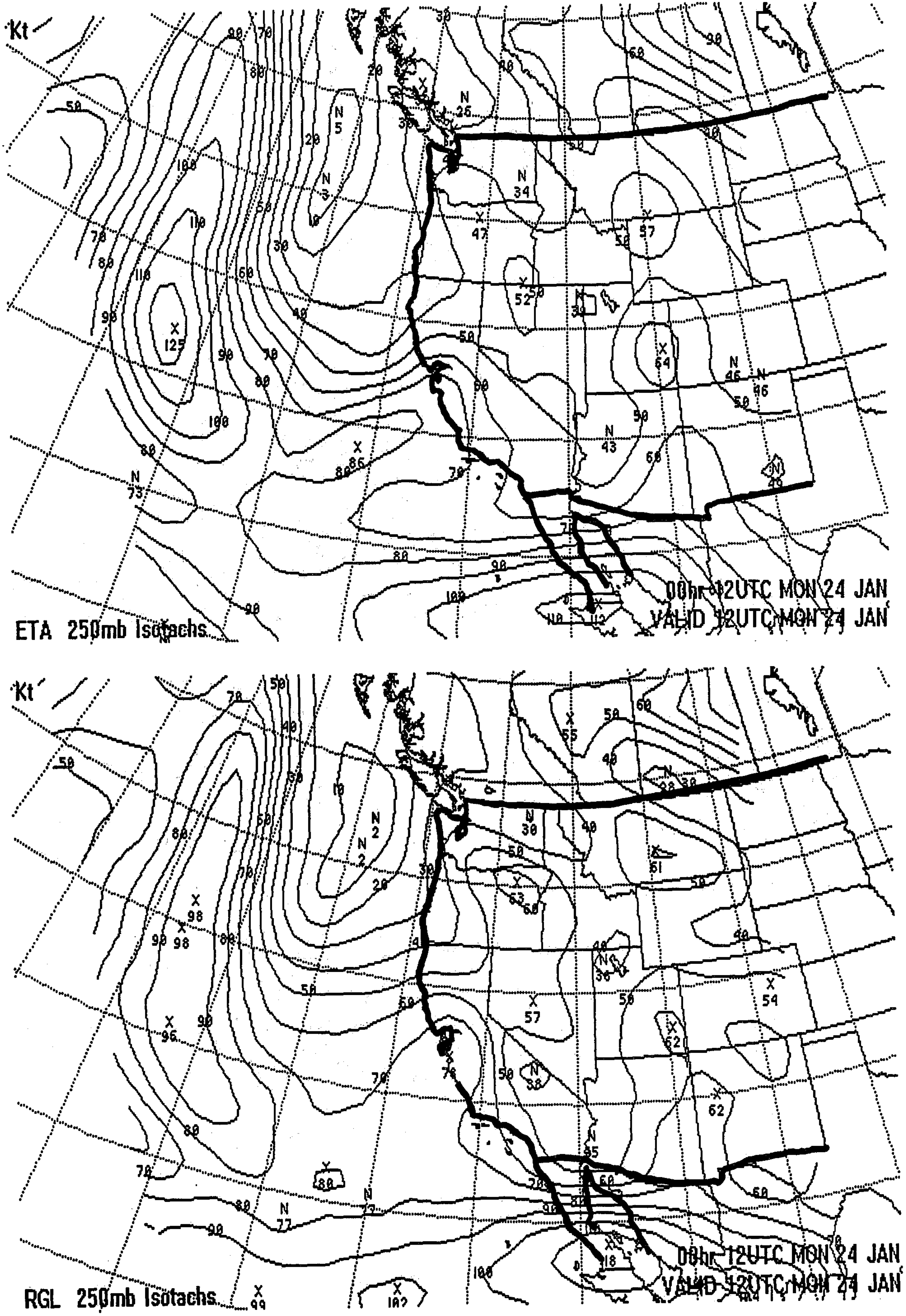

Figure 4. (a) 250 mb isotach (kts) initial analysis at 1200 UTC 24 January 1994 from the Eta/ERL model. (b) Same as (a) but for the NGM/RGL.

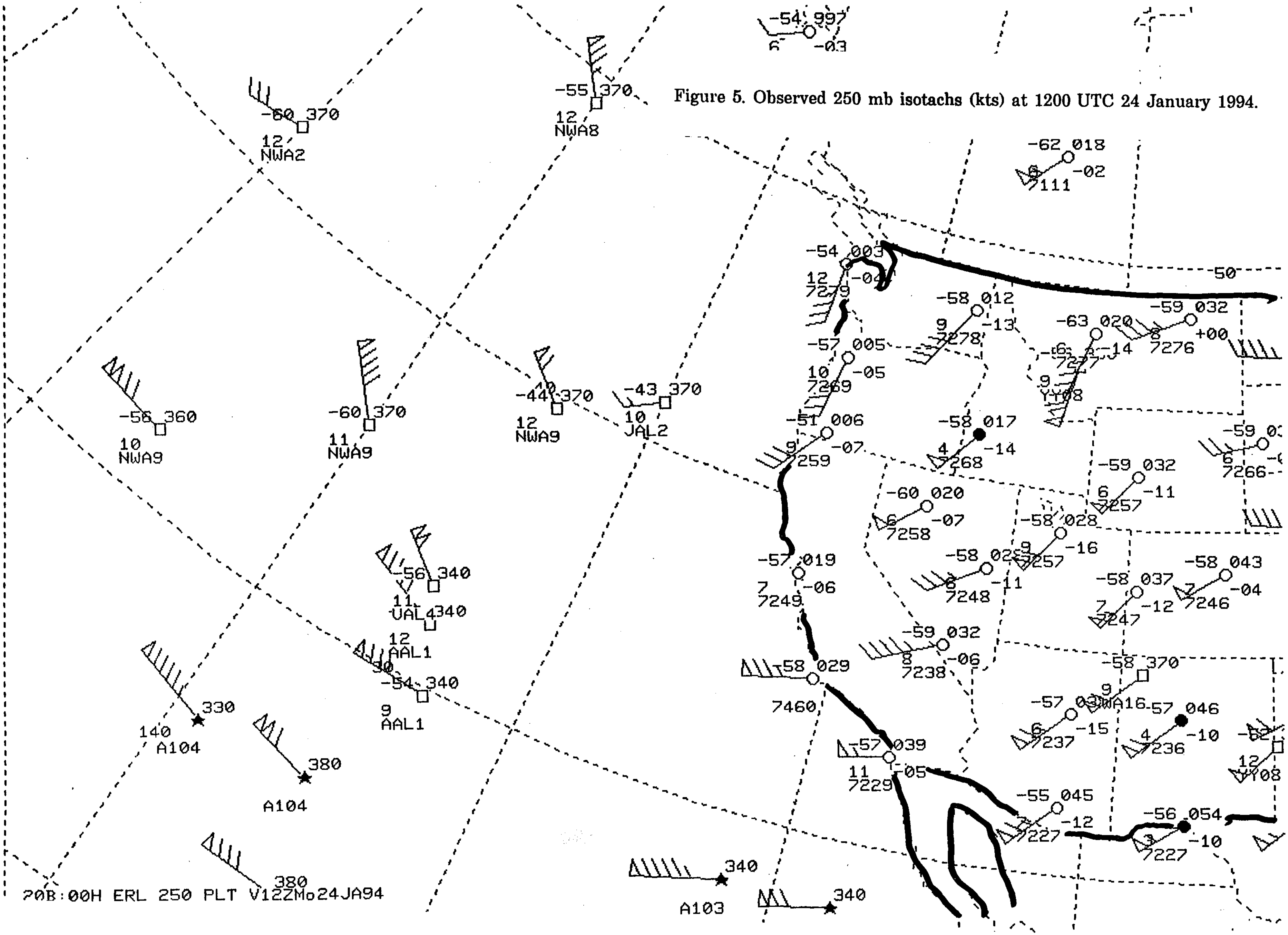

Figure 5. Observed 250 mb isotachs (kts) at 1200 UTC 24 January 1994.

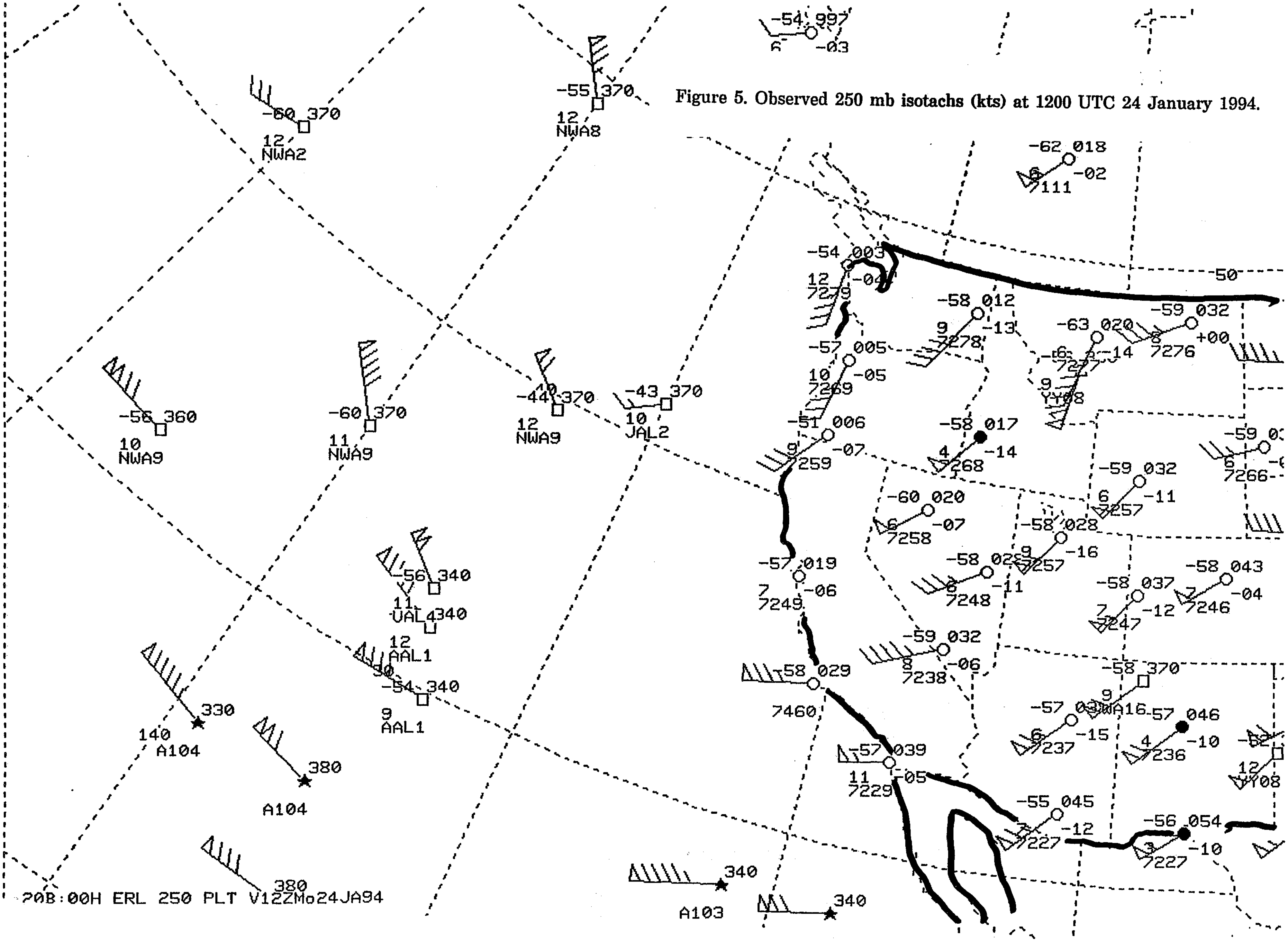

Figure 5. Observed 250 mb isotachs (kts) at 1200 UTC 24 January 1994.

A.

B.

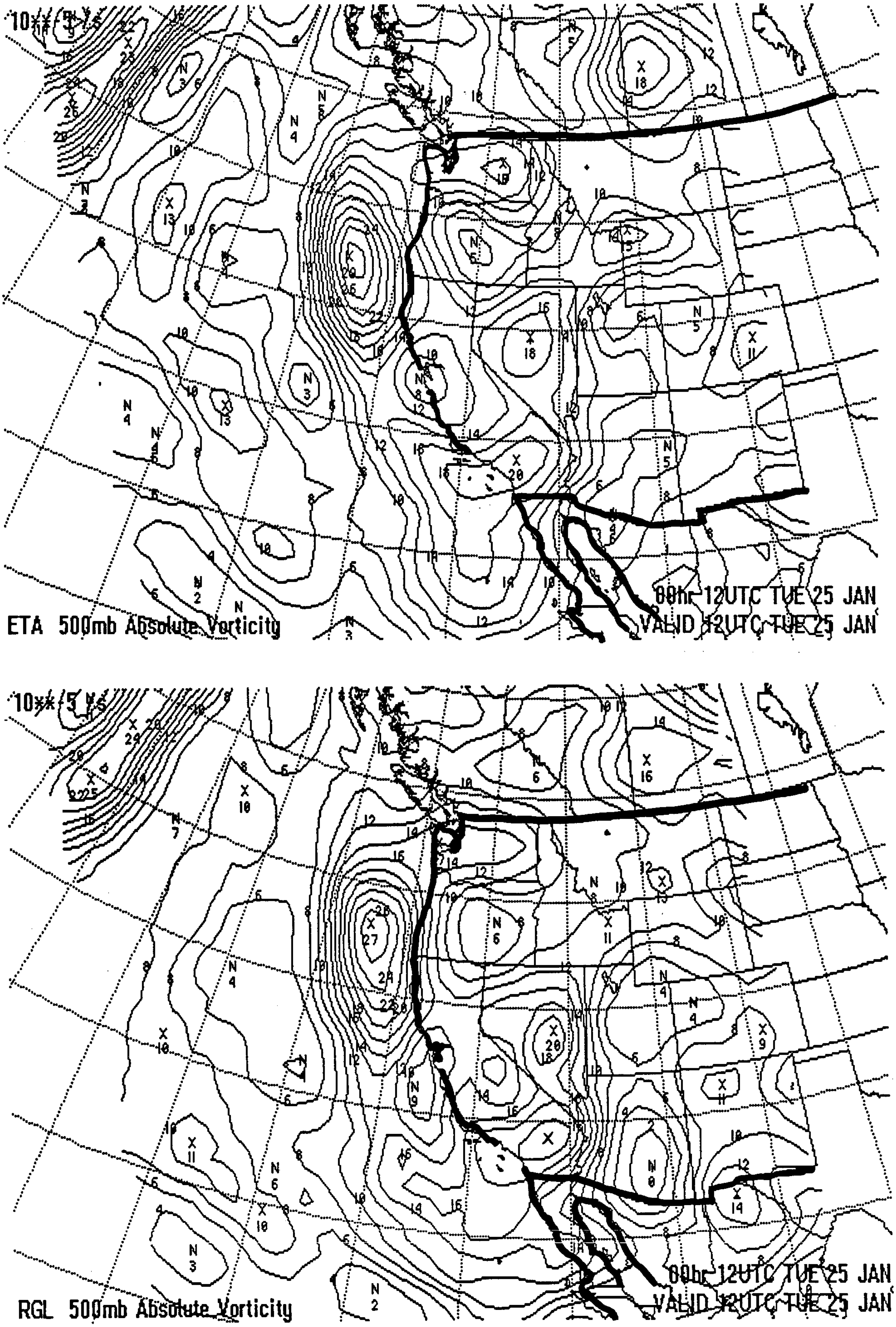

Figure 6. (a) 500 mb absolute vorticity initial analysis at 1200 UTC 25 January 1994 from the Eta/ERL model. (b) Same as (a) but for the NGM/RGL.