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REALTIME DISPLAY OF MODEL SEA LEVEL PRESSURE ERRORS

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One of the more important parameters in making a forecast for a station in the lee of a large mountain barrier is the evaluation of upslope/downslope surface pressure gradients. This is certainly the case at Great Falls in the winter months. Precipitation rarely occurs with downslope low level flow at Great Falls, and precipitation is likely with the initiation of upslope conditions. The pressure gradient is also an important parameter in forecasting the frequent high wind events along the east slopes in the winter.

Over the years at Great Falls several local schemes have been developed for evaluating the strength and onset of upslope/downslope conditions using the sea level pressure values at Boise, Great Falls, and White Court, Alberta. The introduction of the NGM raised the question as to whether the NGM or LFM was better in forecasting upslope/downslope gradients in Montana. An AFOS program was written to display in graphical format the performance in realtime of the two models at these three locations.

The LFM and NGM "FRH" bulletins are used to extract 24- and 48-hour forecasts of surface pressure at Boise, Great Falls, and Edmonton (nearest "FRH" station to White Court). A circular file containing 20 cycles (10 days) of data is maintained and collated with observed surface pressure. Three graphics are produced by the program which display the model error at the stations with a brief statistical analysis.

Figures 1-3 contain sample output generated by the program from the 00Z cycle on November 21st. The graphic is broken down for 24 and 48 hours with NGM errors marked with an "N" and LFM errors with an "L". The model runtime of the forecast is along the bottom and the upper right hand corner contains mean error and bias statistics.

Figure 1 is the graphic for Boise. During this period, southern Idaho was basically out of the main belt of westerlies with high pressure dominating. At both 24 and 48 hours, the models showed similar error patterns, although the LFM was somewhat poorer with a larger negative bias. Also, both models overforecast the pressure falls at 48 hours on the 13th at 00Z and again on the 18th at 00Z when migratory systems were forecast to move through the area.

Figure 2 shows the Great Falls data. Several strong weather systems moved through Montana during the period with several changes between upslope/downslope patterns. Not suprisingly, the errors are somewhat larger. Again, the similarity of error patterns between the 2 models is striking. Overall the LFM pressures were somewhat better but both had a negative bias. Several large busts can be noted especially, at 48 hours. In two cases, large negative errors were a result of the model's failure to develop upslope with a shallow arctic airmass. A third large negative error was due to the erosion of an existing arctic airmass too quickly.

Figure 3 shows the errors at Edmonton, Alberta. Edmonton was also marked by the fluctuating arctic airmass. Again several very large busts can be noted. Two busts of nearly 30mbs occurred at Edmonton at 48hours. In the November 11th case, the NGM moved an arctic airmass too quickly into Edmonton. On the 18th, the NGM brought strong pressure falls into Alberta too fast. The most interesting feature on the Edmonton graph is the poor performance of the NGM at 24 hours. Note several large busts, the large negative bias and an error almost twice that of the LFM. In fact, the NGM error is larger at 24 hours than at 48 hours. This appears to be due to the poor initial surface analysis on the NGM. Since it does not use actual sea-level pressure observations, it often starts off with a poor analysis of the arctic high pressure system. This leads to fairly poor forecasts through the first 24 hours.

This simple, realtime display of pressure errors provides the forecaster with a quick look at model performance over the previous 10 days. It also provides some interesting insights into model performance in wintertime Montana.

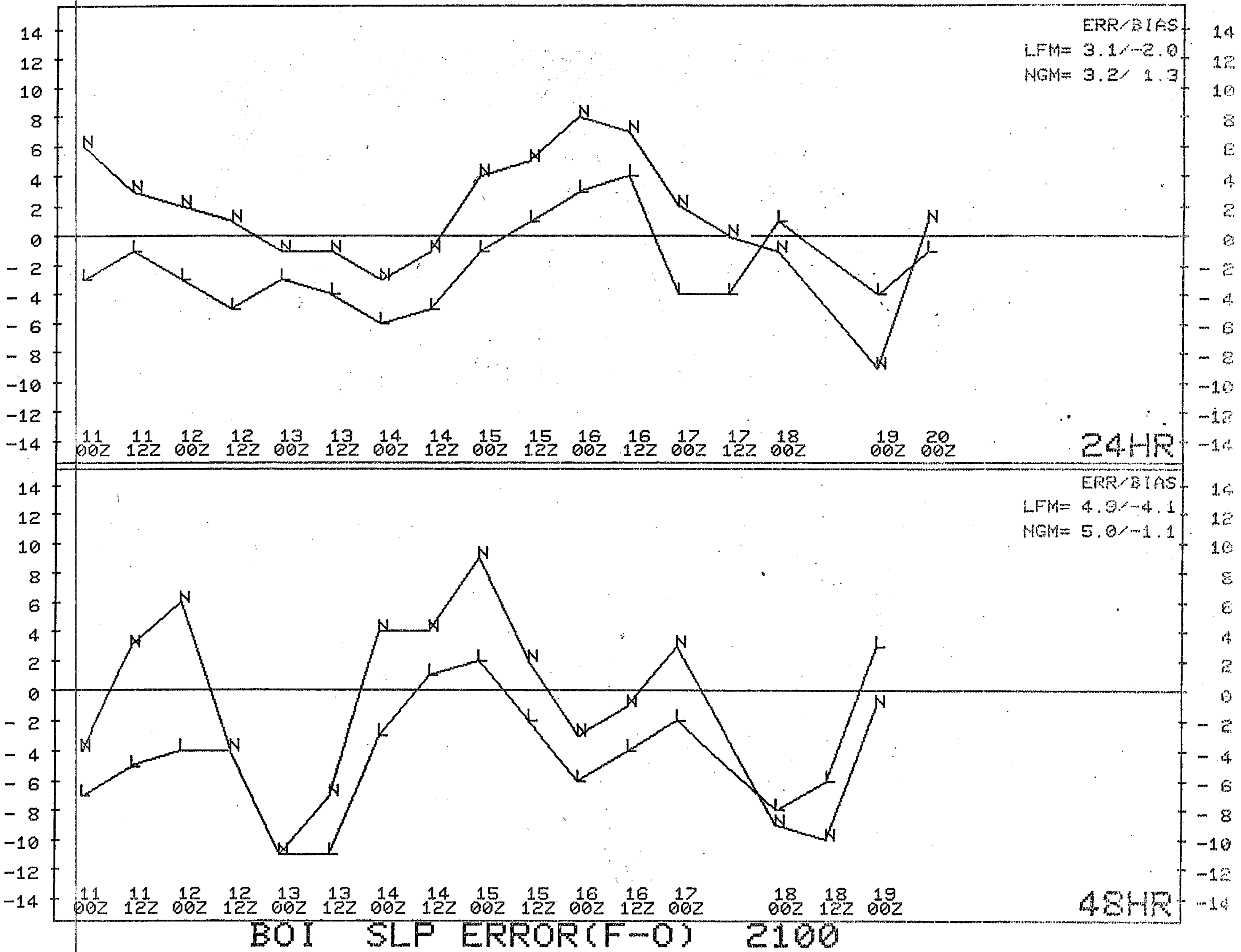
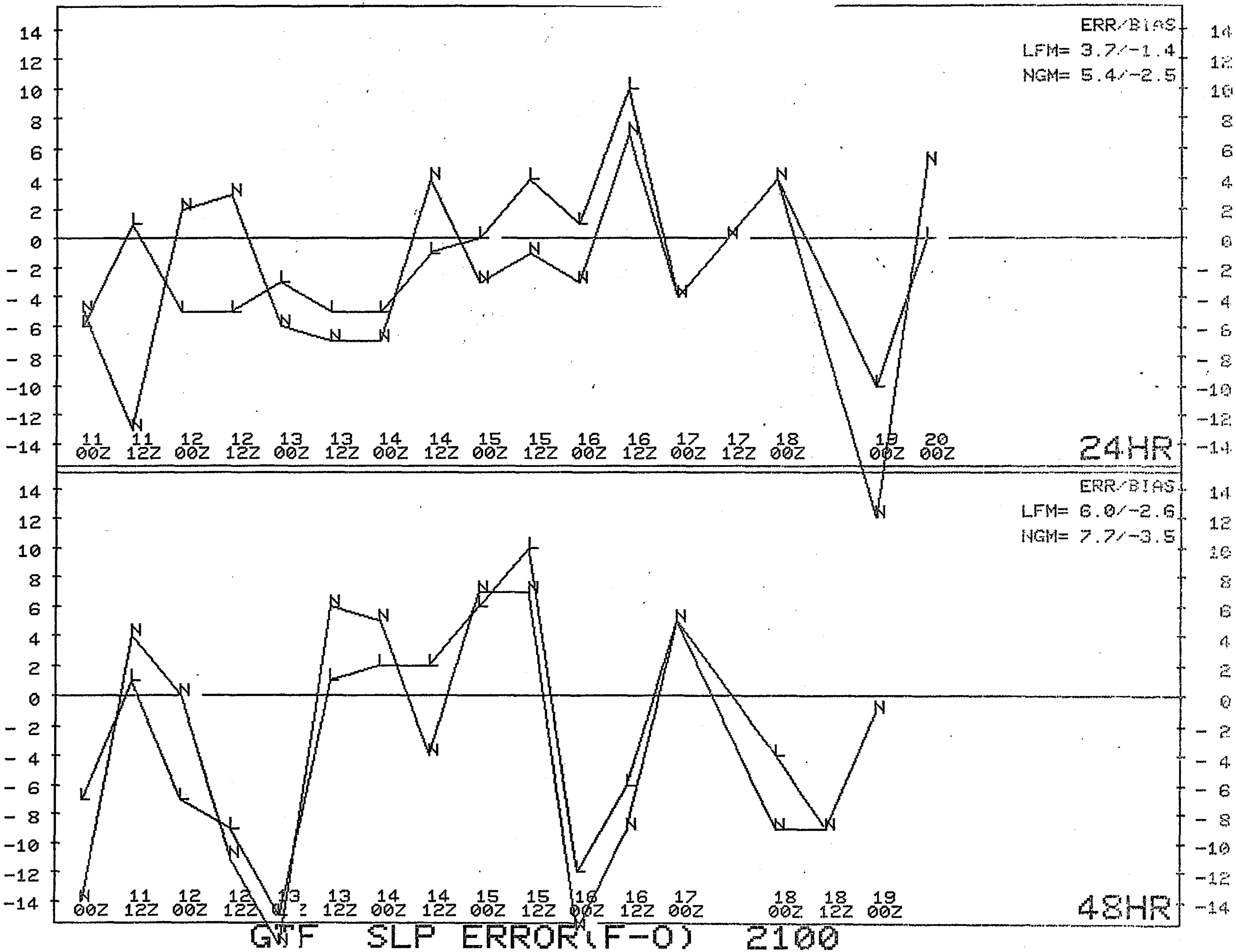


FIGURE 1. 24 and 48-hour LFM and NGM Surface Pressure Errors (in mb) at Boise, 11-20 November 1986.

FIGURE 2. Same as Figure 1, except for Great Falls.



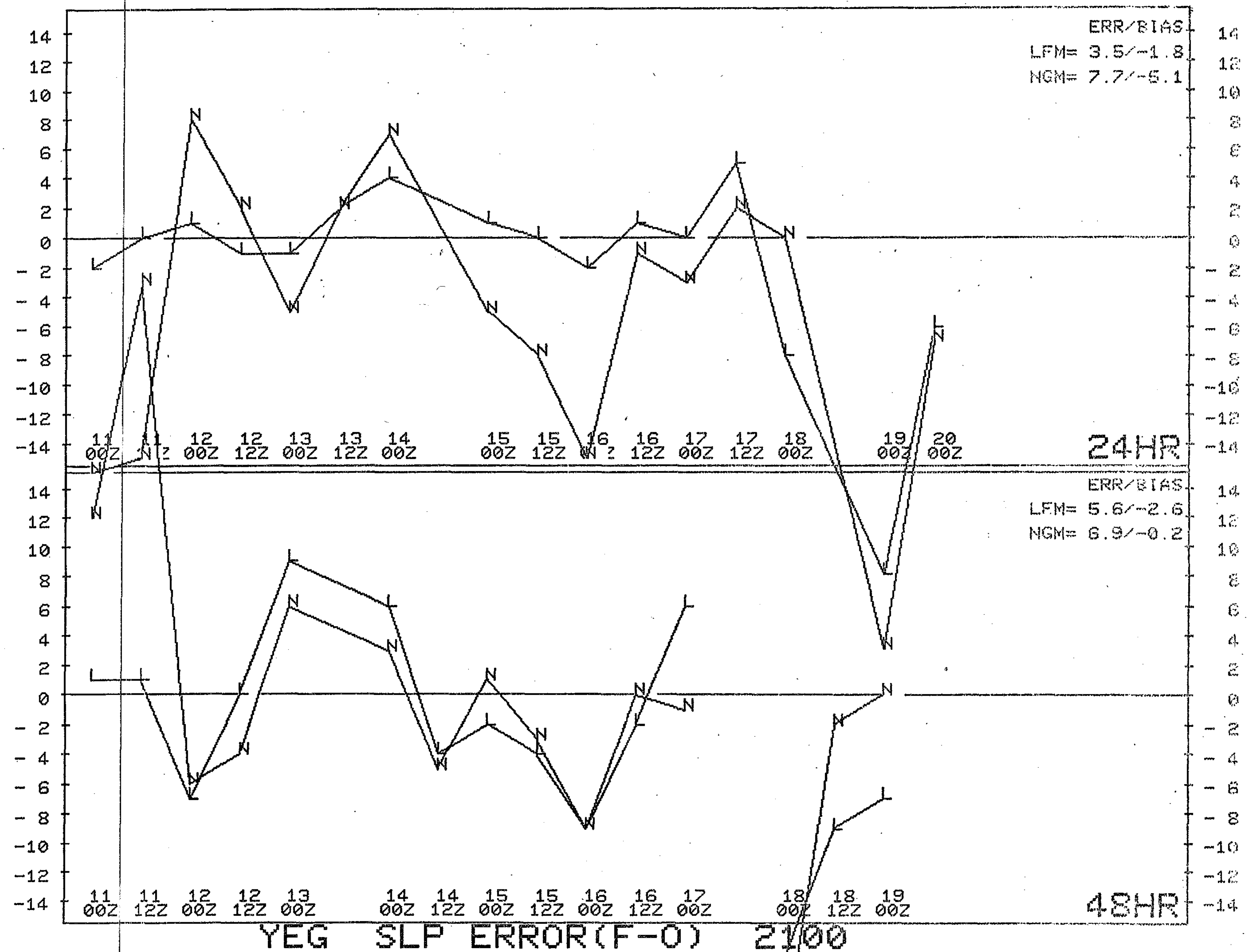


FIGURE 3. Same as Figure 1, except for Edmonton.