Western Region Technical Attachment
No. 92-16
AprilL 28, 1992

VERIFICATION OF THE AVIATION/NGM MODELS WINTER OF 91-92

As discussed in previous Technical Attachments (TAs), for example WRTA 91-27, Richard Grumm and Robert Oravec of NMC keep verification statistics for the location and strength of surface cyclone and anticyclone features in the NMC models. Some interesting features are evident from the results of this past winter.

Figure 1 shows the spatial distribution of surface cyclones observed over the North American region during the winter of 90-91 (WI91 in the figure) and the winter of 91-92 (WI92). It is interesting to note the large differences between the figures that are probably due to the El Nino conditions in the Pacific this past winter. Specifically, many more cyclones were observed in the southern part of the region and off the California coast this past winter than the previous winter. Also, fewer cyclones were observed over the northern part of the region and western Canada. This reflects the "split flow" regime that persisted across the western U.S. throughout much of the winter, and produced above normal precipitation in the southern part of the region, and below normal precipitation in the northern part. In contrast, the winter of 1990-91 (WI91) shows a more "normal" pattern of cyclone occurrence, with a high incidence of cyclones just east of the Rockies, where lee-side cyclogenesis often occurs.

Figures 2 and 3 show the 48-hour Aviation model pressure errors and thickness errors for cyclones in WI92 and WI91. The negative thickness errors indicate that a cold bias remains in the Aviation model, and it has changed little from the previous winter. The pressure errors appear to be a little smaller and more uniform over the country than they did during the previous winter.

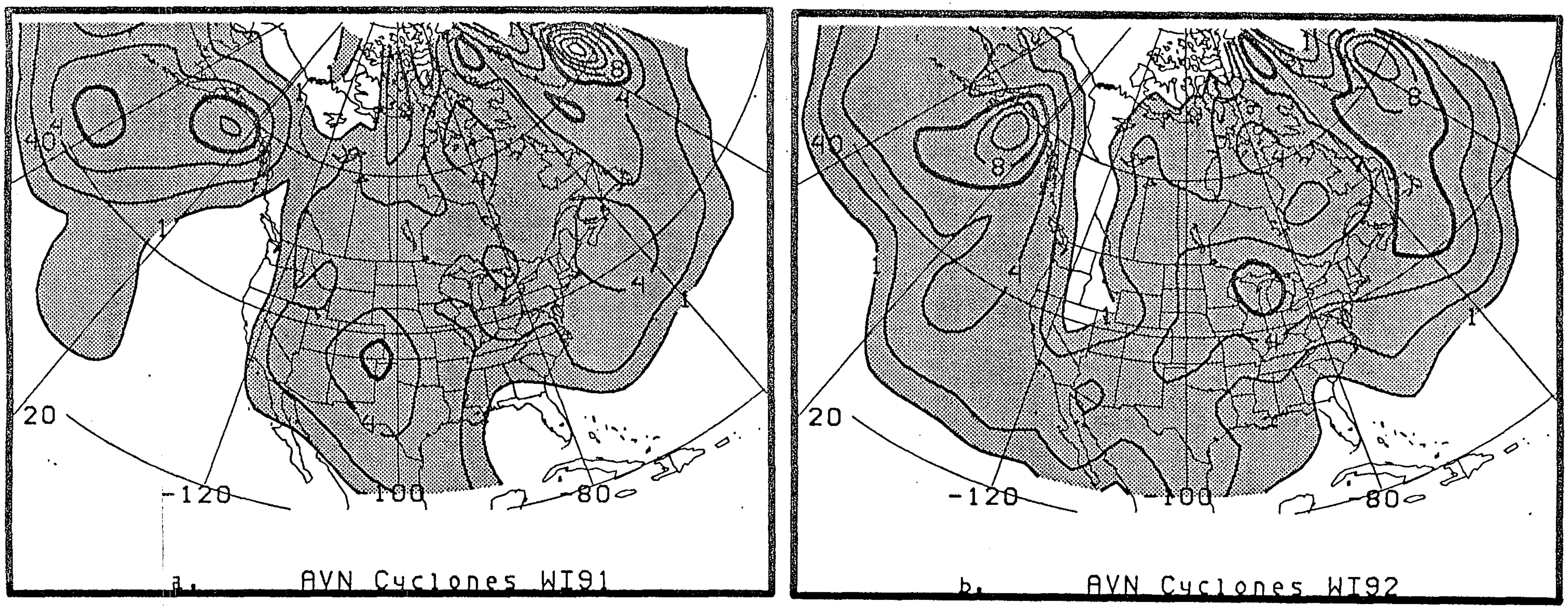
Figure 4 shows the monthly average 48-hour pressure bias and RMS error for forecast cyclones in the NGM and Aviation model over North America. There are several things to note in this figure.

1. The bar graph shows that the Aviation model continues to have smaller RMS pressure errors for cyclones than the NGM. The differences between this last winter and the previous winter were small. Thus, for forecasts of the pressure in cyclones, the Aviation model performs better, on average, than the NGM.

2. The solid line indicates that prior to March of last year, the Aviation model tended to forecast the central pressure of cyclones too high, and, since that time, has had smaller average pressure errors which tend to be slightly negative. In other words, the Aviation model now has a slight tendency to forecast the central pressure of surface cyclones too low, but the errors tend to be smaller than before March. The Aviation model changed from the T80 version, to the higher resolution T126 version in March of 1991, and it appears that this change has had a positive impact on surface pressure forecasts for cyclones.

3. The dashed line indicates that the NGM has also had a slightly smaller surface pressure bias since March 1991, when the NGM was also slightly changed. The NGM continues to have a slight tendency to forecast the central pressure of surface cyclones too low.

Not shown are the 48-hour cyclone and anticyclone distance errors for the NGM and Aviation. As has been the case in previous evaluations, the Aviation model continues to be much better than the NGM at forecasting the position of cyclones and anticyclones. Another finding (not shown) is that the Aviation model rarely misses forecasting the onset of strong, well-developed cyclones in the later forecast periods. The majority of cyclones that are observed, but that the Aviation model fails to forecast, are weak systems. Strong systems are rarely missed.



40
20
-120
-100
-80
a. AVN Cyclones WI91
40
20
-120
-100
-80
b. AVN Cyclones WI92

FIG. 1.

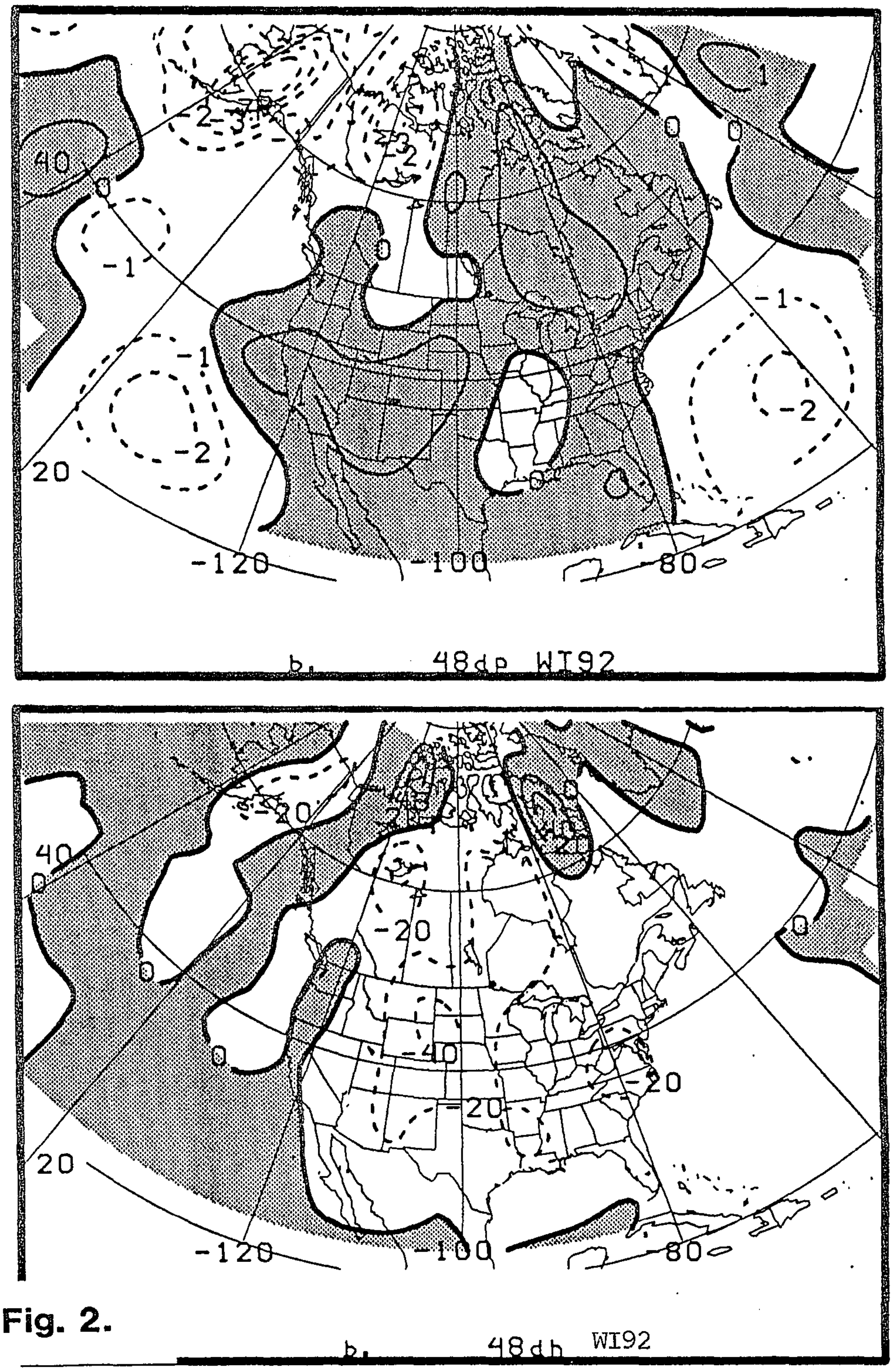

40
0
-1
-2
1
20
-120
-100
-80
b. 48dp WI92
40
0
-20
-40
20
-120
-100
-80
b. 48dh WI92

Fig. 2.

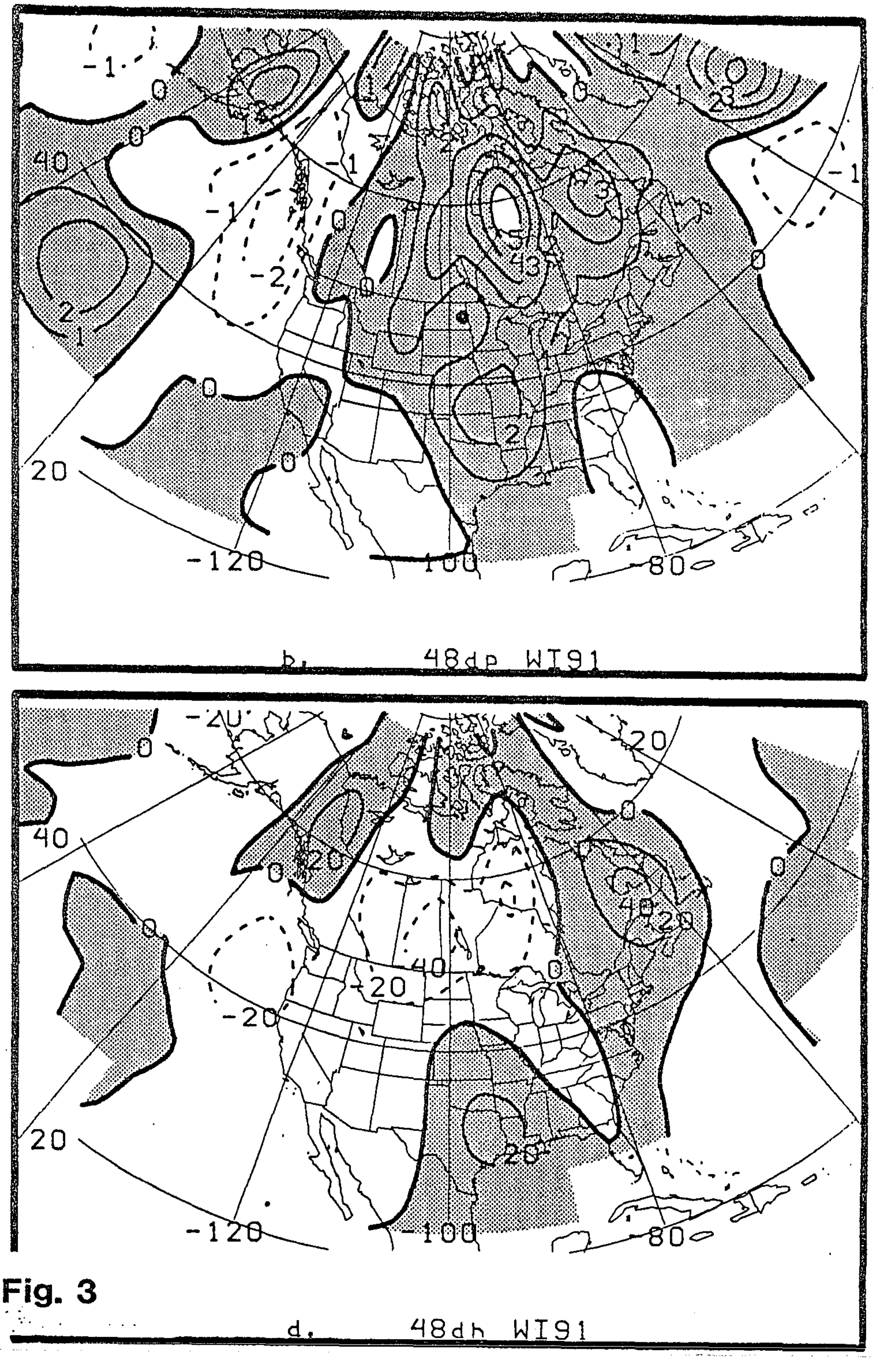


Fig. 3

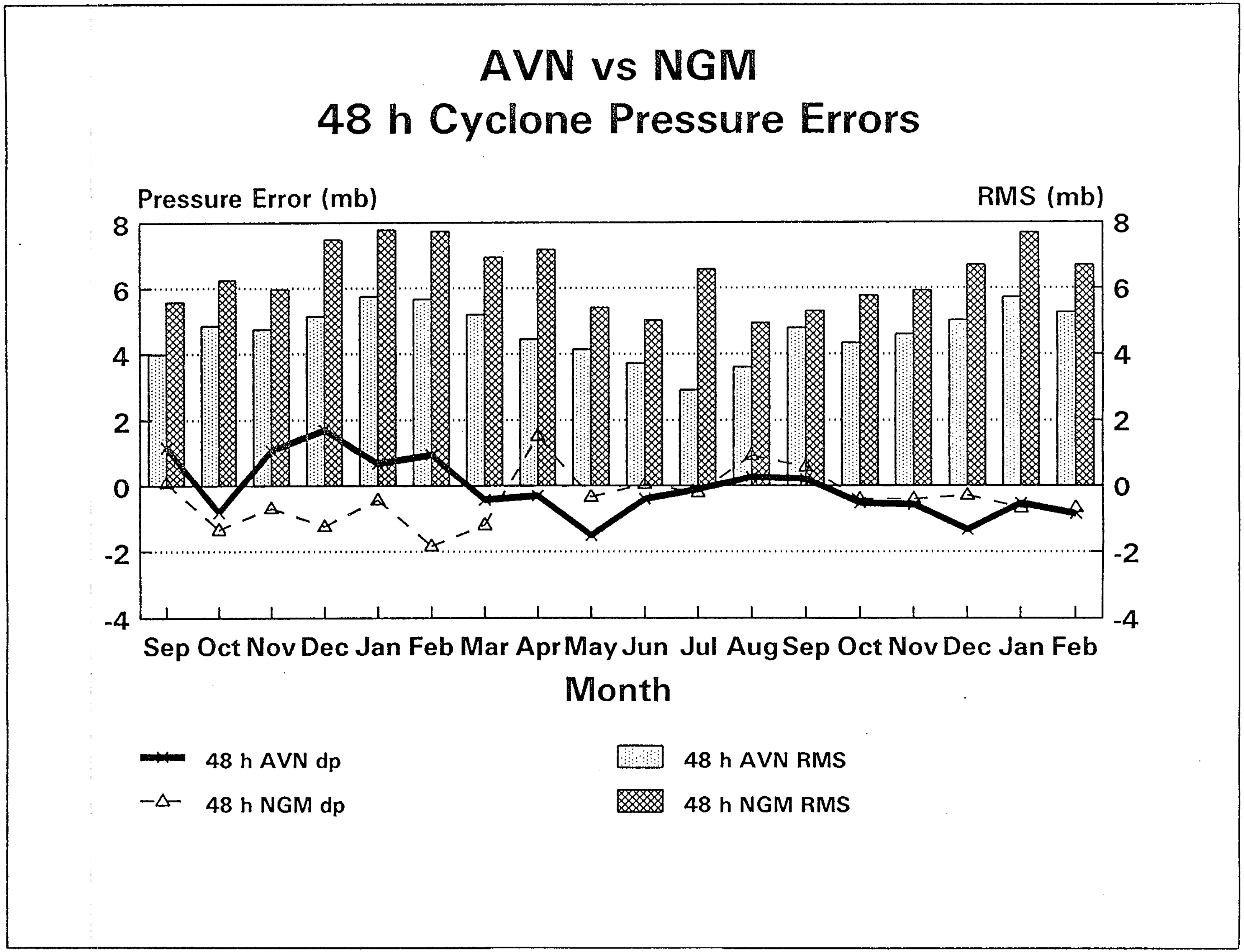

AVN vs NGM
48 h Cyclone Pressure Errors
Pressure Error (mb)
RMS (mb)
8
6
4
2
0
-2
-4
Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb
Month
48 h AVN dp
48 h NGM dp
48 h AVN RMS
48 h NGM RMS

FIG. 4