

## WESTERN REGION TECHNICAL ATTACHMENT

March 25, 1975

No. 75-8

### ARE SATELLITE PICTURES MISLEADING?

Would you believe that seeing so much of what is going on in the atmosphere from SMS-2 pictures is causing forecasters some problems? It is true and brings back memories of the Hiawatha parody that more data is all that is needed to remedy significant forecast busts. GOES pictures now allow us to see much more activity, as indicated by cloud patterns, than our current knowledge permits us to understand and use in preparing forecasts. Consequently, the new SMS-2 pictures on occasion have turned out to be misleading rather than helpful.

Today's forecaster is faced with the problem of locating synoptic systems in satellite imagery and then deciding the fate of each system, i.e., which one will grow to maturity, which will die in infancy, and which are temporarily growing or dying. We have much to learn about making this decision correctly. Probably the biggest lesson to remember is that satellite data is primarily a diagnostic not a prognostic tool. The next important lesson to remember is not to abandon good systematic forecasting procedures for a new sophisticated form of sequence forecasting. In other words, the old-fashioned forecast funnel, Figure 1, is still valid, i.e., the preparation of even short-range (<12 hours) forecasts starts with an understanding of the large-scale flow and its expected changes over a period of 48 to 72 hours before details are considered.

The comment of Alan Jones, MIC, Wenatchee, comes to mind. Some years ago SSD was promoting the use of vorticity charts as a great aid in cloud and precipitation forecasting. Apparently, Alan thought that we were overselling the product because he made a strong statement that is still applicable today. He said, *"This new tool is valuable but not a panacea. If one is going to forecast well, he must be a complete meteorologist--start with a good analysis use all applicable tools and do a lot of good scientific reasoning"*. It is easy to go overboard when you get a new, glamorous tool like SMS observations. A couple of examples will illustrate the current problem.

On March 13, 1975, just 3 days after SMS-2 pictures became available routinely, an unexpected explosive development took place off the California coast, see Figure 2. The SMS-2 satellite pictures in this instance, at least as currently interpreted, were misleading. The visual picture for 2045Z March 12th, Figure 3a, shows a vortex in low-clouds vicinity 37N/135W. Subsequent pictures, e.g., Figure 3b (2245Z) showed this system moving eastward. When IR pictures became available, see Figure 3c and 3d (0245Z and 0545Z), the imagery indicated straight flow over the system with little associated weather indicated.

Of more importance was the trough and associated cloudiness in the vicinity of 40-45N and 130 to 140W (see Figures 3 and 4). The 500-mb barotropic and PE prognoses indicated this trough would approach the West Coast with considerable PVA on the 13th. During the night of the 12 - 13th the SMS-2 pictures through 0845Z (see Figures 3c, 3d, 5a) showed the high cloudiness associated with this trough (arrows in Figure 3c) decreasing with time. About 0845Z (Figure 5a) explosive cyclogenesis began. The 1145Z picture (Figure 5b)

shows how much the storm developed in the space of 3 hours. By daybreak on the 13th, snow was falling in Berkeley, California. While we don't understand this type of cyclogenesis very well, the point being made is that the nighttime satellite pictures, as we interpreted them, indicated less rather than more-than-normal weather when the trough reached the coast. In a case study by Brenner [2], two dormant systems (one subtropical and one extratropical) that merged off the West Coast, similar to the above case, also resulted in unexpected cyclogenesis. However, the physics of the cyclogenesis is not discussed.

To sum: The satellite pictures for March 12 - 13 were misleading up to 0845Z on the 13th, in that they indicated dissipation of a system approaching the West Coast and little associated weather. The barotropic and PE forecasts based on 0000Z/13th initial data indicated no significant change in the intensity of this system as it reached the coast, but related PAPA suggested some precipitation likely. The strong cyclogenesis and abnormal weather were not indicated in any of the NMC guidance available.

Another case: The satellite pictures for March 19 - 20 were misleading, at least as we interpreted them here in SSD, in that the early afternoon SMS-2 pictures suggested good weather for the Intermountain region for the night of March 19 - 20. It was not until late afternoon that the pictures showed development of the rain and snow that fell after dark. This again emphasizes the point that the satellite pictures should be used as a diagnostic tool.

REFERENCES:

- [1] "Application of PE-Model Forecast Parameters to Local-Area Forecasting", by L. W. Snellman, AWS Technical Report 242, April 1971, p. 158.
- [2] "Study on a Significant Precipitation Episode in Western United States", by Ira Brenner, WR Technical Memorandum No. 98 (to be published).

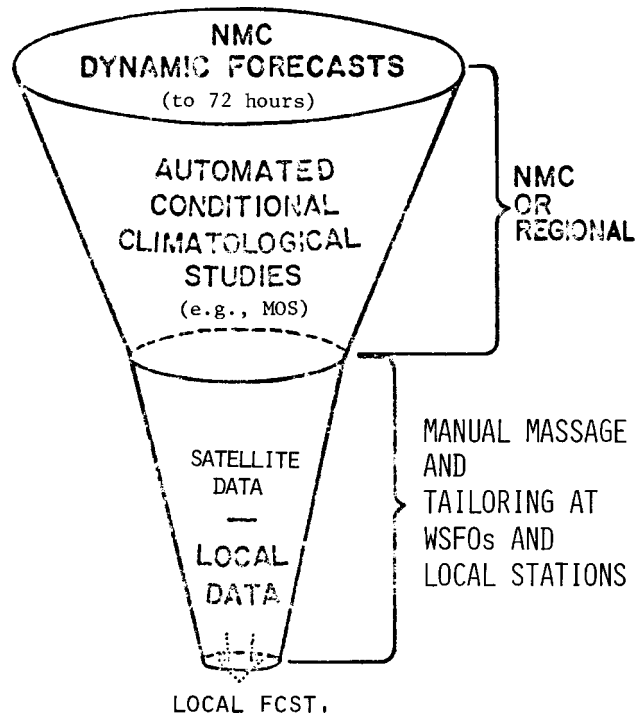


Figure 1.  
Graphical Summary  
of Man-Machine  
Mix Scheme of  
Preparing Local  
Forecasts.  
(Adapted from  
[1].)

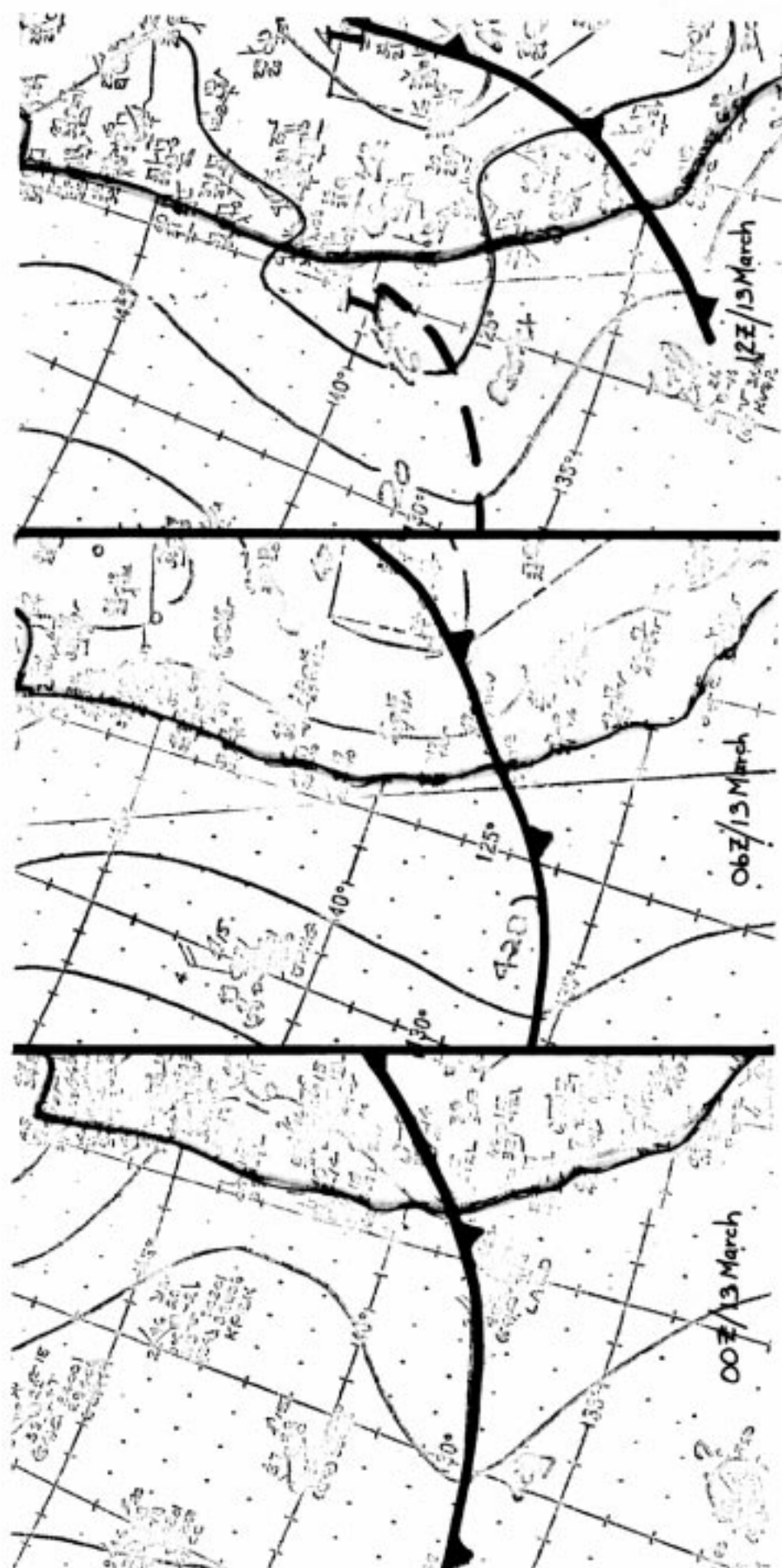


FIGURE 2. MFC SURFACE ANALYSES FOR PERIOD 0000-1200Z MARCH 13, 1975. NOTE SUDDEN APPEARANCE OF LOW CENTER OFF CALIFORNIA COAST.

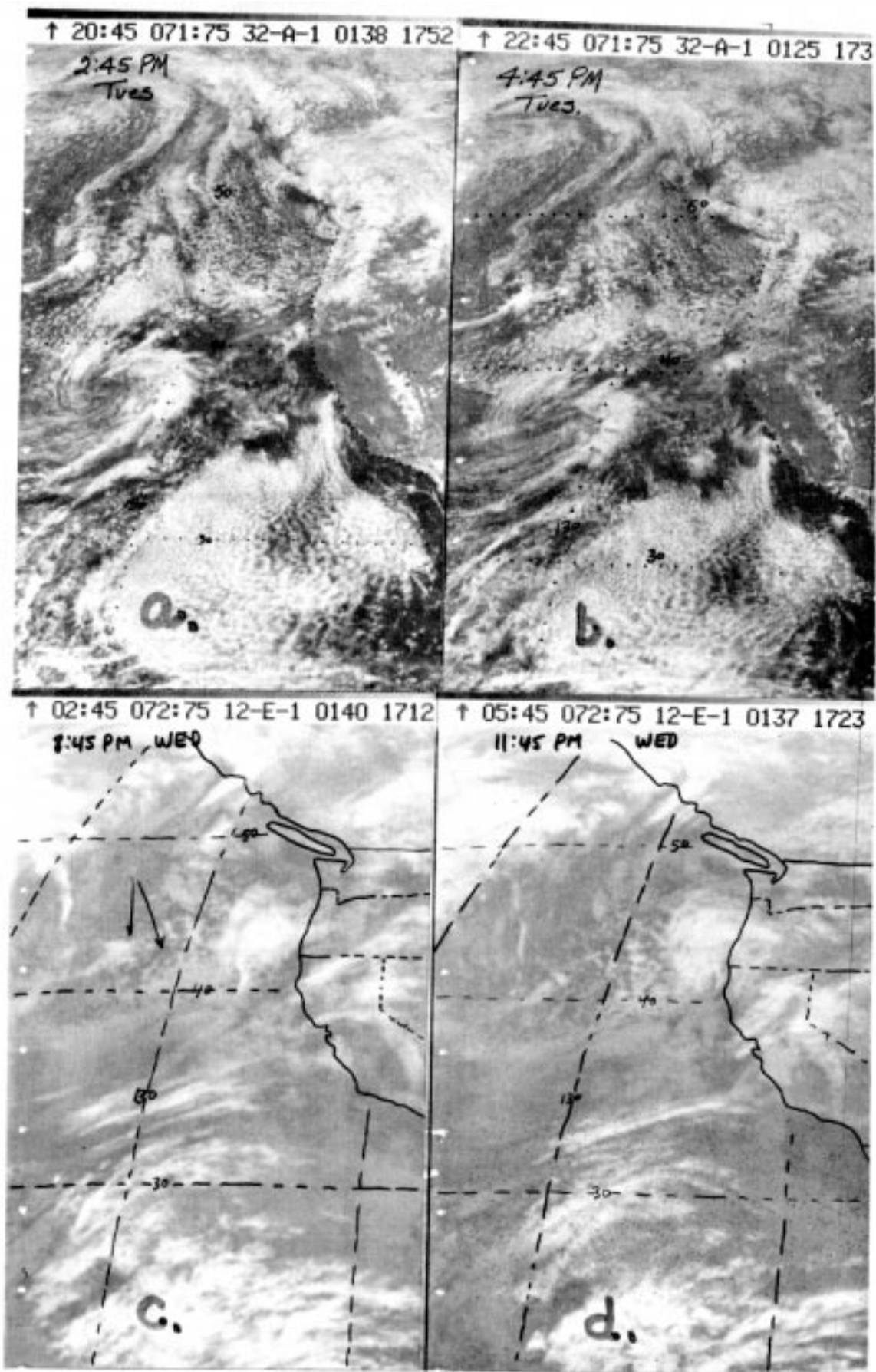


FIGURE 3. SELECTED SMS-2 SATELLITE PICTURES FOR PERIOD 2045Z MARCH 12 TO 0545Z MARCH 13, 1979. (FIGURE A AND B ARE VISUAL; C AND D ARE INFRARED.)

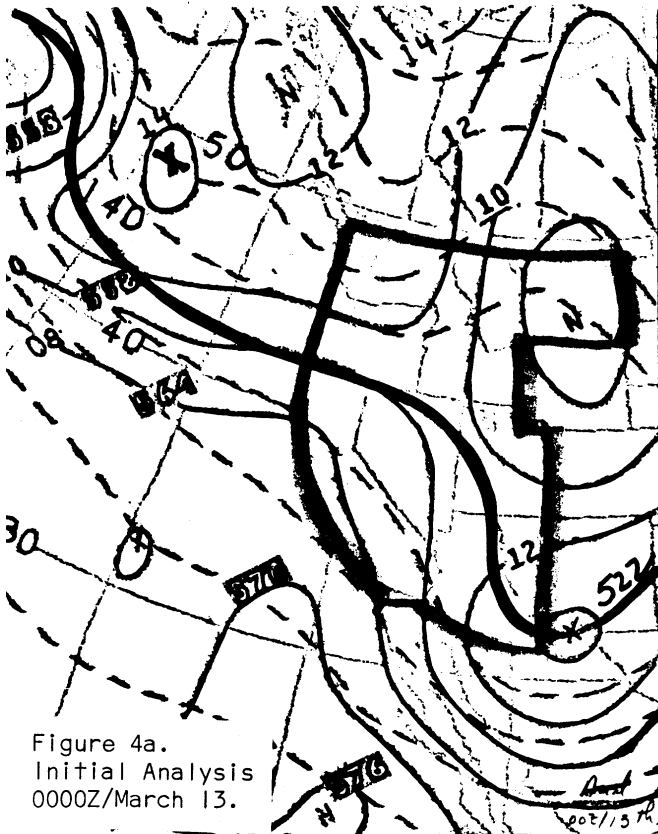


Figure 4a.  
Initial Analysis  
0000Z/March 13.

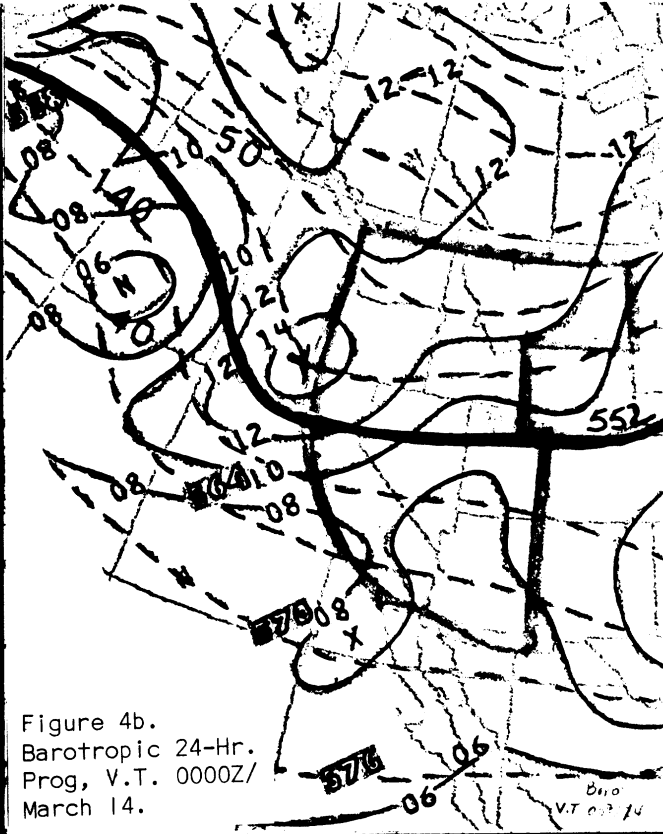


Figure 4b.  
Barotropic 24-Hr.  
Prog, V.T. 0000Z/  
March 14.

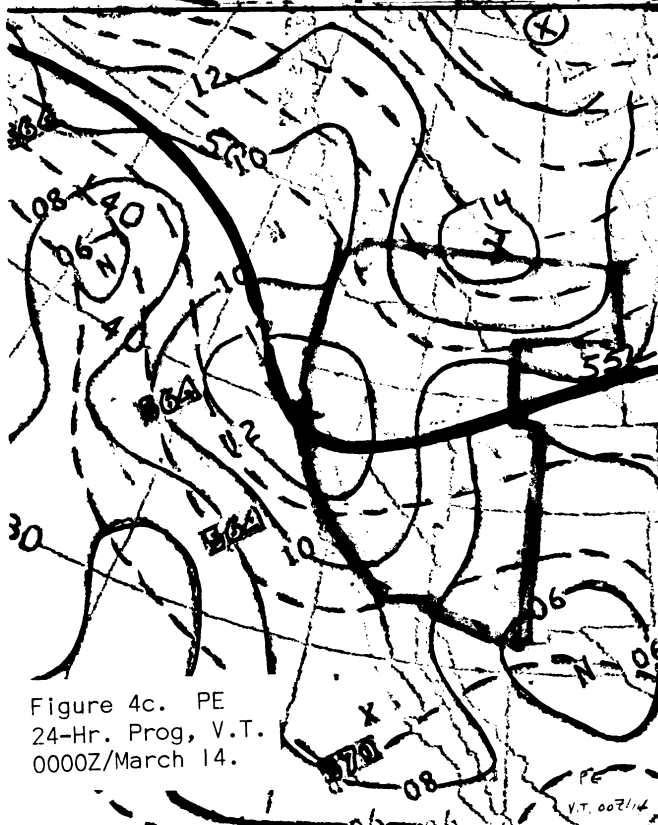


Figure 4c. PE  
24-Hr. Prog, V.T.  
0000Z/March 14.

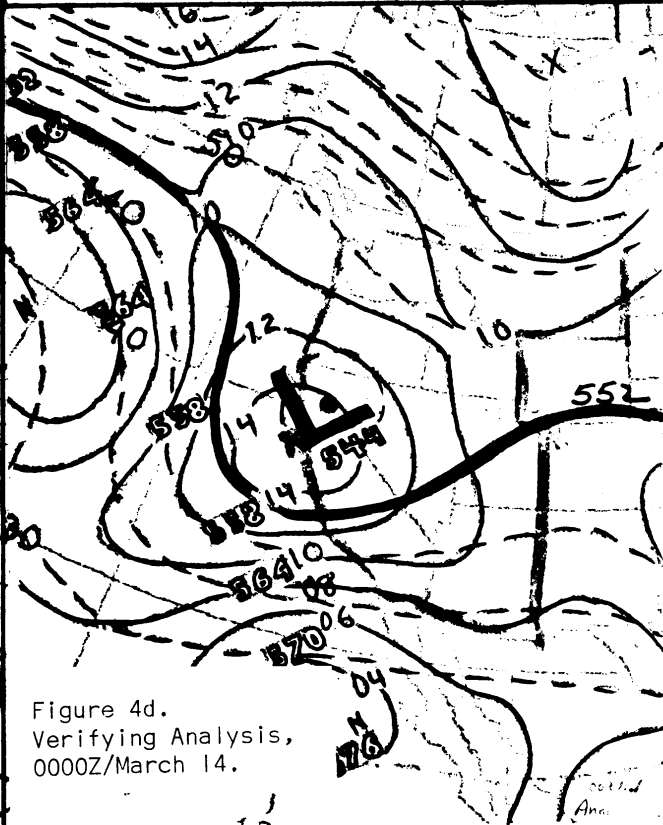
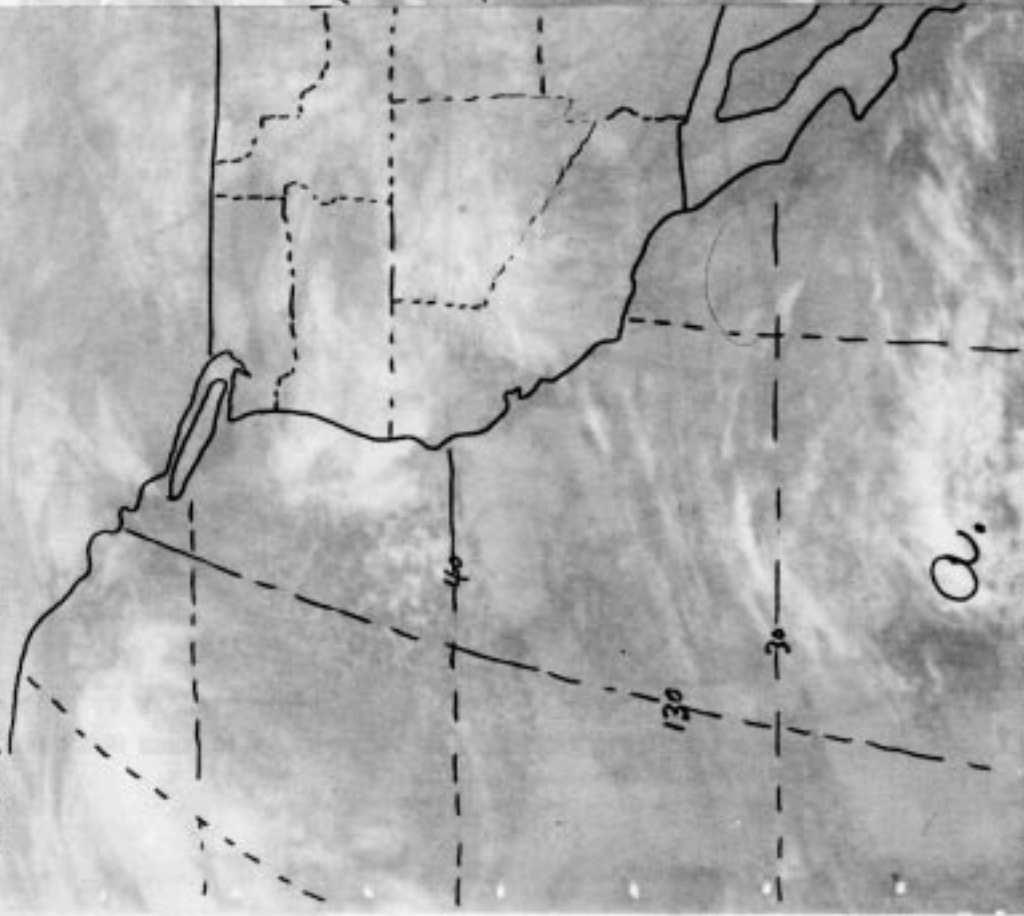


Figure 4d.  
Verifying Analysis,  
0000Z/March 14.

FIGURE 4. 24-HOUR BAROTROPIC AND PE 500-MB PROGNOSSES VALID 0000Z MARCH 14, 1975 WITH VERIFICATION.

↑ 08:45 072:75 12-E-1 0122 1749 SB6-13MR

2:45 AM THU



↑ 11:45 072:75 12-E-1 0117 1770 SB6-13MR

5:45 AM THU

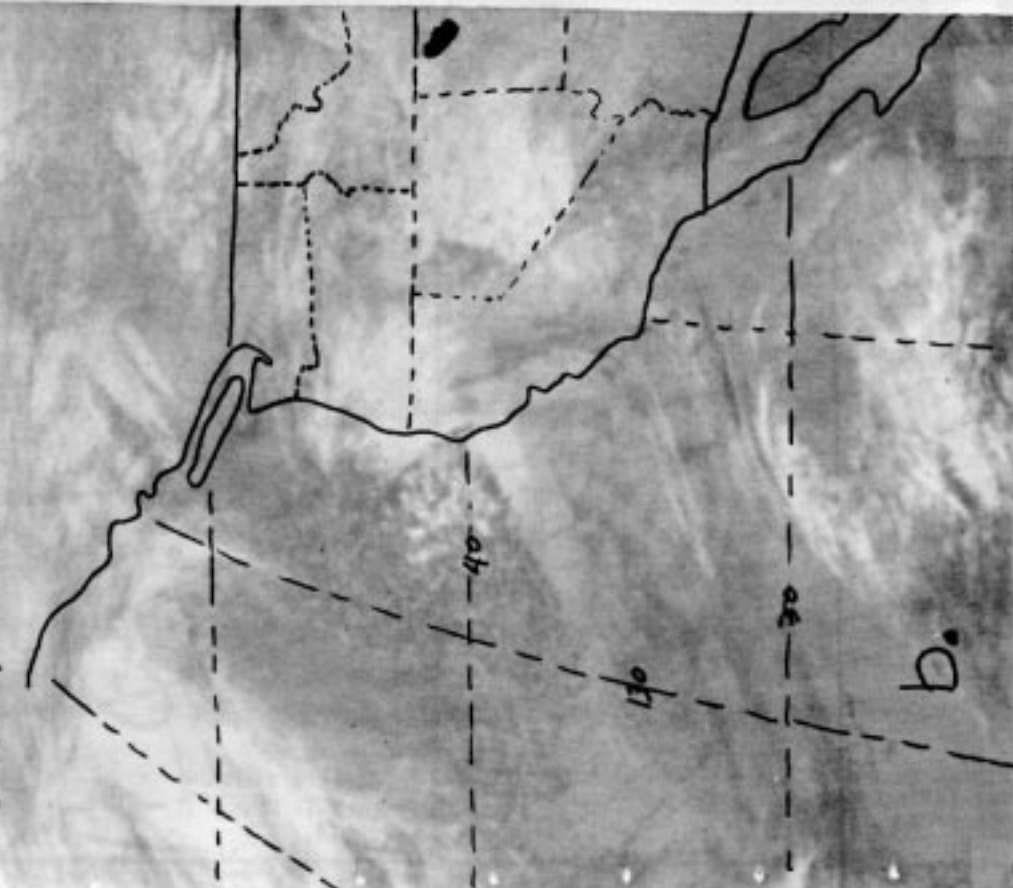


FIGURE 5. SMS-2 INFRARED SATELLITE PICTURES FOR 0845 AND 1145Z MARCH 13, 1975. NOTE ESPECIALLY THE IMAGERY ASSOCIATED WITH UPPER TROUGH NEAR 40N/125-130W AND THE WARM CLOUD TOPS--VICINITY 38N/128-129W---ASSOCIATED WITH LOW-LEVEL SYSTEM MOVING EASTWARD TOWARD COAST.