PACIFIC REGION TECHNICAL NOTES

79-026

August 22, 1979

Development of an Instability Line over the Pacific Northwest - A Case Study

Brian Hammond, Meteorologist
Pacific Weather Centre, Vancouver

INTRODUCTION

On June 26 and 27, 1979 a line of organized convective cloud developed over the Pacific Northwest. The initial development took place along the Oregon coast on the morning of June 26 and within 24 hours had developed and expanded to affect Washington, Oregon, Idaho, Montana, and southern sections of British Columbia and Alberta. This instability line is unusual in that it occurred in the 500 mb ridge position. An attempt is made here to document this case.

THE CASE

First of all, to become familiar with the situation, figures 1 through 5 (the satellite pictures) should be examined. Note the outlined area which comprises the instability area under discussion. Cloud top temperatures were as low as minus 60C in the coldest spots along the band.

Surface reports document the unstable nature of the cloud. Altocumlus castellatus and virga were reported at several stations in southern BC as the band passed over. Thundershowers occurred along the Canadian Rockies and in southern Alberta and western Montana as the band moved eastward.

On figures 6 through 8 we see that the basic surface pressure pattern is unchanged over the period. A ridge is maintained offshore while the usual thermal trough holds over southern BC and eastern Washington.

Figures 9 through 13 are the 500mb analyses (CMC and LFM). Note the broad 500 mb ridge over the region; also the lack of any definite or significant vorticity pattern (shortwaves, etc.).

DISCUSSION

Why did the band develop and why was it so poorly handled by the numerical progs? In looking over the situation it seems that more questions arise than answers and we can only theorize on the real explanation.

.../2

Perhaps the instability line was too fine a feature to be picked up on the numerical model grid. Initially it was, but what about the later stages when the line had achieved significant proportions? One can only assume that a weak shortwave was present even though none was analyzed on the 500mb charts.

At 250mb there was also no indication of an approaching wind maximum or a shortwave trough except on the analysis for 27/00z (note figure 14). At 27/00z there were several pilot reports off the coast. One can pick up a weak trof around 128W. Unfortunately, by 27/00z the instability line was already well developed so the 250mb chart was of little use as a forecasting tool.

I have usually found the LFM 700mb vertical velocity analyses and prognoses to be the best for detail in most cases. This time however, both the analyses and prognoses for the time periods failed to show any area of moisture in the region of the instability line.

Obviously daytime heating was one of the chief fuels for development. Note the increase and organization of the cloud mass on the afternoon of the 26th. The instability line maintained itself throughout the night as it progressed northeastward.

Just looking at the surface maps and the surface reports one may not even have realized that the convection was organized in a line but this fact is very well documented by the satellite pictures.

SUMMARY REMARKS

In this situation there was little or no indication that development of this nature was going to take place. The numerical prognoses were of no help. Even a consideration of the physical factors involved was of little help. In fact the magnitude of development that was to take place did not become apparent until it was well along.

As the numerical models become more accurate with larger scale features perhaps the meteorologist would make more profitable use of his time by concentrating on subsynoptic features such as this one that have the potential to produce serious weather situations.

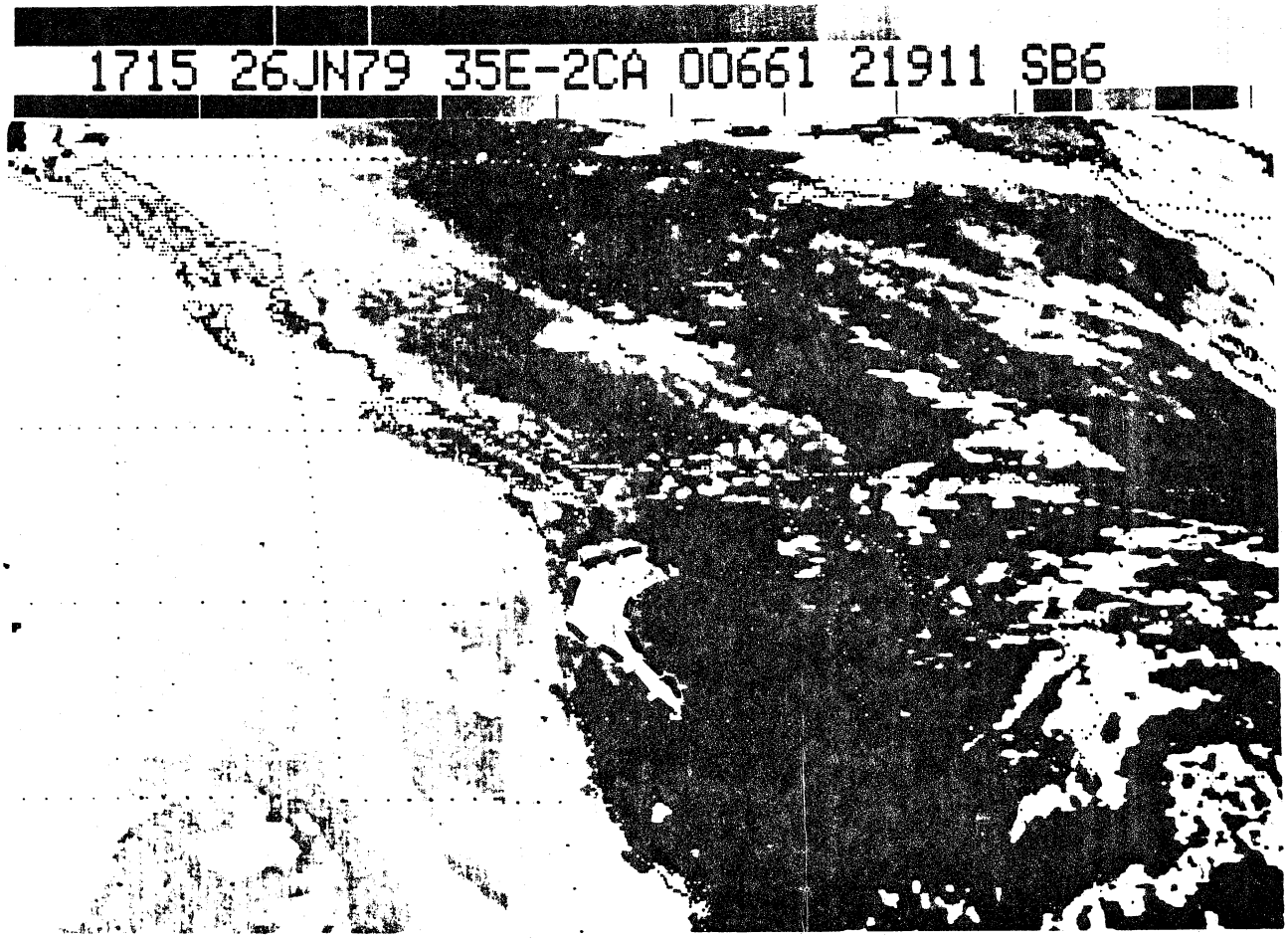

Figure 1

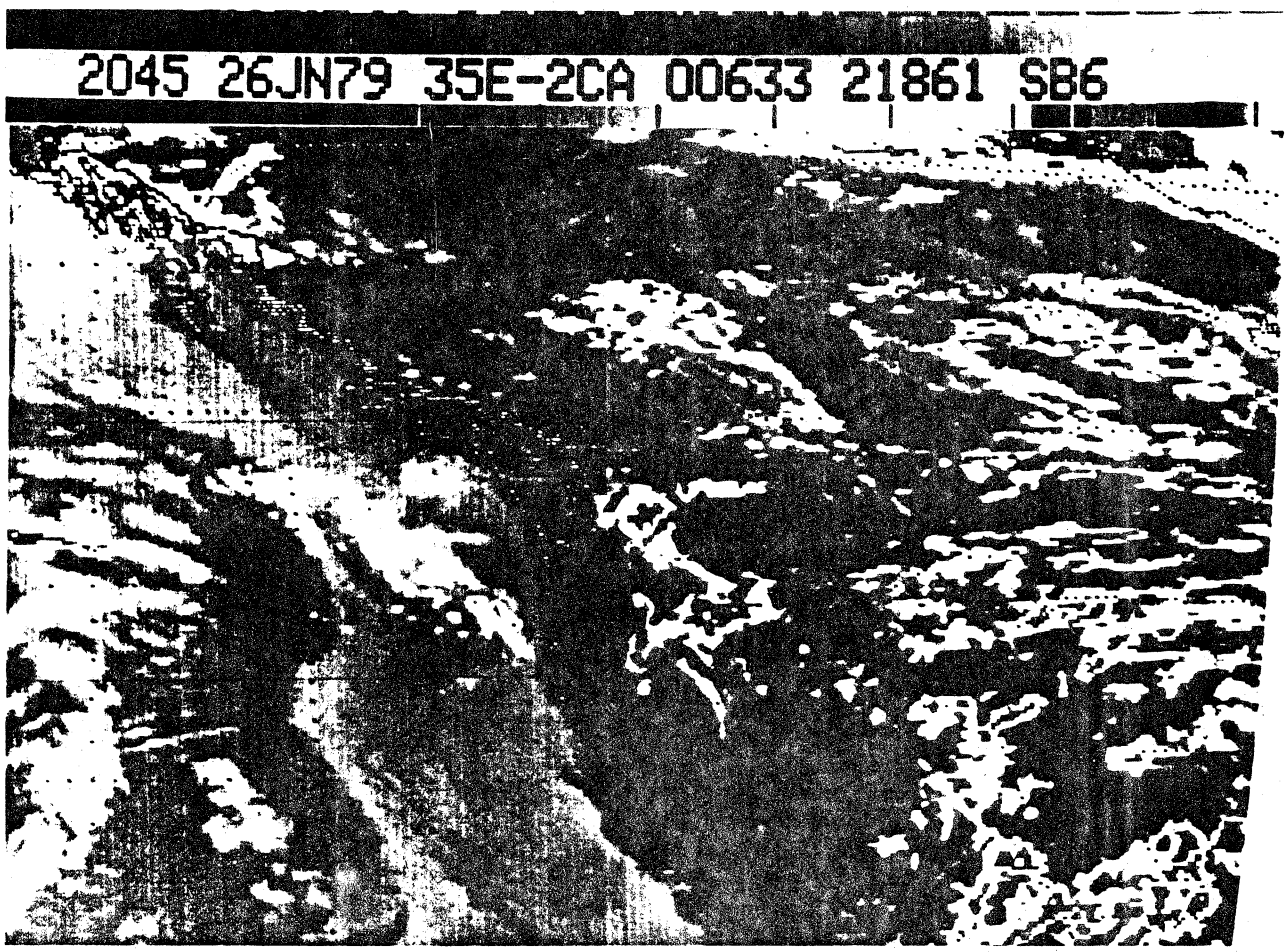

Figure 2

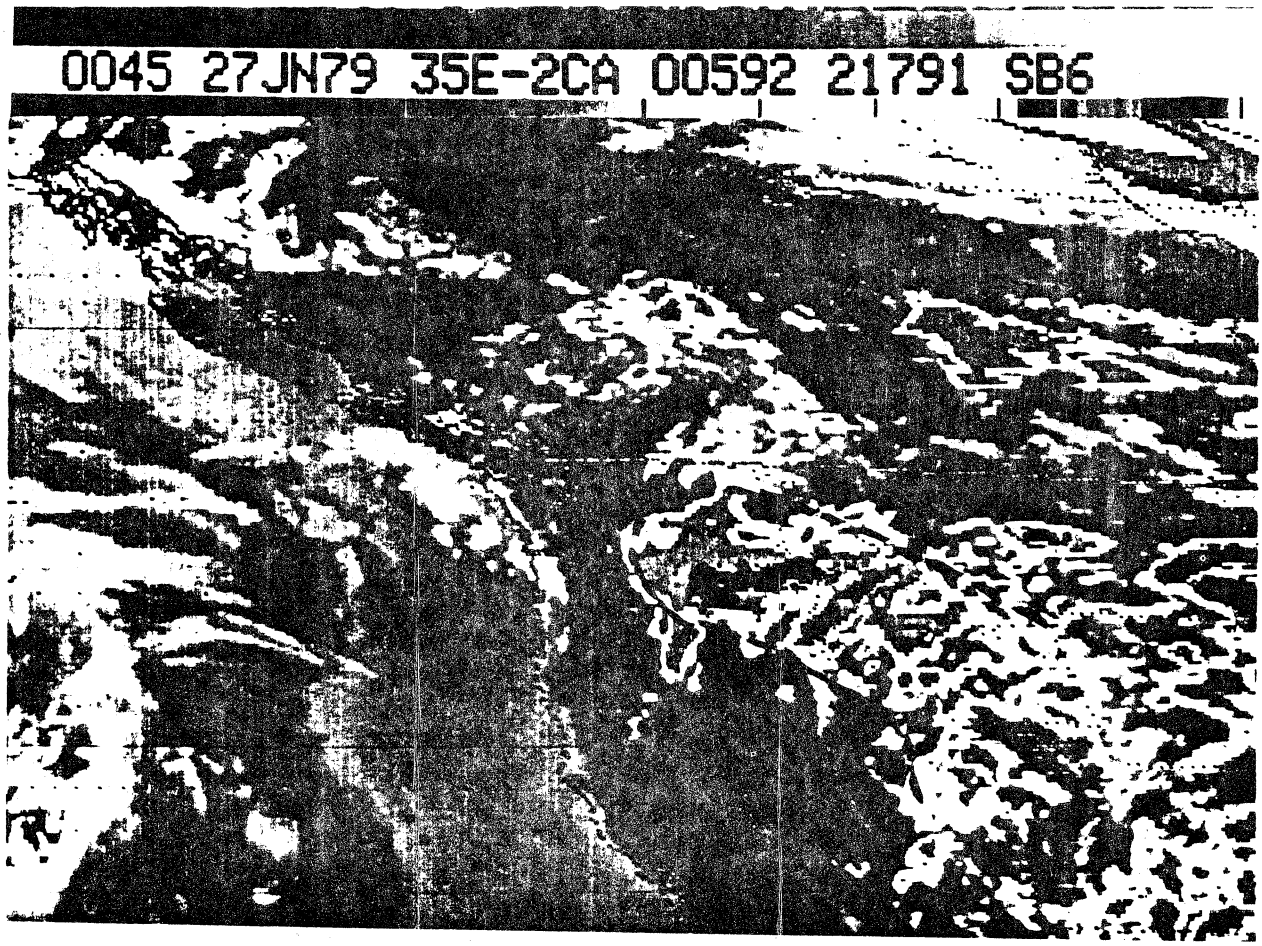

Figure 3

Figure 4

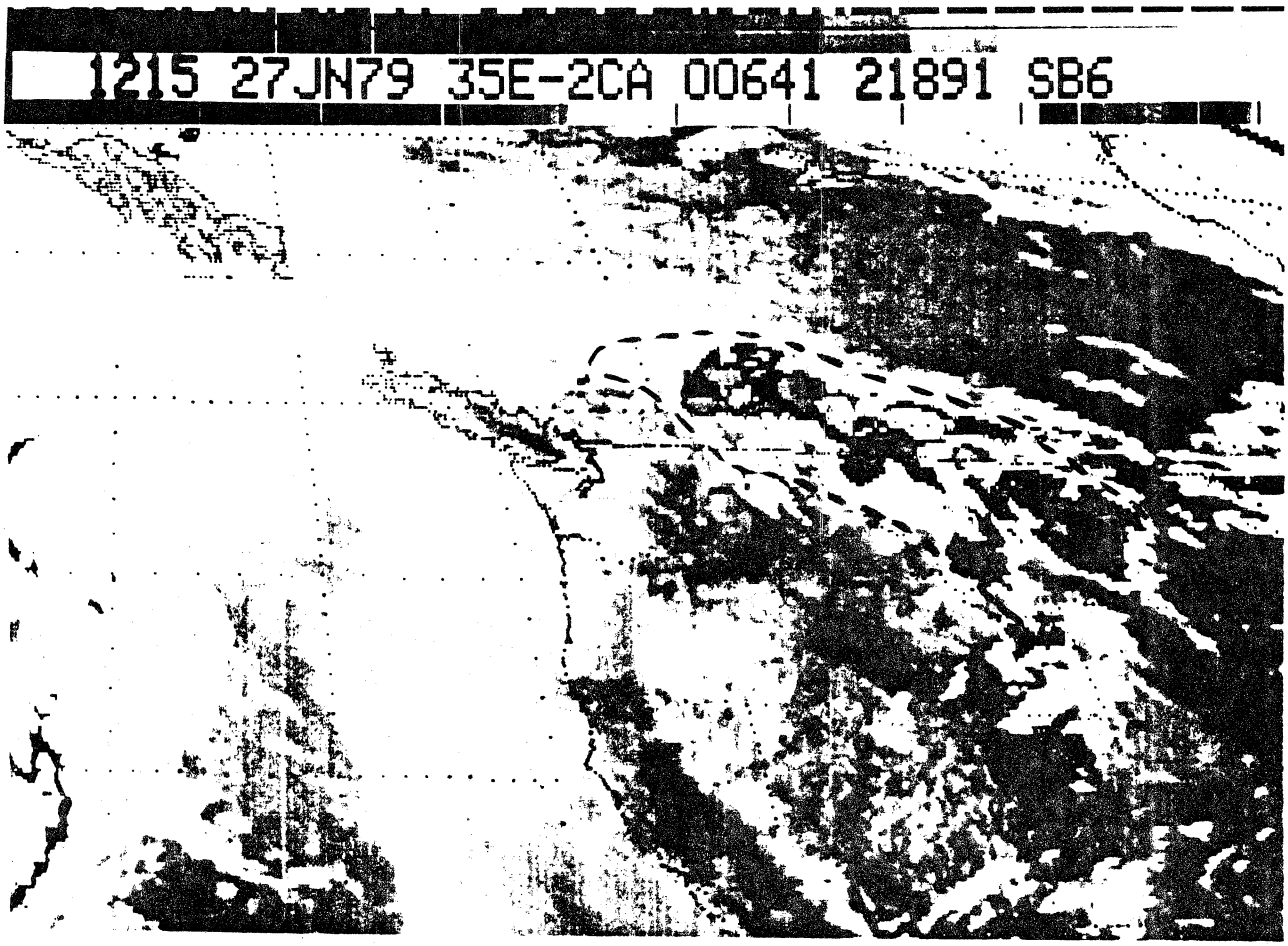

Figure 5

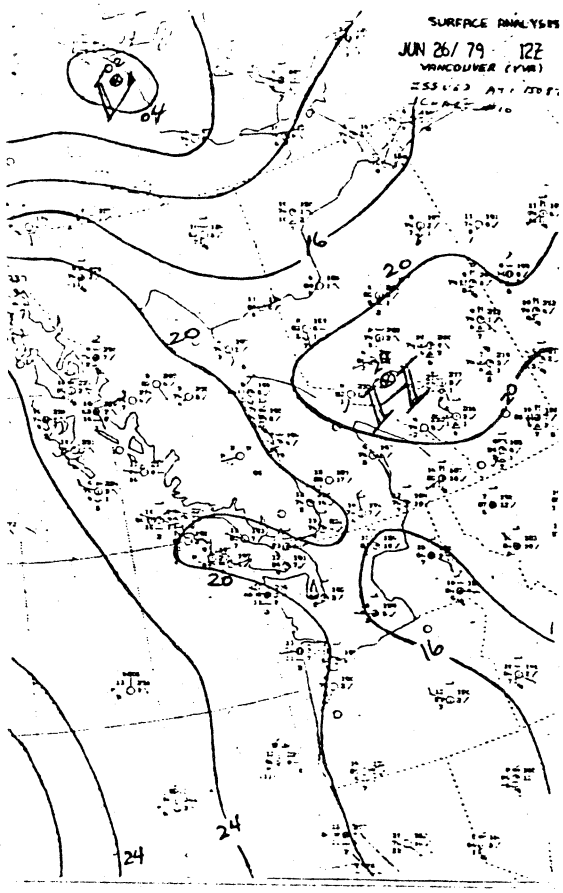

Figure 6
SURFACE ANALYSIS - JUNE 26/79
1200Z

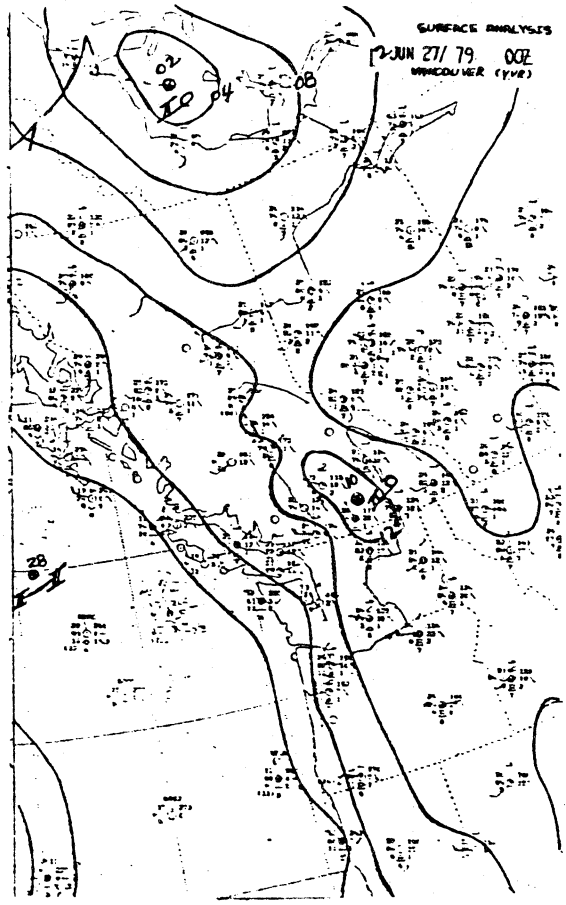

Figure 7
SURFACE ANALYSIS - JUNE 27/79
0000Z

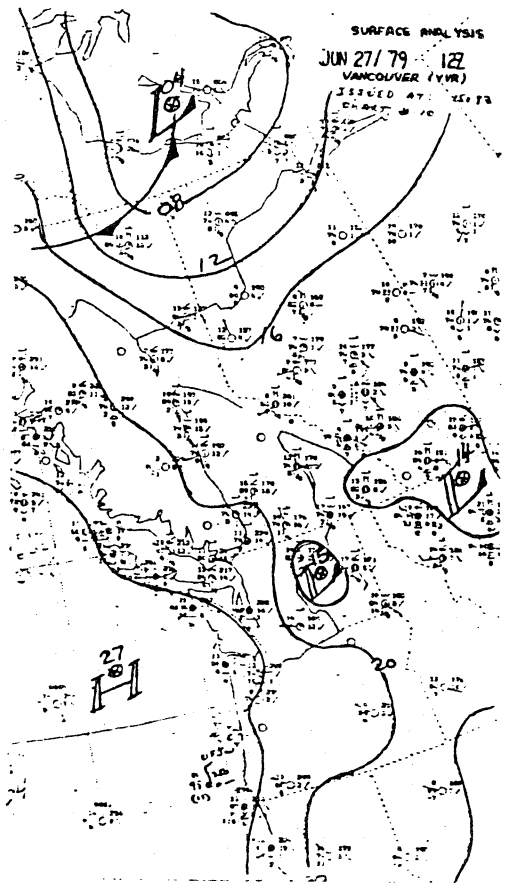

Figure 8
SURFACE ANALYSIS - JUNE 27/79 1200Z

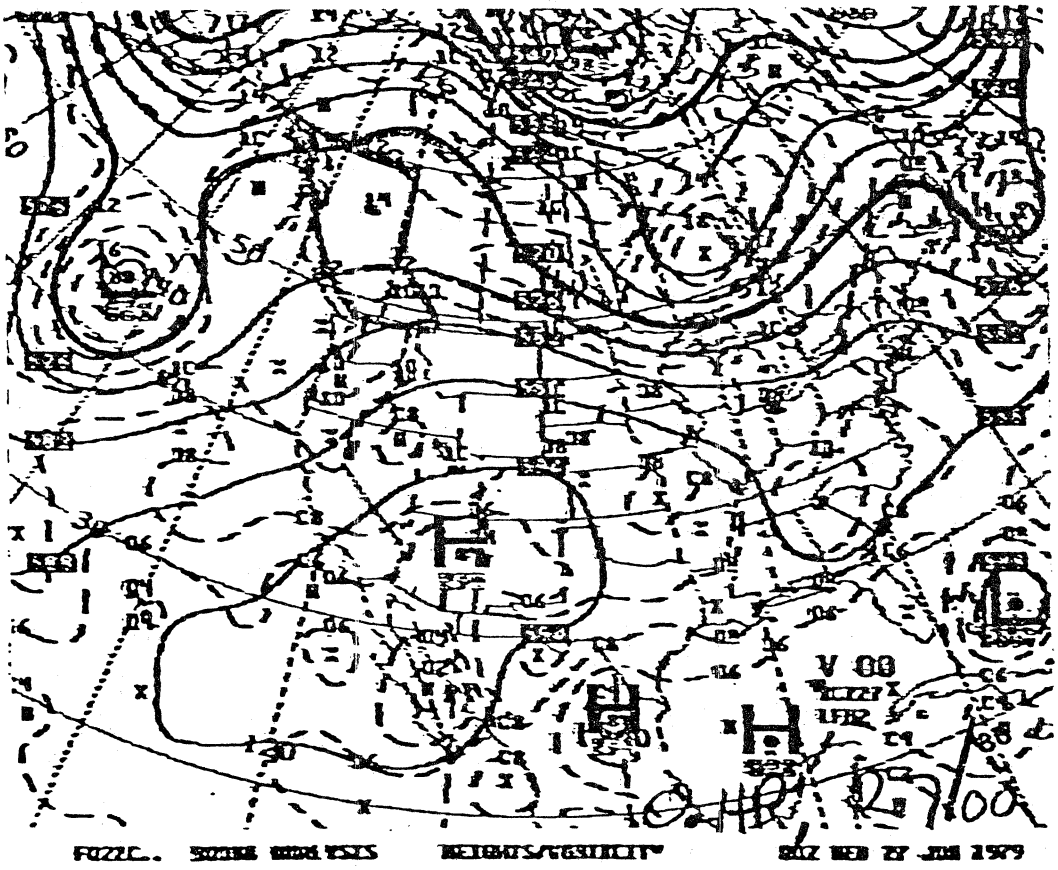

Figure 9 LFM 500mb Analysis 00z 27 June 1979

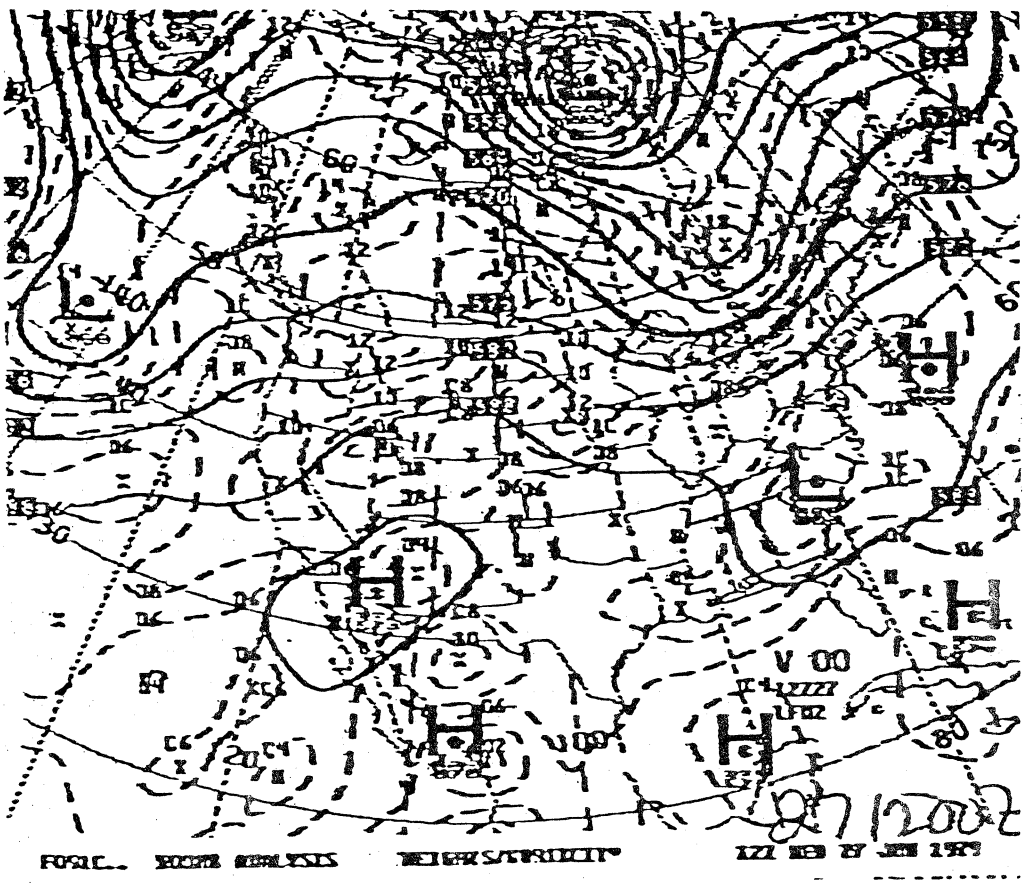

Figure 10 LFM 500mb Analysis 12z 27 June 1979

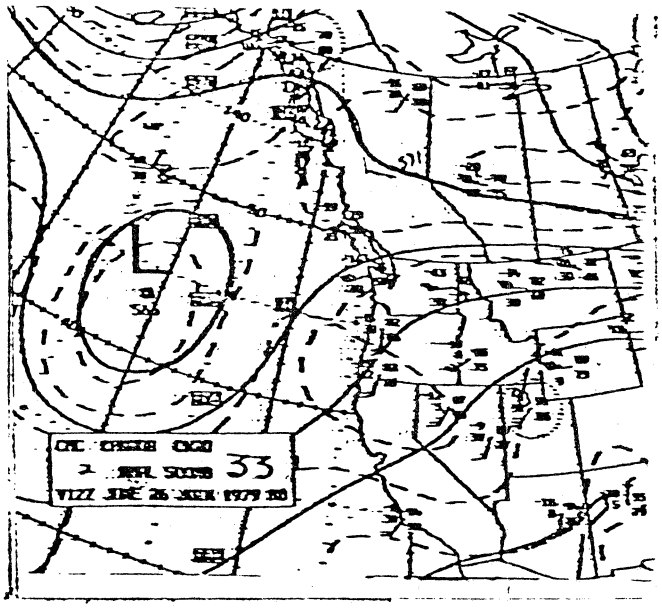

Figure 11 CMC 500mb Analysis
12z 26 June 1979

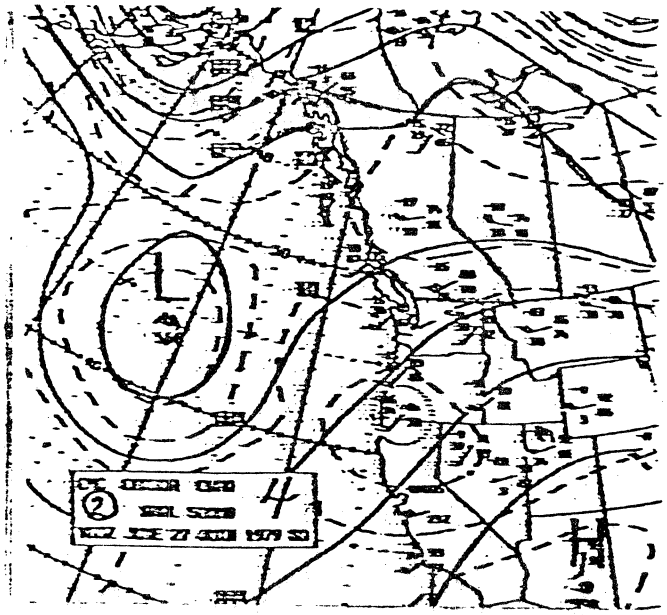

Figure 12 CMC 500mb Analysis
00z 27 June 1979

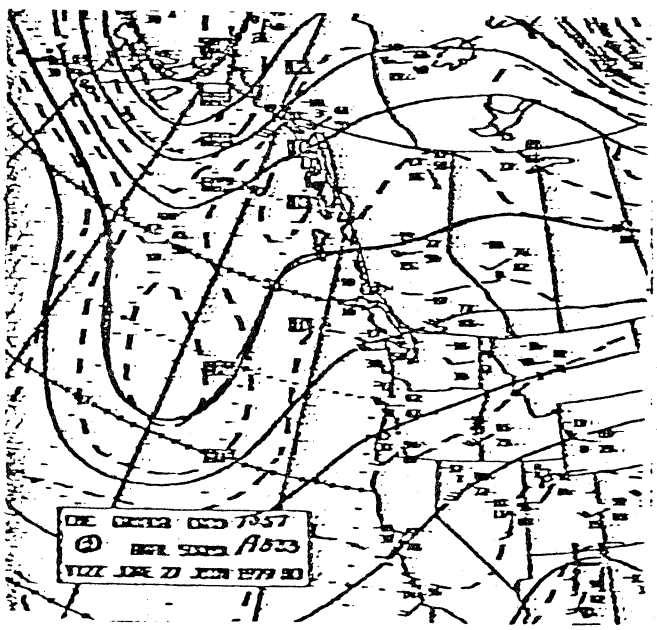

Figure 13 CMC 500mb Analysis
12z 27 June 1979

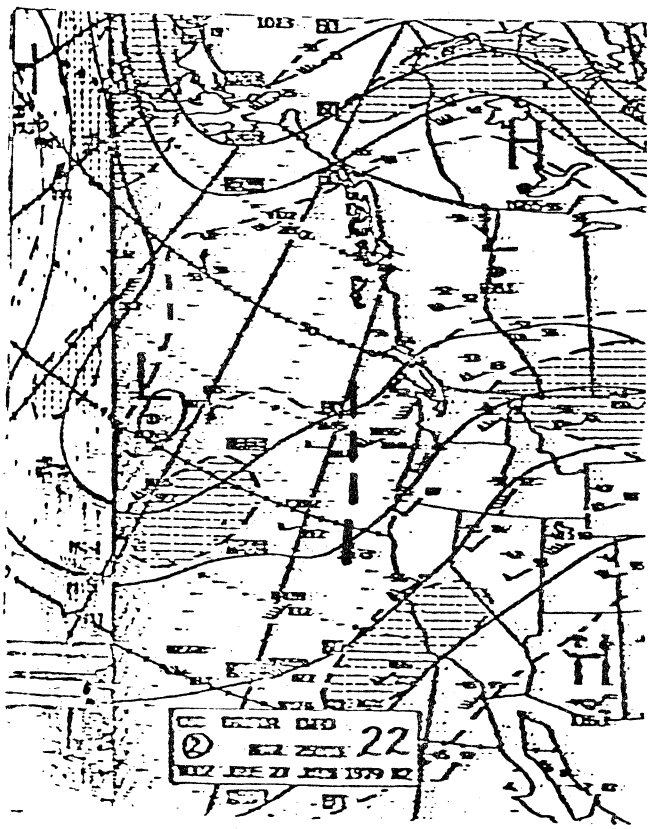

Figure 14 CMC 250 mb Analysis
00z 27 June 1979

Figure 1

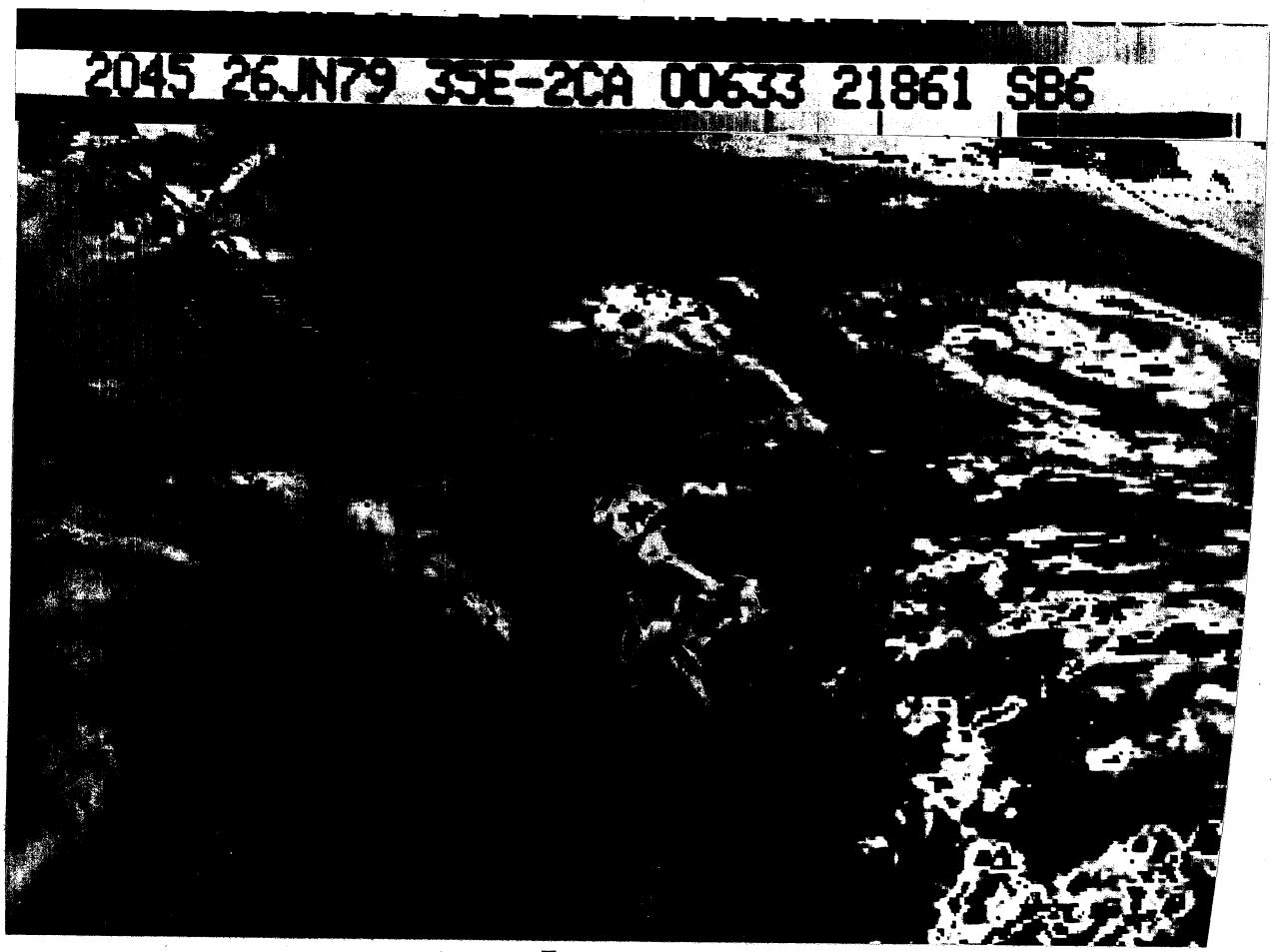

Figure 2

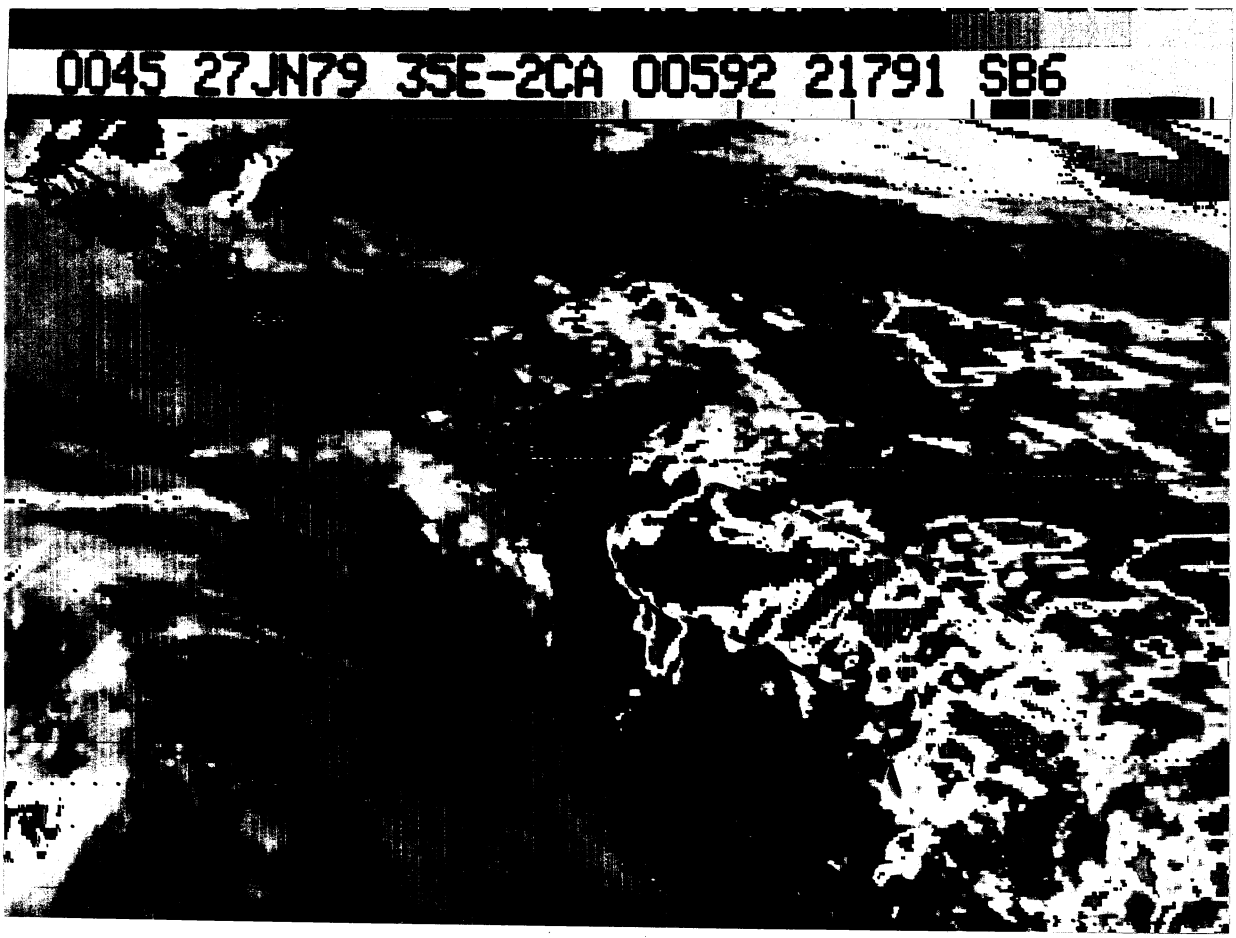

Figure 3

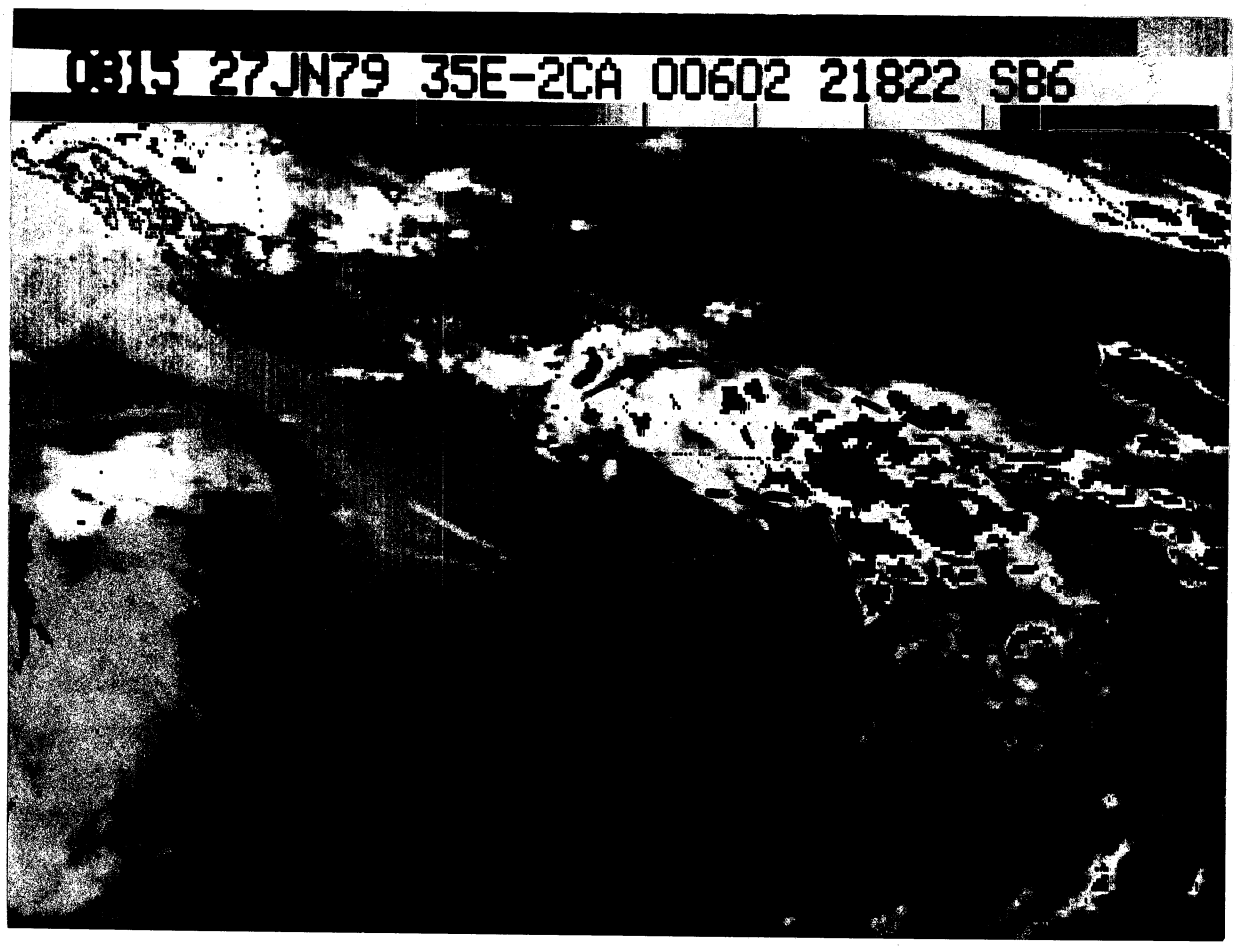

Figure 4

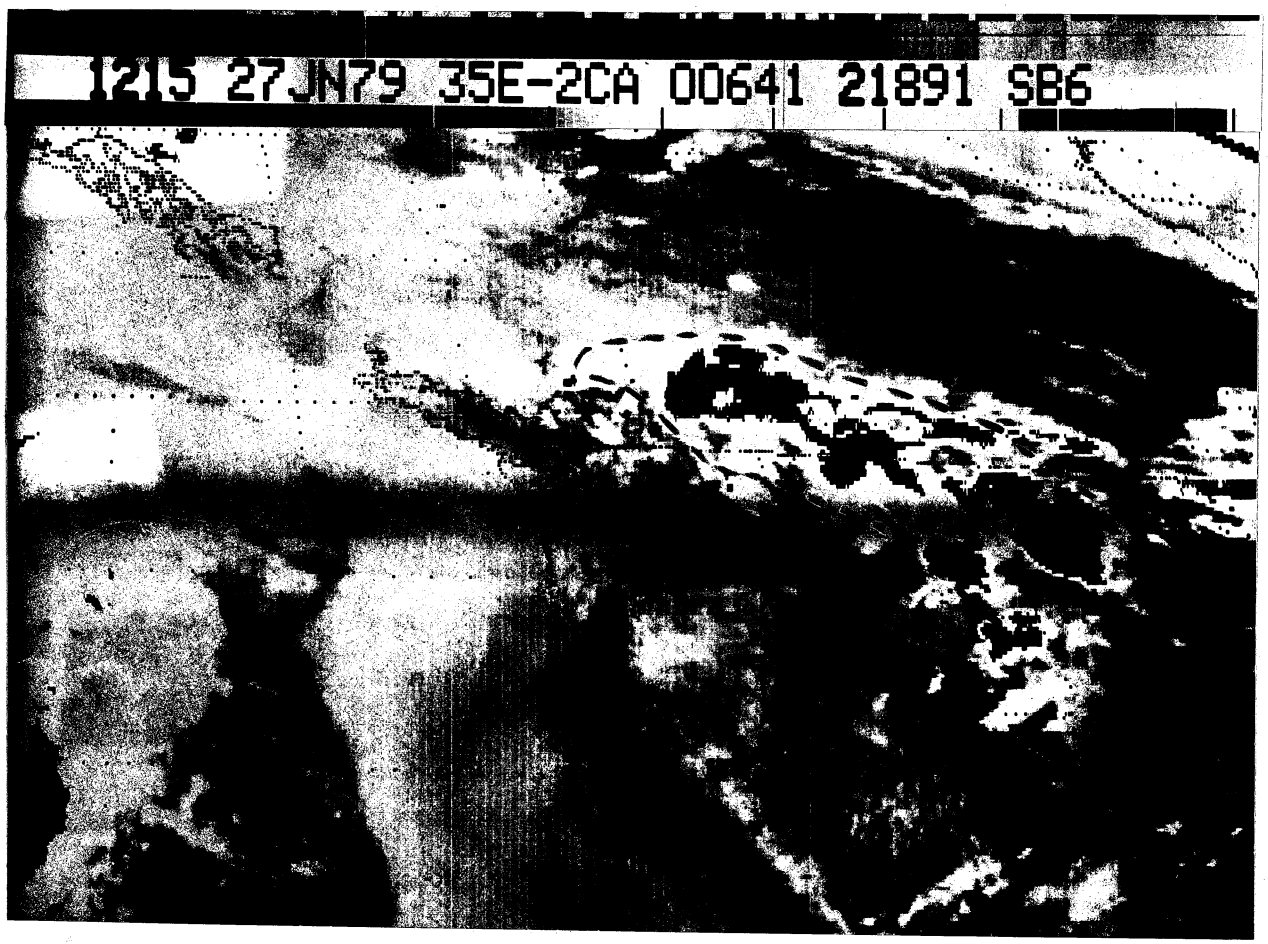

Figure 5

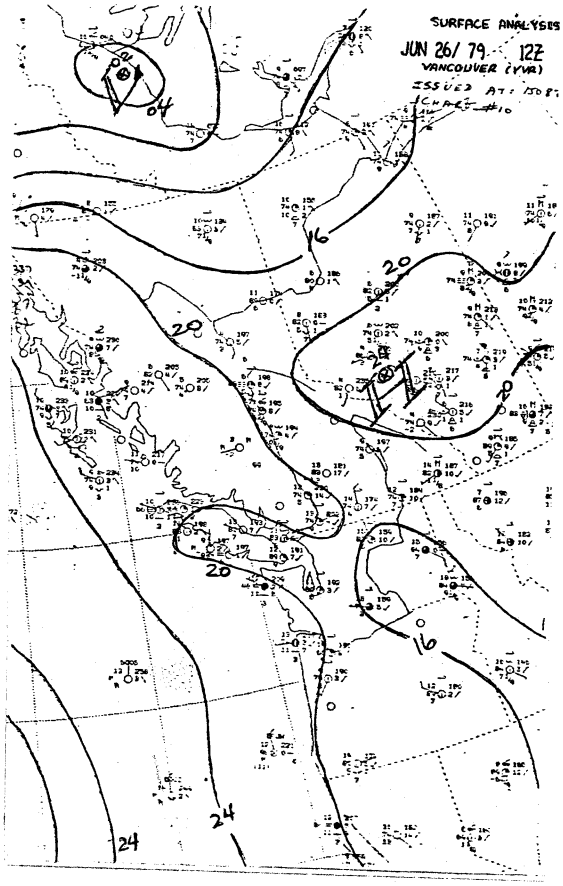

Figure 6
SURFACE ANALYSIS - JUNE 26/79
1200Z

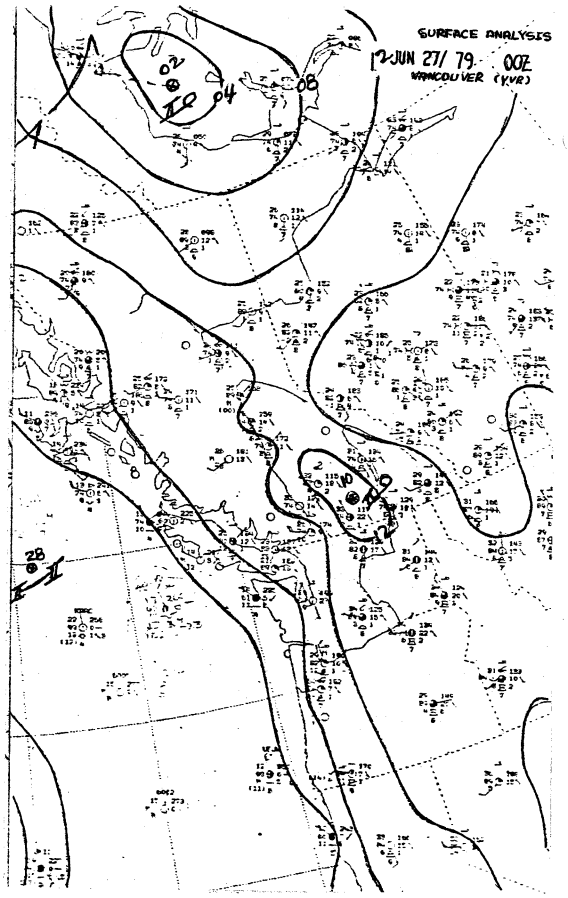

Figure 7
SURFACE ANALYSIS - JUNE 27/79
0000Z

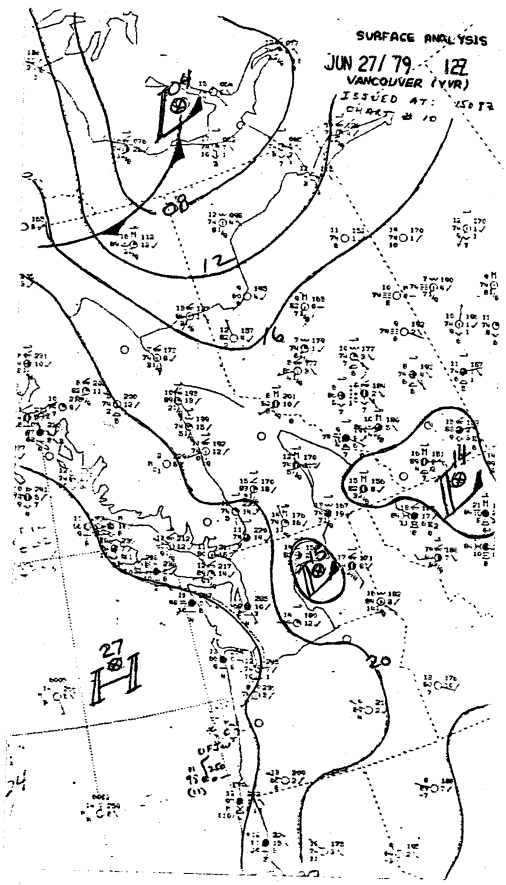

Figure 8
SURFACE ANALYSIS - JUNE 27/79 1200Z

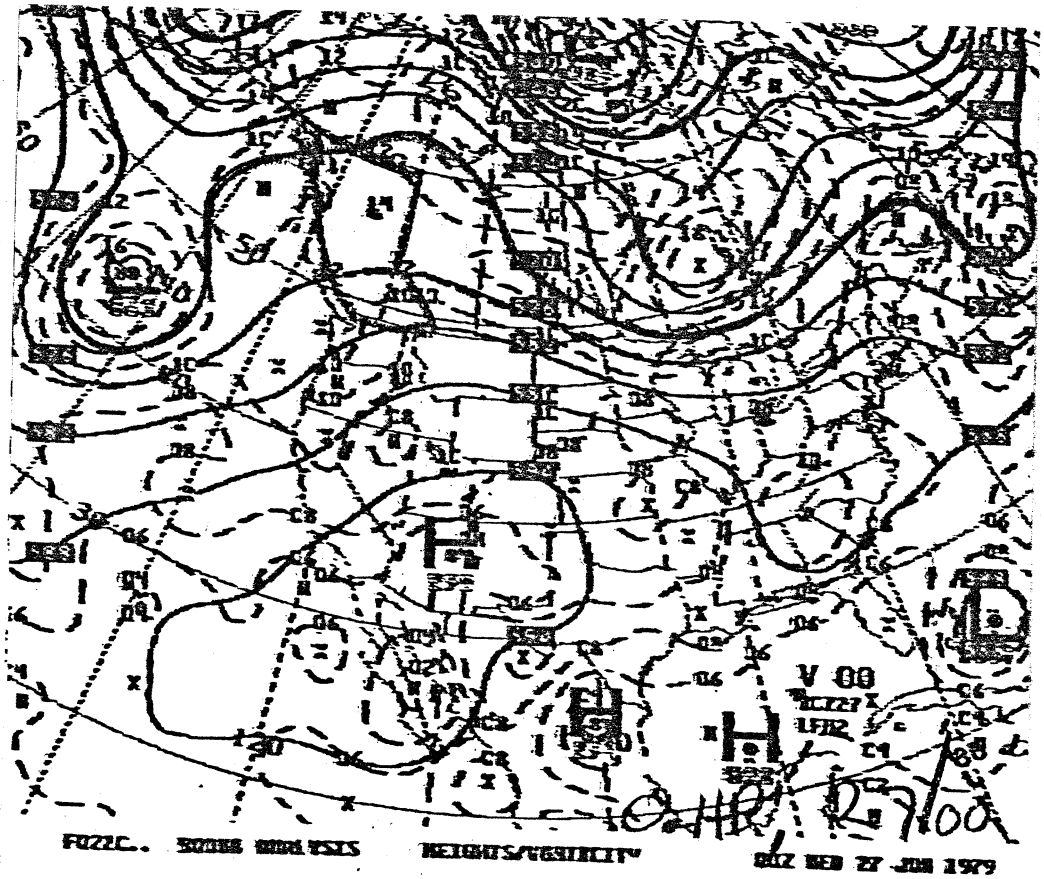

Figure 9 LFM 500mb Analysis 00z 27 June 1979

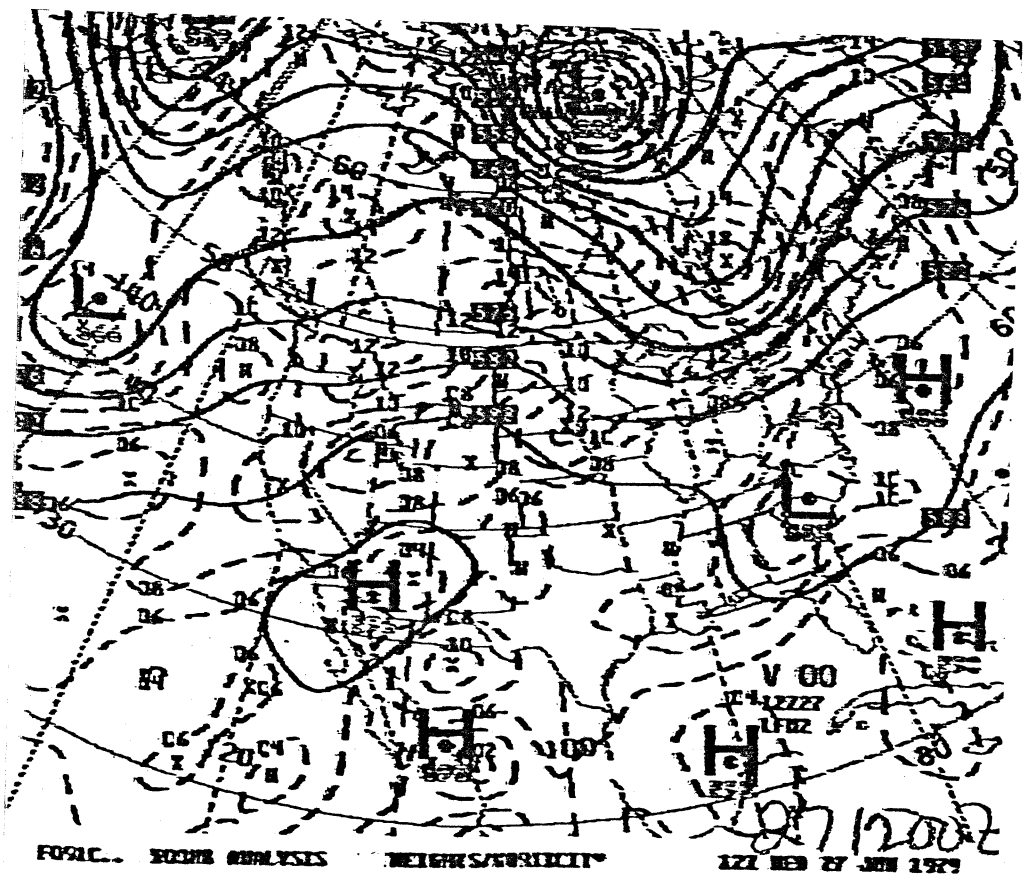

Figure 10 LFM 500mb Analysis 12z 27 June 1979

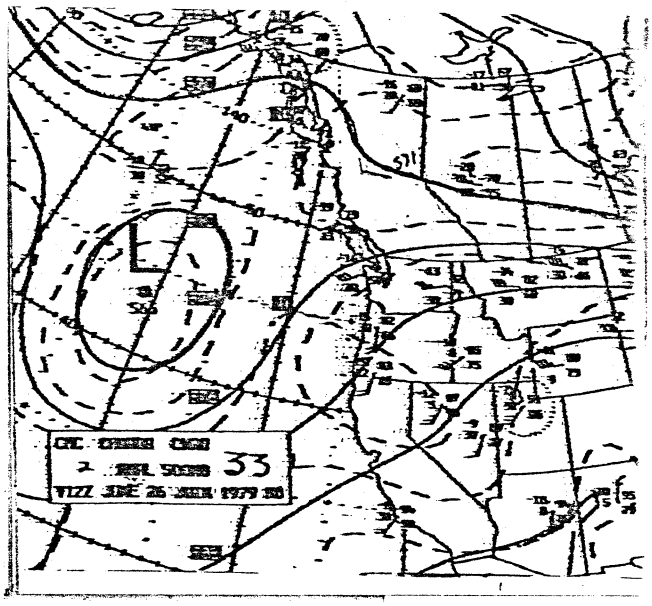

Figure 11 CMC 500mb Analysis
12z 26 June 1979

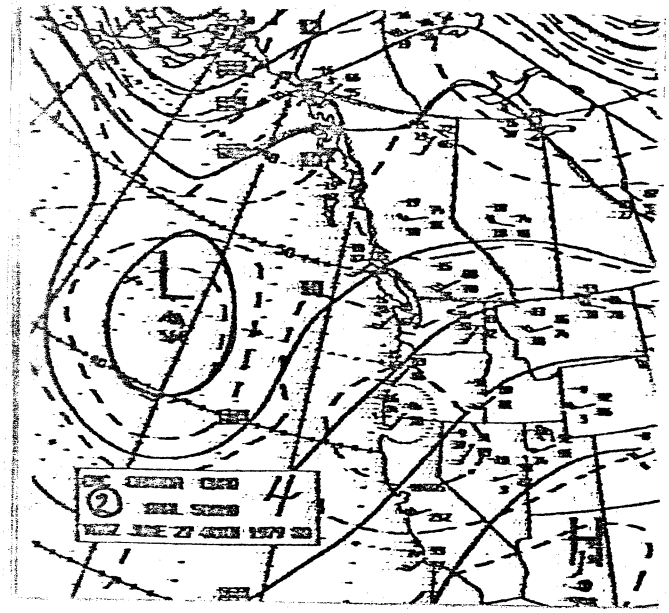

Figure 12 CMC 500mb Analysis
00z 27 June 1979

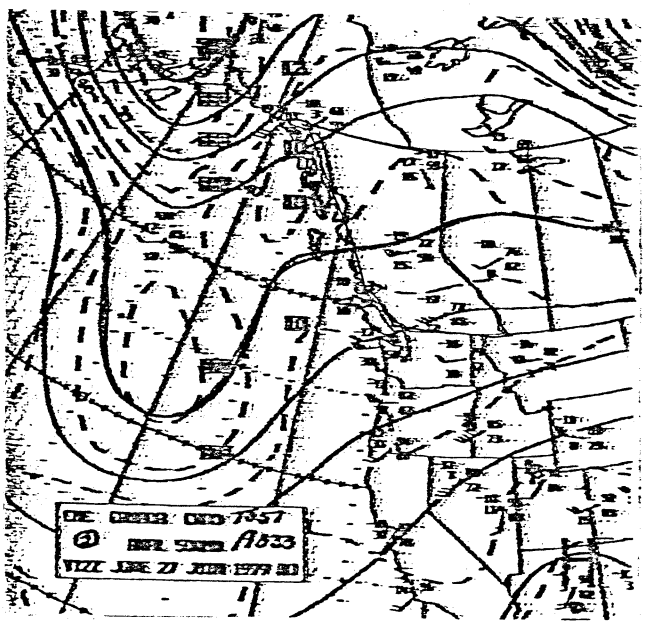

Figure 13 CMC 500mb Analysis
12z 27 June 1979

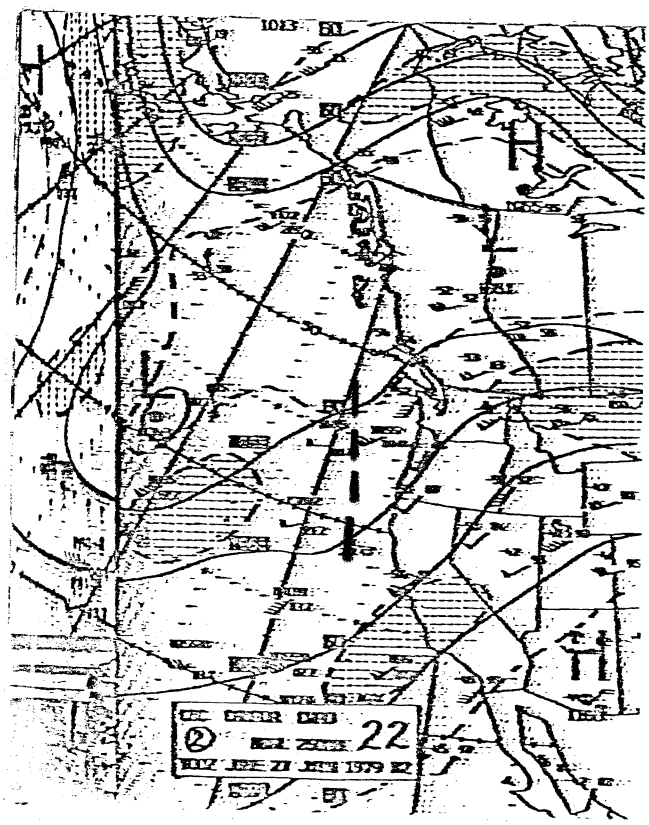

Figure 14 CMC 250 mb Analysis
00z 27 June 1979