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New TIROS-N Sounding Data

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Introduction

As of 1200 GMT February 28, 1979 the NOAA-5 sounding data commonly known as SIRS (Satellite Infra-Red Spectrometer) data was replaced by sounding data from the new TIROS-N satellites. This new series of satellites uses microwave frequencies for its soundings as well as the infrared frequencies. The use of microwave frequencies allows the sensors to take soundings over cloud covered areas as well as the clear areas. This new data is available over land and water.

The encouraging reports from the American National Meteorological Centre have given rise to optimism as to the usefulness of this new sounding data. The Pacific Weather Centre is at present monitoring the accuracy, frequency and operational utility of this data for the Pacific Region. Since this data has been available to us for only one week an in depth study is not possible. This note will examine one days data, picked without prior examination, to illustrate by example the value of the satellite sounding data.

The Data

The satellite sounding information comes to the PWC from Washington via the AES communication circuit, under the headings TUXN6, TUXN10, TUXN14 and TUXN18. The information presently available in the messages are:

a) percentage of cloud cover and pressure level at the average cloud top
b) thickness values between several layers up to and above 10mb; a percent confidence value of the accuracy of the thickness
c) precipitable water amounts (in mm) between several layers up to approximately 300mb; a percent confidence value ot the accuracy of the amounts
d) surface and tropause temperature

Analysis of the Satellite Thickness and Cloud Amount data for 00Z and 12Z Mar. 7, 1979

1. Thickness data

Figures 1 and 2 compare the thickness values obtained from the satellite soundings with the CMC 1000-500mb thickness analysis. In general there is good agreement however two satellite data points differ from the analysis. The first point is located just south of the Queen Charlotte Islands on figure 1. It registers a thickness of 534 decameters whereas the CMC analysis indicates the value should be between 534 and 540 decameters. Attention is directed to this data point because 12 hours later, in figure 2, a closed thickness contour of 522 decameters is analysed over the southern portion of the Queen Charlotte Islands. Perhaps it can be inferred that the satellite 534 value on figure 1 was correct.

The second point which does not agree well with the CMC analysis is on figure 2, it is the satellite thickness value of 555 decameters located at 30N 137W. The CMC analysis would place this data point within the 558 to 560 decameter range. Examination of the satellite pictures in figures 3 and 4 would suggest that the lower satellite thickness value may be more appropriate.

Table 1 compares the thickness values as obtained from the satellite sounding at 47N, 127W with the nearby Quillayute radiosonde values. Difference in values are less than 6 decameters.

2. Cloud cover data

Figures 3 and 4 compare the GOES satellite image with the TIROS-N satellite data for percentage of cloud cover. The values obtained from the TIROS-N satellite appear reasonable.

Summary

From the analysis of this one days sample of TIROS-N sounding data encouraging results have been found as to the accuracy and utility of the thickness data. In this sample at least one data point may have given a higher resolution of analysis then what was available from the CMC analysis. It appears that awareness of this point would have been of value for operational weather forecasting.

From this analysis and from the subjective examination of the one week of data presently available, a note of optimism might be expressed as to the utility of the TIROS-N satellite sounding data for the operational forecast office.

Table 1

Thickness comparison between satellite sounding at 12Z March 7, 1979 (47N, 127W) and Quillayute radiosonde sounding at 12Z March 7, 1979 (confidence level of satellite sounding 90%)

Thks level	satellite	Quillayute	Diff
1000-700mb	2830m	2833m	-3m
500	5350	5327	-23
400	6930	6877	- 53
300	8870	8817	53
250	10050	10027	23
200	11500	11487	13
150	13350	13357	- 7
100	15950	15987	-37

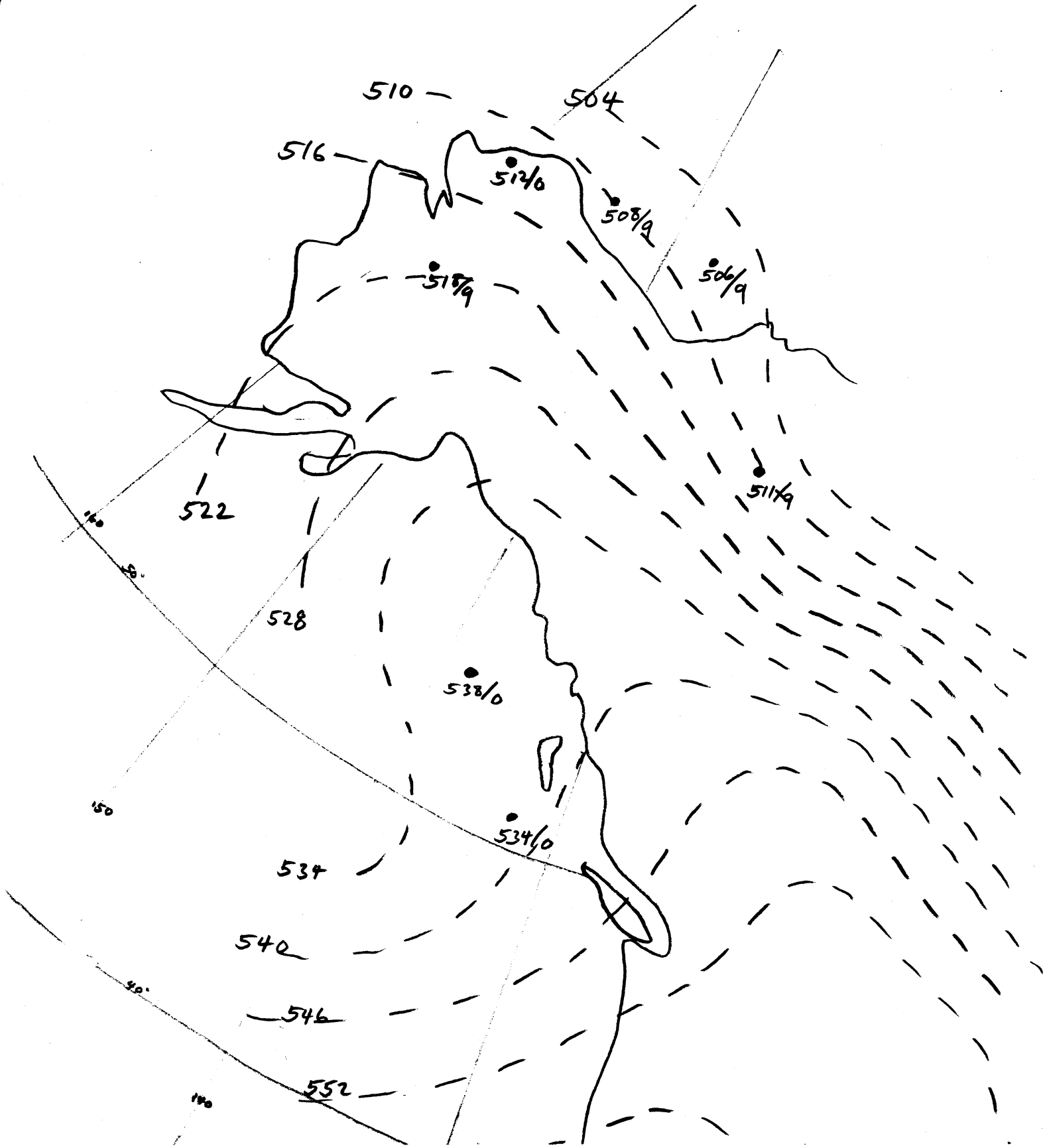

Figure 1

00Z March 7, 1979: 1000-500mb thickness comparison between CMC analysis (dashed lines and satellite sounding values (thickness in decameters and confidence level in tens of percent)

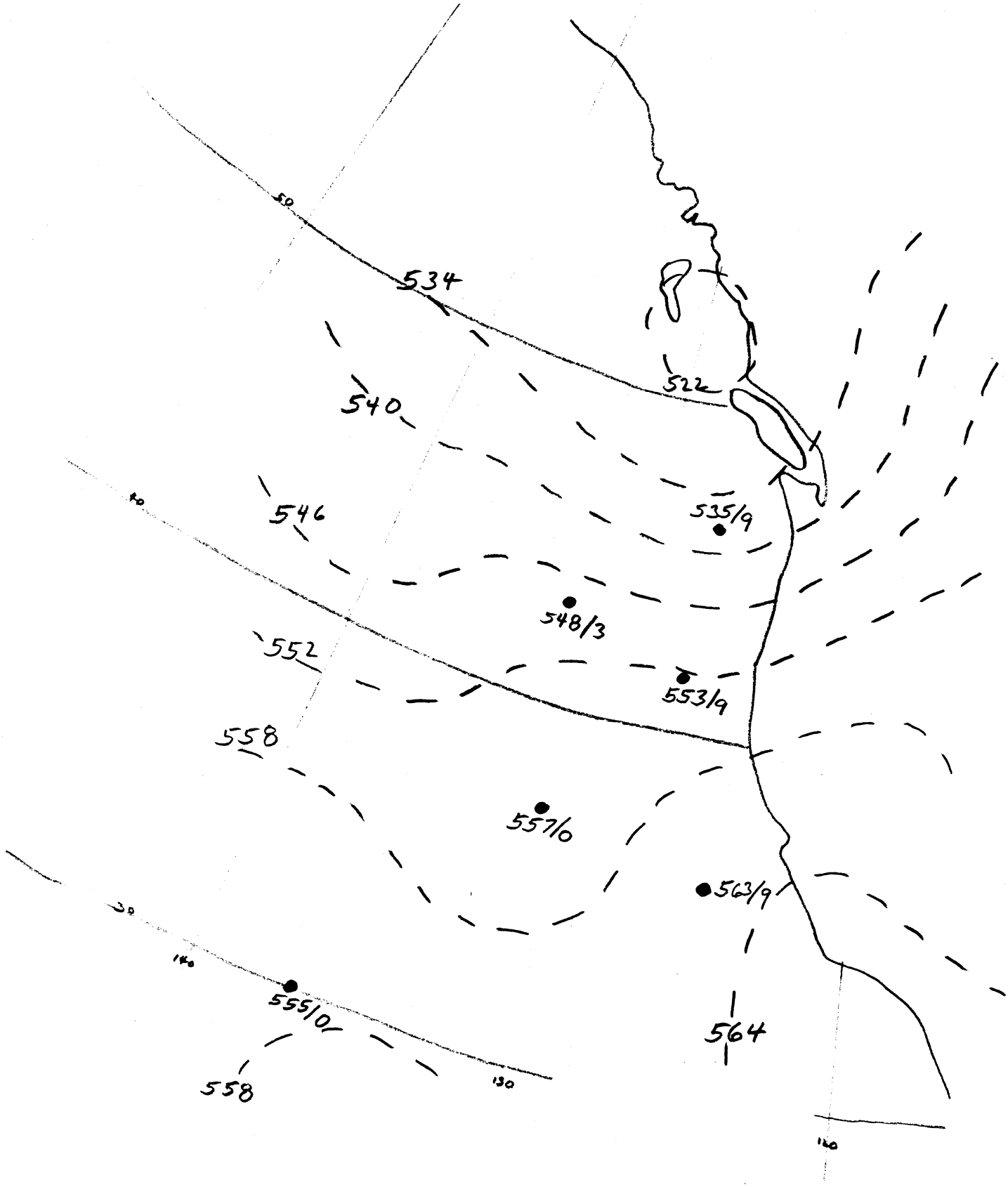

Figure 2

12Z March 7, 1979: 1000-500mb thickness comparison between CMC analysis (dashed lines) and satellite sounding values (thickness in decameters and confidence level in tens of percent)

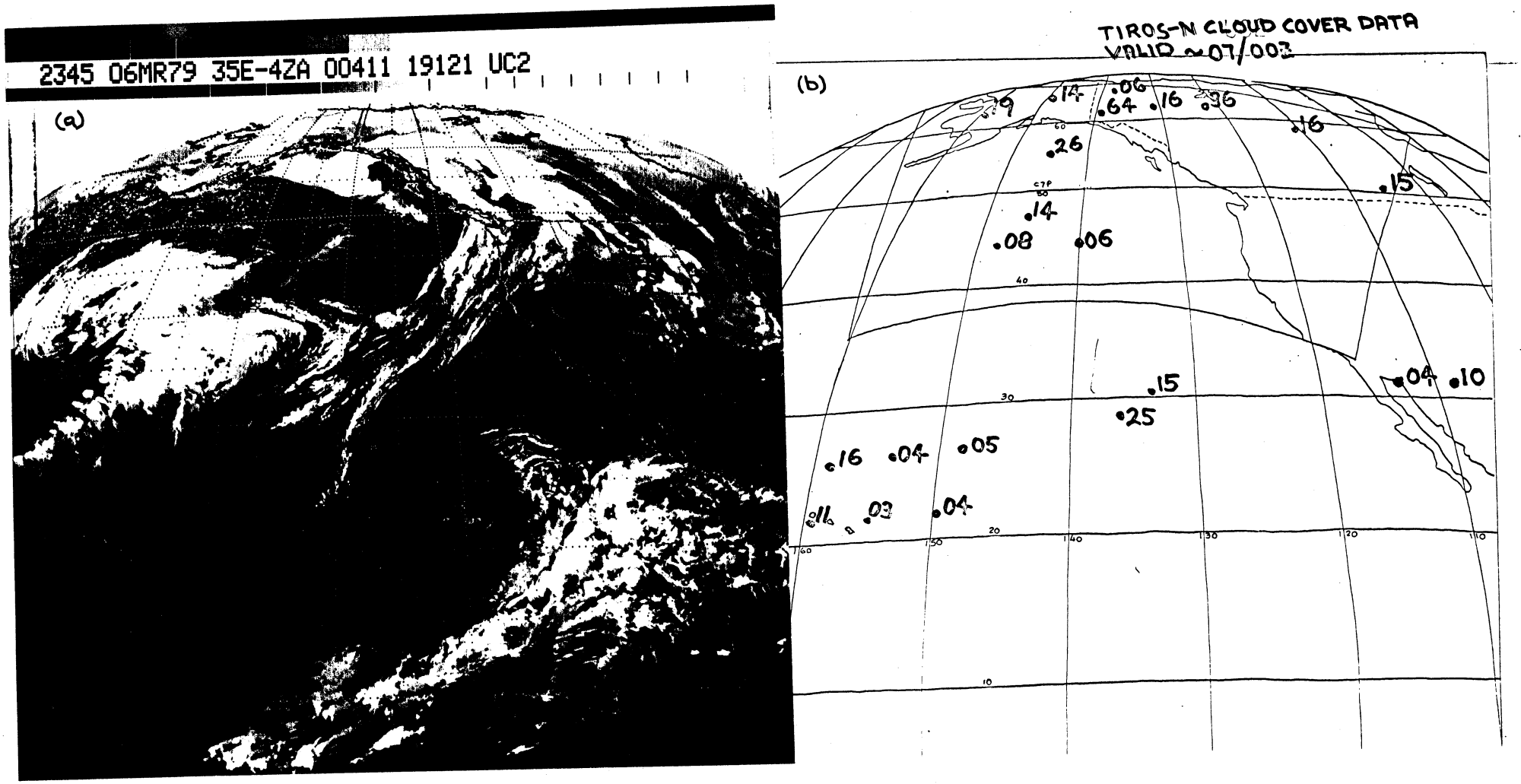

FIGURE 3 (a) IR GOES satellite image valid 2345Z, March 6th, 1979
(b) Percentage of cloud cover, as determined by the TIROS-N sounding instruments

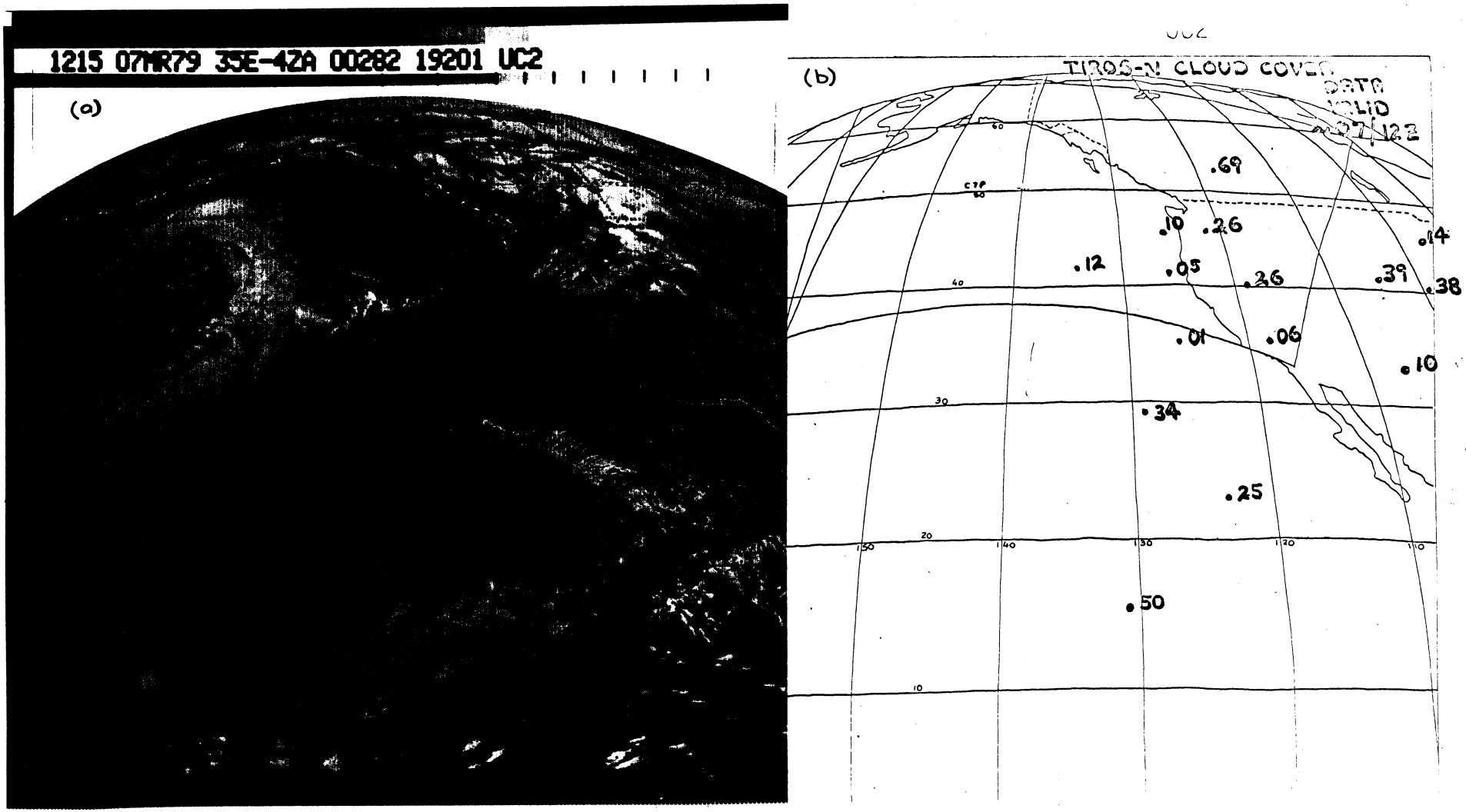

FIGURE 4 (a) IR GOES satellite image valid 1215Z, March 7th, 1979
(b) Percentage of cloud cover, as determined by the TIROS-N sounding instruments