



PACIFIC REGION TECHNICAL NOTES

81-019

September 23, 1981

EXPERIMENTAL MOISTURE CHANNEL IMAGES

AT THE PACIFIC WEATHER CENTRE

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INTRODUCTION

On an experimental basis, during the three-week period from August 24 to September 14, 1981, the 6.7 micrometer moisture channel images were transmitted in place of certain standard 11.5 micrometer GOES-W IR images. (See Appendix A for description.) At the Pacific Weather Centre (PWC) these images were regularly received at 0015Z and 1215Z throughout this period.

Preliminary assessments by PWC satellite meteorologists have found that these new moisture channel images are useful in locating circulation centres, assessing the upper level moisture content of weather systems and delineating wind flow above 600 mb. A report by the U.S. - N.W.S. Western Region (ref. 1) has cited several examples of the usefulness of these moisture channel images.

This note is written to document one example of the value of these images to the operational forecasters at the PWC. The example presented, occurred on August 26, 1981, two days after the first series of 6.7 micrometer moisture images commenced.

CASE OF AUGUST 26-28, 1981

Figure 1 (0000Z August 25) and Figure 2 (0000Z August 26) depict the synoptic conditions confronting the evening and nightshift forecasters at the PWC on August 25 / 26th. The 500 mb analyses and standard IR images indicated a quasi-stationary low off the B.C. coast and a trough near 170°W; and from the trough a strong southerly flow towards the Aleutians.

Of the three numerical prognoses (CMC spectral, U.S. spectral, U.S. LFM) received at the PWC, the CMC spectral and U.S. LFM were at times during the previous 12 to 48 hours prematurely moving the low onto either the B.C. or Washington coast. Only the U.S. spectral appeared to be consistent in holding the low quasi-stationary. However, the numerical prognoses from the models, including the U.S. spectral, issued from the 26/0000Z data all now agreed that the low would be pushed inland due to a westerly stream

developing from the base of the trough to the base of the low.

The problem then was whether or not to accept the numerical guidance. It was decided to accept the guidance based on several reasons, one of which was the indication by the moisture channel image that the flow at the base of the trough (near 32N, 155W) was now breaking out. (See figure 2 and for a better copy of the moisture channel image figure 5). A comparison of the standard IR and the moisture channel images, shows the inability of the IR images to trace the advection of moisture into a ridge position, whereas the moisture image shows it quite clearly.

Figure 3 (0000Z August 27) and figure 4 (0000Z August 28) show the subsequent motion of the low into B.C. Twelve hours after figure 4, at 1200Z August 28th the low was on the B.C. - Alberta border.

CONCLUDING REMARKS

During the experimental test period (August 24 - September 14) the new moisture channel images have proven to be beneficial for weather analysis and forecasting at the PWC. As shown in the case presented in this brief note, the early detection by the moisture channel images of a significant change in the upper flow near the dateline assisted in determining the prognosis of a low off the B.C. coast.

This author's summation would concur with the summation made by the author of the U.S. Western Region Technical Attachment (Ref. 1) - "The potential usefulness of the new satellite 'moisture' pictures appears great". It is hoped that the moisture channel images will soon be available on a regular operational basis.

REFERENCES:

1. "Satellite Moisture Charts - A New Forecast Tool",
U.S. Western Region Technical Attachment No. 81-33,
Sept. 1, 1981.

APPENDIX A

TO: ALL GOES RECEIVERS
FROM: SSD/CDDP, WASHINGTON, D.C.
DATE/TIME: AUGUST 23, 24, 25 0515Z/0730Z
SUBJECT: VAS MOISTURE CHANNEL IMAGERY

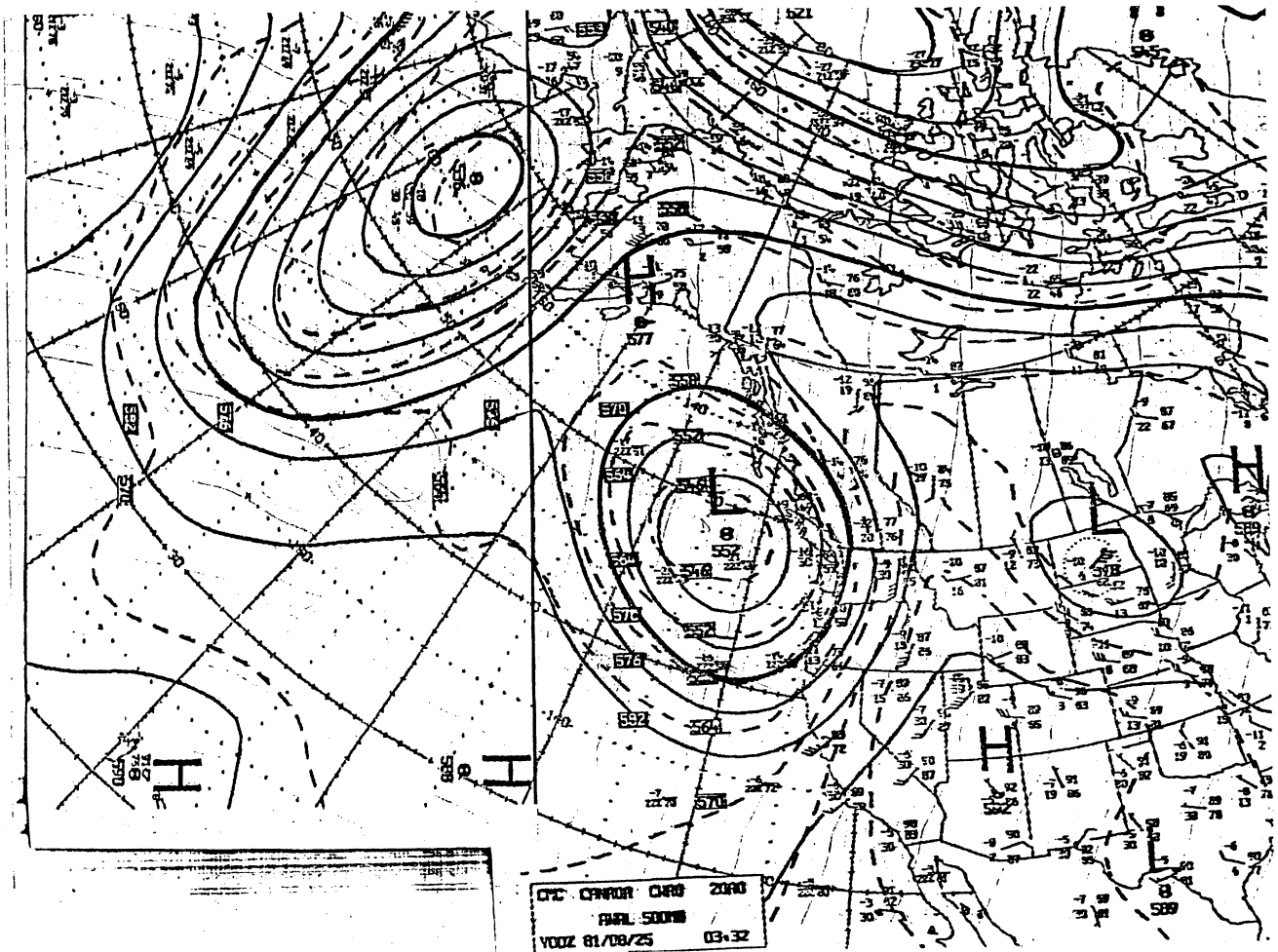
DURING THE PERIOD FROM AUGUST 24 THRU SEPTEMBER 14, 1981, THE 6.7 MICROMETER DATA (CHANNEL 10) WILL REPLACE THE NORMAL GOES WEST IR THERMAL IMAGERY AT CERTAIN SCHEDULED TIMES (SEE PRIOR MESSAGE). THE IMAGERY PRODUCED DURING THIS TEST WILL BE EVALUATED BY NESS AND NWS FOR FUTURE OPERATIONAL USE. THE 6.7 MICROMETER CHANNEL IS THE ABSORPTION CHANNEL OF WATER VAPOR AND WHEN DATA ARE DISPLAYED AS AN IMAGE, IT IS REPRESENTATIVE OF THE HUMIDITY IN THE MIDDLE AND UPPER TROPOSPHERE. WHITE REGIONS CORRESPOND TO WATER VAPOR RADIATING AT COLDER TEMPERATURES; DARK REGIONS, TO VAPOR AT WARMER LOWER ALTITUDES. THUS, IN WHITE REGIONS, THE UPPER TROPOSPHERE IS RELATIVELY MOIST AND IN DARK REGIONS IT IS RELATIVELY DRY. SOME HIGH CIRRUS CLOUDS WILL APPEAR THE SAME IN 6.7 MICROMETER IMAGERY AS THEY DO IN THE STANDARD 11.5 MICROMETER THERMAL IR DATA, BUT CLOUDS AT LOWER LEVELS CANNOT BE IDENTIFIED. THE DARKER THE AREA, THE DRIER IT IS THRU THE LAYER BEING SENSED, BUT THESE DARK AREAS ARE NOT NECESSARILY DRY IN THE LOWER TROPOSPHERE. CALIBRATION OF THESE DATA IS NOT YET COMPLETE, AND THE DISPLAY IS MEANT TO SHOW ONLY PATTERNS OF THE MOISTURE DISTRIBUTION IN THE UPPER TROPOSPHERE. CONSIDERABLE ENHANCEMENT OF THE MOISTURE CHANNEL DATA IS NECESSARY TO PRODUCE A USEFUL IMAGE. DURING THE 3-WEEK EVALUATION, THE ENHANCEMENT TABLES MAY BE CHANGED BY NESS WITH THE OBJECTIVE OF INCREASING THE CONTRAST TO BETTER DELINEATE THE MOISTURE PATTERNS.

THE PATTERNS WHICH APPEAR IN THE IMAGERY ARE PRODUCED BY A COMBINATION OF MOISTURE ADVECTION AND AREAS OF RISING AND SINKING AIR. IN MANY CASES, THE PATTERNS WILL HELP IDENTIFY CIRCULATION FEATURES OF THE UPPER TROPOSPHERIC FLOW SUCH AS THE JET STREAM, COLD LOWS, AND DEFORMATION ZONES, IN AREAS WHERE CLOUDS ARE NOT PRESENT. OFTEN THE RELATIONSHIP OF THE MOISTURE PATTERNS TO CIRCULATION FEATURES IS AMBIGUOUS AND THE IMAGERY SHOULD BE USED WITH CAUTION PENDING FURTHER STUDIES WITH GOES AND METEOSAT WATER VAPOR IMAGERY.

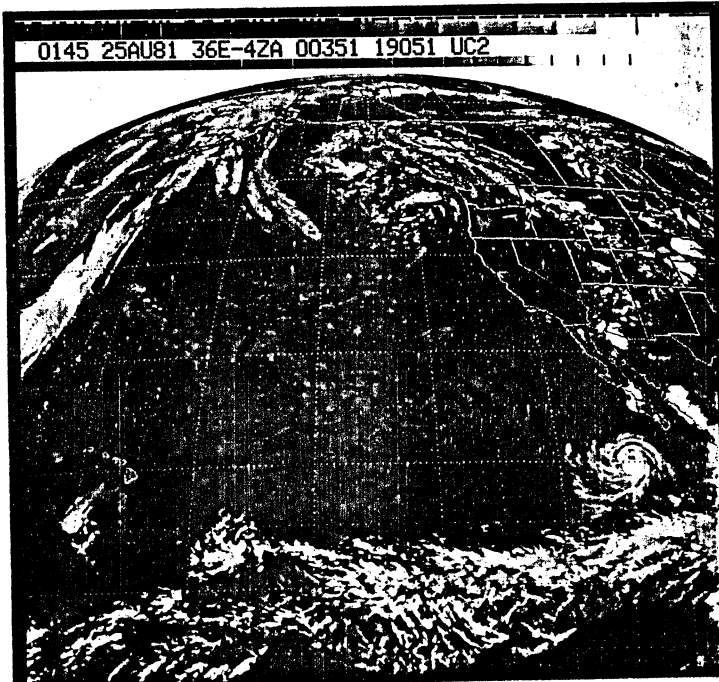
SOME OF THE POTENTIAL APPLICATIONS OF THIS IMAGERY ARE (1) IMPROVED DETECTION OF UPPER-LEVEL CUTOFF LOWS OVER THE OCEANS; (2) INFORMATION ON THE STRENGTH OF INVERSIONS IN ANTICYCLONES; (3) IMPROVED ANALYSIS OF THE UPPER-LEVEL WIND FIELDS IN SPARSE DATA AREAS AND OVER THE UNITED STATES IN SUMMER MONTHS WHEN WEAK GRADIENTS ARE PRESENT; (4) IDENTIFICATION OF AREAS WHERE CLOUDS ARE LIKELY TO FORM IN THE IMMEDIATE FUTURE; (5) IDENTIFICATION OF MOISTURE BOUNDARIES WHERE THE POTENTIAL FOR CONVECTION EXISTS; (6) IMPROVED ABILITY TO FORECAST MOUNTAIN LEE CIRRUS; (7) BETTER MINIMUM TEMPERATURE FORECASTS; AND (8) IMPROVED ABILITY TO OBSERVE THE INTERACTION BETWEEN THE POLAR JET AND CIRCULATION SYSTEMS IN THE TROPICS AND SUBTROPICS.

FIGURE 1.

CMC ANALYSIS AUGUST 25 0000Z



STANDARD IR IMAGE AUG 25 0145Z



MOISTURE CHANNEL AUG 25 0015Z

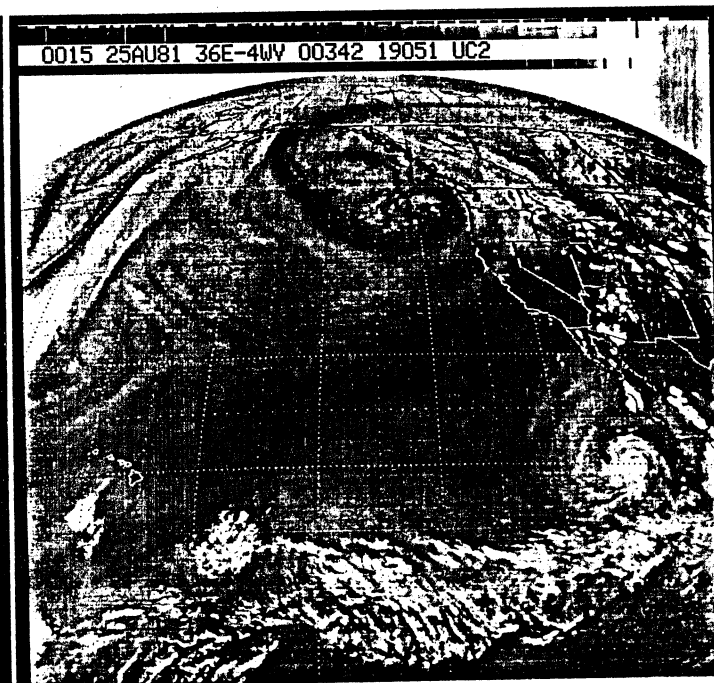
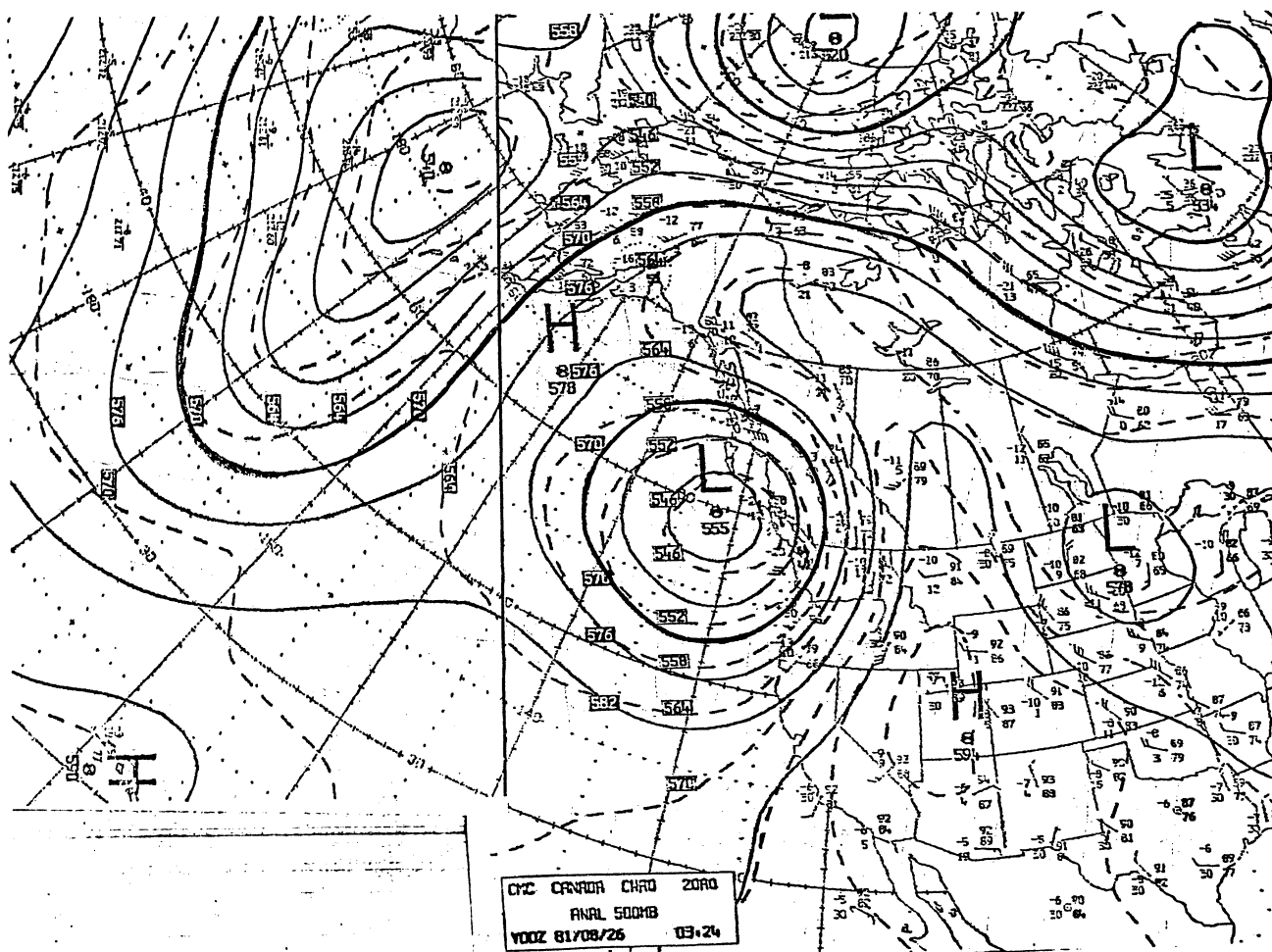
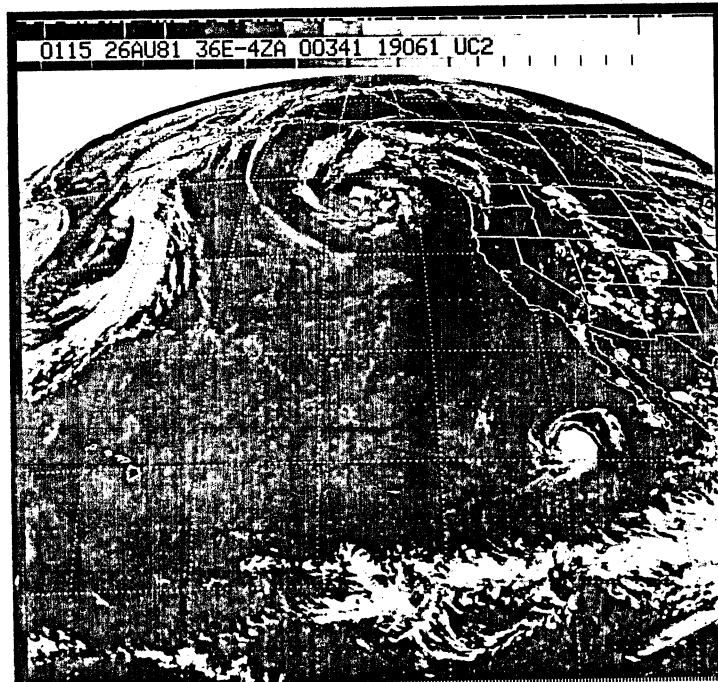


FIGURE 2.

CMC ANALYSIS AUGUST 26 0000Z



STANDARD IR IMAGE AUG 26 0115Z



MOISTURE CHANNEL AUG 26 0015Z

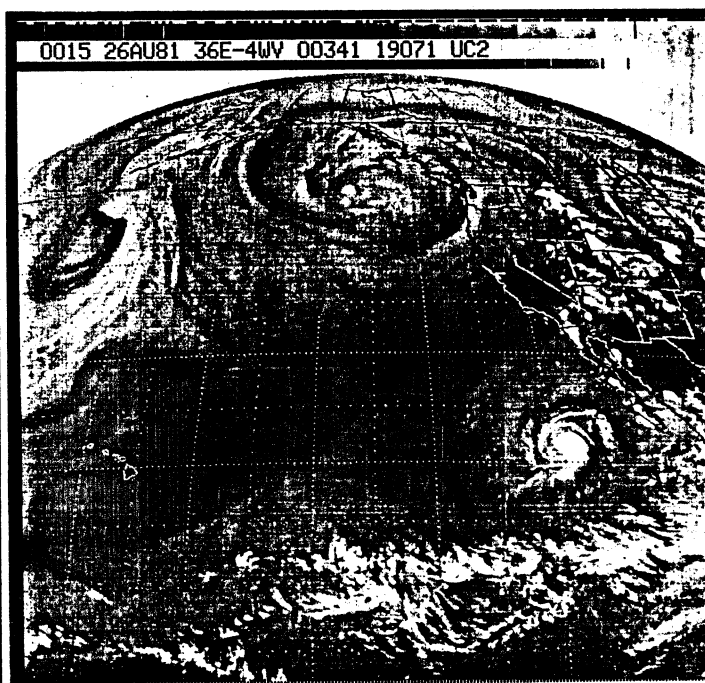
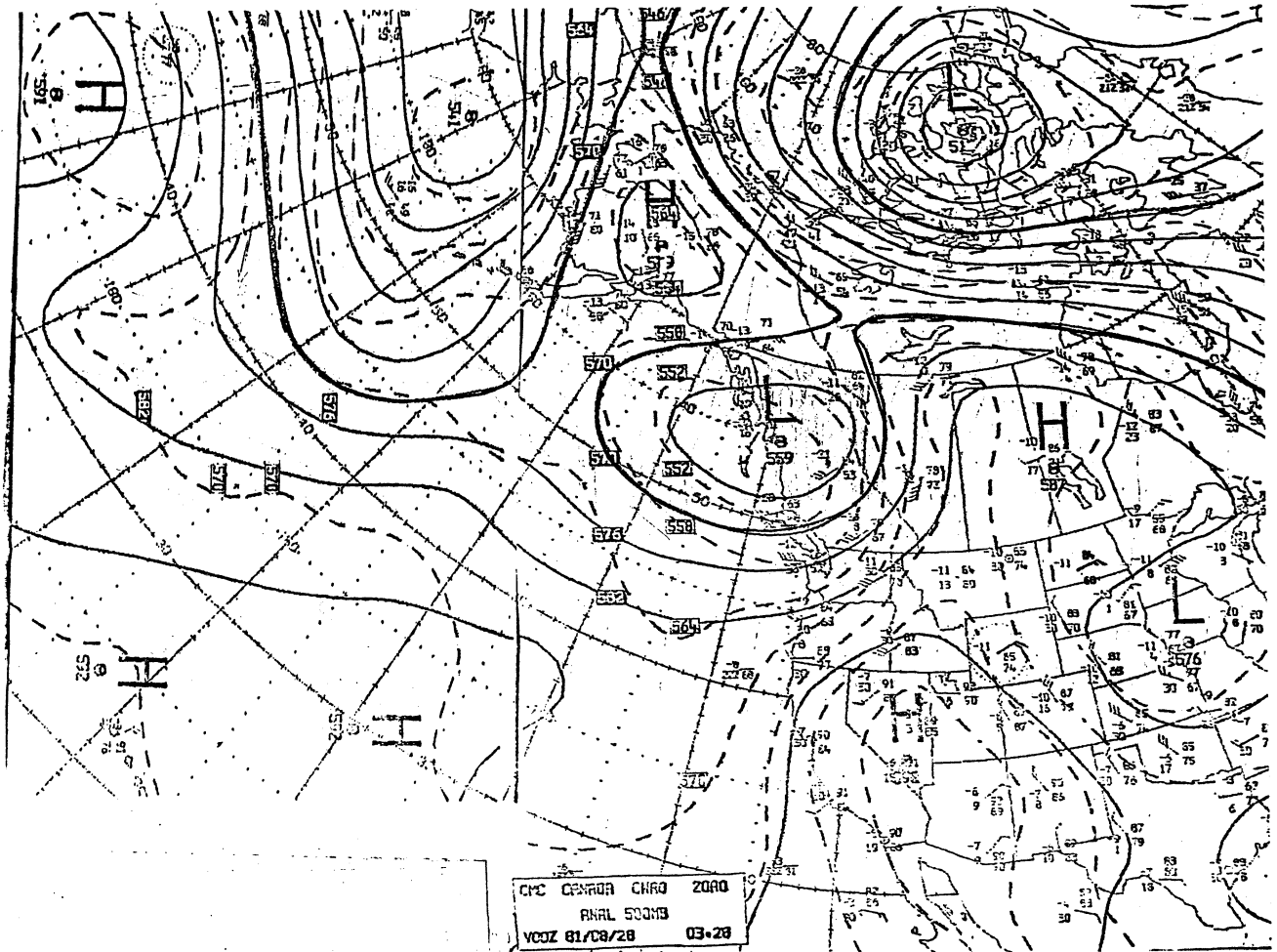
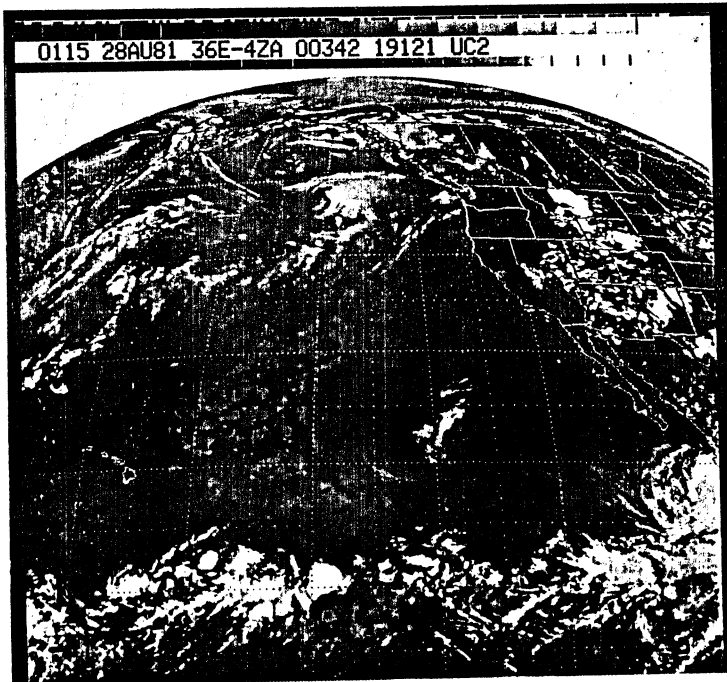


FIGURE 4.

CMC ANALYSIS AUGUST 28 0000Z



STANDARD IR IMAGE AUG 28 0115Z



MOISTURE CHANNEL AUG 28 0015Z

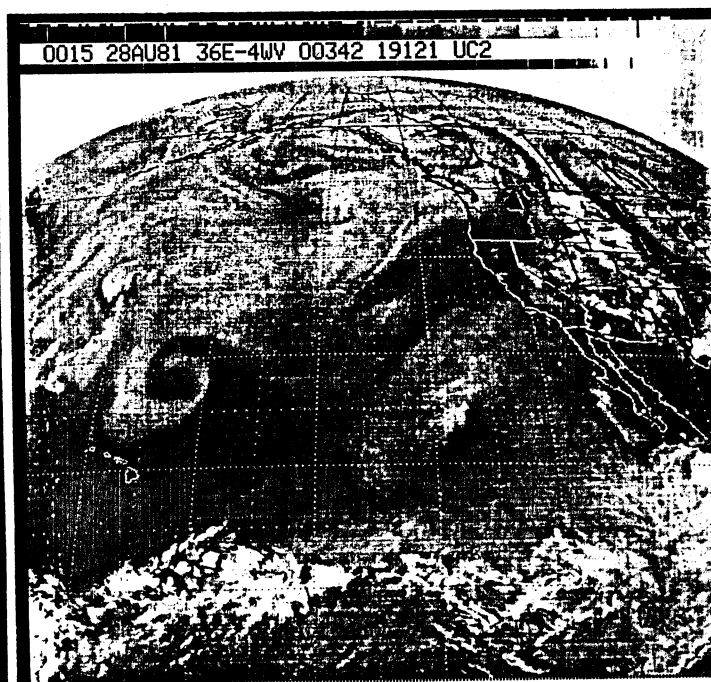


FIGURE 5.

MOISTURE CHANNEL IMAGE

AUGUST 26 0015Z

(NOTE: SAME MOISTURE IMAGE AS IN FIGURE 2,
REPRODUCED HERE IN LARGER SCALE FOR CLARITY)

