PACIFIC REGION TECHNICAL NOTES

NO. 78-014

MAY 9, 1978

SATELLITE IMAGERY AND THE LOCATION OF FRONTAL WAVES

Peter Haering, Meteorologist
Pacific Weather Center, Vancouver

INTRODUCTION.

Over data sparse ocean areas and with a Meridional Trof Type circulation pattern one of the more difficult tasks of the synoptic meteorologist is the correct positioning of frontal waves on a surface map. Oft-times on satellite imagery frontal waves will be completely obscured by the broad baroclinic cirrus shield that is usually associated with such a situation. Predictions of the development of a particular frontal wave from satellite imagery alone generally has to await the distortion of the cirrus deck, the emergence of the comma cloud or for a more confident prediction the appearance of the characteristic dry slot. Such indications of development associated with one frontal wave usually means that the other frontal waves will weaken as development proceeds. However, this note is primarily concerned with the aid that satellite imagery can give in the correct positioning of frontal waves in a Meridional Type of flow pattern.

DISCUSSION.

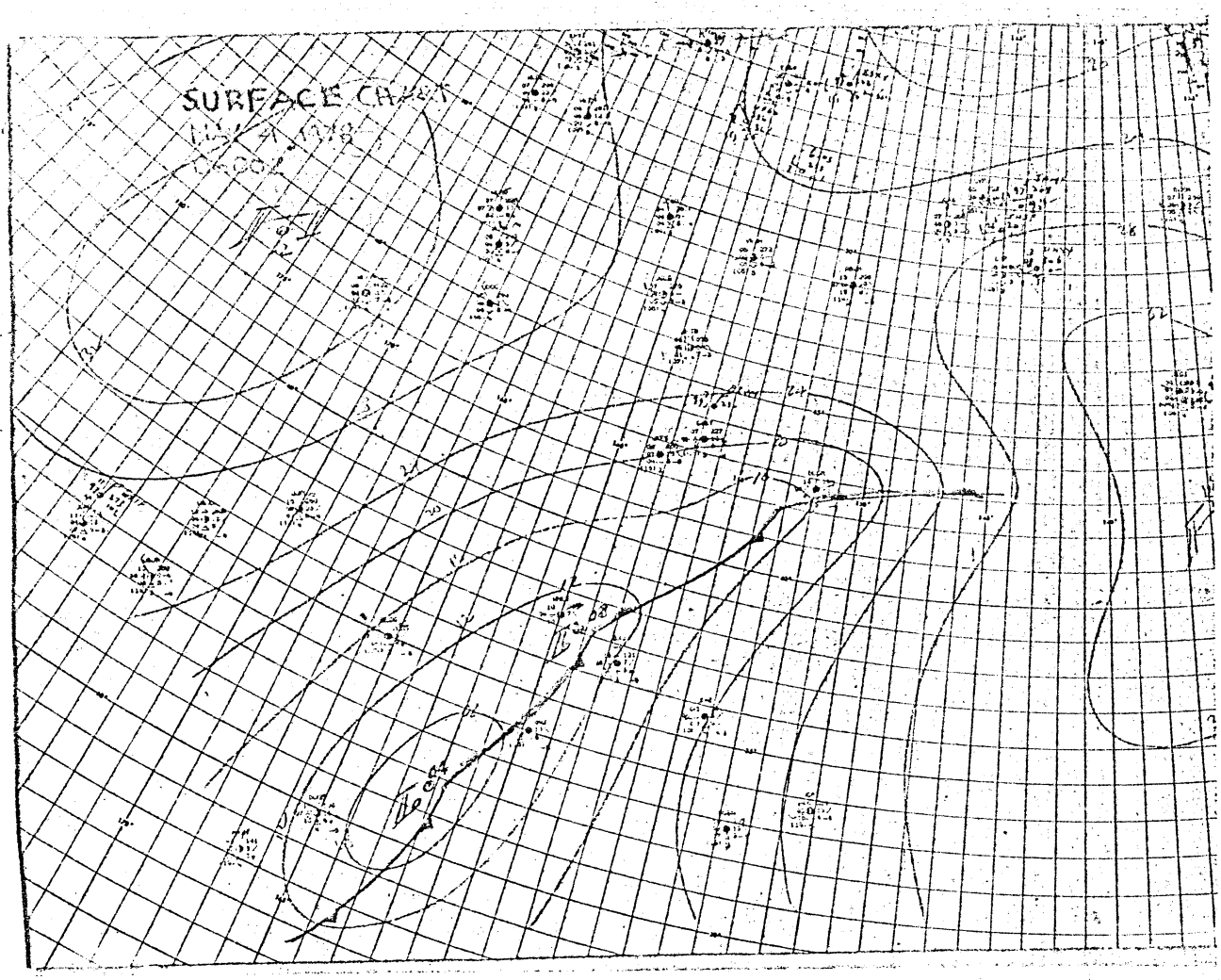
The following charts and satellite pictures are attached:

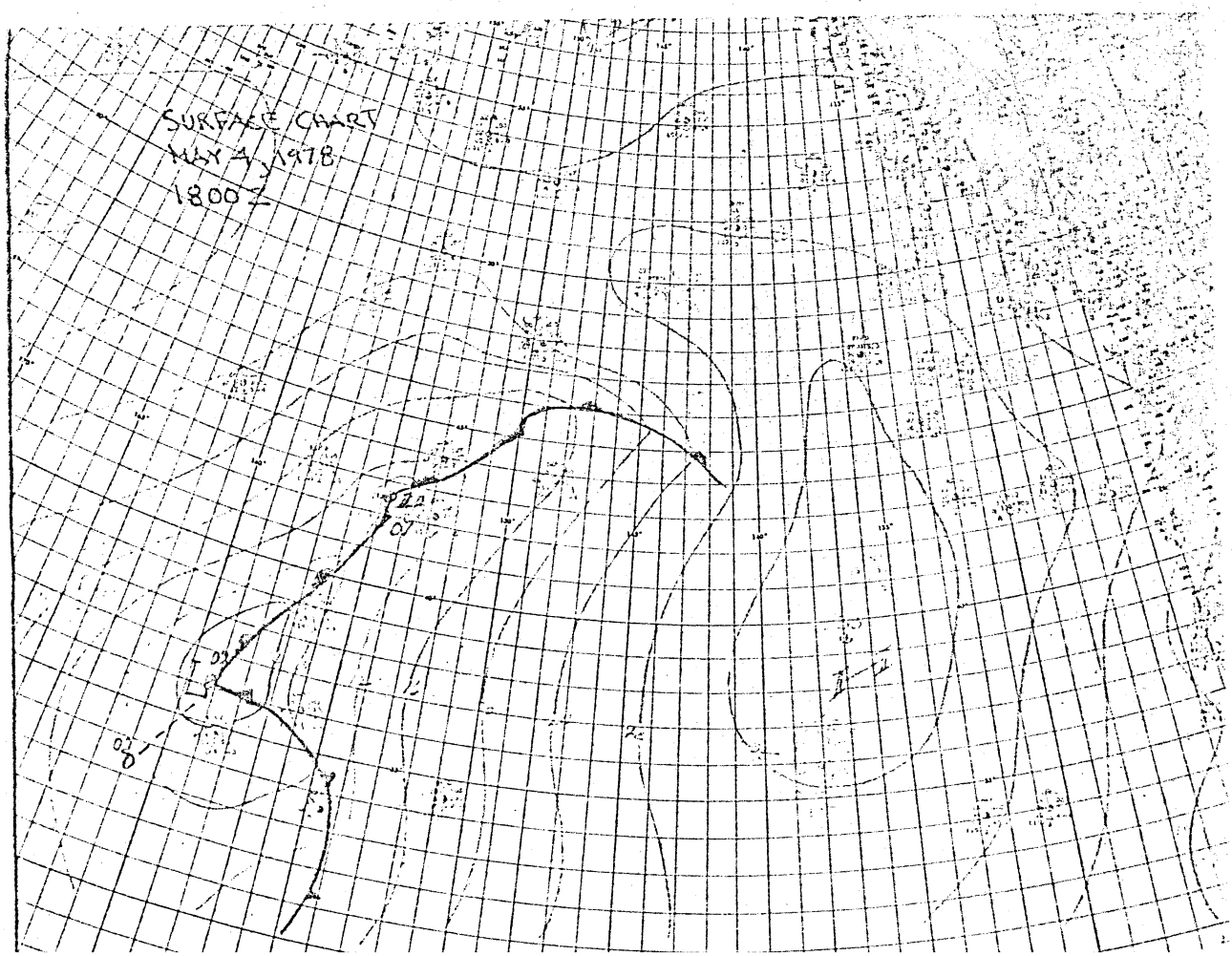
1. Surface chart for May 4, 1978, 0600Z.
2. Surface chart for May 4, 1978, 1800Z.
3. Enhanced Ir. imagery for May 4, 1415Z.
4. Normal Ir. imagery for May 4, 1446Z.
5. Visible imagery for May 4, 2315Z.

All three satellite pictures show the extensive baroclinic cirrus deck usually associated with a Meridional Type upper air pattern. The cirrus deck is anticyclonically curved and both Ir pictures show clouds protruding from the main cirrus deck on the right -hand side of the cirrus band as one faces downwind. These protruding cloud fragments are marked A on the Ir imagery. It is these cloud fragments which give an indication of where one should place the frontal waves associated with this system. The cloud fragments are usually made up from a mixture of cloud types including convective clouds. The attached satellite pictures show three of these cloud features, and an examination of the surface charts indicate that it is quite feasible to analyse three frontal waves in the positions indicated on the imagery (the 12Z chart was not used because there was no data in the area of interest). The cold cloud tops as revealed by the enhanced Ir imagery and marked C also suggest that the front lies quite close to the edge of the cloud deck near the arrowheads associated with C. Furthermore, the beginning of a dry slot is evident on the enhanced ir imagery at B, suggesting that the last frontal wave will be the one most likely to develop. The Visible imagery for 2315Z supports this, as the dry slot by this time is more fully developed. In effect this last frontal wave developed into an intense storm on May 5.

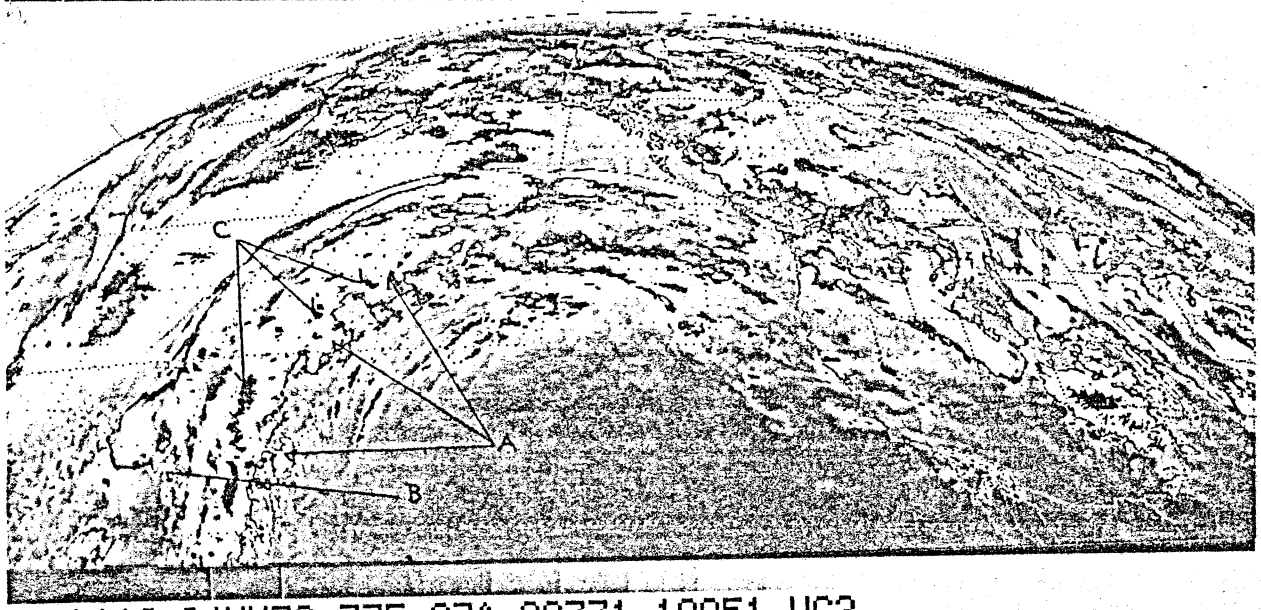
CONCLUSIONS.

1. In a Meridional Type Flow Pattern it is possible to use satellite imagery to locate or to help to locate warm frontal waves which are frequently observed in such a synoptic situation.
2. Protruding cloud fragments which are made up from a mixture of cloud types some of which are convective in nature appear to pinpoint the location of these frontal waves.
3. The location of the front can often be determined by examining the cold cloud tops on the enhanced Ir imagery. In most cases the frontal position will be near the right-hand side of the cirrus deck as one faces downwind.

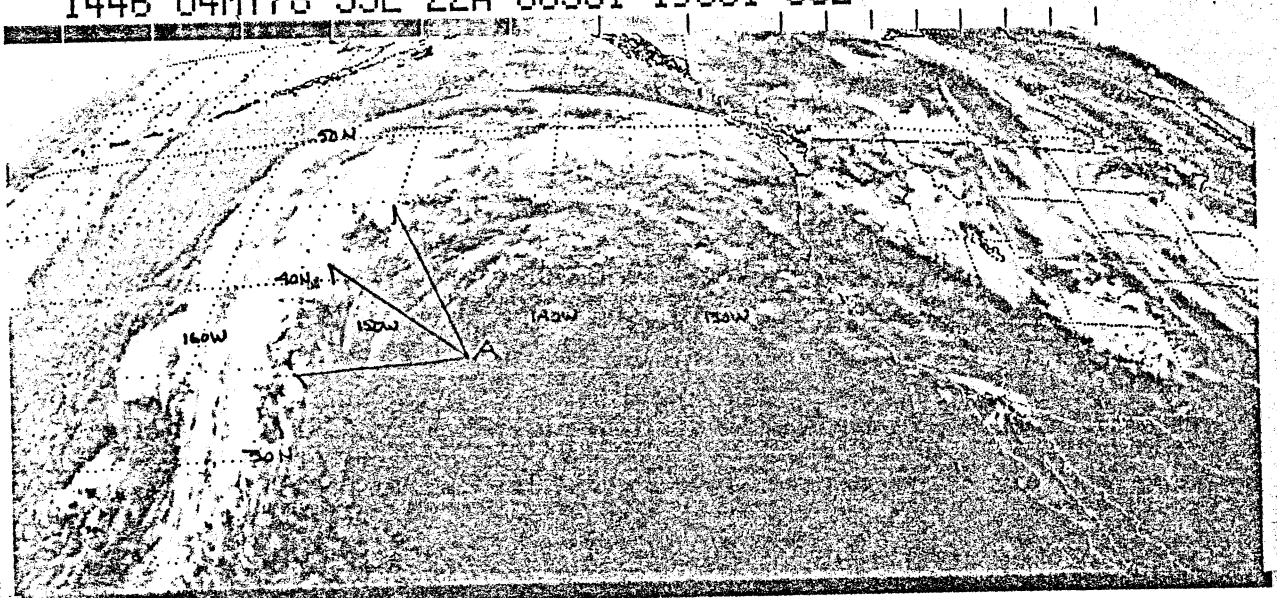

SURFACE CHART


SURFACE CHART
MAY 4, 1978
1800 Z

1415 04MY78 33E-2EC 00321 19071 UC2



1446 04MY78 33E-2ZA 00331 19051 UC2



2315 04MY78 33A-2 00341 19071 UC2