SECOND BI-MONTHLY PROGRESS REPORT
UNIVERSITY OF ALASKA
ERTS PROJECT 110-4

December 13, 1972

A. TITLE OF INVESTIGATION: Survey of the Seasonal Snow Cover of Alaska

B. PRINCIPAL INVESTIGATOR/GSFC ID: Gunter E. Weller/UN681

C. PROBLEMS IMPENDING INVESTIGATION: None

D. PROGRESS REPORT:

1. Accomplishments during reporting period: The satellite information received so far represents 165 scenes along the north-south transect of Alaska extending over the period August 2 - November 5, 1972. Because of adverse cloud conditions the repetitive image coverage of one and the same area is generally poor. Therefore, we cannot describe the build-up of the seasonal snow cover using satellite data as the only source of information.

Each scene is generally represented by positive prints and transparancies in black and white corresponding to the 4 MSS sensors. Most of the material is of excellent quality and seems ideally suited for a detailed description of snow cover characteristics.

We are still working on the first look at aerial photographs from the NASA aircraft flights of the 1972 summer.

We have tentatively selected about 40 satellite images for analysis of seasonal snow cover characteristics, glacier features, auf-eis fields, ice conditions on lakes and rivers, etc.

The preliminary analysis shows that the transient snow-line can generally be determined directly from any of the RBV or MSS images. However, complications may arise if 1) the difference between the albedo of snow and the adjacent surface is small, e.g. snow and glacier ice, 2) the overall albedo is little effected by a snow-fall, as in forest-clad terrain, 3) the solar elevation above horizon becomes less than ca 10° in mountainous regions.

Climatological and meteorological synoptic data are being collected on a routine basis to establish relationships between synoptic weather patterns and changes of the aerial extent of the snow cover. We may mention that we have started an exchange of information with the U.S. Geological Survey in Alaska as to the analysis of the ERTS and ground-truth data. The U.S.G.S. project deals with glaciers from south central and southeastern Alaska, the Yukon Territory, British Columbia, Washington and Oregon. Where our north-south transect overlaps the U.S.G.S. study area we are coordinating our interpretive studies as much as possible.

2. Plans for next reporting period: We plan to continue the analysis of the images selected, with the emphasis on a comparison of snow cover characteristics in the different climatic zones in Alaska. As to the analysis of the snow break up in spring 1973, we plan to include available ground-truth data on snow depths and stream flow in the transect area in addition to the meteorological data presently collected.

In order to obtain usable methods to delineate the extent of the snow cover on glaciers and in forested areas we intend to apply displays of satellite data on a color additive viewer and a digital color CRT unit when these facilities become available. These tools will also be used to investigate the ripening of the snow cover by melting in spring, areas of wind-blown dust on the snow surface, patterns of extensive snow drifts on the Arctic tundra north of the Brooks Range etc.

E. SIGNIFICANT RESULTS:

See attached sheet

F. PUBLICATIONS:

None

G. RECOMMENDATIONS:

None

H. CHANGES IN STANDING ORDER FORMS:

None

I. ERTS IMAGE DESCRIPTIONS FORMS:

None

J. DATA REQUEST FORMS:

Request submitted on August 22, 1972.

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DISCIPLINES: Meteorology/Hydrology

SUBDISCIPLINES: Snow survey

SUMMARY OF SIGNIFICANT RESULTS:

The delineation of the transient snow cover can generally be made directly from any of the RBV or MSS images. On many glaciers, however, there seems to be a relatively small difference between the reflectivities of snow and ice in the visible portion of the spectrum (corresponding to MSS Bands 4 and 5). On the other hand, the reflectivity is distinctly lower for ice than for snow in the near infared (MSS Bands 6 and 7). By applying the sensors of the latter spectral bands the position of the transient snow-line, indicative of the mass balance, can in many cases be determined with what appears to be a satisfactory accuracy. This circumstance should prove especially useful in studies of regional variations of glacier mass balances. It seems furthermore possible that the various types of a glacier surface (like dry snow, wet snow, superimposed ice and bare glacier ice) may be identified by displaying satellite data via a colour additive viewer and/or a digital colour CRT unit.

We have found it possible to see the effect of winds early in the fall seasons on the arctic slope when a light dusting of snow is present. Winds channeled by topography redistribute the snow and actually remove it from regions.

After freeze up has occurred and a continuous snow cover exists it is possible to identify open water reaches on streams flowing through the region. Such cases are identifiable on the ERTS images especially on the MSS 7 images.