CR-136176

EIGHTH BI-MONTHLY PROGRESS REPORT
UNIVERSITY OF ALASKA
ERTS PROJECT 110-1
November 30, 1973

A. TITLE OF INVESTIGATION:
Coordination and Establishment of Centralized Facilities and Services for the University of Alaska ERTS Survey of the Alaskan Environment

B. PRINCIPAL INVESTIGATOR/GSFC ID: Albert E. Belon/UN318

C. PROBLEMS IMPEDING THE INVESTIGATION:

The status of the CDU-200 Digital Color Display Unit continues to be unsatisfactory and is the only problem impeding the otherwise successful performance of the investigation. Although the CDU-200 was delivered by the manufacturer in mid-September (several months late) and has been used to great advantage since then in the digital processing of ERTS data, it has numerous deficiencies which have limited its use to a fraction of its potential capabilities. We have provided the manufacturer, Interpretation Systems, Inc. (ISI) with a detailed account of the deficiencies of the CDU-200 and have insisted for a realistic time-table for completion of the CDU-200. ISI has informed us that they diagnosed and found solutions for most of the hardware problems and intend to send an engineer to Alaska in early January. They estimate that it will take their engineer 6 to 8 weeks to complete and test the CDU-200 to our mutual satisfaction. For this reason and because we have withheld a substantial fraction of the payment from ISI, it may be necessary to request a no-cost extension of the contract to insure that the CDU-200 be satisfactorily completed and available for follow-on U of A ERTS investigations.

In the meantime the current capabilities of the system have been used extensively by most of the U of A ERTS projects and have proved to be of great assistance in the determination of multispectral signatures and in the preparation of color-coded thematic maps.

D. PROGRESS REPORT:

1. Accomplishments during the reporting period

a. Coordination and management of the U of A ERTS Program

Much of the time of the investigators during the reporting period was devoted to reporting activities:

- A one-hour presentation of the U of A ERTS program to the National Academy of Sciences' Committee on Polar Research during its meeting in Boulder, Colorado on October 26/27, 1973. This was the result of an invitation extended by CPR which was accepted by the P/I with the suggestion that similar invitations

be extended to other groups involved with ERTS applications in the arctic. As a result CPR devoted an entire afternoon of its meeting to ERTS presentations by Albert E. Belon (U of A), Jean Thie (Canada CRS), Ernest Lathram (U.S.G.S.), Mark Meier (U.S.G.S.), Richard Williams (U.S.G.S.), and Duwayne Anderson (CRREL). Thus CPR had the benefit of a comprehensive evaluation of ERTS potential for arctic research, for which they expressed considerable enthusiasm, and the investigators had a unique opportunity to share results and coordinate future activities among themselves.

- A one-hour presentation of ERTS project 110-1 to the NASA Discipline Review Panel on Data Interpretation Techniques at NASA/GSFC on October 29, 1973. This presentation and the ensuing discussion proved very worthwhile and must have been successful because the principal investigator was invited by the panel to present the results of his project at the Third ERTS-1 symposium.

- A two-hour seminar on "Applications of ERTS data in Alaska" presented on November 1, 1973 at the University of Alaska. This seminar was attended by university-wide research scientists and government agency personnel.

- Preparation of two invited papers for presentation at Third ERTS-1 Symposium to be held in Washington, D. C., on December 10-15, 1973. The first paper, scheduled for the session on data interpretation techniques, will present the results of ERTS project 110-1. The second paper, scheduled for a special session, will present, at NASA's request, an overview of ERTS applications in Alaska and will include the activities of several government agencies in addition to the 12 U of A ERTS projects.

- In addition to the above direct reporting activities, project 110-1 coordinated the presentations of the twelve U of A ERTS projects at the NASA Discipline Panel reviews in October, and the preparation and submittal of the seventh bi-monthly reports, interim scientific reports etc.

During the months of October and November, 1973 approximately 250 new ERTS scenes of Alaska were received, catalogued and transmitted to the various U of A ERTS investigators. Our summer 1973 ERTS data map was completed (copy attached) and the fall, 1973 map was brought up-to-date. The catalog of available ERTS scenes of Alaska with 20% or less cloud cover was brought up-to-date. These Alaska ERTS data maps and catalogs are used extensively by U of A investigators as well as an increasing number of ERTS data users in government agencies and industry.

Three data requests were submitted to NASA/NDPF by ERTS project 110-1, and many others on behalf of the other U of A ERTS projects. Few of the color data products ordered since August 1973 have been received so far.

b. Establishment of data processing facilities

The photographic and optical data processing facilities specified in the contract have been established and operational for several months. They were described in the first and second semi-annual reports on the project. In addition we recently acquired from military surplus a multi-format zoom stereo photo interpreter table for roll or cut film. This equipment is in a very good condition and particularly valuable for analysing aerial photographs in 9 1/2", 5" and 70mm formats. We have also acquired with funds from another project a ZT4 Zoom Transfer Scope which has greatly aided the multi-faceted tasks of data transfers between ERTS images, aerial photographs, CDU displays, computer print-out maps and topographic maps.

The digital data processing facilities are essentially unchanged from those described in detail in the seventh bi-monthly report. As discussed in that report and in section C of the present report, the CDU-200 has numerous deficiencies which limit the present capabilities of the system to a fraction of its ultimate potential. It is expected that the manufacturer, ISI, will start correcting these deficiencies in January, 1974.

c. Development of ERTS Data Processing Techniques

In previous reports, principally the first and second semi-annual progress reports, we described the optical and photographic data processing techniques and the digital data processing techniques using computer print-outs and CDU displays which have been developed and utilized by the U of A ERTS projects. These techniques were further improved during the last period as the need arose and our proficiency grew. In particular there is an increasing need for photographic color reconstitution for two reasons: 1) NDPF has been unusually slow recently in providing us with ERTS color products; 2) several projects are mapping vegetation in small test areas at a scale of 1:63,000. The latter requires a high degree of image registration, scale and control of color-balance which we have successfully achieved in our photographic laboratory.

During the last two months activity in the digital data processing area has been moderately heavy. Approximately 15 NASA tapes have been converted to CDU format tapes. Most of these scene conversions have been for Dr. McKendrick (ERTS Project 110-2) but others included scenes for Dr. Lent (ERTS project 110-7) and several scenes for Dr. Wendler's (ERTS project 110-5) snow-ice

study and Mr. Miller's (ERTS project 110-1) spruce beetle infestation study and Cook Inlet sedimentation study.

In most cases digital printouts and picel frequency distribution were made for these scenes. Most scenes were also displayed on the CDU and in one case classification signatures were derived using both the digital printouts and the CDU. It was found that the CDU derived signatures were almost identical to those arrived at using the digital printouts and that the time and expense consumed using the CDU was considerably less. Several scenes were classified by multispectral signature and displayed on both the CDU and by the use of digital printouts.

A computer routine was written to take the band 7 to band 5 ratio and convert the result to a number in the range of 0 to 15. This output was displayed on the CDU and a computer printout and a frequency distribution were also made for it. This ratioing technique is being developed as a potential technique for the discrimination of subtle reflectance differences such as melting and non-melting snow cover.

A program was developed to attempt to correct the"banding" problem caused by the slight miscalibration of the six sensors in the ERTS-1 satellite. This program works totally automatically using as an input any CDU format tape and outputs a similar tape in which integer values have been added or subtracted to certain lines such that the total (or average) of all picel levels for lines 1,7,13,..., 2,8,14,..., etc. will be as near equal as possible. Initial indications are that this "de-banding" program is effective though not yet perfect. If we can refine it to a satisfactory degree, our plans are to use the program to correct many of the CDU format tapes already in existence, especially in those cases where these tapes are to be classified by signature and where the various classifications depend on differences of only 1 or 2 levels in certain bands.

2. Plans for the next reporting period

The project will work closely with the two other U of A ERTS investigators as well as other government projects whose results are to be presented at the third ERTS-1 Symposium. Project 110-1 will prepare two papers which co-investigator, Mr. John Miller will present at the third ERTS-1 Symposium.

The Type III final report for project 110-5 will be reviewed by and submitted to NASA through project 110-1.

ERTS data will continue to be received, catalogued, mapped and transmitted to the U of A ERTS investigators.

We will continue to press and work with the manufacturer of the CDU-200 for a prompt completion of the system and correction of its current deficiencies.

We will continue to develop computer programs for interpretation and display of ERTS digital data using the CDU-200, in particular the ratioing technique and "debanding" programs.

We will continue to supervise and provide data processing assistance to the other U of A ERTS projects, especially those whose phase III investigation terminates in January and February.

We will start preparing the Type III final report for project 110-1.

E. SIGNIFICANT RESULTS:
Significant results of the project will be reported in two papers to be presented at the Third ERTS-1 Symposium.

F. PUBLICATIONS:

1) Published:

Miller J. M. and A. E. Belon, A multidisciplinary survey for the management of Alaskan Resources utilizing ERTS imagery, Proceedings of Symposium on Significant Results Obtained from Earth Resources Technology Satellite - 1, Volume II, Summary of Results, pp. 39-49, NASA/GSFC, March 5-9, 1973.

Miller J. M. and A. E. Belon, earlier version of above paper, Volume I, Technical Presentations, pp. 999-1005, NASA/GSFC, March 5-9,1973.

Anderson J. H., L. Shapiro and A. E. Belon, Vegetative and Geologic Mapping of Western Seward Peninsula, Alaska, Based on ERTS-1 Imagery, Proceedings of Symposium of Significant Results Obtained from Earth Resources Technology Satellite - 1, Volume I, Technical Presentations, pp. 67-75, NASA/GSFC, March 5-9, 1973.

Miller J. M. and A. E. Belon, Alaska and the Super Eye, Alaska Magazine, vol. XXXIX, p. 34, September 1973.

Belon A. E. and J. M Miller, Remote Sensing by Satellite - Applications to the Alaskan Environment and Resources, 1972/73 Annual Report, pp. 127-147, University of Alaska, Geophysical Institute, October 1973.

2) In Press:

Miller J. M. and A. E. Belon, The University of Alaska ERTS Program, Proceedings of 24th Alaska Science Conference "Climate of the Arctic", University of Alaska Press, 1974.

3) In preparation:
Belon A. E. and J. M. Miller, Applications of ERTS Data to Resource Surveys of Alaska, to be presented at the Third NASA ERTS-1 Symposium, Washington D. C., December 10-15, 1973.

Miller J. M. and A. E. Belon, An overview of the ERTS activities of the University and Government Agencies in Alaska (tentative title), to be presented at the Third NASA ERTS-1 Symposium, Washington D. C., December 10-15, 1973.

G. RECOMMENDATIONS:
None

H. CHANGE IN STANDING ORDER FORM:
November 15, 1973

I. IMAGE DESCRIPTOR FORMS:
Attached

J. ERTS DATA REQUESTS:

October 12, 1973	Data received
November 6, 1973	Data not received
November 15, 1973	Data not received

ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

NDPF USE ONLY
D
N
ID

DATE November 30, 1973

PRINCIPAL INVESTIGATOR Albert E. Belon

GSFC UN318

ORGANIZATION Geophysical Institute, University of Alaska

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	glaciers	mts.	snow	
1408-20435		x	x	City, river
1455-20034	x	x	x	Ocean, sedimentation
1456-20092	x	x	x	" "
1457-20150	x	x	x	" "
1458-20205	x	x	x	" "

*FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE PRODUCT ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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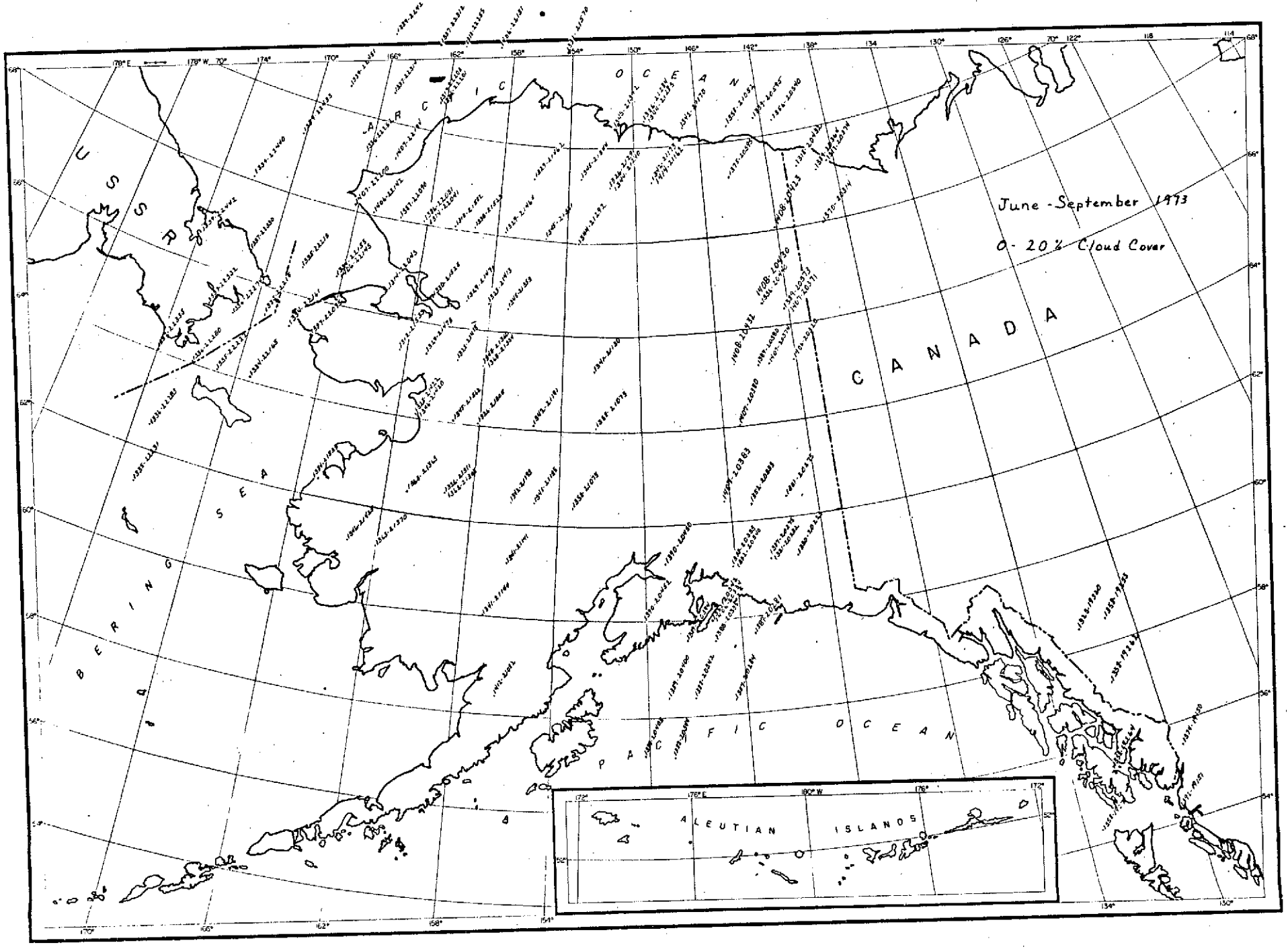
June - September 1973
0 - 20 % Cloud Cover
U S S R
A R C T I C O C E A N
C A N A D A
B E R I N G S E A
P A C I F I C O C E A N
A L E U T I A N I S L A N D S