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1 SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF  
2 ICELAND

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4  
5- Richard S. Williams, Jr.  
6 U. S. Geological Survey  
7 Reston, Virginia 22090

8 (E74-10723) SATELLITE GEOLOGICAL AND  
9 GEOPHYSICAL REMOTE SENSING OF ICELAND  
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Type I Progress Report

ERTS-1

a. Title: Satellite Geological and Geophysical Remote Sensing of Iceland

ERTS-A Proposal No.: SR 651

b. GSFC ID No. of P.I.: IN 079

c. Statement and explanation of any problems that are impeding the progress of the investigation:

The only problem currently impeding the progress of the investigation is the failure to get some requested MSS color composites. The reason given by NDPF is "poor quality" of one or more bands of a particular ERTS image. I have had some of these MSS color composites independently made up by General Electric with excellent results. There is a problem here which must be resolved so that I can receive the requested MSS color composites and proceed with the analysis of these images.

d. Discussion of the accomplishments during the reporting period and those planned for the next reporting period:

1. Most of the reporting period was directed at analysis of black and white enlargements of ERTS imagery (up to 1:84,225 scales) and preparation of papers for publication.

1           2. A lengthy and comprehensive paper, "Environmental  
2           Studies of Iceland with ERTS-1 Imagery," was prepared  
3           and submitted for publication in the Proceedings of  
4           the Ninth International Symposium on Remote Sensing of  
5-          the Environment, University of Michigan, Ann Arbor,  
6           Michigan. The paper was also presented at the  
7           symposium on April 15, 1974.

8           3. Word was received of the acceptance by the  
9           International Society of Glaciology of the paper,  
10-         "Glaciological Studies in Iceland with ERTS-1 Imagery,"  
11          for presentation at the Symposium on Remote Sensing in  
12          Glaciology, Cambridge, England, in September 1974.

13          4. Dr. Guðmundur Pálmason, a geophysicist and  
14          coinvestigator on the ERTS-1 project in Iceland,  
15-         visited the EROS Program Office of the U. S. Geological  
16          Survey to review the status of and progress with the  
17          ERTS project. Preliminary plans were also made to  
18          carry out research on the Icelandic geothermal areas  
19          with the ERTS imagery, aerial photography, and aerial  
20-         thermography acquired of Iceland by NASA during 1973.

21          5. Mr. Ólafur Ásgeirsson, a photogrammetrist with  
22          Landmælingar Íslands (Icelandic Surveying Department)  
23          who is assisting Ágúst Böðvarsson, one of the  
24          coinvestigators on the ERTS-1 project in Iceland, also  
25-

1 visited the EROS Program Office of the U.S. Geological  
2 Survey to review the status of and progress with  
3 cartographic aspects of the ERTS project.

4 6. Plans were completed to participate in an 8-  
5- day glaciological expedition across the Vatnajökull  
6 icecap in Iceland in late May and early June 1974. Of  
7 particular interest will be the field observation of  
8 some of the new morphologic features discovered by  
9 ERTS-1 imagery within this large icecap.

10- 7. For the next 2-month reporting period, emphasis  
11 will be placed on the preparation of scientific papers  
12 and orthoimage maps of Iceland. Research emphasis  
13 will be placed on the mapping of glaciological  
14 phenomena. The following activities, including trips,  
15- will be carried out during the next 2 months:

16 a) Member of a glaciological expedition onto  
17 Vatnajökull (icecap) to make field observations of  
18 glaciological features mapped on ERTS-1 imagery.  
19 Also research with Icelandic co-investigators.  
20- (22 May - 4 June 1974.)

21 b) Preparation of a paper, "Glaciological Studies  
22 in Iceland with ERTS-1 Imagery," for the Inter-  
23 national Society of Glaciology's Symposium on  
24 Remote Sensing in Glaciology, Cambridge, England  
25- (16-20 Sept. 1974).

1 c) Participation in a NATO Advanced Study  
2 Institute, "Geodynamics of Iceland and the North  
3 Atlantic Area," Reykjavík, Iceland. Also research  
4 with Icelandic co-investigators. (29 June -  
5- 16 July 1974).

6 d) Preparation of a false-color (MSS),  
7 uncontrolled, orthoimage mosaic of Iceland  
8 (1:1,000,000 scale).

9 e. Discussion of significant scientific results and their  
10- relationship to practical applications or operational  
11 problems including estimates of the cost benefits of  
12 any significant results:

13 Most of the research emphasis was directed at the  
14 analysis of Icelandic icecaps on ERTS imagery. A  
15- number of new findings were made, including: (1) on low  
16 sun angle imagery of Hofsjökull, the outline of a  
17 probable central volcano can be seen delineated on the  
18 northwest part of the icecap; (2) on low sun angle  
19 imagery of Langjökull, two parallel hyaloclastite  
20- ridges can be seen to continue for more than 10 km in  
21 from the margin of the icecap; (3) measurements of  
22 contorted medial moraines on images of Skeiðarárjökull,  
23 acquired about 11 months apart (Oct. 1973 - Sep. 1973)  
24 show an approximate 600 m of annual glacier movement;  
25-

1 (4) Measurements on images of the surging glacier,  
 2 Eyjabakkajökull, taken about 11 months apart (Oct.  
 3 1972 - Sept. 1974) show an approximate 1.8 km of  
 4 movement during that time; and (5) successive ERTS  
 5- images of the glacier-dammed lake, Grænalón, show an  
 6 increase in area of the lake until the ice dam was  
 7 partially breached, causing a jökulhlaup across the  
 8 Skeiðarársandur. Because of the shape of the lake  
 9 basin the elevation of the post-jökulhlaup lake can  
 10- be determined from ERTS imagery to  $\pm 2$  m. [2D, 3I,  
 11 3L, 4F, 4H, and 10A (Iceland)]

12 f. A listing of published articles, and/or papers,  
 13 preprints, in-house reports, abstracts of talks, that  
 14 were released during the reporting period:

15- Papers Published

16 Williams, R.S., Jr., Böðvarsson, Ágúst, Friðriksson,  
 17 Sturla, Pálmason, Guðmundur, Rist, Sigurjón,  
 18 Sigtryggsson, Hlynur, Sæmundsson, Kristján,  
 19 Thorarinsson, Sigurður, and Thorsteinsson, Ingvi,  
 20- 1974, Environmental Studies of Iceland with ERTS-1  
 21 imagery (abs.): in Summaries of Ninth Symposium on  
 22 Remote Sensing of Environment, Univ. of Mich.,  
 23 Ann Arbor, Mich., p. 3-5.  
 24  
 25-

1 Williams, R.S., Jr., 1974, ERTS photos: Letter in  
2 Aviation Week and Space Technology, 15 April 1974,  
3 p. 80.

4 Papers in Press

5- Williams, R.S., Jr., and Thorarinsson, Sigurður, 1973,  
6 ERTS-1 image of Vatnajökull area: General comments:  
7 Jökull, v. 23, (in press).

8 Thorarinsson, Sigurður, Sæmundsson, Kristján, and  
9 Williams, R.S., Jr., 1973, ERTS-1 image of  
10- Vatnajökull: Analysis of glaciological, structural,  
11 and volcanic features: Jökull, v. 23 (in press).

12 Williams, R.S., Jr., Böðvarsson, Ágúst, Friðriksson,  
13 Sturla, Pálmason, Guðmundur, Rist, Sigurjón,  
14 Sigtryggsson, Hlynur, Sæmundsson, Kristján,  
15- Thorarinsson, Sigurður, and Thorsteinsson, Ingvi,  
16 1974, Environmental Studies of Iceland with ERTS-1  
17 imagery: in Proc. Ninth Symposium on Remote Sensing  
18 of Environment, Univ. of Mich., Ann Arbor, Mich.,  
19 (in press).

20- Williams, R.S., Jr., Böðvarsson, Rist, Sigurjón,  
21 Sæmundsson, Kristján, and Thorarinsson, Sigurður,  
22 1974, Glaciological studies in Iceland with ERTS-1  
23 imagery: in Summaries of Symposium on Remote  
24 Sensing in Glaciology, Intl. Glaciol. Soc.,  
25- Cambridge, England (in press).

Presentation

Williams, R.S., Jr., Böðvarsson, Ágúst, Friðriksson, Sturla, Pálmason, Guðmundur, Rist, Sigurjón, Sigtryggsson, Hlynur, Sæmundsson, Kristján, Thorarinsson, Sigurður, and Thorsteinsson, Ingvi, 1974, Environmental studies of Iceland with ERTS-1 imagery: Ninth International Symposium on Remote Sensing of Environment, Univ. of Mich., Ann Arbor, Mich., 15 April.

g. Recommendation concerning practical changes in operations, additional investigative effort, correlation of effort and/or results as related to maximum utilization of the ERTS system:

None.

h. A listing by date of any changes in Standing Order Forms:

N/A

i. ERTS Image Descriptor Forms:

N/A

j. Listing by date of any changed Data Request Forms submitted to Goddard Space Flight Center/NDPF during the reporting period:

None.