TYPE I PROGRESS REPORT FOR ERTS I INVESTIGATION FOR THE PERIOD ENDING DECEMBER 15, 1972

Submitted by Y.W. Isachsen, N.Y.S. Geological Survey,
N.Y.S. Museum and Science Service

a. Objective: To evaluate ERTS I data for usefulness as a geological sensor in the diverse geological terranes of New York State.

b. GSFC ID S348, NAS 5-21764

c. Problems:

1. Unevenness in photographic processing of certain film products, even for adjacent frames in the same and contiguous orbits, limits the geological usefulness of the imagery. See: "Recommendations" below, and the attached Bruning copy of a mosaic of four 9.5" film positives obtained over the Adirondacks on the 10th and 11th of October, 1972.

2. Record breaking early snow has caused ground checking of spectral anomalies to be postponed until spring.

d. Accomplishments: More than 1300 film products were categorized in terms of geological usefulness (as a function of cloud distribution). That imagery having little or no snow cover has received scrutiny to varying degrees, mainly in white light, after learning that color-additive viewing of full-foliage NASA imagery is not information-additive.

1. Of the four MSS bands imaged, bands 5 and 7 compliment each other, and together provide the greatest amount of geological information; no additional geological data have been detected on bands 4 and 6.

2. In presently available imagery (full-foliage) the greatest amount of spectral geology is displayed in the Adirondack region, where bedrock geology is strongly linked to topography. Of the first four ERTS cycles, only the images obtained October 10th and 11th provide cloud-free coverage of the entire Adirondack region. These show numerous geological features, including some interesting new ones, as indicated below.

(continued)

The boundary between the basement rocks of the Adirondack Dome and the surrounding Lower Paleozoic rocks is well delineated except in the Northwest Lowlands and along parts of the eastern Adirondacks. Along the northern border, contacts between the basement and the Potsdam Sandstone and between the Potsdam and Theresa formations are surprisingly well shown by the differences in land use patterns.

Within the basement complex, the most prominently displayed features are numerous north-northeast trending faults and topographic lineaments, and arcuate east-west valleys developed in some of the weaker metasedimentary rocks.* The majority of the faults and lineaments shown on the Geologic Map of New York at 1:250,000 appear in the ERTS imagery. In addition, many new linears were detected, as well as a number of anomalous curvilinear elements, some circular in plan and measuring up to 25 km in diameter, which do not bear any clear relationship to mapped geological contacts. One of these, centered on Cranberry Lake, has a radial pattern of linears like the spokes of a wheel. The probability that this spectral feature is geologically real, and the possibilities that it is an astrobleme will be investigated on the ground when snow conditions permit next spring, and earlier by observation from small aircraft.

3. Glacial features observed in the imagery include the following: Harbor Hill and Ronkonkama moraines, in part, revealed by cultural enhancement, Tully moraine revealed by land-use discontinuity, glaciated valleys and cross channels south of Syracuse, glacial streamline forms atop Tug Hill Plateau, ice marginal channels in Watertown quadrangle. Glacial features searched for but not observed in the full-foliage imagery include the marginal moraines of Wallkill Valley, the southern terminus of glaciation (e.g. terminal moraines, outwash), Lake Iroquois shoreline, Champlain Sea shoreline, Fort Covington moraine, Covey Hill drainage channel, and the moraines parallel to Lake Erie shorelines.

*Best displayed on images 1079-15115-7, 1079-15122-7, 1080-15174-7, 1080-15180-7.

(continued)

4. We have just received our first photographically-reprocessed ERTS imagery for experimentation. Contrast is markedly increased, and topographic linears are clearly enhanced. It remains to be determined whether or not more linears can be delineated than on ERTS bulk products. The photographic method used was as follows: convert, by contact printing, 70 mm ERTS negative to a 70 mm Kodalith film positive. Convert this high-contrast product by contact printing to a high-contrast negative using Kodak Professional Copy film. D-72 developer was used. By enlargement, obtain 1:1:000,000 or other scale paper prints for analysis.

5. The most prominent spectral features on band 7 of orbit 1100 across New York-New England are scattered white measle-like patches which have a maximum concentration in southeastern New York and adjacent Connecticut. Although clearly not of geologic origin, curiosity led us to make a cursory investigation of these using 1:24,000 aerial photographs. Of twenty-three investigated, all except one are golf courses. It thus appears that ERTS imagery can search out at least one kind of playground!

6. The author-identified significant results under Items 1 and 2 above were submitted in abstract form to NTIS on 14 December 1972. A copy is here attached. After entering the public domain, the abstract will be published by the Geological Society of America, and presented as a paper at the Northeast Section Meeting this spring.

e. Planned:

1. Continuing geological analysis and evaluation of ERTS imagery as a geological mapping tool.

2. Examination of the Cranberry Lake and other anomalies in the Adirondacks from small aircraft as weather and snow conditions permit.

3. Experimentation with photographic reprocessing of ERTS film products, using both white light and color-additive viewing.

(continued)

3. Attempt to format the four 70 mm ERTS film positives for bands 4-7 on a clear 9.5" mylar to make possible instant repetitive viewing with the SDC Model 64 color additive viewer. Much time is lost at present because each 70 mm frame must be aligned separately.

f. Publications and lectures:

1. As indicated under "d", the following abstract will be published after the information has entered the public domain; Isachsen, Yngvar W., "Geological Features and Spectral Anomalies in Satellite Imagery of the Adirondack Mountain Region". Isachsen gave two general lectures on Remote Sensing and the NASA ERTS program at the University of Rochester on November 17th. Results of the present investigation were not discussed.

g. Recommendations:

1. Better quality control in Goddard photographic laboratory (see attached Bruning copy of film positives showing disparity in photo-processing of four contiguous images flown on the 10th and 11th of October, 1972.

2. Correction of the above by reprocessing the 9.5" and 90 mm film products of orbit 1100 to match the tonal values of adjacent strips. See attached Data Request Form.

h. Changes in Standing Order Products consist of request for reduction of allowable cloud coverage from 90% to 80%. Request dated 4 December 1972 has already been submitted.

i. ERTS image descriptor forms attached.

j. Two new retrospective Data Request Forms are attached. One is a "routine" order for scene-corrected (precision) imagery of selected cloud-free images to improve cartographic fit for geological map compilation. The second is a special request

(continued)

for reprocessing of the incorrectly exposed film products referred to under "Recommendation" above.

k. The geological content of this report falls under the sub-disciplines 3k. Structural Surveys (section d,2 of this report), and 3I Geomorphic and Landform Surveys (section d, 3).

YWI:dm

ERTS-I Data User Investigation
Publication and Information Release Policy

Author-identified Significant Results

Evaluation of ERTS-I data for usefulness as geological sensor over diverse geological terranes of New York State

Yngvar W. Isachsen
Geological Survey, New York State Museum and Science Service, Albany, New York, 21 December 72, NAS 5-21764

In the present imagery, obtained during the full foliage of summer and fall, the greatest amount of spectral geology is displayed in the Adirondack region where bedrock geology is strongly linked to topography. Of four repetitive ERTS cycles, 18 days apart, images obtained October 10th and 11th provide cloud-free coverage of the Adirondack region.* Of the four spectral bands imaged, band 5 and band 7 provide the most geological information.

The boundary between the basement rocks of the Adirondack Dome and the surrounding Lower Paleozoic rocks is well delineated except in the Northwest Lowlands and along parts of the eastern Adirondacks. Along the northern border, contacts between the basement and the Potsdam Sandstone and between the Potsdam and Theresa formations are surprisingly well shown by differences in land use patterns.

Within the basement complex, the most prominently displayed features are numerous north-northeast trending faults and topographic lineaments, and arcuate east-west valleys developed in some of the weaker metasedimentary rocks. The majority of the faults and lineaments shown on the Geologic Map of New York at 1:250,000 appear in the ERTS imagery. In addition, many new linears were detected, as well as a number of anomalous curvilinear elements, some circular in plan and measuring up to 25 km in diameter, which do not bear any clear relationship to mapped geological contacts. One of these, centered on Cranberry Lake, has a radial pattern of linears, like spokes on a wheel. The probability that this spectral feature is geologically real, and the possibility that it is an astrobleme, will be investigated on the ground when snow conditions permit next spring, and earlier by observation from small aircraft.

*Best displayed on images 1079-15115-7, 1079-15122-7, 1080-15174, 1080-15174-7, 1080-15180-7.

REFERENCE SUBDISCIPLINE - Structural Surveys

ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

NDPF USE ONLY
D
N
ID

DATE 20 Dec 72

PRINCIPAL INVESTIGATOR Y.W. Isachsen

GSFC S 348

ORGANIZATION Geol. Survey, N.Y. State Museum & Science Service

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Ridge	Linmnt.	Fold	
1023-15005-5				Barrier Bar, Barrier Island, Coast
1023-15012-5				Excessive Cloud Cover
1030-15403-5				Barrier Bar
1040-14554-5				Atlantic Ocean
1042-15071-5				Barrier Bar, Coast, Coastal Plain
1045-15225-5		✓		
1045-15231-5		✓	✓	Barrier Bar
1045-15234-5				Barrier Bar, Finger Lake
1045-15240-5	✓	✓	✓	Anticline, Syncline
1045-15243-5	✓	✓	✓	Anticline, Syncline
1048-15405-5				Barrier Bar
1061-15111-5				
1061-15114-5	✓	✓		
1061-15120-5		✓		
1061-15123-5	✓	✓		
1061-15125-5	✓	✓	✓	Barrier Bar, Coast, Estuary
1062-15170-5	✓	✓	✓	
1062-15172-5	✓	✓	✓	
1062-15175-5		✓	✓	Barrier Bar, Finger Lake, Quarry
1062-15181-5	✓	✓	✓	
1062-15184-5	✓	✓	✓	Estuary
1066-15404-5				Excessive Cloud Cover
1076-14555-5				Excessive Cloud Cover
1077-15005-5		✓		Coast
1077-15011-5		✓		Barrier Bar, Barrier Island, Coast, Estuary
1077-15014-5				Barrier Bar, Coast
1078-15063-5				Excessive Cloud Cover

*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).

MAIL TO ERTS USER SERVICES
CODE 563
BLDG 23 ROOM E413
NASA GSFC
GREENBELT, MD. 20771
301-982-5406

GSFC 37-2 (7/72)

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	Ridge	Linmnt.	Fold	
1078-15070-5				Barrier Bar, Barrier Island, Coast
1078-15072-5				Barrier Bar, Barrier Island, Coast, Coastal Plain
1079-15113-5	✓	✓		
1079-15115-5	✓	✓		EEO Airfield
1079-15122-5	✓	✓		
1079-15124-5	✓	✓		Coast
1079-15131-5	✓	✓	✓	Barrier Bar, Barrier Island, Coast, Coastal Plain
1080-15171-5	✓	✓		
1080-15174-5	✓	✓	✓	
1080-15180-5	✓	✓		EEO Airfield, Finger Lake
1080-15183-5	✓	✓	✓	Anticline, Finger Lake, Syncline
1080-15185-5	✓	✓	✓	Anticline, Syncline
1082-15291-5		✓	✓	
1082-15293-5				Excessive Cloud Cover
1082-15300-5	✓	✓		
1083-15354-5				
1084-15410-5				Barrier Bar
1096-15063-5	✓	✓		
1096-15065-5	✓	✓		
1096-15072-5	✓	✓		Barrier Bar, Coast
1096-15074-5		✓		Barrier Bar, Barrier Island, Coast,
1097-15115-5				Excessive Cloud Cover
1097-15124-5				Excessive Cloud Cover
1097-15130-5				Excessive Cloud Cover
1098-15173-5				Excessive Cloud Cover

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Ridge	Linmnt.	Fold	
1099-15232-5	✓	✓		
1099-15234-5		✓	✓	
1099-15243-5				Excessive Cloud Cover
1099-15250-5	✓		✓	
1100-15293-5		✓	✓	
1101-15351-5		✓	✓	
1101-15354-5				Barrier Bar
1101-15360-5				
1113-15015-5				Excessive Cloud Cover
1113-15021-5				Excessive Cloud Cover
1118-15294-5		✓	✓	
1118-15303-5				Excessive Cloud Cover

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ERTS DATA REQUEST FORM
560-213 (7/72)

1. DATE 22 Dec 72

2. USER ID S 348

4. SHIP TO: Y.W. Isachsen

ADDRESS Geological Survey ☐ NEW
N.Y. State Museum and
Science Service
Albany, N.Y. 12224

5. TELEPHONE NO. _____ ☐ NEW

6. CATALOGUES DESIRED

STANDARD ☐ U.S. ☐ NON-U.S.

DCS ☐

MICROFILM ☐ U.S. ☐ NON-U.S.

ADDDHHMMS OBSERVATION IDENTIFIER	C CENTER POINT COORDINATES	B SENSOR BAND	P PRODUCT TYPE	F PRODUCT FORMAT	T TICK MARKS	NN NUMBER OF COPIES	A AREA
1079-15115	CN 44-35/ W073-18	5		T		1	U
1079-15122	CN 43-10/ W073-50	5		T		1	U
1079-15124	CN 41-44/ W074-21	5		T		1	U
1079-15131	CN 40-18/ W074-51	5		T		1	U
1079-15115	CN 44-35/ W073-18	5		M		1	U
1079-15122	CN 43-10/ W073-50	5		M		1	U
1079-15124	CN 41-44/ W074-21	5		M		1	U
1079-15131	CN 40-18/ W074-51	5		M		1	U
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1079-15122	CN 43-10/ W073-50	5		S		1	U
1079-15124	CN 41-44/ W074-21	5		S		1	U
1079-15131	CN 40-18/ W074-51	5		S		1	U
1079-15115	CN 44-35/ W073-18	7		T		1	U
1079-15122	CN 43-10/ W073-50	7		T		1	U
1079-15124	CN 41-44/ W074-21	7		T		1	U

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1079-15131	CN 40-18/ W074-51	7		T		1	U
1079-15115	CN 44-35/ W073-18	7		M		1	U
1079-15122	CN 43-10/ W073-50	7		M		1	U
1079-15124	CN 41-44/ W074-21	7		M		1	U
1079-15131	CN 40-18/ W074-51	7		M		1	U
1079-15115	CN 44-35/ W073-18	7		S		1	U
1079-15122	CN 43-10/ W073-50	7		S		1	U
1079-15124	CN 41-44/ W074-21	7		S		1	U
1079-15131	CN 40-18/ W074-51	7		S		1	U

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1079-15115	CN 44-35/ W073-18	7	A	T		1	U
1079-15122	CN 43-10/ W073-50	7	A	T		1	U
1079-15124	CN 41-44/ W074-21	7	A	T		1	U
1079-15131	CN 40-18/ W074-51	7	A	T		1	U
1080-15174	CN 44-36/ W074-44	7	A	T		1	U
1080-15180	CN 43-11/ W075-17	7	A	T		1	U
1080-15183	CN 41-45/ W075-48	7	A	T		1	U

NOTE: THIS IS A SPECIAL REQUEST TO CORRECT IMPROPERLY EXPOSED PHOTOGRAPHIC PRODUCTS FOR BANDS 5 AND 7. THE POSITIVES ARE TOO DENSE WHEN COMPARED WITH ADJACENT IMAGES. EXPLANATION FOLLOWS. Using the 9.5 inch and 70 mm film positive of band 5 (and band 7 as well) of orbit 1337 in New York State (images 1096-15063-5, 1096-15065, 1096-15072-5, 1096-15074-5) on the east side, and those of orbit 1114 (images 1080-15174-5, 1080-15180-5, 1080-15183-5) on the west side as a standard, those of orbit 1100 are too dense (1079-15115-5, 1079-15122-5, 1079-15124-1079-15131-5). This can be seen by visual comparison of the whole images as well as of the gray scales. Image 1079-15131 of the 1100 orbit is even denser than the others. The corresponding negatives are also incorrectly exposed.

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