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FOURTH SEMIANNUAL (TYPE II) PROGRESS REPORT FOR NASA OHIO-ERTS DATA USER PROGRAM (JANUARY-JUNE, 1974)

Project Title: Relevance of ERTS-1 to the State of Ohio

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Preface

The objective of the Ohio-ERTS program is to determine how state government can benefit from orbital survey programs such as ERTS-1. The program is multidisciplinary in nature and involves the experimental evaluation of ERTS-1 imagery and data relay capabilities to environmental quality, agriculture and forestry, and geographic (land-use) applications in Ohio. The statewide program involves the cooperation of the Departments of Natural Resources, Health and Public Works, Economic and Community Development (Lead Department), Transportation, the Environmental Protection Agency, and the Ohio State University. Prime technical subcontractor is the Battelle Columbus Laboratories.

During the first year of the project, efforts concentrated on developing an effective multiagency program for collecting, analyzing, and evaluating ERTS-1 data for Ohio; maintaining an active user awareness program; and, extensive demonstration/documentation of the application candidates identified during the preliminary data analysis phase of the project. Efforts during the third six months of the project continued to emphasize on-site/ground-truth data collection and increased demonstration/documentation of the land use, surface mining, forestry, and other application candidates identified during the preliminary data analysis phase of the project. User awareness efforts continued with seminars, lab visitations, and preparation of papers.

During the recently completed fourth semiannual period of the project, program efforts have focused on continuing user awareness efforts including a two-day Ohio ERTS Skylab Data User Workshop, laboratory visitations, presentations and preparation of papers. Nominal effort was expended on equipment modifications to increase laboratory analytical capabilities. Also drafting of the Ohio-ERTS-program final report has commenced during this period.

Efforts during the remaining two months of the project will focus upon the assessment of the relevance of demonstrated ERTS data uses to Ohio governmental activities and the completion of the final report.

I. INTRODUCTION

This report represents the fourth semiannual (Type II) report prepared under the Ohio-ERTS Users Contract NAS5-21782. The report summarizes the status and progress of this program from January 1 through June 30, 1974.

Discussion is presented in the same format as previous progress reports and thus treats data collection, data analysis, DCS, and data utility assessment activities. In addition, a section noting significant results during this period is provided along with a miscellaneous section describing other project developments of potential sponsor interest such as press releases, significant correspondence, visits, etc. This semiannual report is brief in nature because of the mimimal rate of effort expended during the period and to avoid duplicating information contained in the final (Type III) ERTS-1 report currently being drafted.

II. DATA COLLECTION

A. ERTS-1 Data

Table 1 correlates dates of ERTS-1 orbital traces over Ohio with the data received. As recorded in Table I, the project has received imagery for 90 days out of the 132 days that ERTS-1 has flown over Ohio since August 21, 1972. (Imagery acquired since the March overflights of Ohio is expected to be received shortly.) Thus, data for approximately 70 percent of the ERTS-1 Ohio overflights are being received. However, since all imagery that contains up to 90 percent cloud cover is received, only about 60 percent of the ERTS scenes received are of value for analytical purposes. Table II describes the coverage and quality of all of the ERTS-1 imagery received according to the orbital traces over Ohio to date. In addition to the imagery described in these tables, compatible computer tape data have been received for these same scenes and

TABLE I. SUMMARY OF ERTS-1 DATA RECEIVED IN OHIO

Date	Trace 1	2	3	4
1972				
Aug.	21*	22	23	24
Sept.	8	9	10	11
Sept.	26	27	28	29
Oct.	14	15	16	17
Nov.	1	2	3	4
Nov.	19	20	21	22
Dec.	7	8	9	10
Dec.	25	26	27	28
1973				
Jan.	12	13	14	15
Jan./Feb.	30	31	1	2
Feb.	17	18	19	20
Mar.	7	8	9	10
Mar.	25	26	27	28
Apr.	12	13	14	15
Apr./May	30	1	2	3
May	18	19	20	21
Jun.	5	6	7	8
Jun.	23	24	25	26
Jul.	11	12	13	14
Jul./Aug.	29	30	31	1
Aug.	16	17	18	19
Sept.	3	4	5	6
Sept.	21	22	23	24
Oct.	9	10	11	12
Oct.	27	28	29	30
Nov.	14	15	16	17
Dec.	2	3	4	5
Dec.	20	21	22	23
1974				
Jan.	7	8	9	10
Jan.	25	26	27	28
Feb.	12	13	14	15
Mar.	2	3	4	5
Mar	20	21	22	23
Apr.	7	8	9	10
Apr.	25	26	27	28
May	13	14	15	16
May/Jun.	31	1	2	3
Jun	18	19	20	21

* Underlined dates indicate dates for which data have been received as of June 30, 1974.

TABLE II. COVERAGE AND QUALITY OF ERTS-1 DATA AVAILABLE BY ORBITAL TRACE OVER OHIO

Date	Time	Area	Quality Comments*
		TRACE 1	
8/21/72	15353	Eastern Lake Erie	Very good
8/21/72	15354	Eastern Ohio and Pennsylvania	Very good
8/21/72	15361	SE Ohio and West Virginia	Very good
9/8/72	15355	NE Ohio and Pennsylvania	Very poor
9/8/72	15362	SE Ohio and 90% West Virginia	Poor
9/26/72	15361	SE Ohio and 90% West Virginia	Poor
10/14/72	15354	NE Ohio and Lake Erie	Good
10/14/72	15361	Eastern Ohio and Pennsylvania	Good
10/14/72	15363	SE Ohio and 90% West Virginia	Poor
12/7/72	15362	NE Ohio and Pennsylvania	Very poor
12/7/72	15364	Eastern Ohio	Excellent
12/7/72	15371	SE Ohio and 90% West Virginia	Poor
1/12/73	15355	NE Ohio and Pennsylvania	Good
1/12/73	15362	Eastern Ohio and Pennsylvania	Good
1/12/73	15364	SE Ohio and 90% West Virginia	Good
2/17/73	15362	NE Ohio and Pennsylvania	Excellent
2/17/73	15365	Eastern Ohio, West Virginia, & Pennsylvania	Excellent
2/17/73	15371	SE Ohio and 90% West Virginia	Good
2/17/73	15374	SE Ohio, West Virginia, & Kentucky	Very good
3/7/73	15375	SE Ohio and West Virginia	Fair
3/25/73	15375	SE Ohio and West Virginia	Fair
4/12/73	15364	NE Ohio and Western Lake Erie	Fair
4/30/73	15363	NE Ohio and Western Lake Erie	Fair
5/18/73	15362	NE Ohio and Western Lake Erie	Fair
5/18/73	15365	Eastern Ohio and Pennsylvania	Fair
5/18/73	15371	SE Ohio and West Virginia	Good
5/18/73	15374	SE Ohio, West Virginia, & Kentucky	Good
6/5/73	15361	NE Ohio and Western Lake Erie	Good
6/5/73	15363	Eastern Ohio and Western Pa.	Fair
6/5/73	15370	SE Ohio and West Virginia	Fair
6/5/73	15372	SE Ohio, West Virginia, & Ky.	Fair
6/23/73	15360	NE Ohio and Western Lake Erie	Fair
6/23/73	15365	SE Ohio and West Virginia	Fair
7/29/73	15353	NE Ohio and Western Lake Erie	Poor
7/29/73	15355	Eastern Ohio and Western Pa.	Very poor
7/29/73	15362	SE Ohio and West Virginia	Very poor
7/29/73	15364	SE Ohio, West Virginia, & Ky.	Poor
8/16/73	15351	NE Ohio and Western Lake Erie	Fair
8/16/73	15354	Eastern Ohio and Western Pa.	Poor

* Quality relates to general cloud cover condition over area covered by satellite photography.

TABLE II. (Continued)

Date	Time	Area	Quality Comments*
		TRACE 1 (Continued)	
9/3/73	15350	NE Ohio and Western Lake Erie	Excellent
9/3/73	15352	Eastern Ohio and Western Pa.	Excellent
9/3/73	15355	SE Ohio and West Virginia	Excellent
9/3/73	15361	SE Ohio, West Virginia, and Ky.	Excellent
9/21/73	15343	NE Ohio and Western Lake Erie	Fair
9/21/73	15350	Eastern Ohio and Western Pa.	Fair
10/9/73	15340	NE Ohio and Western Lake Erie	Poor
10/9/73	15343	Eastern Ohio and Western Pa.	Very poor
10/9/73	15345	SE Ohio and West Virginia	Very poor
10/9/73	15352	SE Ohio, West Virginia, & Ky.	Poor
10/27/73	15334	NE Ohio and Western Lake Erie	Fair
10/27/73	15340	Eastern Ohio and Western Pa.	Fair
10/27/73	15343	SE Ohio and West Virginia	Excellent
11/14/73	15333	NE Ohio and Western Lake Erie	Good
12/2/73	15332	NE Ohio and Western Lake Erie	Excellent
12/2/73	15335	Eastern Ohio and Western Pa.	Excellent
12/2/73	15341	SE Ohio and West Virginia	Excellent
1/25/74	15320	NE Ohio and Western Lake Erie	Excellent
1/25/74	15322	Eastern Ohio and Western Pa.	Good
1/25/74	15325	SE Ohio and West Virginia	Good
2/12/74	15315	Eastern Ohio and Western Pa.	Fair
2/12/74	15322	SE Ohio and West Virginia	Very Good
3/20/74	15305	NE Ohio and Western Lake Erie	Excellent
3/20/74	15312	Eastern Ohio and Western Pa.	Excellent
3/20/74	15314	SE Ohio and West Virginia	Fair
		TRACE 2	
8/22/72	15405	NE Ohio, Lake Erie, and Canada	Poor
8/22/72	15412	North from Salt Fork Lake	Poor
8/22/72	15414	East of Columbus, North of boot	Poor
8/22/72	15421	South of Ohio River boot	Poor
9/9/72	15411	NE Ohio, Lake Erie, and Canada	Poor
9/9/72	15414	East of Columbus	Poor
9/9/72	15420	SE Ohio and Kentucky	Fair

* Quality relates to general cloud cover condition over area covered by satellite photography.

TABLE II. (Continued)

Date	Time	Area	Quality Comments*
		TRACE 2 (Continued)	
10/15/72	15413	NE Ohio, Lake Erie, and Canada	Very poor
10/15/72	15415	East of Columbus	Fair
10/15/72	15422	SE Ohio and Kentucky	Fair
11/20/72	15420	NE Ohio, Lake Erie, and Canada	Very poor
1/13/73	15413	NE Ohio, Lake Erie, and Cleveland	Good
1/31/73	15415	NE Ohio, Lake Erie, and Cleveland	Very good
1/31/73	15422	East of Columbus	Very good
1/31/73	15424	SE Ohio and West Virginia	Very good
1/31/73	15431	South from Ohio River boot	Good
2/18/73	15421	NE Ohio, Lake Erie, and Cleveland	Very good
2/18/73	15423	East of Columbus	Good
2/18/73	15430	SE Ohio and Kentucky	Good
2/18/73	15432	South from Ohio River boot	Fair
3/8/73	15422	NE Ohio, Lake Erie, & Canada	Excellent
3/8/73	15424	Columbus and Eastern Ohio	Excellent
3/8/73	15431	SE Ohio	Excellent
3/8/73	15433	SE Ohio and Kentucky	Good
4/13/73	15422	NE Ohio, Lake Erie, and Canada	Good
4/13/73	15425	Columbus and Eastern Ohio	Fair
4/13/73	15431	SE Ohio	Poor
4/13/73	15434	SE Ohio and Kentucky	Very poor
5/1/73	15424	NE Ohio, Lake Erie, and Canada	Very poor
5/1/73	15430	Eastern Ohio	Very poor
5/1/73	15433	SE Ohio and Kentucky	Very poor
6/24/73	15414	NE Ohio, Lake Erie, and Canada	Poor
6/24/73	15420	Columbus and Eastern Ohio	Fair
6/24/73	15423	SE Ohio	Very good
6/24/73	15425	SE Ohio and Kentucky	Good
7/12/73	15415	Columbus and Eastern Ohio	Fair
7/12/73	15422	SE Ohio	Excellent
7/12/73	15424	SE Ohio and Kentucky	Excellent
7/30/73	15411	NE Ohio, Lake Erie, and Canada	Poor
7/30/73	15414	Columbus and Eastern Ohio	Fair
7/30/73	15420	SE Ohio	Good
7/30/73	15423	SE Ohio and Kentucky	Fair
8/17/73	15410	NE Ohio, Lake Erie, and Canada	Fair
8/17/73	15412	Columbus and Eastern Ohio	Fair
8/17/73	15415	SE Ohio	Poor

* Quality relates to general cloud cover condition over area covered by satellite photography.

TABLE II. (Continued)

Date	Time	Area	Quality Comments*
		TRACE 2 (Continued)	
9/4/73	15404	NE Ohio, Lake Erie, and Canada	Excellent
9/4/73	15410	Columbus and Eastern Ohio	Excellent
9/4/73	15413	SE Ohio	Excellent
9/4/73	15415	SE Ohio and Kentucky	Excellent
9/22/73	15404	NE Ohio, Lake Erie, and Canada	Poor
9/22/73	15410	Columbus and Eastern Ohio	Poor
9/22/73	15412	SE Ohio	Poor
10/10/73	15394	NE Ohio, Lake Erie, and Canada	Good
10/10/73	15401	Columbus and Eastern Ohio	Fair
10/10/73	15403	SE Ohio	Fair
10/10/73	15410	SE Ohio and Kentucky	Fair
12/3/73	15391	NE Ohio, Lake Erie, and Canada	Excellent
12/3/73	15400	SE Ohio	Excellent
12/3/73	15400	SE Ohio	Excellent
1/8/74	15382	NE Ohio, Lake Erie, and Canada	Good
1/8/74	15384	Columbus and Eastern Ohio	Good
1/26/74	15374	NE Ohio, Lake Erie, and Canada	Poor
2/13/74	15371	NE Ohio, Lake Erie, and Canada	Very Good
2/13/74	15374	Columbus and Eastern Ohio	Good
2/13/74	15380	SE Ohio	Poor
2/13/74	15383	SE Ohio and Kentucky	Fair
3/3/74	15381	SE Ohio	Fair
		TRACE 3	
9/28/72	15465	Toledo and Detroit	Poor
11/3/72	15473	NW Ohio, Lake Erie, and Toledo	Poor
11/3/72	15480	Columbus, SW Ohio, and East Liberty	Fair
11/3/72	15482	Southern Ohio and Kentucky	Very good
11/21/72	15474	NW Ohio, Lake Erie, and Toledo	Very poor
12/27/72	15480	NW Ohio	Very poor
12/27/72	15482	Southern Ohio and Kentucky	Very poor
1/14/73	15481	Southern Ohio and Kentucky	Good
2/1/73	15480	NW Ohio and Lake Erie	Very poor
2/1/73	15474	NW Ohio	Very poor
2/19/73	15484	Southern Ohio and Kentucky	Fair
3/9/73	15480	NW Ohio, Lake Erie, and Canada	Very poor
3/9/73	15485	SW Ohio	Very poor
3/27/73	15481	NW Ohio, Lake Erie, and Canada	Excellent
3/27/73	15483	Columbus and Western Ohio	Excellent
3/27/73	15490	SW Ohio, Indiana, and Kentucky	Excellent

* Quality relates to general cloud cover condition over area covered by satellite photography.

TABLE II. (Continued)

Date	Time	Area	Quality Comments*
		TRACE 3 (Continued)	
4/14/73	15480	NW Ohio, Lake Erie, and Canada	Excellent
4/14/73	15483	Columbus and Western Ohio	Excellent
4/14/73	15474	SW Ohio, Indiana, and Kentucky	Excellent
5/2/73	15480	NW Ohio and Lake Erie	Very poor
5/2/73	15482	Western Ohio	Very poor
5/20/73	15475	NW Ohio, Lake Erie, and Michigan	Fair
6/7/73	15474	NW Ohio and Lake Erie	Excellent
6/7/73	15480	Columbus and Western Ohio	Good
6/7/73	15483	SW Ohio, Indiana, and Kentucky	Good
6/25/73	15472	NW Ohio and Lake Erie	Excellent
6/25/73	15475	Columbus and Western Ohio	Excellent
6/25/73	15481	SW Ohio, Indiana and Kentucky	Excellent
7/13/73	15471	NW Ohio and Lake Erie	Excellent
7/13/73	15474	Columbus and Western Ohio	Excellent
7/13/73	15480	SW Ohio, Indiana, and Kentucky	Excellent
8/18/73	15464	NW Ohio and Lake Erie	Good
8/18/73	15471	Columbus and Western Ohio	Good
8/18/73	15473	SW Ohio, Indiana, and Kentucky	Fair
9/5/73	15465	Columbus and Western Ohio	Poor
9/5/73	15471	SW Ohio, Indiana, and Kentucky	Poor
9/23/73	15460	NW Ohio and Lake Erie	Excellent
9/23/73	15462	Columbus and Western Ohio	Excellent
9/23/73	15465	SW Ohio, Indiana, and Kentucky	Good
10/11/73	15453	NW Ohio and Lake Erie	Excellent
10/11/73	15455	Columbus and Western Ohio	Excellent
10/11/73	15462	SW Ohio, Indiana, and Kentucky	Excellent
12/22/73	15443	NW Ohio and Lake Erie	Poor
12/22/73	15450	Columbus and Western Ohio	Poor
12/22/73	15452	SW Ohio, Indiana, and Kentucky	Poor
2/14/74	15430	NW Ohio and Lake Erie	Very Good
2/14/74	15432	Columbus and Western Ohio	Fair
2/14/74	15435	SW Ohio, Indiana, and Kentucky	Poor
3/4/74	15433	SW Ohio, Indiana, and Kentucky	Poor

* Quality relates to general cloud cover condition over area covered by satellite photography.

TABLE II. (Continued)

Date	Time	Area	Quality Comments*
		TRACE 4	
8/24/72	15532	SW Ohio, Indiana, and Kentucky	Very poor
8/24/72	15523	Toledo and area to the West	Poor
10/17/72	15532	Western Ohio and Eastern Indiana	Poor
10/17/72	15535	SW Ohio, Indiana, and Kentucky	Very good
12/28/72	15541	SW Ohio, Indiana, and Kentucky	Very good
1/15/73	15533	Western Ohio and Eastern Indiana	Very poor
2/2/73	15532	Western Ohio and Eastern Indiana	Very poor
2/2/73	15535	SW Ohio, Indiana, and Kentucky	Very poor
3/10/73	15541	Western Ohio and Eastern Indiana	Very poor
3/10/73	15544	SW Ohio, Indiana, and Kentucky	Fair
3/28/73	15535	NW Ohio	Very poor
4/15/73	15544	SW Ohio, Indiana, and Kentucky	Poor
5/3/73	15543	Michigan, Indiana, & NW Ohio	Very poor
5/21/73	15533	Southern Michigan and NW Ohio	Good
5/21/73	15540	Western Ohio and Eastern Indiana	Very good
5/21/73	15542	SW Ohio, Indiana, and Kentucky	Very good
6/8/73	15532	NW Ohio, Michigan, and Indiana	Excellent
6/8/73	15534	Western Ohio and Eastern Indiana	Very good
6/8/73	15541	SW Ohio, Indiana, and Kentucky	Good
7/14/73	15525	NW Ohio, Michigan, and Indiana	Fair
7/14/73	15532	Western Ohio and Eastern Indiana	Fair
8/19/73	15531	SW Ohio, Indiana, and Kentucky	Fair
9/6/73	15520	NW Ohio, Michigan, and Indiana	Good
9/6/73	15523	Western Ohio and Eastern Indiana	Poor
9/6/73	15525	SW Ohio, Indiana, and Kentucky	Poor
9/24/73	15514	NW Ohio, Michigan, and Indiana	Very Good
9/24/73	15520	Western Ohio and Eastern Indiana	Very Good
9/24/73	15523	SW Ohio, Indiana, and Kentucky	Good
10/12/73	15511	NW Ohio, Michigan, and Indiana	Poor
10/12/73	15513	Western Ohio and Eastern Indiana	Poor
10/12/73	15520	SW Ohio, Indiana, and Kentucky	Poor
11/17/73	15505	NW Ohio, Michigan, and Indiana	Very Good
11/17/73	15511	Western Ohio and Eastern Indiana	Very Good
11/17/73	15514	SW Ohio, Indiana, and Kentucky	Very Good

* Quality relates to general cloud cover condition over area covered by satellite photography.

TABLE II. (Continued)

Date	Time	Area	Quality Comments*
		TRACE 4 (Continued)	
12/5/73	15501	NW Ohio, Michigan, and Indiana	Very Poor
12/5/73	15510	Western Ohio and Eastern Indiana	Very Poor
12/5/73	15512	SW Ohio, Indiana, and Kentucky	Very Poor
1/28/74	15495	SW Ohio, Indiana, and Kentucky	Very Good
2/15/74	15484	NW Ohio, Michigan, and Indiana	Excellent
2/15/74	15490	Western Ohio and Eastern Indiana	Excellent
2/15/74	15493	SW Ohio, Indiana, and Kentucky	Excellent
3/5/74	15482	NW Ohio, Michigan, and Indiana	Very Good
3/5/74	15485	Western Ohio and Eastern Indiana	Fair
3/5/74	15491	SW Ohio, Indiana, and Kentucky	Fair

* Quality relates to general cloud cover condition over area covered by satellite photography.

multispectral color composites that have been requested for most of the usable ERTS scenes have also been received. An extension of the existing Ohio ERTS-1 data standing order through June, 1974, was sought and subsequently granted so that the continuity and completeness of the satellite data base on Ohio can be maintained. These data will play an important role in providing an up-to-date data base for analytical purposes and trend analysis as well as constituting a vital element in the data base of the anticipated Ohio follow-on ERTS-B program.

B. Aerial Photography of Ohio ERTS Study Sites

All programmed aircraft study site data collection requirements of the Ohio ERTS-1 project have been fulfilled. However, recent NASA multispectral aircraft underflight data (See Table III) as part of the Ohio Skylab program was received and utilized for correlative analyses purposes during this reporting period. Also additional black and white aerial photography acquired for other ongoing state programs is available to the project.

C. Radiometric and Photographic Study Site Ground Surveys

All programmed radiometric and photographic study site ground-truth surveys of Ohio ERTS-1 study sites were completed last year and no additional radiometric or photographic ground-truth studies have been conducted.

III. DCS/DCP EFFORT

As stated in previous ERTS-1 progress reports, use of the Ohio-ERTS DCP has been discontinued since July 27, 1973, when it ceased transmitting because of an undetermined station outage problem. The DCP unit was shipped to the NASA-Wallops Island Facility for repair for the second time. The unit has recently been returned, but not as yet reactivated. It is planned to have the DCP operating again in time for use with planned Ohio-ERTS-B program activities.

TABLE III

NASA SKYLAB AIRCRAFT UNDERFLIGHTS

MISSION 238: East Liberty to Dayton * 3 Flight Lines, good

Date	Roll	Type	Filter	Frames
6/13/73	74	Color Positive	2A (Haze)	92-179
6/15/73	59	Color IR	510	62-149
6/13-15/73	61	B&W HASS	58 (Green)	97-187
6/15/73	62	B&W HASS		97-189

MISSION 253: Cleveland 3 Flight Lines, good

Date	Roll	Type	Filter	Frames
8/5-6/73	4	Color Positive	AV	41-131
8/5-6/73	5	Color IR	510 MM	40-130
8/5-6/73	6	KA 62 B&W	57 (Green)	4-93
8/5-6/73	7	KA 62 B&W	25A (Red)	4-101
8/5-6/73	8	KA 62 B&W	89B (IR)	3-99

MISSION 247: Buckeye Lake Thru Columbus 3 Flight Lines, good

Date	Roll	Type	Filter	Frames
8/10-16/73	60	Color IR	510 MM	41-108
8/12-16/73	112	Color IR	510 MM	116-185
8/16-24/73	64	B&W HASS	58 (Green)	2-70
8/16/73	66	B&W HASS	89 (IR)	3-70
8/24-29/73	62	Color Positive	AV & 2A (Haze)	59-126
8/24/73	64	B&W HASS	25A (Red)	2-70
8/28/73	113	Color Positive	2A (Haze)	66-135
8/28-29/73	115	B&W HASS	25A (Red)	1-70
8/28-29/73	116	B&W HASS	57 (Green)	14-83
8/28-29/73	117	B&W HASS	89B (IR)	1-70

MISSION 258: Buckeye Lake Thru Columbus 3 Flight Lines, Excellent

Date	Roll	Type	Filter	Frames
1/25/74	125	Color Positive	CL AV (Haze)	1-74
1/25/74	126	Color IR	15 (Yellow)	1-76
1/25/74	127	B&W HASS	58 (Green)	1-74
1/25/74	128	B&W HASS	25-A (Red)	1-74
1/25/74	129	B&W HASS	89-B (IR)	1-74

* Incorrect acquisition - should have been Cleveland SL-2 underflight.

A one-page fact sheet entitled, "Ohio-ERTS Data Collection System Experiment" has been published and distributed throughout the State. This information page has been included on the suceeding page of this progress report. The DCP effort was also summarized during the Ohio-ERTS and Skylab Workshop on March 4 and 5, 1974.

IV. DATA ANALYSIS

A. Data Analysis Laboratory and Equipment Modifications

Further modifications within the laboratory specially constructed for the analysis of remotely sensed data have been made. These modifications include a half-silver mirror system and a second TV camera which is utilized in the dual TV monitor setup as schematically shown in Figure 1. This dual TV monitor setup provides for the superimposition of cartographic and multidate remotely sensed data at a common scale. Figure 2 shows a second analysis set up in which the dual television system links the multispectral and density slicing viewers with the result that density slicing may be performed on one to four data channels. This dual camera system provides an inexpensive yet effective method of transferring and analyzing multisensor and multidate data.

B. Data Analysis Plan

No changes have been made in the data analysis plan and according to schedule the final ERTS data utility assessment by State officials and drafting of the final program are in progress.

C. Data Analysis Tasks

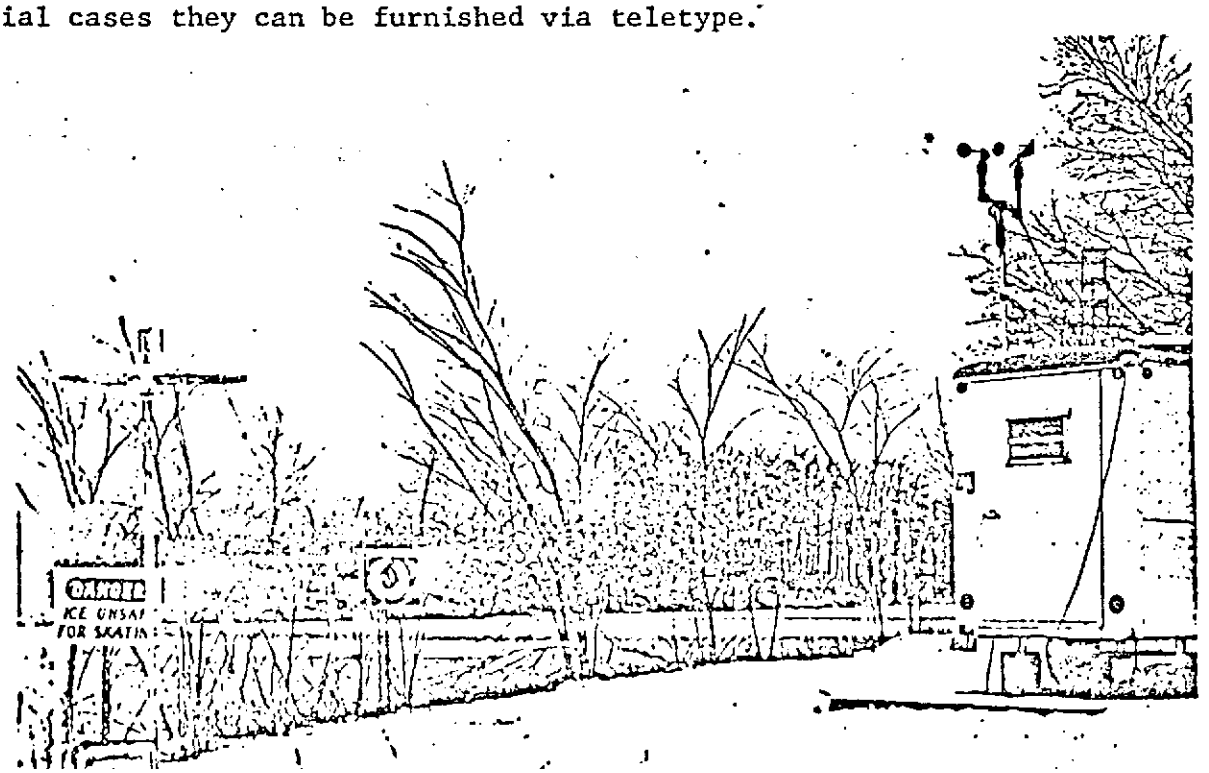
The major analytical task performed during this reporting period focused upon changes detectable over time and trend analysis discernible from ERTS-1 data. One such comparison study recently undertaken to demonstrate the value of repetitive satellite imagery for monitoring surface mining operations. The study site chosen was a controversial area where two of Ohio's major mining

OHIO-ERTS DATA COLLECTION SYSTEM EXPERIMENT

In addition to its remote sensing functions, ERTS-1 serves in a Data Collection System (DCS) which permits environmental data collected at remote sites to be automatically transmitted by Data Collection Platforms (DCPs) for relay by the satellite to one of the NASA ground receiving sites. From there the data are forwarded to the NASA Data Processing Facility and thence to the user agency. Well over a hundred of these platforms are in the field at sites extending from the Arctic to the tropics. The cost of a single DCP is approximately $2500.

A single DCP, located at Battelle's West Jefferson, Ohio, facility, has been used in the Ohio-ERTS program to demonstrate the utility of the DCS for potential state use in an operational mode. The platform was installed in December, 1972, and operated until late July, 1973, except for one outage due to lightning damage. The platform has been interfaced with a Schneider Model RM 25 Robot Monitor, which senses seven water quality and two meteorological parameters.

Although the satellite retraces its path over a given DCP site only once every 18 days, DCP transmissions (which occur at 3 minute intervals) are relayed whenever the platform and a ground receiving site are in mutual radio view of the satellite. Depending upon its location, data from a DCP may be relayed several times a day, which was true with the Ohio ERTS platform. The data are processed and distributed by mail, normally in either IBM card, computer print-out (received in the Ohio-ERTS program), or magnetic tape format. In special cases they can be furnished via teletype.



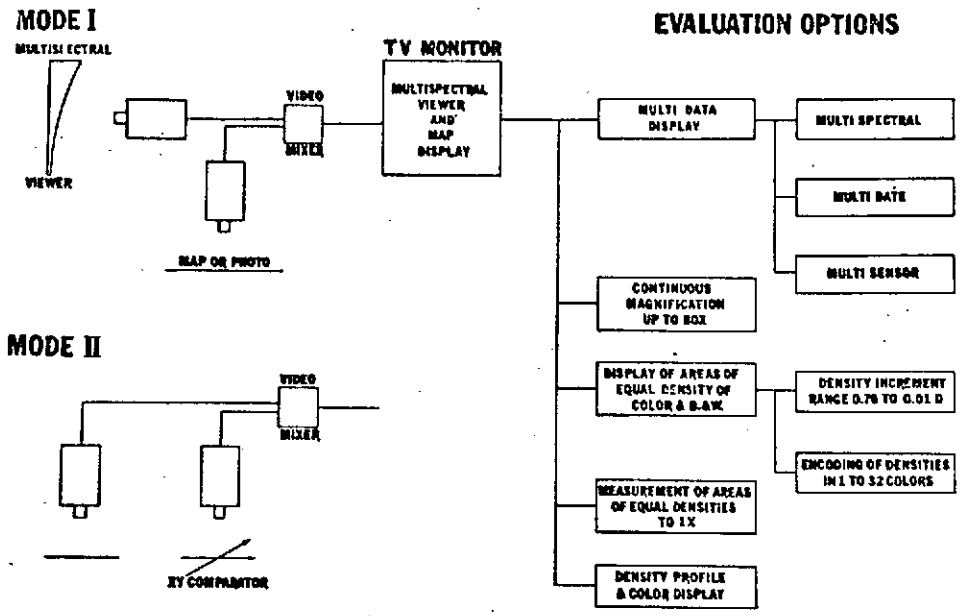


FIGURE 1. OHIO ERTS AND SKYLAB IMAGERY ANALYSIS AND EVALUATION OPTIONS

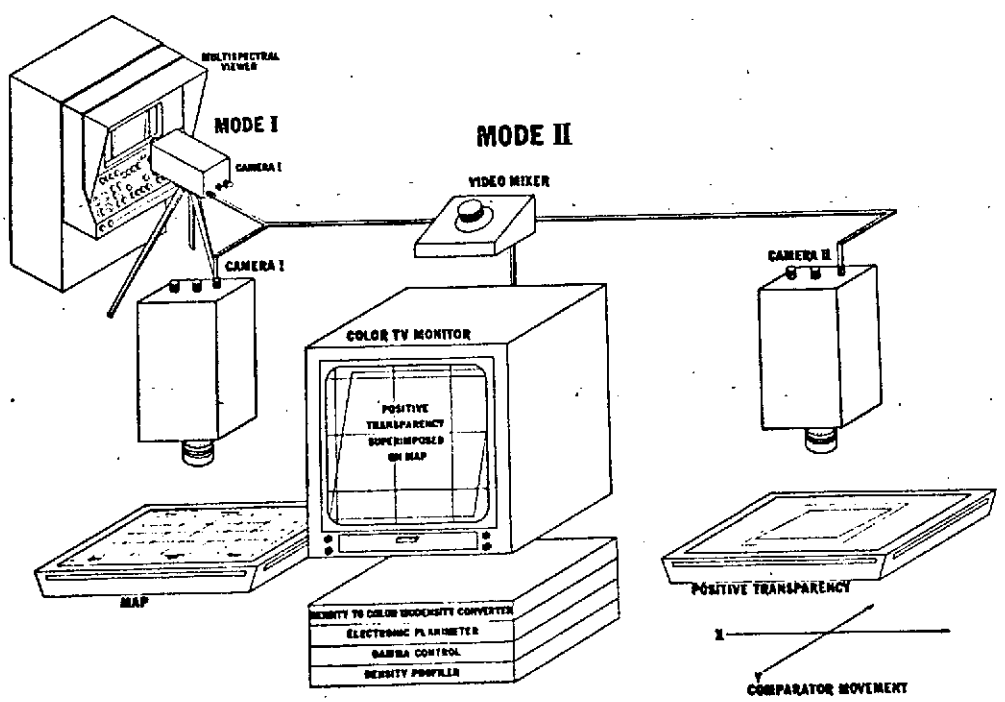


FIGURE 2. ANALYTICAL TECHNIQUE FOR COMBINING MULTISPECTRAL AND DENSITY SLICING VIEWERS

shovels had moved into during January, 1973. The comparison was made between a portion of the MSS Band 5 image of 21 August 72 and 3 September 73. During the one-year period over 400 hectares of land were affected as illustrated in Figure 3.

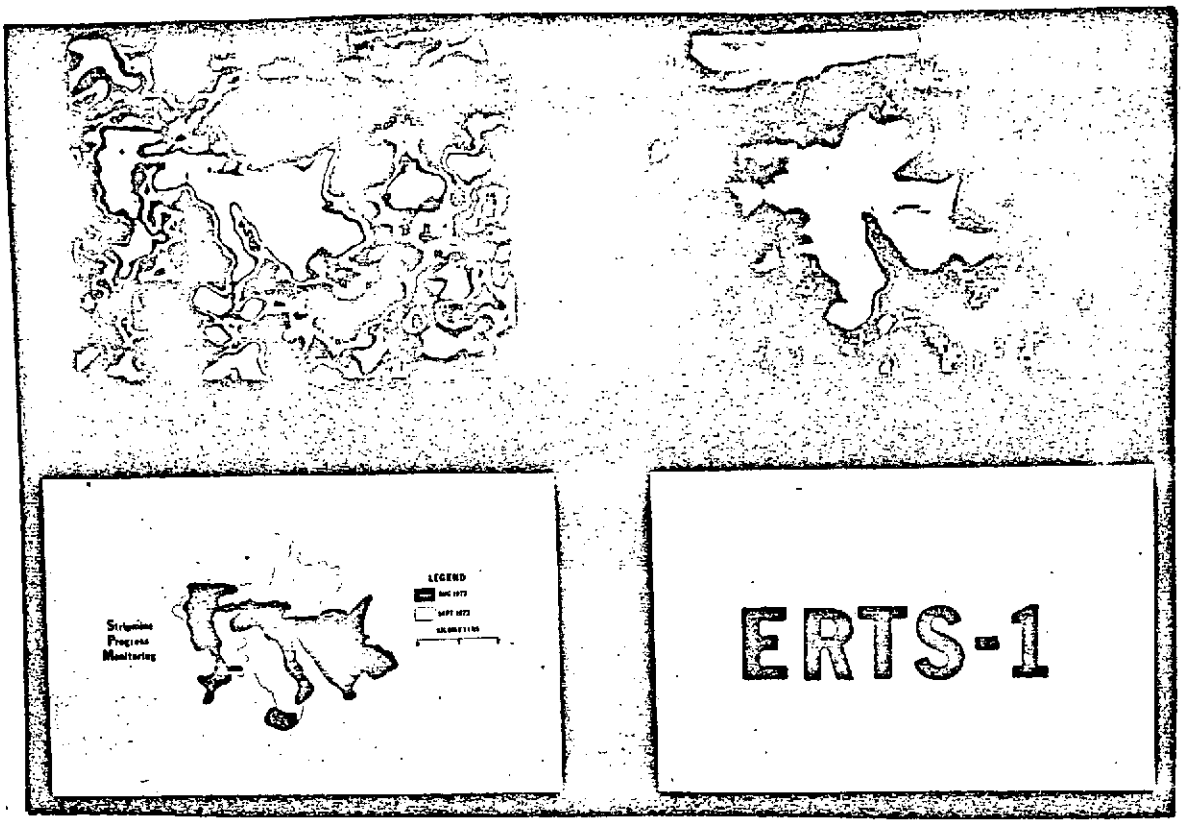


FIGURE 3. USE OF MULTIDATE ERTS-1 DATA TO MONITOR OHIO STRIP-MINING ACTIVITIES

V. DATA UTILITY ASSESSMENTS

During the last six months continuing attention was given to assessing the usefulness and relevance of ERTS-1 data to individual programs and interests within various state agencies. Since the beginning of the Ohio ERTS program two years ago, over 1,000 visitors have toured the laboratory established at Battelle's Columbus Laboratories for analyzing ERTS and Skylab imagery. Many of the visitors represent working level planners and decision makers from the various participating state agencies. Many have made repeated visits during which State and Battelle personnel have jointly analyzed ERTS and Skylab data in regard to a variety of State data requirements. Other visitors have included students, regional planners, and interested representatives of other states and nations.

On March 4 and 5, 1974, the Ohio Department of Economic and Community Development in conjunction with Battelle's Columbus Laboratories sponsored a Ohio ERTS/Skylab Data User Workshop in which approximately 100 land use, resource, and environmental planners from all sections and levels of government and private sector participated. The principal purpose of this 2-day workshop was to present the significant results of the Ohio ERTS and Skylab programs to date and to acquire inputs relative to the utility of satellite survey data to problem areas at the local, regional, and state levels in Ohio. While serving basically as another user awareness activity, the workshop was also tailored to solicit user views as to the potential usefulness and/or limitations of data and data products obtainable from satellite surveys. The workshop agenda, news release, and fact sheet were included as attachments to the Type I progress report of January-February, 1974. Final evaluations and recommendations derived from this workshop have been analyzed and will be included in the final (Type III) report.

State assessment of the utility/relevance of ERTS data is being based on a combination of (1) user attitudes expressed while directly participating in laboratory problem-solving exercises, (2) user evaluation of application-oriented ERTS and Skylab demonstration products generated during the course of the program, and (3) user views expressed directly or recorded on questionnaires during the Ohio ERTS and Skylab Data User Workshop. Final assessments and recommendations will be included in the final report. Based upon an integration of user comments to date, preliminary recommendations are provided in Table IV as to the spectral, spatial, and temporal capabilities required to be of maximum operational benefit to the various ongoing State functions. Most data demands are within present ERTS and Skylab capabilities.

VI. SIGNIFICANT RESULTS

During the first year of project effort the ability of ERTS imagery to be used for mapping and inventorying strip-mined areas in southeastern Ohio, the potential of using ERTS imagery in water quality and coastal zone management in the Lake Erie region, and the extent that ERTS imagery could contribute to localized (metropolitan/urban), multicounty, and overall state land-use needs were experimentally demonstrated and reported as significant project results.

TABLE IV. PRELIMINARY RECOMMENDATIONS FOR OPERATIONAL SATELLITE EARTH RESOURCES SURVEY DATA REQUIREMENTS IN OHIO*

(Environmental Quality, Land Use, and Resource Management Applications Only)

State Functions	Product Types	Data Requirements				
		Spectral Range	Spatial Resolution (in Meters) State	Regional	Local	Temporal Range
Research/Education/Communications	Maps, photographic and digital displays, and models	Multispectral (all bands visible to microwave)	80	80	80	Periodic 18 days
Planning (Data Collection and Analysis)	Maps, photographic and digital displays, and models	Multispectral (visible to thermal IR 4 to 7 bands)	<80	30	10	Seasonal to daily
Management/Decision Making	Output from planners	Multispectral (visible to thermal IR)	30	10	10	Seasonal to daily
Policy Formulation/Legislation	Output from Managers-Dept. Directors	Multispectral (visible to thermal IR)	30	10	10	Yearly
Enforcement (Surveillance/ Monitoring)	Computerized to detect changes	Multispectral (visible - thermal - microwave plus DCS/DCP)	10	10	10	18 days automatically to daily on demand

* Based on ERTS-1 and Skylab EREP data utilization experience

During the second year of the project, significant progress was achieved in the technological development of manual and computerized methods to extract and display multi-feature information as well as singular feature information from ERTS data. Fabrication of an image transfer device and utilization of a dual TV camera system to superimpose ERTS data onto existing maps and other data sources were significant analytical accomplishments.

Most significant is the steadily increasing user confidence in the application possibilities of ERTS type data. Demonstration and documentation of state, regional, and local user views were revealed during a satellite data user workshop held during this reporting period.

VII. MISCELLANEOUS

The Ohio ERTS/Skylab earth resources survey program was the subject of a paper presented at the Ninth International Symposium on Remote Sensing of Environment by State of Ohio and Battelle personnel which was held on April 15-19, 1974 in Ann Arbor, Michigan. The paper titled "Multidisciplinary Applications of ERTS and Skylab Data in Ohio" was included as an attachment in the Type 1 Progress Report of March-April, 1974.

Cloud free ERTS-1 MSS Band 5 70 mm negatives were provided to NASA Lewis Research Center for constructing a photo mosaic of the entire State of Ohio for education/public relation purposes. Also on June 25, 1974, Mr. Paul G. Pincura, ODECD, Ohio ERTS and Skylab Monitor, presented a review of the Ohio ERTS and Skylab program to educational representatives attending a workshop at the NASA Lewis facilities.