Interim Report

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PRELIMINARY SKYLAB MSS CHANNEL EVALUATION*

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INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF EREP DATA WITHIN THE SUSQUEHANNA RIVER BASIN

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*USER IDENTIFIED SIGNIFICANT RESULT

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Objectives

At the outset of this investigation of the SKYLAB multispectral scanner data, a set of initial objectives was established to serve as basic project guidelines and to facilitate understanding of the desired final product. The objectives were as follows:

1. To evaluate each of the 22 channels (13 bands) with respect to suitability for classification,

2. to evaluate the quality of the data in each channel (freedom from banding, etc.),

3. to locate permanent training areas for future channel evaluation, and

4. to classify and map sample areas of a scene.

Procedures

The following is a basic explanation of the steps which were taken to achieve the objectives. It is assumed that the reader has knowledge of the computer programs developed by the Office for Remote Sensing of Earth Resources. These programs are described in detail in ORSER-SSEL Technical Report 16-74: ERTS and Aircraft Multispectral Scanner Digital Data User's Manual.

The first step was to place the data into ORSER format. This was done using the SUBSET program and placing all 22 channels in a single file. Five scenes were randomly selected from the data. (All scenes were from SL 3, Orbit 14, August 5, 1973, tape 933847.) NMAPs (intensity maps) of these five scenes were produced from channel 17 data which, from the imagery, appeared to show features well. A scene including the town of Freeport, the Allegheny River, and various areas of open and forested land was judged to have the best mix of target types This scene was used for both channel evaluation and as the source of targets for signatures.

The second step was to determine which channels contained information of value and which could not be used. The channel evaluation was based upon visual examination of NMAPs generated from individual channels of

data. The evaluation included recognition of reasonable target patterns, obvious banding problems, completely garbled data, etc. Only channels judged to be definitely useless were eliminated. All questionable channels were kept.

The UMAP (uniformity) program was then run on the Freeport scene, using the selected channels. Twelve blocks of uniform data were chosen and run through the STATS program to produce signatures. When it became obvious that several of the areas represented the same target, these were combined and rerun through STATS. This brought the number of targets down to eight. The signatures obtained were then used in an initial attempt to map the Freeport scene. The output map was compared to the USGS quadrangle map (Freeport, Pa., updated 1969) of the area to determine the nature of each of the targets and the nature of the unclassified areas on the map. The targets from the STATS-developed signatures were mostly agricultural land and forests. It was necessary, therefore, to use the DCLUS (clustering) program to obtain signatures for the remaining targets such as the river, urban areas, and disturbed land.

Efforts were then made to improve the mapping as much as possible by running the signatures through the STCLAS program. These new signatures showed some slight improvement in mapping; however, the accuracy of the mapping cannot be determined due to the lack of underflight data for comparison. Finally, the signatures were used to map the four other scenes originally subset.

Findings and Results

A set of 18 channels which were considered of usable quality at this time were identified. These were channels 1-14, 17, 19-21. Channels 15, 16, 18, and 22 were dropped because they were of poor quality. Channels 7 and 11 were dropped out of necessity to limit the number of channels to 16. They were chosen because they appeared to be the two channels which had the highest correlation to their partner channels of the same band. Although channels 15 and 16 were dropped, channel 21 of the same band, which appeared to be the best of the three, was kept because of the desirability of retaining a channel of this relatively long wavelength for further analysis. The results of the analysis are summarized on the following page.

Channel	Band (μm)	Determination	Channel	Band (μm)	Determination
1	0.52-0.56	Kept	12	1.55- 1.75	Kept
2	0.52-0.56	Kept	13	2.10- 2.35	Kept
3	0.56-0.61	Kept	14	2.10- 2.35	Kept
4	0.56-0.61	Kept	15	10.20-12.50	Dropped
5	0.62-0.67	Kept	16	10.20-12.50	Dropped
6	0.62-0.67	Kept	17	12.00-13.00	Kept
7	0.68-0.76	Dropped	18	0.46- 0.51	Dropped
8	0.68-0.76	Kept	19	0.98- 1.03	Kept
9	0.78-0.88	Kept	20	1.09- 1.10	Kept
10	0.78-0.88	Kept	21	10.20-12.50	Kept
11	1.55-1.75	Dropped	22	0.41- 0.46	Dropped

From the 16 channels which were kept, a total of 22 signatures were obtained. Eight were developed from uniform blocks of the UMAP, and 14 from use of the DCLUS program. These 22 signatures fell into six basic categories and classified more than 90% of the five scenes mapped:

1. Open agricultural land - 6 signatures
2. Forest land - 4 signatures
3. Water - 2 signatures
4. Open non-agricultural land (golf course, etc.) - 2 signatures
5. Urban - 6 signatures
6. Disturbed land (construction site, bare soil) - 2 signatures.

The question of the accuracy of the mapping still remains. A USGS 7 1/2 minute quadrangle map for the area is not adequate for determining the accuracy of classification. Again, this is a limitation impressed upon the study by the total lack of large-scale photography obtained from underflights of the area.

In summary, although not all of the objectives have been reached to date, the initial steps to realize them have been taken. In the work ahead, several steps are planned which facilitate evaluation of the importance of each channel in classification of certain targets. Also, ahead is an attempt to perform transformations on the data to enhance classification.