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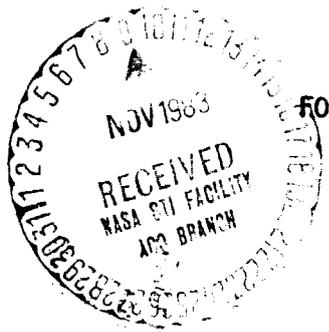
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EARTH SATELLITE CORPORATION

FOURTH QUARTERLY PROGRESS REPORT UNDER CONTRACT NAS5-27384

STUDY OF LANDSAT-D THEMATIC MAPPER PERFORMANCE AS APPLIED TO HYDROCARBON EXPLORATION

Period Covered: July 7, 1983 to Oct. 7, 1983



During the past quarter, the major activities have included: examination of an "A"-tape; field work in the Cement-Velma, Oklahoma area; and continued interpretation and assessment of imagery of the various test sites (Cement-Velma, Oklahoma; Greeley, Colorado and Owl Creek, Wyoming). We have just received a "P"-tape of the Bluff, Utah scene and will begin work on it in the next week or so. This should be a very informative area because we have an abundance of remotely sensed and field geologic data to compare with the TM data. We made a presentation to Pecora VIII, "The Contribution of Landsat-4 Thematic Mapper Data to Geologic Exploration" (copy attached). The paper reviews the progress and results of the geologic aspects of our environment.

A-Tape Analysis

There are three objectives of the A-tape analysis:

1. To examine the radiometric loss of data quality introduced by resampling to P-tape format.
2. To seek a better description of the image by replacing the NASA matching of radiometry to on-board calibration data with an EarthSat matching of the histograms for each of the sixteen detectors, processing separately for forward and backward scanner sweeps.
3. To produce an image with improved appearance and improved

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radiometric properties.

To these ends, a Thematic Mapper A-tape of the Washington, D.C. Image was obtained (November 2, 1982, Image ID 40109-15140). This Image displays a mixture of urban areas, agricultural areas, and shallow water bodies. Preliminary assessment of the tape reveals a number of processing problems, as follows:

1. The forward and backward sweeps of the Thematic Mapper scanner are offset from each other by a variable amount, that varies from one scene to the next, and also varies within a scene. No explicit simple algorithm appears to be available which tells how to adjust backward sweeps to match forward sweeps. Production of an image with registered sweeps is not easy.
2. Although no geometric resampling has been performed on the A-tape, a radiometric adjustment has been done, applying a gain and an offset to the grey levels of each detector for each scan line. To remove the effects of such an adjustment is not always possible, since there is an ambiguity in re-allocating pixels to their original grey levels. Thus, the value to destripping an image using histogram matching is diminished.

Both these factors hinder the accomplishment of the three stated objectives, although misregistration does not have any direct effect on the radiometric quality of the image. The A-tape has been registered as well as possible use of simple methods, and a destriped image is now in process of production.

We regard the key issue in this work as the ability to remove the effects of NASA calibration, since the registration problem can

ultimately be handled, even if somewhat laboriously, by straightforward methods.

During the coming quarter, we plan to complete work on all four test sites and submit our final report early next year. There is no doubt that TM data makes a contribution to geologic exploration significantly beyond that of MSS data. The major limitation is the availability of the data acquired under optimum atmospheric conditions over areas of geologic interest. The initiation of TIPS processing, the emplacement of the TDRSS satellite and the launch of Landsat-D¹ in the spring should all contribute to the solution of this shortcoming.