

(E73-10322) AN EVALUATION OF THE
SUITABILITY OF ERTS DATA FOR THE
PURPOSES OF PETROLEUM EXPLORATION
Progress Report, (Eason Oil Co., Oklahoma
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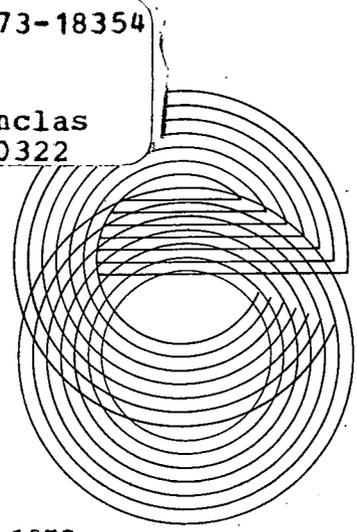
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5225 N. SHARTEL / P. O. BOX 18755 / OKLAHOMA CITY, OKLA. 73118 / AC 405 842-3333

DR. ROBERT J. COLLINS, Jr.
President



E73 10320
CR-130740

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Gentlemen:

This is a Type I Progress Report for the period December 1972 and January 1973. This report will also serve as a first-look analysis report and will affirm that the data analysis plan presented in the original proposal will be essentially followed during this experiment.

Experiment Title: An Evaluation of the Suitability of ERTS Data for the Purposes of Petroleum Exploration
NASA Proposal No. 173

Principal Investigator: Dr. Robert Collins, GSFC Identification No. PR 043

FIRST-LOOK ANALYSIS REPORT

Since 26 November 1972, we have received sufficient imagery (10 frames) to complete our first-look analysis of the imagery. Based on the frames we have received, we conclude that ERTS data will be satisfactory for the purposes of this experiment. The imagery received to date is a better resolution than we originally anticipated and we believe that using this imagery we will be able to realistically evaluate the usefulness of ERTS data for the purposes of petroleum exploration.

The data we have received have included 70mm transparencies (both positive and negative) of each band for each frame and either 9x9 positive transparencies or 9.5x9.5 positive transparencies. The 70mm positive transparencies will be used for additive color viewing and the 70 mm negatives will be used to make enlargements to a scale of 1:250,000 for a compilation base. Our preliminary examination of the imagery shows that the imagery is very good for recognizing linear features, which we interpret as being fracture related (related to faults or joints). One problem is that in Oklahoma the land is divided up according to township and range so that there are numerous north-south and east-west trending linear features in the landscape that are related totally to

man's activity. Foreknowledge of this condition coupled with NASA provided photography and radar imagery (SAC provided by NASA) has helped separate "natural" from "cultural" linears. In addition to the linear features recognizable in the imagery, we have found that some lithologic contacts are consistently recognizable. This is particularly true for the contact between Quaternary alluvial and colluvial deposits with other Tertiary and Paleozoic rock units. In addition to the geologic features of direct interest to this experiment, we have found that the imagery also reveals many areas that are known to be underlain by shallow aquifers. Other features that stand out strongly on one or more of the bands are cities, cultivated areas, and, in all bands, areas where carbon black is being produced. Band 7 is particularly good for assessing surface water and a combination of bands 4, 5 and 7 often give an indication of the turbidity of the surface water.

Overall we have found for our purposes the most useful bands are bands 5 and 7. However, there are items of information specific to each of the bands and we have found that in order to extract the maximum amount of information from the imagery for our purposes it is necessary to examine all four bands. Thus the procedure we intend to adopt is to interpret bands 5 and 7 in detail and then examine bands 4 and 6 for additional information not present in 5 and 7. We have done very little work on enhancing the imagery of Anadarko Basin; however, based on work that we have done in Anadarko Basin and considerable work elsewhere it appears that additive color viewing will be one of the most valuable enhancement techniques for use in this experiment.

Based on our first-look analysis we will enlarge coverage of the entire area to 1:250,000 and compile the interpretations on an overlay to a mosaic composed of these enlarged images. We have not yet settled firmly on a presentation scale because we have not completely assessed how much information will be extractable from the imagery. However, our estimate at present is that the presentation scale will also be at 1:250,000.

In our first-look analysis work we have found that the imagery acquired by the RB-57 (multispectral black and white photography, color and color IR photography) is exceedingly useful for forming a bridge between ground features and features seen in the ERTS imagery. This photography is also very useful for resolving ambiguities in interpretation of the ERTS imagery in areas where there is photography. NASA has also provided us with three strips of side-looking airborne radar imagery (flown by SAC) in the southwestern part of the experiment site, and we have found these to be exceedingly useful for separating natural and cultural linear features seen in the ERTS imagery. The sensitivity of the radar to gentle geomorphic features is also extremely useful for relating ground geomorphic features to textural and tonal patterns seen in the ERTS imagery. We feel that additional SLAR data would be exceedingly useful to the project.

DATA ANALYSIS PLAN

Based on our first-look analysis work during the past two months, we feel that the data analysis plan submitted in the original proposal will be sufficient for successful completion of this experiment. The only change that we would

see in the original plan would be perhaps a delay or even a reduction in amount of computer processing that will be possible in the course of this experiment. This would be caused by a slow delivery of the computer compatible tapes of the MSS imagery. It is our present intention to have completed the experiment by early May.

ACTIVITIES ANTICIPATED DURING THE NEXT REPORTING PERIOD

During the next reporting period we will be in the continuing analysis phase of the experiment and will be beginning to compile interpretations made from the ERTS data and comparing these interpretations against existing geologic maps and available information. We will also continue our work on evaluating various types of enhancement for use in this experiment and will have reached at least preliminary conclusions in this field of endeavor. We anticipate that by the end of the reporting period we will have received the first of the spring ERTS imagery that we have requested and will be able to make some comparisons between the spring and the fall imagery, perhaps allowing some preliminary observations on the value of temporal discrimination for petroleum exploration purposes.

In general, the quality of data we have received to date is very good. However, three of the frames we have received had reticulated negatives, positives and positive paper prints (1130-16404, 15410 and 16413). These data were totally unusable and have been reordered. We have also noted that imagery acquired during times that snow was on the ground, either in Oklahoma or in adjacent areas to the north and west, the majority of the scene seems to be underexposed. That is, positive products are extremely dark except for snow covered areas which are white and, in fact, show some shading detail within the snow itself. We have tried some reprinting of these products. However, we are concerned that perhaps the lower end of the dynamic range, that is the darker shades of grey, have been clipped in converting the tapes to imagery. We have no concrete evidence that this is so and would very much appreciate your observations on this possibility.

Respectfully submitted,


Robert J. Collins

President, Eason Oil Company