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# THE USE OF ERTS/LANDSAT IMAGERY IN RELATION TO AIRBORNE REMOTE SENSING FOR TERRAIN ANALYSIS IN WESTERN QUEENSLAND, AUSTRALIA

ERTS FOLLOW-ON PROGRAMME STUDY NO.2692B
(29650)

QUARTRLY REPORT

by

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## I Introduction

The investigations cover the Gregory River - Mt Isa - Cloncurry - Dobbyn area of western Queensland, Australia.

The aim is an evaluation of ERTS/LANDSAT I and II imagery taken at different seasons of the year, namely March, July, September and December, for analyses of features of the natural terrain with particular reference to geological mapping and mineral exploration. The imagery is being evaluated in relation to airborne imagery of selected areas and interpretation is being verified by the ground truth investigations.

## II Techniques

The techniques elaborated in the second quarterly have continued to be used.

Additionally the CC tapes have been used and the first colour composite of the Dugald River area enlarged from the Cloncurry - Dobbyn frame 2039 23555, 2 March 1975 have been generated. Interpretation of this will now be undertaken.

## III Accomplishments

The interpretation procedures described in the second quarterly report have been used for the grid section covering the Dugald River area of the Cloncurry - Dobbyn area flown on 2.3.1975 for the grid section covering the Lady Annie area of the Gregory River - Mr Isa frame flown on 22.3.1975 and for the grid section covering

the Cloncurry Plains of the Cloncurry - Dobbyn frame flown on 2.3.1975. Additionally the imagery covering the Lady Annie area flown at different seasons, 22.5.1975, 18.9.1975 and 10.11.1975 has been compared and geological interpretations have been made on the imagery of 22.3.1975. Geological interpretations of the Dugald River area have been made from the imagery flown on 2.3.1975 and on 24.7.1975.

On the colour composites of the Lady Annie - Mt Gordon fault zone area generated by combinations of bands 4, 5 and 7 projected through appropriate filters, the major structural units, the individual geological formations, and major faults may be clearly discriminated on the March, September and November 1975 imagery when displayed at a scale of 1:50,000 or greater. The spectral signatures displayed on this imagery differs at each season; some geological features are better delineated in March, others in November, while the March imagery has been studied in detail, comparative studies with that of the other months indicates that seasonal imagery provides complementary information. The detailed studies of the March imagery have disclosed several faults and also a number of linears not hitherto known.

Mineralization is known at several sites along some of these linears which are referred to again under the section clearly with significant results. Overlay maps giving a geological interpretation of the March imagery have been prepared and are being drafted for publication.

The colour composite transparencies for the whole of frame 2039-23555 and for grid 23 at an unchanged scale, of that frame have been scanned and digitized. Both unsupervised and supervised classification have been made of these two images and the resulting map compared with the visual interpretation. Supervised maps for both six and nine classes have also been generated from grid section 23 of the Lady Annie - Mt Gordon fault zone and the six group map is shown in fig.1.

The CCT for frame 2039-23555 has been used to generate both simple density sliced maps and contrast stretched density maps and supervised maps of part of this frame will shortly be generated. An example of ratioing bands 4 and 6 for the Dugald River area in this frame is shown in fig.2.

IV Significant Results

The following significant results have been obtained:

1. Series of linears have been identified on the March imagery of the Lady Annie - Mt Gordon fault zone area. The series with a WSW-ENE orientation which is normal to the major structural units and also several linears with a NNW-SSE orientation appears to be particularly important. Copper mineralization is known at several localities where these linears are intersected by faults. Areas of iron rich rocks occur at these sites and also at a number of comparable ones at which there may be a potential for ore deposits.

2. Automated outputs using supervised methods involving the selection of training sets selected by visual recognition of spectral signatures on the colour composites obtained from combinations of Mss bands 4, 5

and 7 projected through appropriate filters, have been generated. Using six groupings these display successfully the major geological formations and distinguish the lithological units within them for the Lady Annie - Mt Gordon fault zone area northwest of Mt Isa.

V Publications

A paper entitled 'The use of multi-spectral and thermal imagery taken at different seasons from aircraft and satellite platforms in the recognition of superficial and bedrock geology, structural features and ore horizons in western Queensland, Australia' has been prepared for the forthcoming International Geological Congress in Sydney, Australia.

VI The new photographic products have been received and some of the seasonal imagery requested for the project has not been received. The position regarding the supply of imagery was tabled in our last report. Noticeable gaps include the absence of imagery of the Lady Annie area [contained on the Gregory River - Mt Isa LANDSAT frame for July].

IX Conclusions

Our only conclusions additional to those on the March report are:-

1. Confirmation of the complementary information obtained from imagery at different seasons.

2. Interpretation of major linears of importance relative to the location of ore deposits has been possible

3. The results for initial studies of imagery generated from the CCT for the area containing the Dugald River lead zinc lode indicate the possibilities for outlining ore deposits in the area. This could be verified if the CCT for the Gregory River Mt Isa area is provided by NASA for frame 2059-00012 [22.3.1975].

ERTS FRAME 11A

6 GROUPS-SOUPED NO BIN 06/04/76 FROM TSI -LANDSAT AUSTURALIA FRAME 11A S

| GP | SHADING | POINTS | GP | SHADING | POINTS |
|---|---|---|---|---|---|
| 1 | A | 545 | 5 | I | 6047 |
| 2 | H | 3402 | 6 | J | 2436 |
| 3 | G | 4534 | | | |
| 4 | K | 5536 | | | |

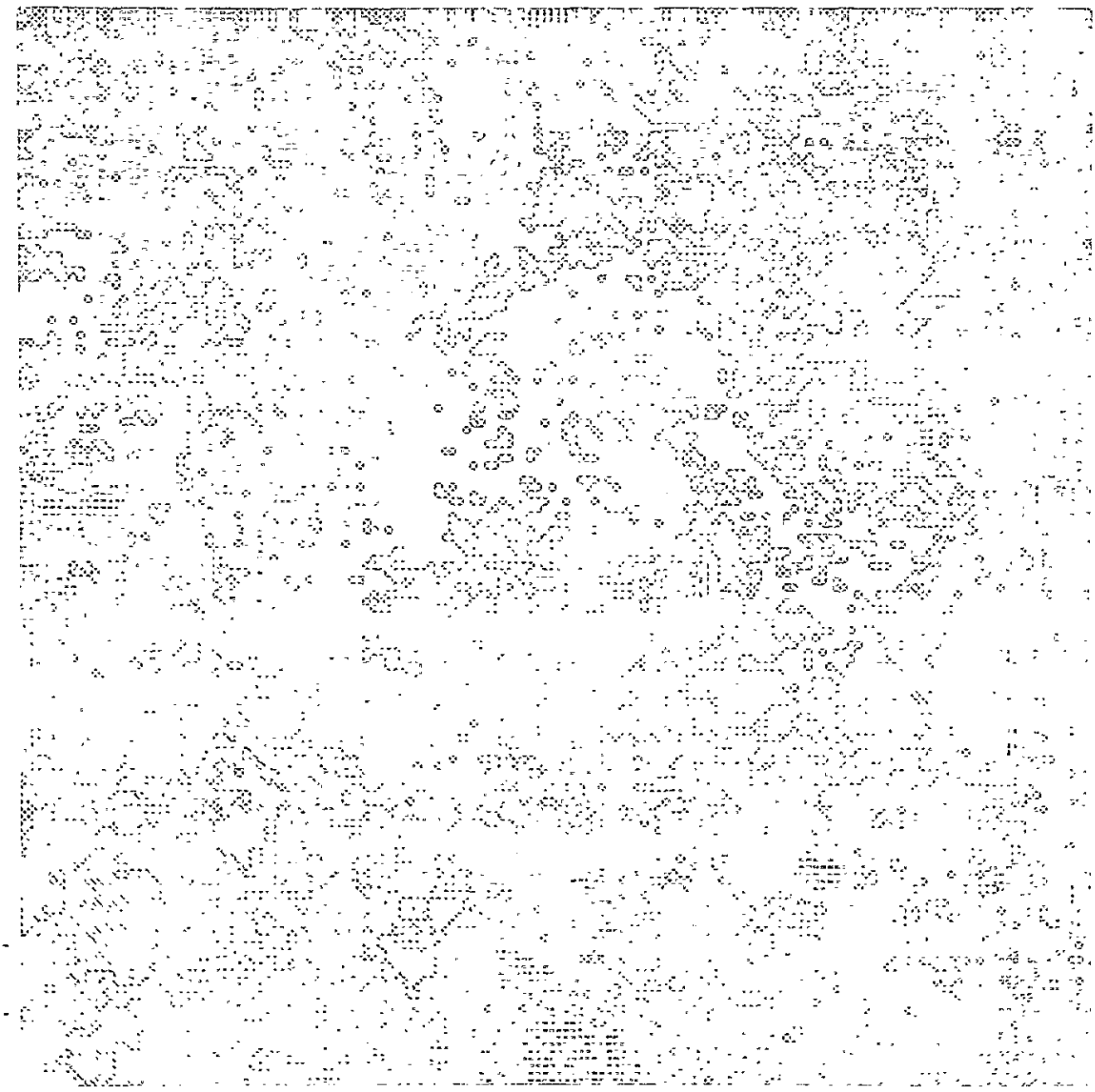

Fig. 1. Six-group classification map of Lady Annie Mt. Gordon zone.

DUGALD RIVER AREA *RATIOS* 12/07/76

20 GROUPS - EPOP LEVEL SLICE PARAMETER 1 ** 12/07/76

| GROUP: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SIZE: | 3757 | 3727 | 3665 | 4232 | 3688 | 3649 | 3657 | 4539 | 3439 | 4025 | 2241 | 4064 | 4414 | 3629 | 4065 | 3345 | 4061 | 3680 | 3914 | 3760 |

Fig.2. Digitally ratioed map of Band 4/Band 6 for the Dugald River area.

@abs The author has identified the following significant results. Series of linears were identified on the March imagery of Lady Annie-Mt. Gordon fault zone area. The series with a WSW-ENE orientation which is normal to the major structural units and also several linears with NNW-SSE orientation appears to be particularly important. Copper mineralization is known at several localities where these linears are intersected by faults. Automated outputs using supervised methods involving the selection of training sets selected by visual recognition of spectral signatures on the color composites obtained from combinations of MSS bands 4, 5 and 7 projected through appropriate filters, were generated.