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ERTS-1 PRELIMINARY RESULTS ON IMAGERY ACQUIRED OVER THE AMAZONIAN REGION

Fernando de Mendonça and co-investigators

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ABSTRACT

This brief report presents preliminary results of the first MSS images obtained with ERTS-1 over the area located between latitudes of 02° 30'S - 10°S and longitudes 61°30'W - 63°30'W in the Brazilian Amazonia. This area is predominantly of equatorial forests with pratically no dry season throughout the year. The imagery shows a number of interesting details concerning rivers, drainage systems, mapping inaccuracies, roads under construction, location of small towns, geological features, etc. By proper combination of the different MSS channels one can produce false color images which enhance small but important features of the region. Due to the very thin population of this part of Brazil the information provided by this imagery could not be economically reproduced by any other way. Compared with existing maps, the Amazon and part of the Madeira Rivers which present no navigation problems show acceptable matching. This is not true of the Purus and other streams shown in the imagery. Away from river banks the existing maps reflect a complete lack of reliable information.

CO-INVESTIGATORS WHO PARTICIPATED IN THIS PRELIMINARY ANALYSIS

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The cooperational program on remote sensing between NASA and INPE has been in effect since 1968. This cooperation has been described in many reports. Presently we are establishing our own data acquisition and processing station for ERTS-1. I shall now present some preliminary results.

The first slide shows strips corresponding to the ERTS-1 MSS channels 4 (green-yellow), 5 (red), 6 (red-IR), 7 (infrared) and a map. This ERTS-1 imagery was specially sent by Dr. W. Nordberg of NASA late September 1972 for a preliminary interpretation having this IAF meeting in mind.

Each image has been numbered by area (A through G) and the MSS channel (4 through 7). Let us start with area C.

(Frame 3)

C.4 - Note the Amazon River and the road Manaus - Porto Velho.

(Frame 11)

C.5 - Note the same road Manaus - Porto Velho, under construction, sharply defined and better than on channel 4.

Arrow: 5. Clear difference between clean water (lakes) presenting dark tones of

6. Dark waters of the River Solimões with a large quantity of material from heavy erosion and

7. A transition in the River Purus between muddy waters which are parts where the current velocity is stronger (lighter tones) and the cleaner waters (darker tones).

8. Presence of abandoned meanders, or turns in the river which show the previous normal course of the river. These meanders are shown in darker tones.

11. Channel 5 shows a good contrast between base soil and reddish color (reddish) reflecting well in the red and showing lighter tones, and the vegetation in darker tones.

12. The forest with intense green color presents darker tones in channel 5, forming a good contrast with

13. The marsh-swamp vegetation which is a lighter green and is shown in the imagery in light grey tones.

29. The city of Codajás.

(Frame 19)

C.6 -

Arrow: 10. Reflection differences in the river waters are clear in channel 6. These differences possibly could be atributed to the quantity of solid material close to the surface, the cleaner waters appearing darker.

14. It is possible to delineate very clearly the drainage pattern. The larger river is the Solimões and

15. The second one in importance is the Purus,

16. Discloses a rectilinear pattern indicating its subordination to a larger fracture oriented approximately 040^{o}. The analysis of the drainage pattern on both sides of it, indicates that the SE block has moved up in relation to the NW one. This movement caused a flooding area of the region between the Solimões (Amazon) and Purus Rivers.

17. This river, a tributary and a lagoon

18. The Porto Velho - Manaus road is not so sharp.

(Frame 27)

C.7 - The Porto Velho - Manaus road disappears.

Arrow: 1. The low reflection of water in the infrared region, showing dark tones, in contrast with the good vegetation reflection (light tones), permits a clear differentiation of surface waters. It appears to be the ideal band for charting basins.

We shall now see the imagery of the Area D.

(Frame 4)

D. 4 - The Manaus - Porto Velho road is easily identifiable but ends abruptly.

(Frame 12)

D.5 - The Manaus - Porto Velho road looks sharper than in channel 4 but also disappears abruptly.

- The sand banks on the Madeira River are sharply defined.

(Frame 20)

D.6 - Shows the most complete length of the Manaus - Porto Velho road, namely, both sectors (temporary primary road and unpaved primary road). The Madeira River is well defined.

(Frame 28)

D.7 - The drainage patterns are better defined on this channel. A comparison made between the ERTS imagery with existing maps shows great discrepencies in drainage with error of 90 degrees in direction. On this image only the southern part of the road Manaus - Porto Velho appears. The mentioned differences correspond to different stages of construction.

(Frame 29)

E.7 - On Area E we can observe on the IR channel 7 the superficial water under thin clouds.

(Frame 15)

G.5 - Here we have observed the following:

Arrow: 20. The Brasília - Acre road (BR-364) is visible in some parts.

21. Similar to above, but the contrasts are stronger. The BR-364 road and part of Guajará - Mirim - Ariquemes road (BR-421) is also visible.

27. Ariquemes town.

30. Nova Vida town.

(Frame 31)

G.7 -

Arrow: 19. It is possible to delineate the northeastern scarp of the Pacaãs - Novos Plateau.

22. Lower sandstone unit and the contrast between this unit and the basement.

23. The upper shale - sandstone unit and the boundary between this unit and the lower Pacaãs - Novos group.

24. Talus deposits

25. Lineaments and fractures are also visible.

26. Newton rings probably due to pressing the 70 mm original between glass plates, are also visible in the images and can lead to misinterpretation.

We shall present now three additional slides. The first one shows an area acquired with a side-looking radar compared with the IR MSS channel 6. Since the area is flat we have practically the same information. Naturally for this region the four MSS channels provide more information than the SLAR imagery. The final slides are false color transparencies made with channels 4, 5 and 7 of Area C.

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Arrow: 1. The surface watershed is better defined in channel 7.

2. Channel 7 permits better distinguishing of water surface covered by fog.
3. Clear distinction of sand banks in channel 5.
4. Better characterization of drainage networks in channel 7.
5. Channel 5 differentiates clean waters (dark tones) from
6. Waters with material close to the surface (light tones) and
7. A transition in the same river of waters with material close to the surface to clean waters.
8. Channel 5 shows evidence of the presence of previous meanders (darker tones).
9. Clear differentiation of trails in channel 7.
10. Channel 6 shows different tones in the Amazon River.
11. Channel 5 shows good contrast between vegetation and base soil.
12. Channel 5 presents a better contrast between forests (dark tones) and
13. Slightly dense marsh-swamp vegetation (light tones).
14. Solimões River
15. Purus River
16. Rectilinear pattern
17. Lagoon
18. Porto Velho - Manaus road
19. Pacaás-Novos Plateau

20. Brasília - Acre road (BR-364)
21. Guajará - Mirim - Ariquemes road (BR-421)
22. Boundary between lower Pacaás - Novos Group (sandstone) and crystalline basement.
23. Boundary between sandstone and upper Pacaás - Novos Group (shale)
24. Talus deposits
25. Lineament trend NNW
26. Newton rings
27. Ariquemes
28. Madeira River
29. City of Codajás