Geophysical and Imaging Processing Techniques Applied to Regional Geological Correlation: The case of Paranoá Group, Goiás State, Brazil.

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ABSTRACT

The Paranoá Group has a high economic potential for base metals and gold; however, the geologic knowledge is far from being satisfactory. It is still necessary that the tectono-lithostratigraphic subdivisions be better understood. That Group is part of the Brasília Folded Belt, which is represented by, meso to neoproterozoic metasediments between the São Francisco Craton at east and the Goiás Median Massive at west (Marini *et al.*, 1984 - Fig1).

The area covered by the geophysical survey outcrops basement and supercrustal rocks. Basement is represented by Granit-gnaissic Complex (GGC), the Niquelândia (NC) and Barro-Alto (BAC) complexes. The supracrustal rocks (Brasília Folded Belt) are constituted by Serra da Mesa (SM), Araí (A) and Paranoá Groups (Marini, *op cit.*). Some important questions remain, as it was not possible yet to correlate the local geologic information of the northeastern part of the area (which contain 10 sub-units for Paranoá group (Fuck *et. al.*, 1988) with the regional knowledge. The available geologic map (CPRM, 1987) has only two major sequences Pelitic-psamo-carbonate (Ppc) and Pelitic-psamitic (Pp).

In order to answer these questions, we have used a combination of geophysical and image processing techniques, involving joint processing, integration and interpretation of aerogamaspectrometric and Landsat data on the software ER Mapper 5.5. After the pre-processing corrections, data was processed using pseudocolor, intensity layer, rgb composite, band rationing, principal component analysis, spatial frequency filtering and sun shading features. The processed images were integrated by joining them with a pseudocolor and intensity layer, together or by applying the combination (RGB)) and fusion (IHS) techniques.

At the Total Counts image (CT in Fig. 2) the higher intensities can be associated to the Granit-gnaissic Complex, bordering the Niquelândia Complex (northeastern corner of the image). The lower counts are associated to the mafic-ultramafic Complexes (Niquelândia e Barro Alto).

At the thorium channel (Th – Fig. 2) the higher counts are associated to the Serra da Mesa Group (northwestern part of the image) and Paranoá Group (southeastern part of the image). At the potassium channel (K – Fig. 2) the higher counts are probably associated to feldspatic quartzite's. We show in Figure 2 the geologic map (CPRM, 1987), comparing with the radiometric data, especially the ternary image, it can be seen the major contacts between the units are easily identified.

The best results of digital processing were a [(5/4)x(3/4)]R, 5/1G, 5/7B and Pc1] (Souza Filho & Drury, 1997) and principal components 1R 2 G and 3B (6 bands) images. In these image (Fig. 3) is possible to subdivide the sequence (Ppc) into several sub-units. For instance, carbonate rocks appear in green-brown tons (Fig. 3a) and the blue tons (Fig. 3b). The psamitic rocks (alluminous material) appear in red tons (Fig. 3a).

The interpretation of the integrated images has shed some new light into the geologic knowledge of the area by identifying the sub-units in the sequence Pelitic-psamo-carbonate and determining their relationship with the regional structures along the Brasilia Belt.

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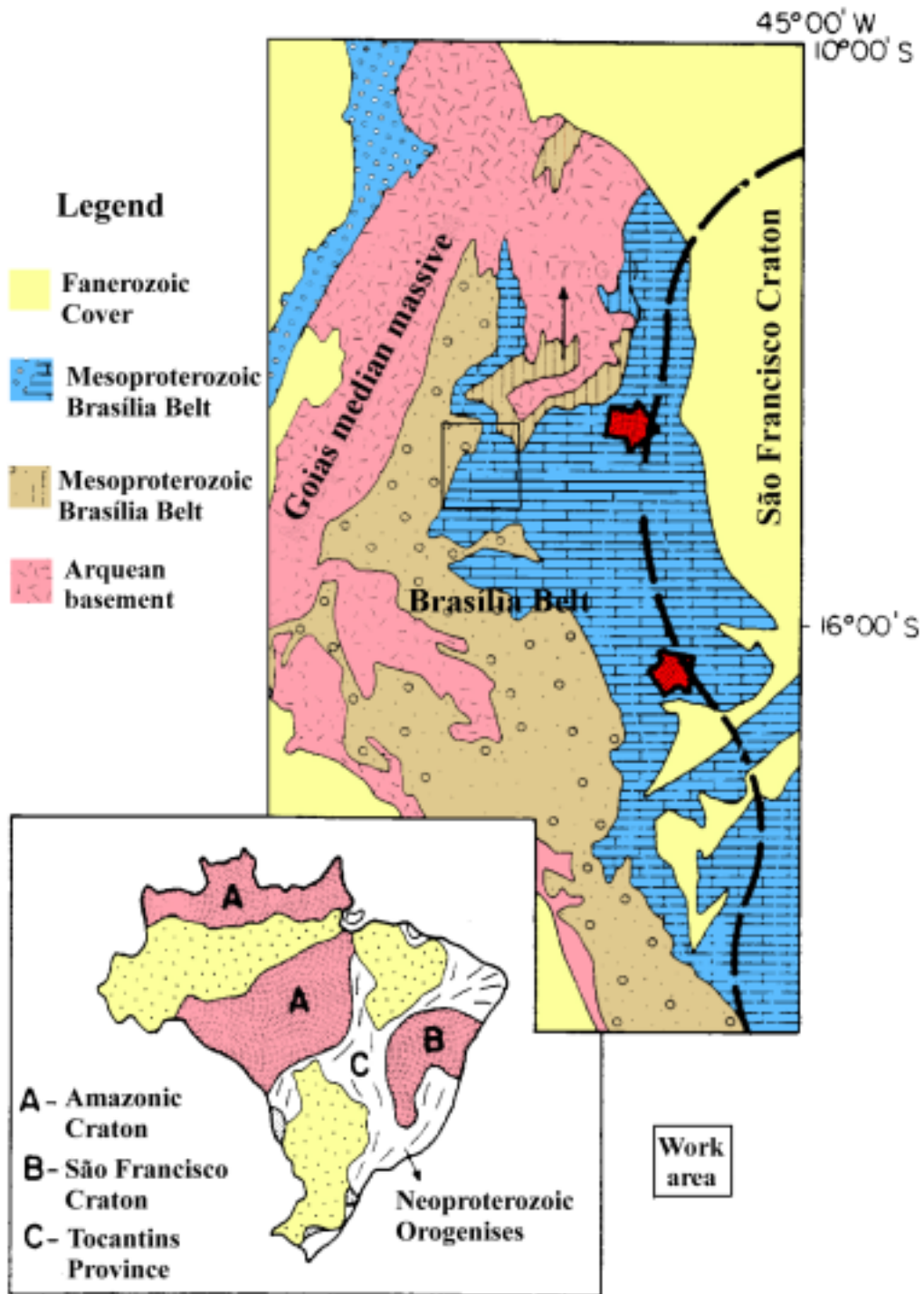
Fig. 1 - Geotectonic map of Provincia Tocantins (Marini et al., 1984)
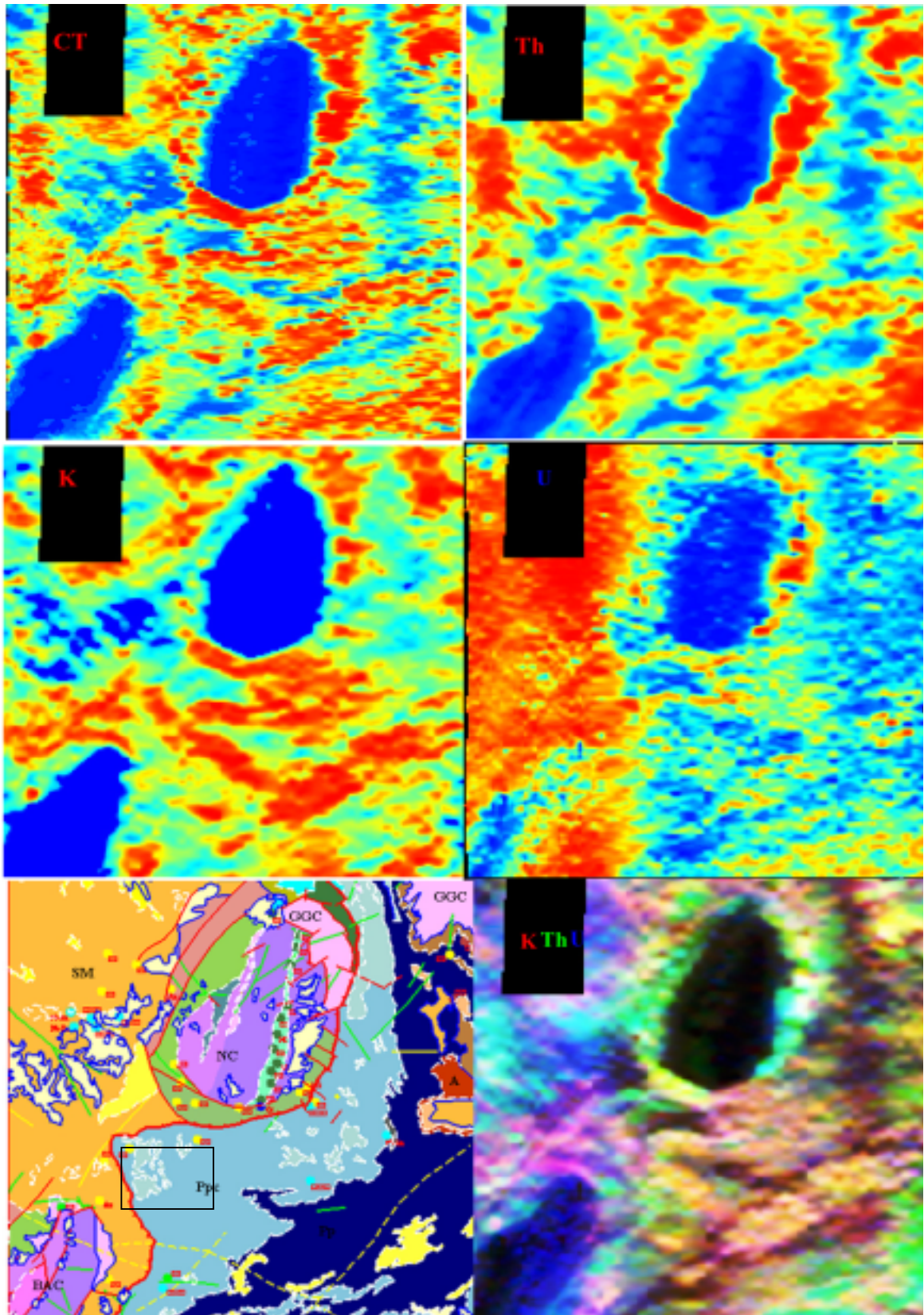
Fig. 2 - Pseudocolor Images, from top to bottom: CT - Total Count; Th - thorium channel; K - potassium channel and U - uranium channel. Geological map (CPRM, 1987). GGC - Granit-gnaissic Complex, NC - Niquelândia Complex, BAC - Barro-Alto Complexe, SM - Serra da Mesa Group, A - Araí Group and Ppc - sequences Pelitic-psamo-carbonate and Pp Pelitic-psamitic. The square represent the area to be detailed in figure 3.
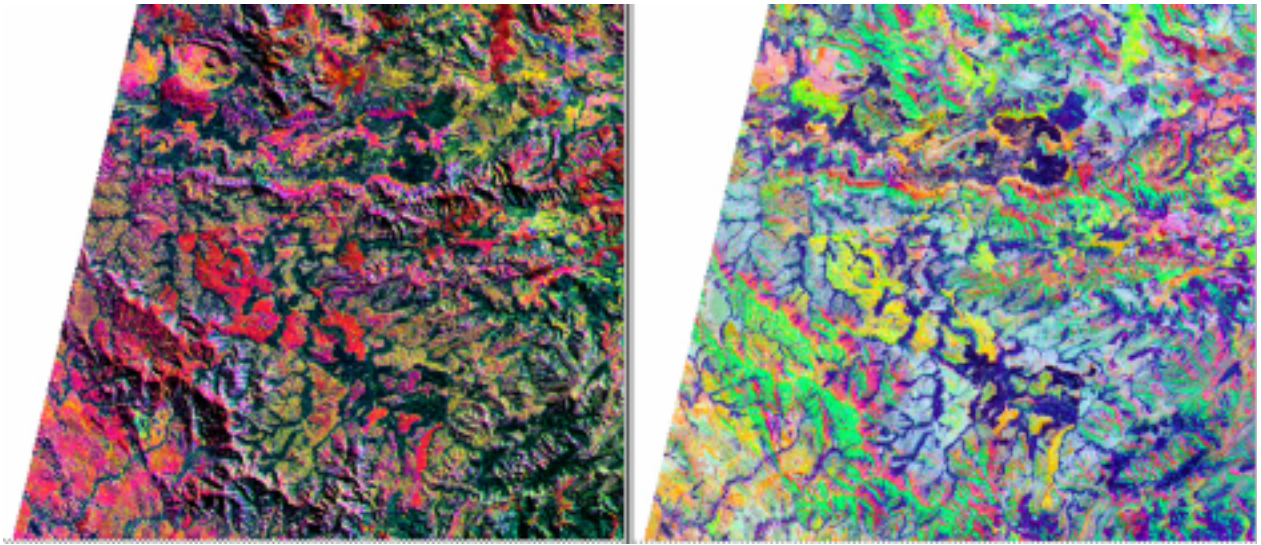
Fig. 3 - (a) Image [(5/4)x(3/4)] red, 5/1 green; 5/7 blue and PC1 (6 bands) in intensity; (b) Principal components (RGB - PC1, 2 e 3) image.