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MAPPING OF DIAMOND MINERALIZATION INDICES IN THE SEGUELA REGION BASED ON AEROMAGNETIC SIGNATURES: THE CASES OF BOBI, DIARABANA, AND NANDALA

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Background and Issues

The Séguéla region has been the subject of numerous previous studies aimed at locating diamonds. In 2021, geological prospecting work carried out in Bobi, Diarabana, and Nandala identified six (06) promising areas suitable for semi-industrial mining of kimberlite dykes (Koné and Koné 2021). According to the work program, a geophysical survey is to be conducted in these six (6) promising areas. It therefore seems necessary to refine our understanding of the kimberlite dykes by building on previous work (aeromagnetic method) in order to better guide future geophysical exploration efforts.

It is with this in mind that we have initiated this study entitled: Mapping of diamond mineralization indicators in the Séguéla region based on aeromagnetic signatures: the cases of Bobi, Diarabana, and Nandala.

Objectives

Thus, by launching this study in the Séguéla region, the aim was to identify indicators of diamond mineralization in the Bobi, Diarabana, and Nandala areas based on aeromagnetic data collected in these three (3) areas. To achieve this objective, the specific tasks will be:

- to compile magnetic maps;
- to produce a summary map of magnetic formations.

Methodology

The database consists of aeromagnetic maps of the Mankono 1b, 1d, 2a, 2b, 2c, and 2d transects. The magnetic data were generated by digitizing the aeromagnetic maps and processed using Géosoft 7.0.1's Oasis Montaj software.

Results and Discussion

Analysis of the aeromagnetic maps has identified three (3) major lithological units: weakly magnetic, magnetic, and intermediate (Figure 1). The non-magnetic zone, shown in blue, consists of biotite granite; the magnetic zone, ranging from orange-red to magenta, indicates the presence of lamprophyre veins or dykes, metadiorites, and metatonalites; and finally, the intermediate zone (green) indicates transition zones between the magnetic and weakly magnetic formations. These are formations with intermediate magnetism. To the southeast of the study area, this intermediate domain, consistent with the geological map, indicates the presence of a biotite- and hornblende-bearing granodiorite intrusion. Structurally, a fault system is observed with the following main strike directions: NE-SW, NNE-SSW, N-S, NW-SE, and WNW-ESE.

The magnetic method has also proven effective in geological mapping to determine lithological contacts and structures in the Tortiya region. Indeed, according to Decho (2017), the Tortiya region consists of two lithological units: a magnetic unit composed of basic rocks (basalts, andesites, and gabbros), to which biotite and hornblende metagranodiorites may be added. The other, weakly magnetic unit consists of granites, schists, conglomerates, and grauwackes.

The biotite granite body identified by the aeromagnetic method was also observed in Séguéla by Gnoleba (2021). According to this author, high susceptibility values (k > 6.10^(−3) SI) were obtained in biotite and amphibole granites and granodiorites that also contain numerous iron oxides, which are presumed to be magnetic. Similarly, Gnoleba's (2015) work in the Téhini area also identified NE-SW, WNW-ESE, and NW-SE directions. Indeed, he indicates that these fractures affecting the surface formations could indicate the effects of late tectonics subsequent to the formation of the geological formations in the study area.The directions highlighted in this study differ from those reported by Pouclet et al. (2004), who show that the Séguéla region is largely affected by N170° fracturing corresponding to a strongly structured contact between the Archean lithosphere to the west and the Paleoproterozoic lithosphere to the east.

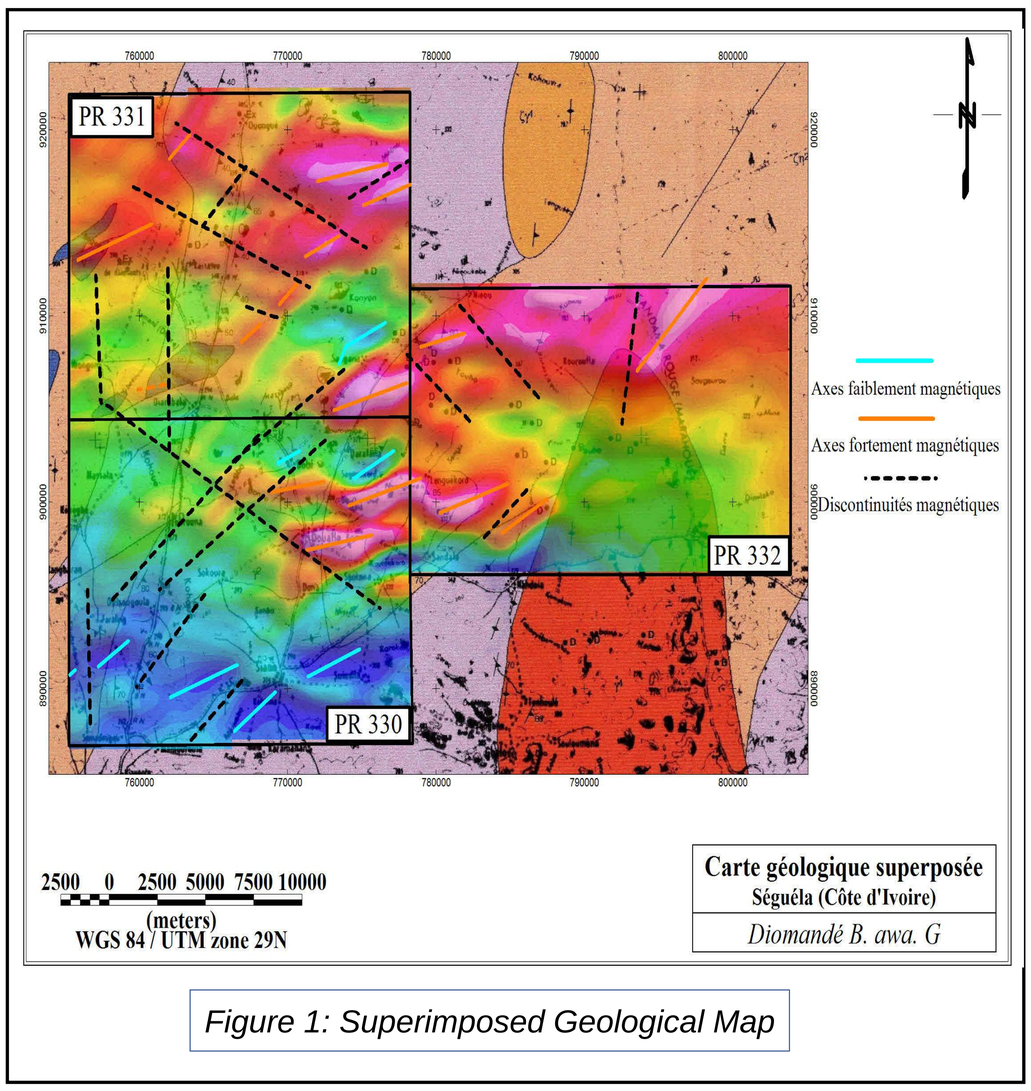

Figure 1: Superimposed Geological Map

Conclusion

The analysis and interpretation of the results obtained have helped to improve geological understanding of the study area by identifying three (3) major lithological units based on magnetic field intensity (non-magnetic, magnetic, and intermediate). These units correspond to biotite granites, lamprophyre veins or dykes, metadiorites and metatonalites, and an intrusion of biotite and hornblende granodiorite. Structurally, a fault system is observed with the following main strike directions: NE-SW, NNE-SSW, N-S, NW-SE, and WNW-ESE.

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