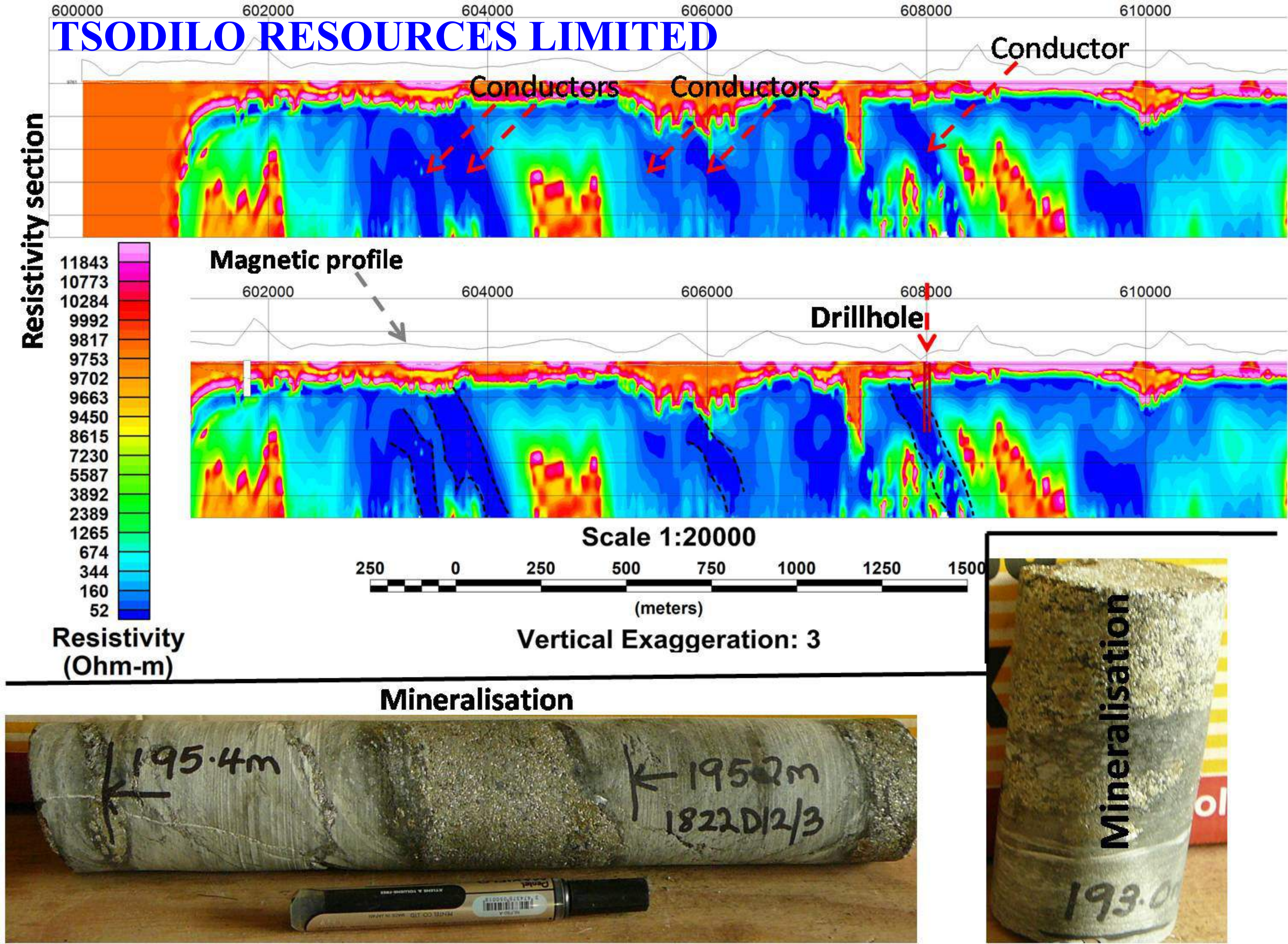
TSODILO RESOURCES LIMITED



Tsodilo Resources Limited drills extension of Zambian copper belt-like mineralisation in Pan African Basement of northwest Botswana.

The Lufilian Arc, better known as the Zambian copper belt (>25 million tons of copper produced in Zambia), and its extension into Katanga (DRC), is a major source of mineral wealth that has captured the minds of exploration geologists and mining magnates ever since the discovery of this huge metallogenic province revealed its copper, cobalt and uranium riches, more than 80 years ago. Whilst the origins of the metals are still a subject of much debate, its relationship of the mineralisation to Pan-African (Neoproterozoic) age tectonics has been recognised from early days. Recent work has confirmed that these ore deposits were generated from deep sources during north-directed thrusting and concomitant regional-scale fluid flow through basement rocks with precipitation from these pregnant fluids at structural traps within the overlying sediments, such as the carbonates and graphitic shales of the Kalumbila Co-Ni-Cu deposits. Where did all this copper come from; and the nickel and cobalt (60% of the world's cobalt is contained in the Lufilian arc)? Structural geologists have speculated for decades about the western extension of the Lufilian Arc - a fold and thrust belt- as it curves sharply southwest before it is buried by younger rocks (Figures 1& 2). Some favour a subsurface connection to the West-Congolian Belt in Angola and Gabon, whilst others truncate the Zambian belt by the northeast trending Kibaran tectonic structures. Many geologists, however, have suggested that the belt is better linked-up with the northeast trending Damaran Belt and in particular its sulphides-rich Matchless Amphibolite Belt (MAB, comprising mineralised meta-ophiolites) that marks a Neoproterozoic suture zone between the Kalahari and Congo-Tanzania-Bengwuela shields, and formed at the peak of collision-related metamorphism in the Damara-Lufilian-Zambezi orogen at ca.550 Ma. Our work, for the first time conclusively shows this to be the most likely correlation. Could it be that, therefore, the copper was tectonically recycled from hydrothermal black-smoker type sulphide deposits that formed originally in the basaltic pillow lavas, associated gabbros, and ultramafic rocks all exposed in the extensive Namibian Matchless Belt? Cu-co mineralization along this Matchless Belt has been known for more than a century. We have followed the northwest extension of the Matchless belt with new and existing magnetic surveys data into central Botswana where it abruptly bends to the northwest (Figures 2-6). Here, the tectonic structures of the Damaran Belt also bifurcate. *First*, a northeast-trending branch follows the Mwembeshi Shear Zone (MSZ) that separates the Ghanzi-Chobe Belt (a Mesoproterozoic calc-alkaline Andean-like belt [with the newly discovered copper deposits close to the bifurcation] flanking the Kalahari Shield) from the Congo-Bengwuela Shield, and from there continues into the Irumbide/Zambezi Belt (Figure 2). High P/T grade ophiolitic rocks (including eclogites) in the Zambezi belt suggest that the suture zone follows the general trend of this MSZ. S*econd,* a northwest trending branch that contains the continuation of the MAB, comprises a series of en echelon shears and NW-SE striking fold axis. This branch is likely rooted in a a continental transfer zone between the suture zone flanking the MSZ to the south and the higher crustal level Lufilian Arc to the north (Figure 4). In this model, the MAB rocks are tectonically emplaced northwards, and the source of the mineral enriched fluids lies in the suture zone from where they were squeezed out and transferred to structural and stratigraphy traps at higher levels, along thrust duplexes and the vertical transfer fault zone. A similar transfer zone may directly underlie the Zambian-DRC Copper Belt of the Lufilian Arc, since all its major deposits follow linear NW-SE trending lineaments (Figure 2). The newly discovered NW trending branch that links the Damaran Belt to the Lufilian Arc should, therefore, provide ideal sites for structural controlled copper-cobalt mineralisation. Tsodilo Resources Limited has drilled 25 deep DDH into large and extensive magnetic anomalies within this NE tranding transfer zone (Figures 7–10). The first occurs at 1822C10, with average magnetic amplitude of 100 nano-Teslas measuring some 2 by 2.3 km. Every drill hole that penetrated into this anomaly, beneath the 20-120 m thick Kalahari cover sequence, intersected concentrated and disseminated mineralised zones-sulphides- varying in thickness from 5 mm to 5 meter. Rock types of various compositions, ranging from white carbonates interlayered with black graphite-rich shales, to metabasalts, gabbros and serpentinites, and to granitic gneiss and paragneiss basement are all invariably mineralised. All rocks are intensely but heterogeneously deformed, showing strong cleavages and mylonites mineralised with syn- to post- tectonic sulphides, ranging from massive deformed layers to late vein mineralisation. Examples of the mineralised core substantially enriched in pyrite, chalcopyrite, bornite and magnetite are illustrated in Figure 11. The petrography and chemistry of these rocks are still in progress. These cores typically contain Co values of up to 6996 ± 913 ppm as measured by handheld XRF (a Thermo Niton XL3t-500) (see Table 1). The assemblages of rocks from the different holes resemble a shallow carbonate-black shale sequence, overlain by tectonically emplaced ophiolite-rocks. We surmise that the ophiolites were rooted in Matchless-Mwembeshi suture zone before they were emplaced northwards onto the foreland shallow marine sediment that covered the Congo-Bengwuela basement, and subsequently deformed in late transfer fault within which Tsodilo Resources located a large mineralised zone (Figures 7-10). The polymetallic nature of mineralization and the presence of cobalt, copper, nickel and platinum-group elements throughout the Lufilian Arc, implicates the mafic-ultramafic igneous rocks of the suture zone as a source of the metals, whilst the extensive carbonaceous, graphitic-rich shales are indicative of metamorphism and migration of hydrocarbons that often aid in early development of secondary porosity important for mineralisation of sulphides from migrating ore fluids (60% of the known copper-cobalt in Zambia is concentrated in dark shales). In view of these newly discovered extensions to the Zambian copper-cobalt fields, and the mafic-ultramafic rocks of the Matchless-Mwembeshi Belt, as well as the marked similarities that characterize all major Proterozoic polymetalic stratiform deposits in Africa, Australia and North America, the new finding of Tsodilo Resources Limited in northwest Botswana has a rich potential for an extensive new base-metal field.

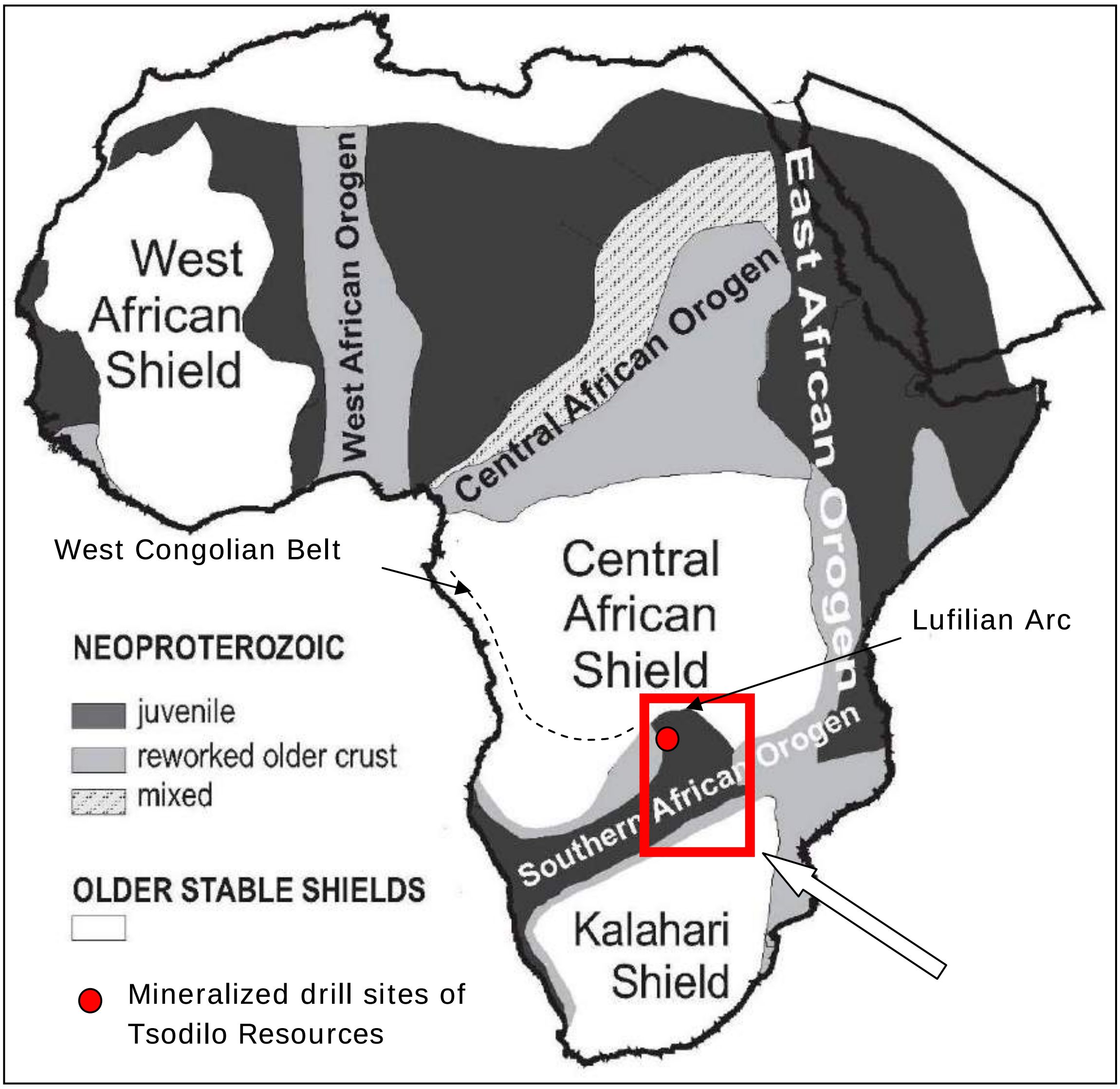
Maarten de Wit, chartered geologist of the geological society, London, UK

For more details about the geophysics and geology, see website or supplementary data.

Table 1 Cu, Co, Ni, Cr and Ag values (ppm) as measured in cores by handheld XRF (Thermo Niton XL3t-500.)

Index	Cu	Cu Error	Ni	Ni Error	Co	Co Error	Fe	Cr	Cr Error	Ag	Ag Error
19	-77	68	485	283	-2396	2470	2028669	-787	131	26	14
20	392	59	-204	132	6996	913	549866	-482	79	22	10
21	125	20	72	34	47	44	3460	-68	22	7	5
22	3203	124	374	121	-781	884	613833	-384	85	13	9
23	-1	14	38	32	109	106	25079	192	36	1	4

Figure 1 Location of Tsodilo Hills Exploration areas.



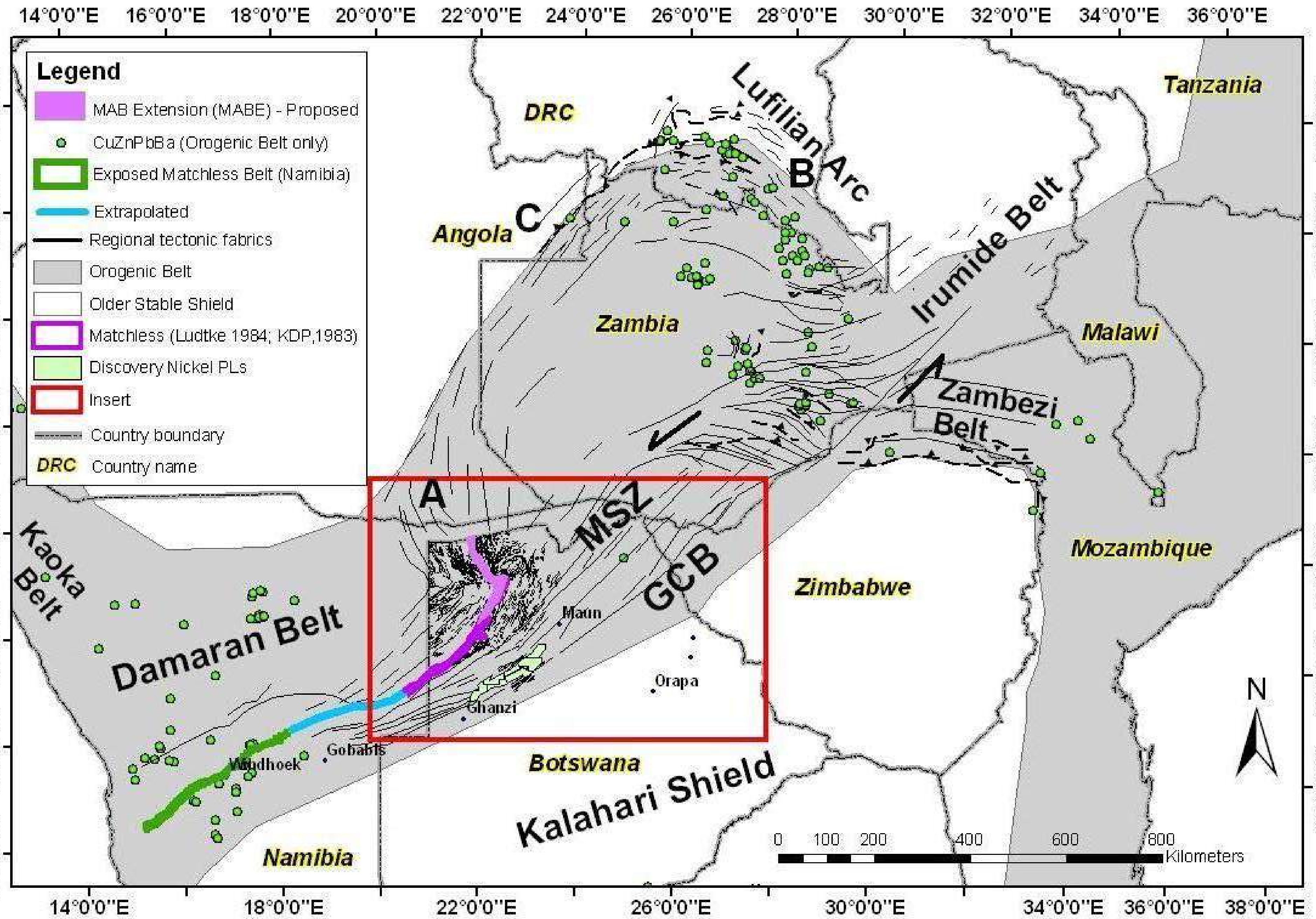


Figure 2 Regional tectonic fabrics mapped from the Total Aeromgnetic Intensity data for Southern Africa. Also shown are copper deposits, the Matchless Amphibolite Belt and Zambia Copperbelt deposits in Southern Africa. (Insert outline refers to figure 3). MSZ=Mwembeshi Shear Zone; GCB= Ghanzi-Chobe Belt

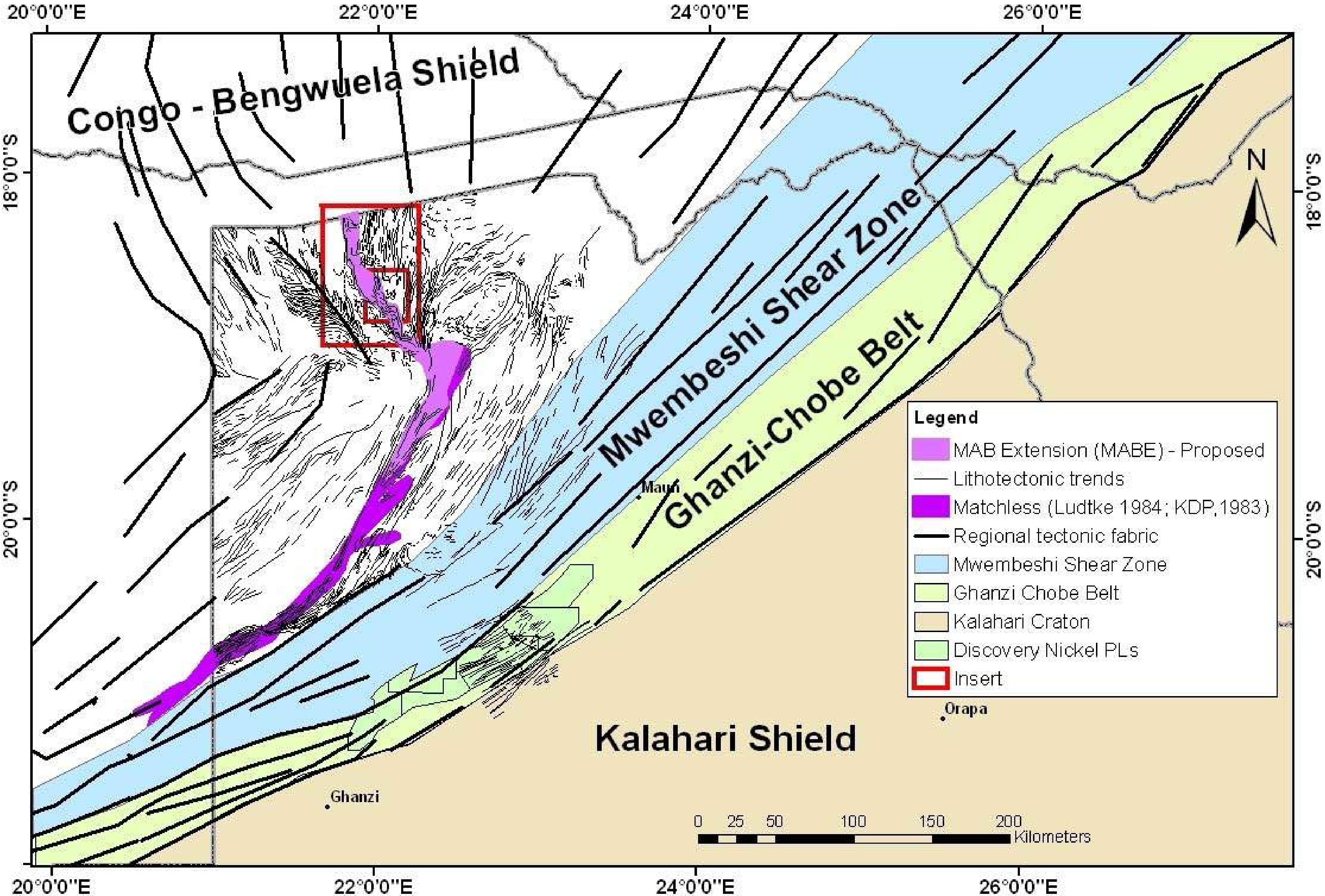
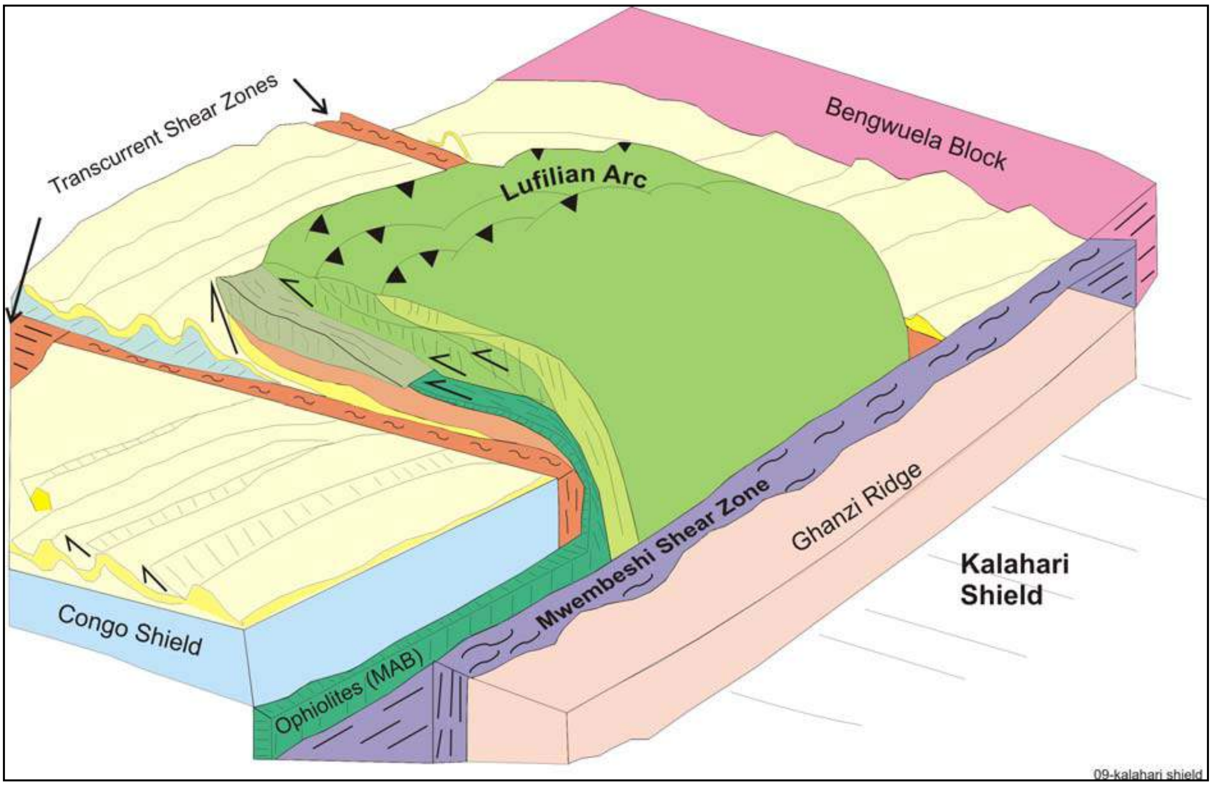


Figure 3 Lithotectonic trends in Pan African Basement in NW Ngamiland (Insert outlines refer to figures 5 - 10). Also shown are the possible entry point and trajectory of the Matchless Amphibolite Belt Extension (MABE).

Figure 4 Schematic 3-d interpretation of the link between regional thrust structures of the Lufilian Arc and a major Pan African suture zone in which ophiolitic rocks of the Matchless Belt-type are rooted, and from which the sulfide ores of the Copper-Cobalt belts may have been derived following extensive fluid fluxing during Pan African deformation. Note that the thrust panels are guided by two inferred transcurrent shear zones in the basement. Outside of these the foreland basin sediments are folded and thrust to a lesser extent. Copper deposits of the Lufilian arc are believed to align in the cover thrusts along the northerly transcurrent shear (not shown for clarity). Also not shown are the tectonic structures of other tectonic regimes such as the Kibaran belt.



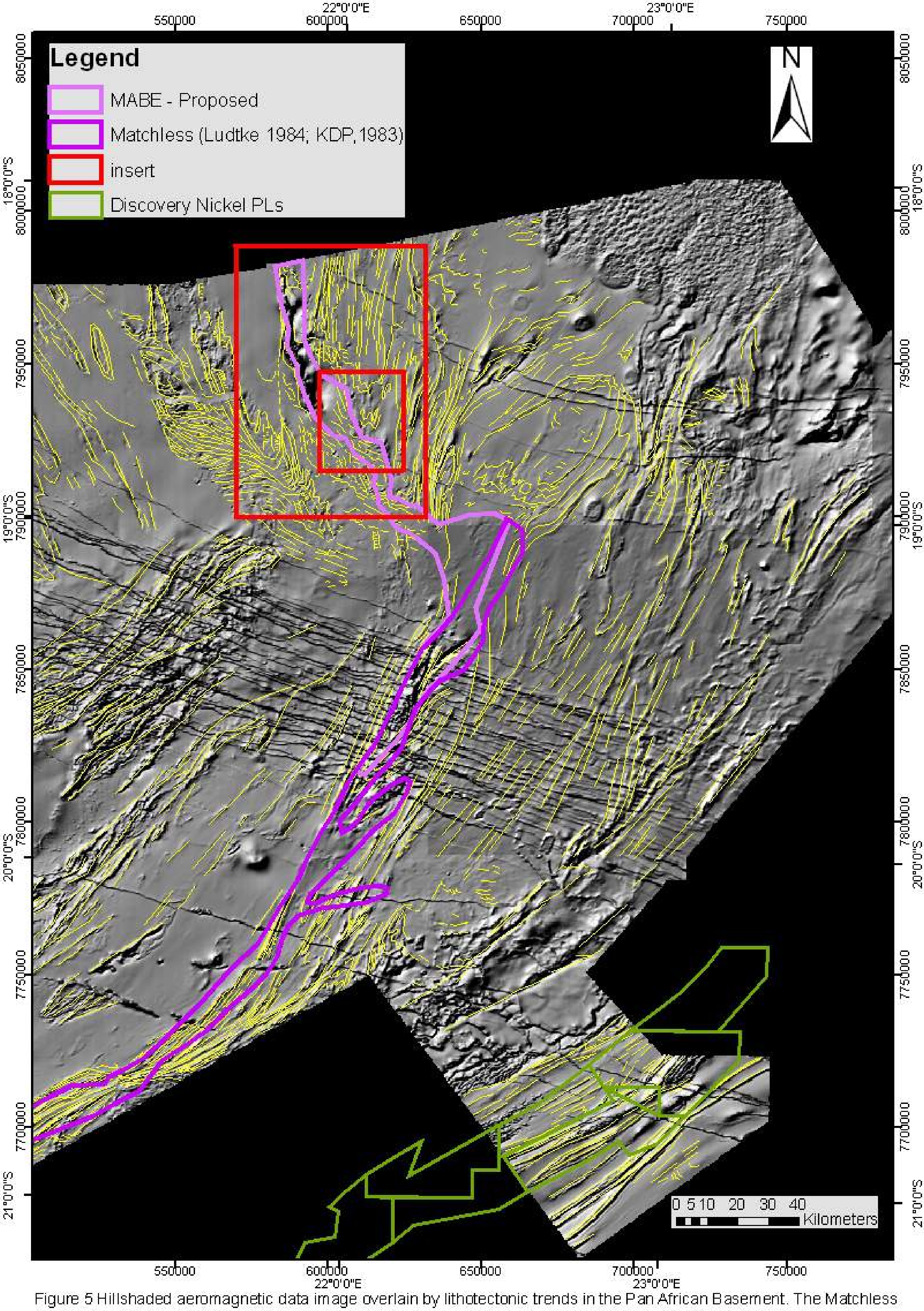


Figure 5 Hillshaded aeromagnetic data image overlain by lithotectonic trends in the Pan African Basement. The Matchless Amphibolite Belt Extension (MABE) as proposed in this study is shown. The inserts show the location of figures 7 - 10.

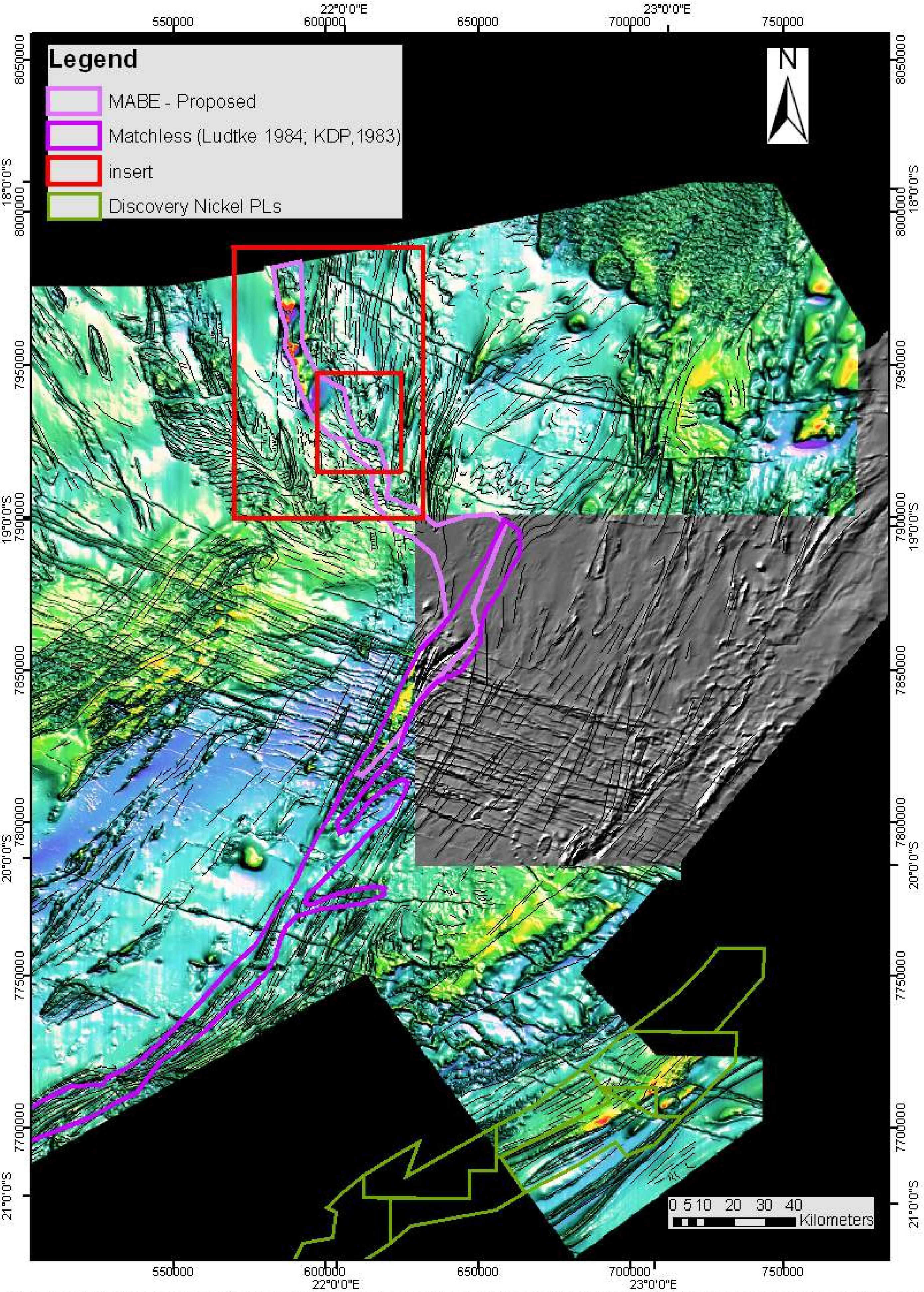


Figure 6 Structurally enhanced aeromagnetic data image overlain by lithotectonic trends in the Pan African Basement. (Hillshaded image shown where enhanced imagery is unavailable.) The inserts show the location of figures 7 - 10.

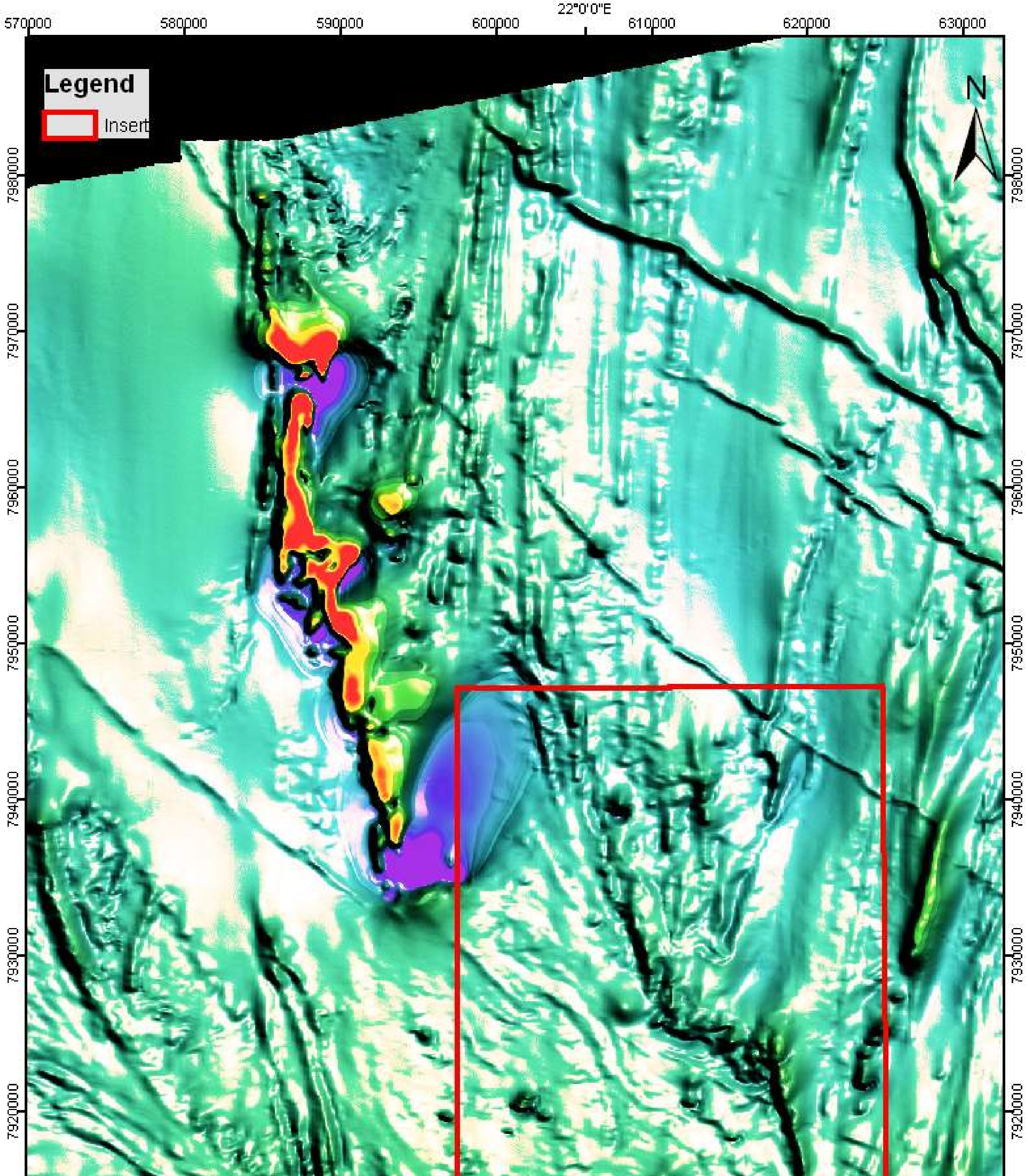


Figure 7 Structurally enhanced aeromagnetics data image overlain by lithotectonic trends in the Pan African Basement. The insert shows location of figure 10. (Highest aeromagnetic data residual field values range up to 31159 nT and are shown in red.)

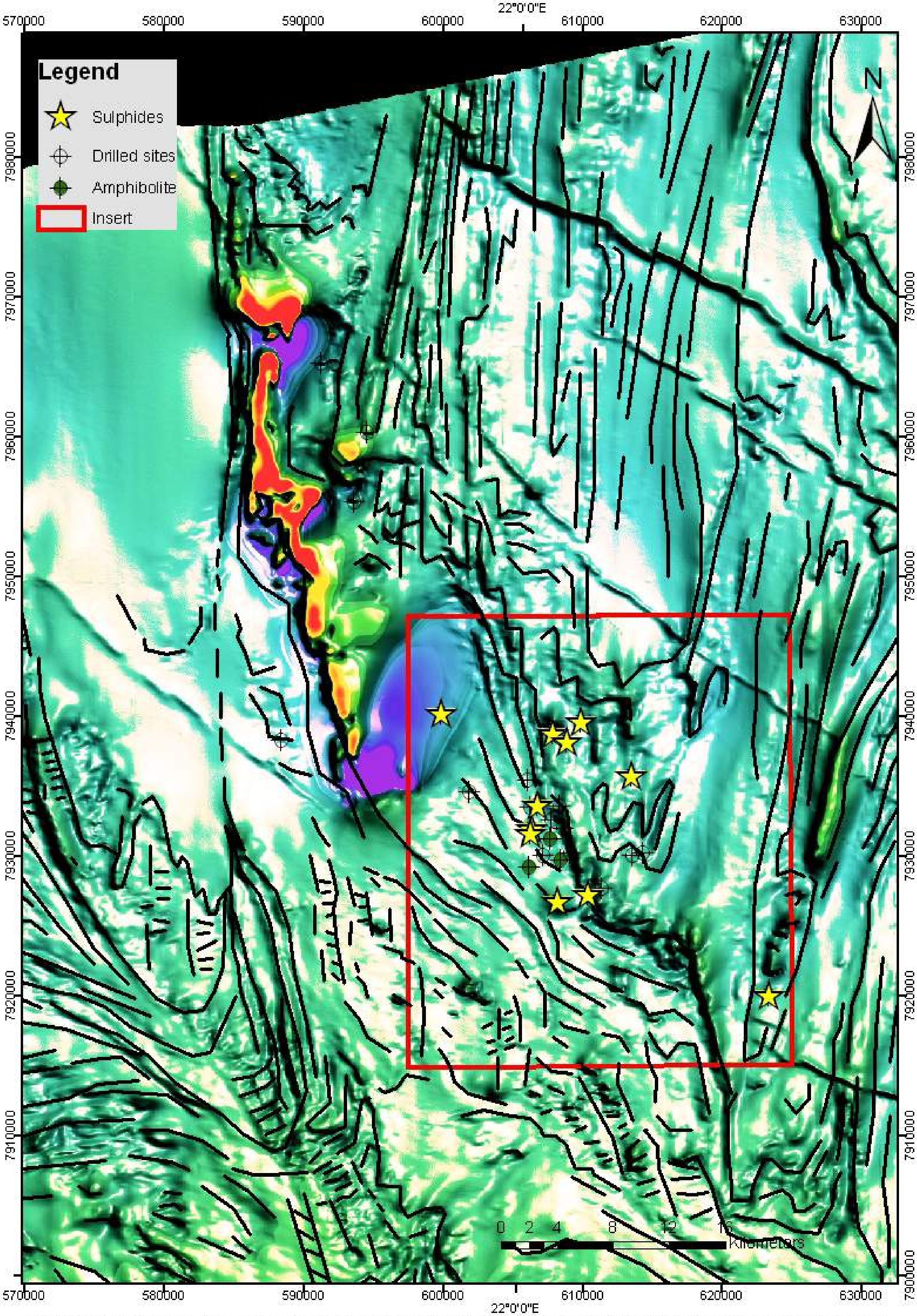


Figure 8 Structurally enhanced aeromagnetics data image overlain by lithotectonic trends in the Pan African Basement. The insert shows location of figure 10.

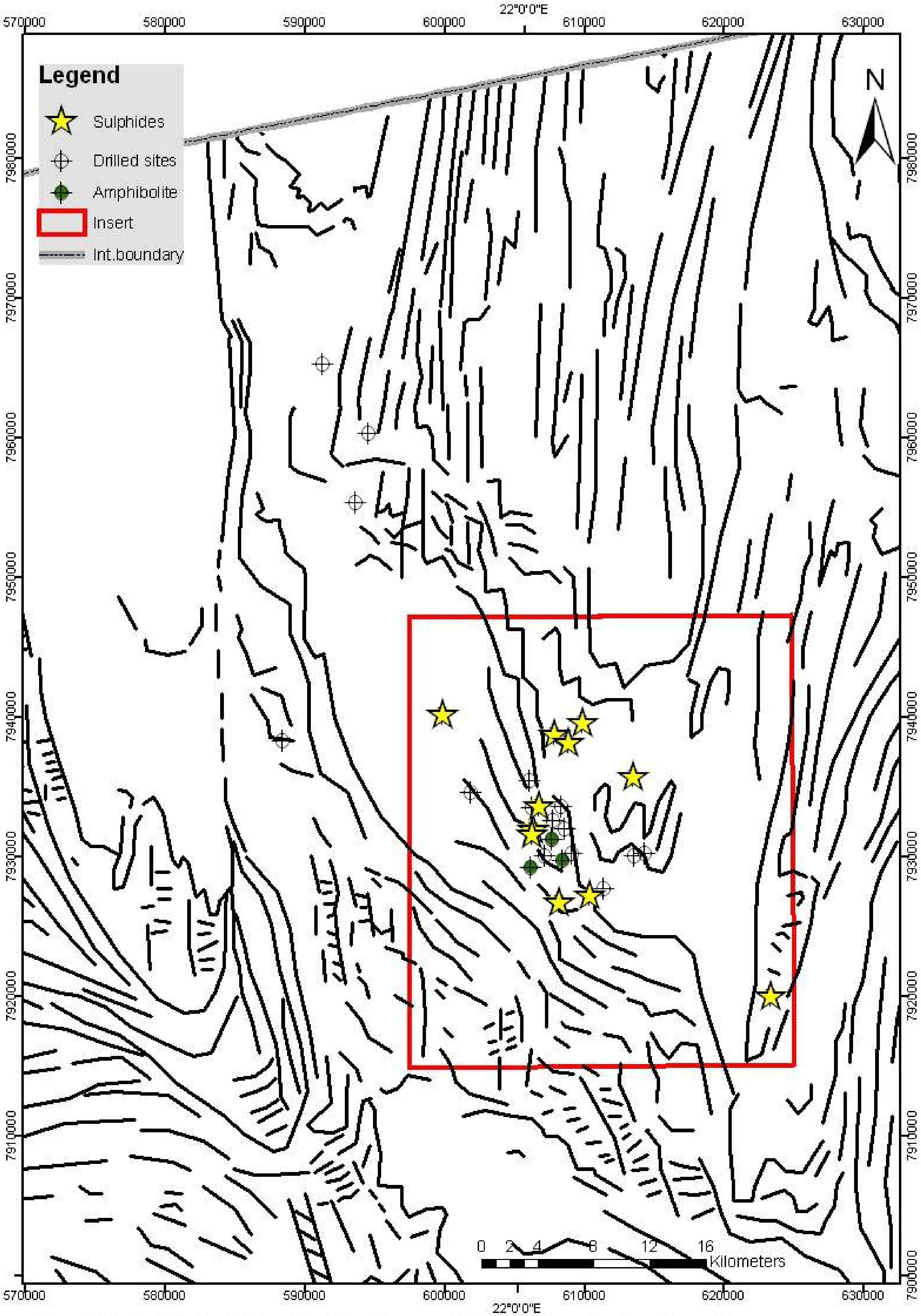


Figure 9 Lithotectonic trends in the Pan African Basement. The insert shows location of figure 10.

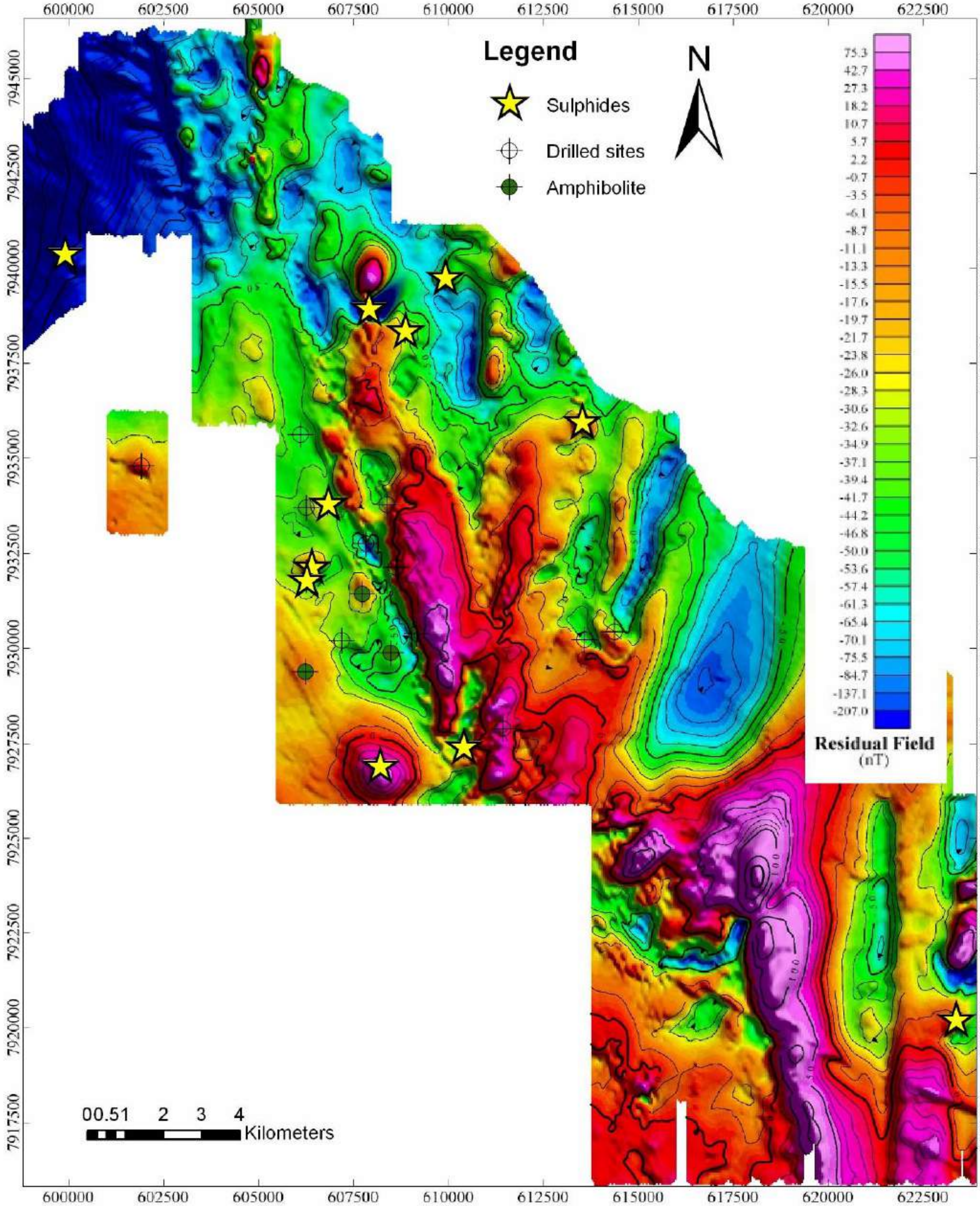


Figure 10 Aeromagnetics field data (3rd order residual contoured) for current drilling location.
Location of sulphide-rich samples shown.

Figure 11.1 - 6 Representative cores with suphide mineralisation in various different lithologies.

Figure 11.1 Massive magnetite (dark gray) with sulphides, in carbonate (white).

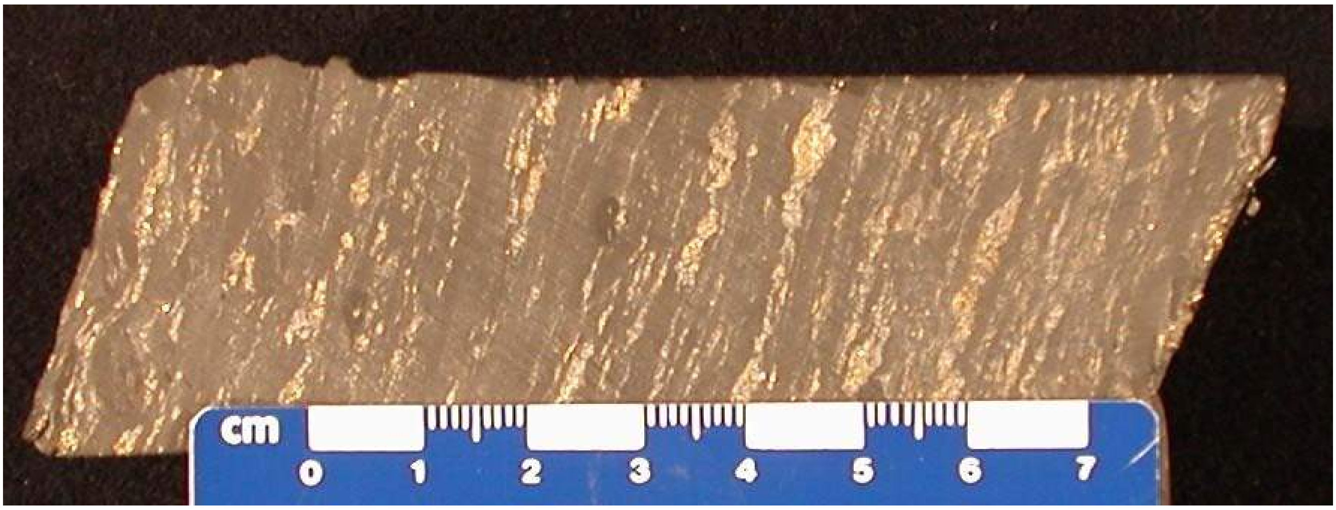


Figure 11.2 Deformed disseminated sulphides along foliation in black graphite-shale.

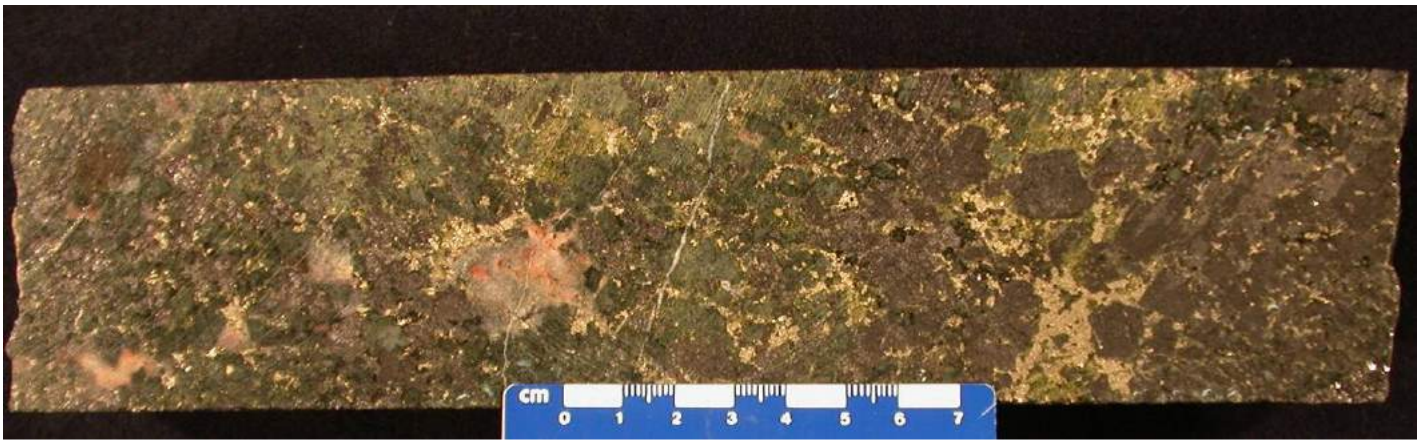


Figure 11.3 Disemminated sulphides in coarse meta-gabbro.

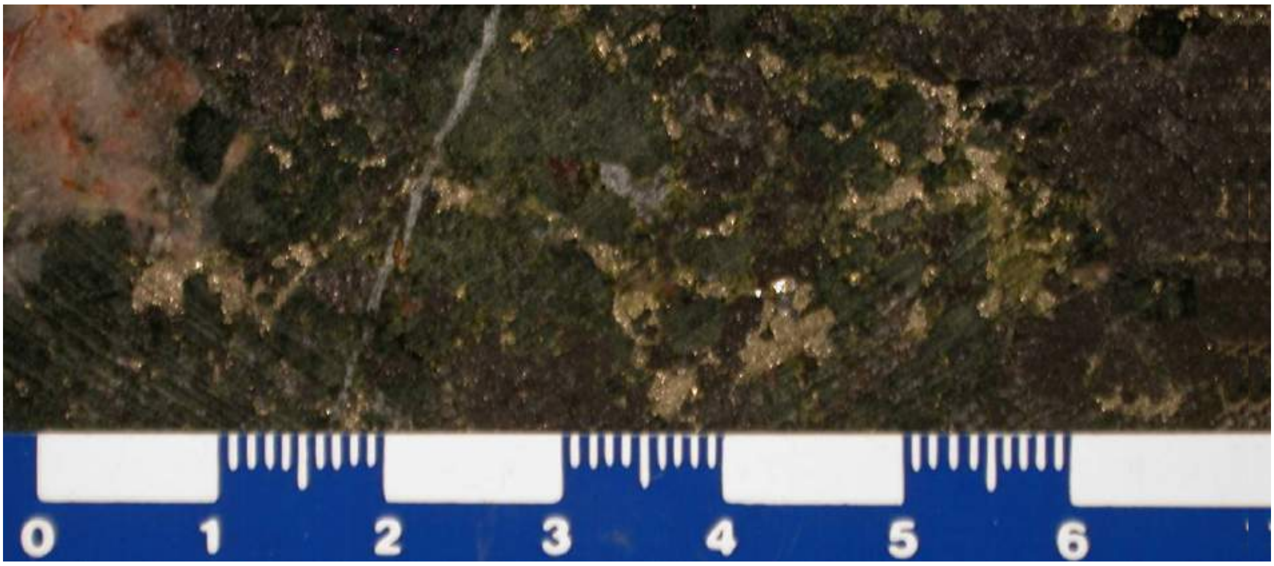


Figure 11.4 Close up of Figure 11.3.

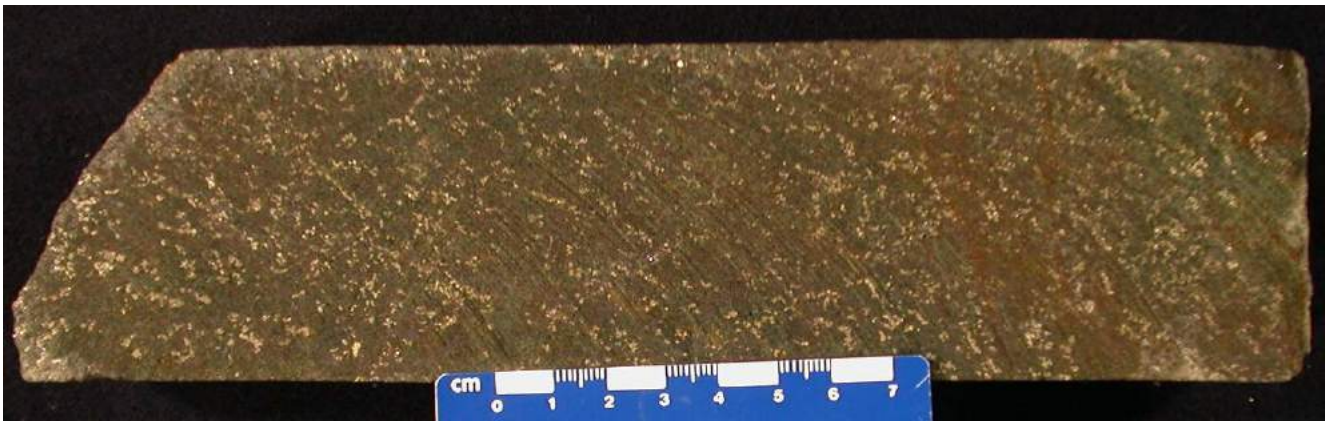
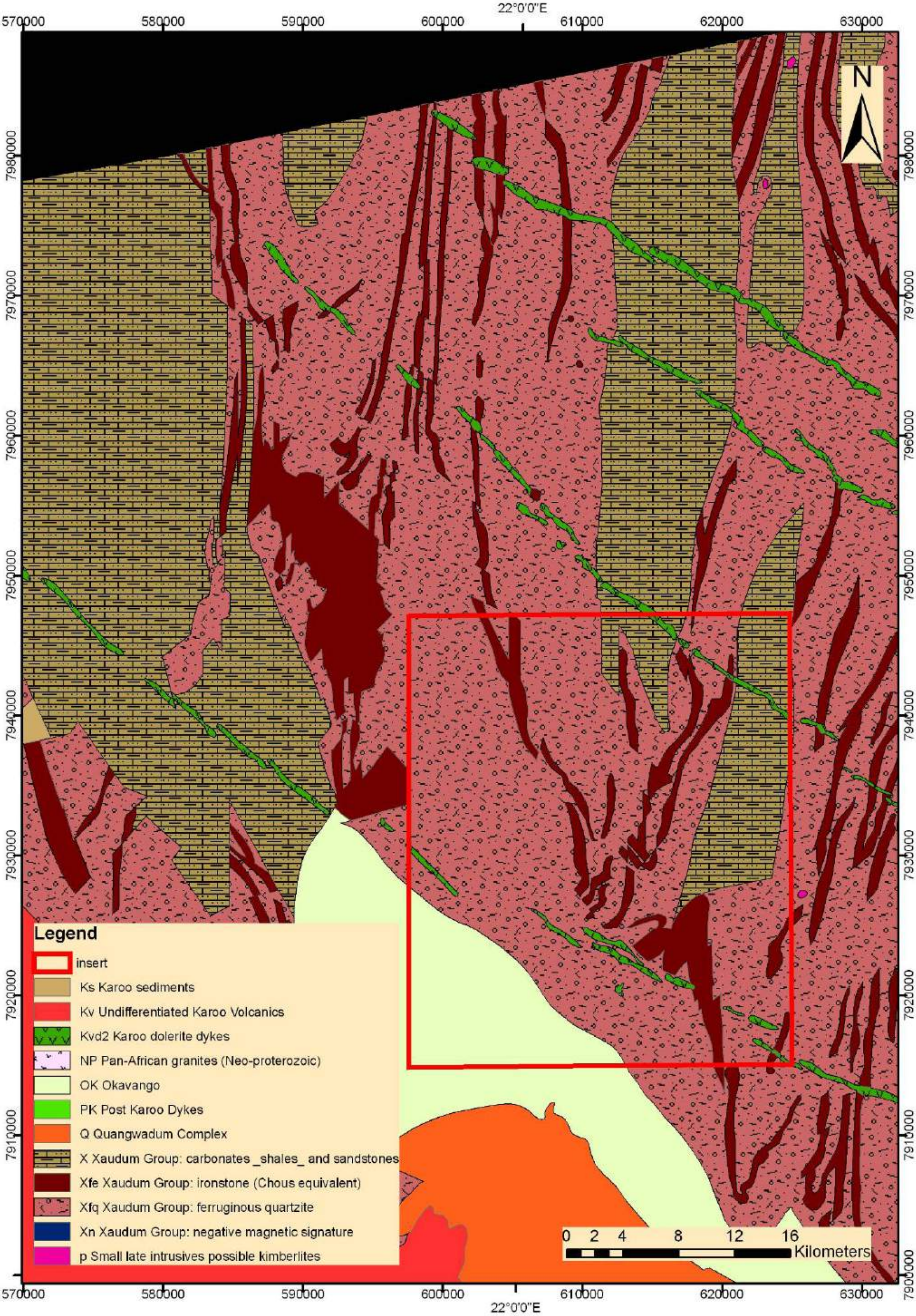
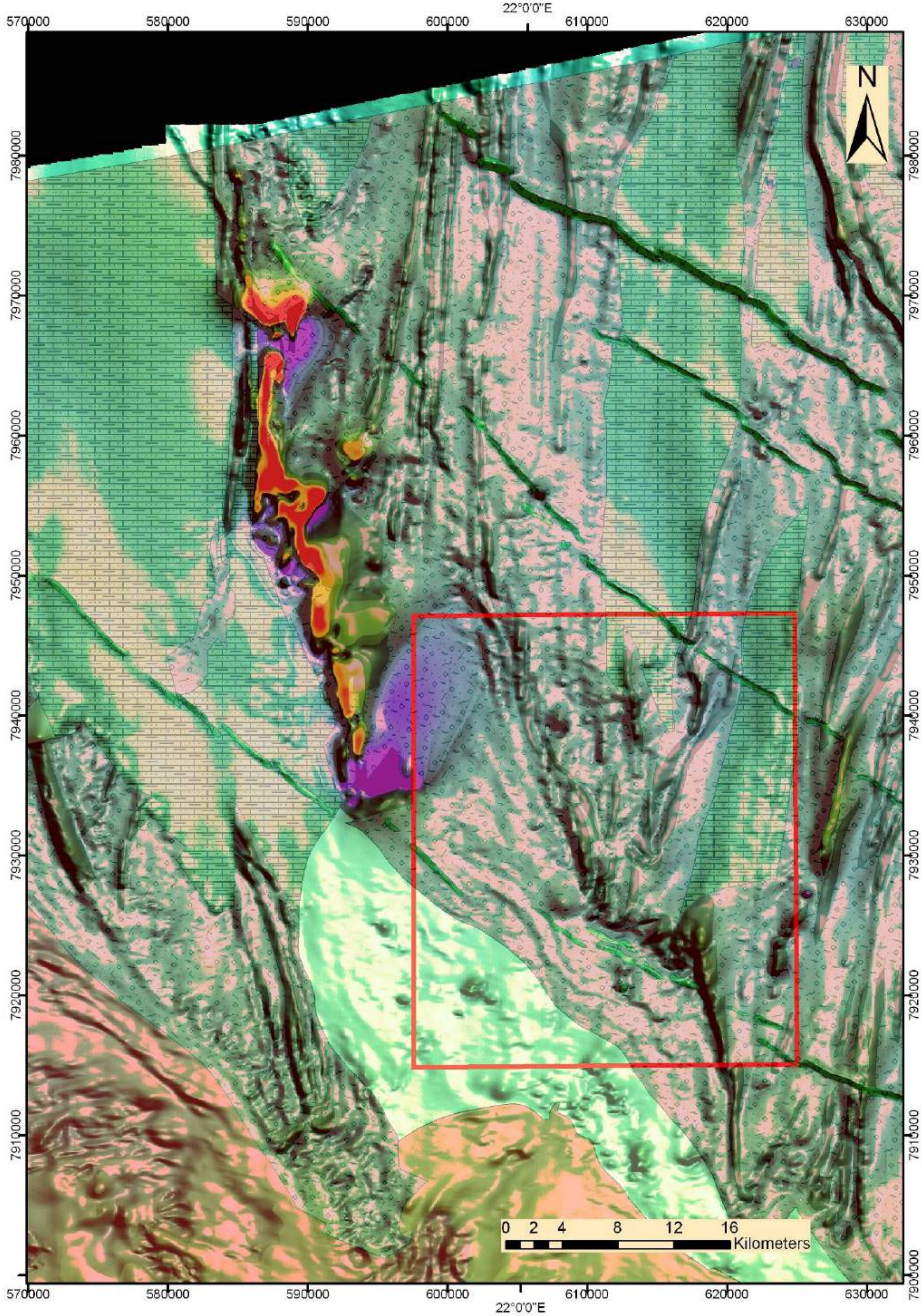


Figure 11.5 Disseminated sulphides in metabasalt.

Figure 11.7 Sulphides deformed along mylonite fabric in garnet bearing paragneiss.



Appendix Figure 1 Structurally enhanced aeromagnetics data image overlain by geology (0% transparent). The outline shows the location of the current drilling site shown in text figure 10.



Appendix Figure 2 Structurally enhanced aeromagnetics data image overlain by geology (60% transparent). The outline shows the location of the current drilling site shown in text figure 10.

Supplementary Material 1: General characteristics of the Tsodilo Hills base metal sulphides and the location of the Matchless Amphibolite Belt Extension (MABE) in NW Ngamiland, Botswana.

Tsodilo Hills Prospect is situated (22°00'E, 18°42' S) about 40km north west of the location of the Matchless Amphibolite Belt (MAB) proposed by Ludtke (1984) and Meixner (1983) (SM 2). The nature of the mineralization encountered in this area bears strong similarities to the Kalumbila Co-Ni-Cu deposits Steven & Armstrong (2003). These similarities prompted a more detailed comparison of the available structural, lithological, soil geochemistry, geophysics and age data for the two regions (SM 3).

The combination of the sulphide-rich cores, local geophysical anomalies (RTP-TMI, Bouger Anomaly Gravity), structural (fault junctions, antiformal features) and lithological (sulphide rich-carbonaceous shales) features in the context of the promising regional characteristics (proximity to MAB, tectonic fabrics etc) characterize the Tsodilo Hills drill site as an area of very high economic potential. This mineralization may be associated with two tectono-thermal metamorphic events which led to mineralization during the Damara Orogeny. These events include one associated with mineralization in the MAB (circa: 500 – 480 Ma) and an older event (comprised of two phases) associated with the Lufilian Arc (SM 9) and Zambezi Copper Belts (550 – 510 Ma; M1 ≈ 540 Ma; M2 ≈ 520 – 510 Ma).

A detailed investigation of the aeromagnetic data, historical field data (1966) and previous data collated was conducted to establish the entry point of the MAB into Botswana (SM 4). While linear extrapolations from the last known MAB outcrop in Namibia based on Gray et al (2008) suggest a more northern entry point at approximately 20°17'S, the magnetic trends suggest that these units are likely to have been deformed (folded/ thrusted?) towards a northerly direction at some point. The resultant trends show a better alignment of the postulated MAB entry point into Botswana at approximately 20°45'S.

Ternary aeromagnetic data has been useful in highlighting thrust faults in the Okavango region (Kinabo et al., 2008). An examination of the ternary aeromagnetic imagery showed a series of linear anomalies (thrust/fault lineaments) that overlap with the MAB Extension (MABE). Prominent anomalies are also present in the bouger anomaly gravity (horizontal gradient and the band passed) images and RTP-TMI aeromagnetic data that coincide with the MABE.

A preliminary investigation of recently acquired VTEM data revealed an anomalous area approximately 25 km sub-parallel and northwest of the MAB location centre-line as defined by Ludtke and the KDP (SM2 and SM7). More recent VTEM data profiles suggest that the previous identified anomalous region represents MABE material within a NW-SE trending fracture/shear zone (SM 11).

New targets have also been identified for more southern PLs that are intersected by the MABE. These targets were defined on the basis of aeromagnetic, gravity, structural, soil geochemistry (high Ni and Cu values) and other data (SM 6 and SM 13). Landsat ferrous oxides ratios are higher in these areas (PL118-119/2005) than those encountered in the current drilling area (SM 12). This suggests that even more sulphide-rich cores may be expected in these regions.

Modal mineralogy (QEMSCAN®) results obtained for 1821-C3, 1822-C4 and 1822-C8 (Stammer, 2008) were compared with MAB deposit and associated amphibolite sulphide mineralogy published by Schmidt and Wedephol (1983) and (Killick, 1982). The analyses revealed high iron sulphide values ranging from 7.8 to 13.2 % , with chalcopyrite being the primary fe-sulphide. These high fe-sulphide values confirm the proximity of current drilling to the MABE. In summary, all of the data considered to date indicates that Tsodilo Resources Pty Ltd holds prospecting licenses in areas that intersect two major sections of the MAB Extension (MABE) in Botswana.

References

Aeromagnetic Survey of Western Ngamiland for and on behalf of The Ministry of Mineral Resources and Water Affairs Government of Botswana Final Report: July 1996 - March 1998 :-7-ACP-BT-0038 Contract:-CTB 10 / 2 / 14 / 95-96

Annels, A.E. & Simmonds, J.R. (1984) Cobalt in the Zambian Copperbelt. Precambrian Research, 25, 75-98.

Daly (1986) The intracratonic Irumide Belt of Zambia and its bearing on collision orogeny during the Proterozoic of Africa. In: Coward, M. P. & Ries, A. C. (eds) Collision tectonics, Geological Society Special Publication No. 19, pp 321-328.

De Wit, M. (pers. comm. 2008) Africa Earth Observatory Network (AEON) – Tsodilo Resources Limited Joint Research Program on the Location of the Matchless Amphibolite Belt / Lufilian Arc / Zambezi Copperbelt type Sulphide Deposits in NW Ngamiland.

Eckardt,F. (2008) AEON – KDP Kalahari Drilling Program, AEON/EGS, University of Cape Town (file ref: AEON Kalahari Drilling Proposal v7 10-03-08.pdf)

Geological Survey Department, Lobatse (1997)The Pre-Kalahari Geological Map of the Republic of Botswana.

Gray et al (2008) Diagrams (Unpublished)

Hanson,R., Wilson, T. & Wardlaw, M. (1988) Deformed batholiths in the Pan-African Zambezi belt, Zambia: Age and implications for regional Proterozoic tectonics. Geology, vol.16, p 1134-1137.

Hartnady, C., Joubert, P. & Stowe, C. (1985) Proterozoic Crustal Evolution in Southwestern Africa. Episodes, vol.8, No.4, pp.236-244

Johnson, S. P., Rivers, T. & De Waele, W. (2005) A review of the Mesoproterozoic to early Palaeozoic magmatic and tectonothermal history of south – central Africa: implications for Rodinia and Gondwana.

Journal of the Geological Society, London, Vol. 162, pp.433-450.

Kinabo,B.D., Hogan,P., Atekwana, E.A., Abdelsalam, A.G. and Modisi, M.P. (2008)Fault growth and propagation during incipient continental rifting: Insights from a combined aeromagnetic and Shuttle Radar Topography Mission digital elevation model investigation of the Okavango Rift Zone, northwest Botswana. TECTONICS, VOL. 27, TC3013, doi:10.1029/2007TC002154

Linol,B. (2008) DESCRIPTION OF THE TSODILO BOREHOLE. Ngamiland, Northwestern Botswana -facies description and stratigraphic analyses of the sedimentary succession. Progress Report (file ref: ProgressReport_Tsodilo.pdf)

Linol,B. de Wit,M.J., de Wit, M.C., Thorose,E., Bruchs,J., Eckardt, F & Guillocheau,F. (2008) Stratigraphy of calcrete and related climate proxies from the Kalahari Plateau: new clues to 100 million years of climate fluctuations across central Africa. 5th EGU International Alexander von Humboldt

International Conference: IPHAKADE – Climate changes & African Earth Systems – Past, Present and Future.

Ludtke, G. (1984) Geophysical, Geochemical and Geological Investigations in the Ngami and Kheis Areas of Botswana 1980 – 1983. Final report. (GS 17 Project – Mineral Exploration of the Kalahari) 319p.

Meixner, H.M. (1983) Geological framework of Western Botswana and adjacent areas. Kalahari Drilling Project.

Raybould, J.G. (1978) Tectonic controls on Proterozoic stratiform copper mineralization. Trans. Inst. Min. Metall. B79-B86

Stammer, J. (2008) Preliminary data on three base metal core samples from Botswana. Advanced Mineralogy Research Center, Colorado School of Mines.

Steven & Armstrong (2003) A Metamorphosed Proterozoic Carbonaceous Shale-Hosted Co-Ni-Cu Deposit at Kalumbila, Kabompo Dome: The Copperbelt Ore Shale in Northwestern Zambia. Economic Geology Vol. 98, 2003, pp. 893–909

Unrug, R. (1988) Mineralization Controls and source of Metals in the Lufilian Fold Belt, Shaba (Zaire), Zambia and Angola. Economic Geology, Vol. 83. pp. 1247-1258

Additional supplementary materials

SM 2 UPDATE JANUARY 2009 (pp.1-19)

SM 3 TSODILO HILLS PROSPECT (pp.1-22)

SM 4 MAB ENTRY POINT (pp.1-39)

SM 5 TERNARY AEROMAGNETICS DATA (pp.1-17)

SM 6 AOIs FOR NEW PL APPLICATIONS (pp.1-18)

SM 7 MAB LOCATION - GRAVITY AND VTEM DATA (pp.1-19)

SM 8 DIAGRAMS MAB AND PRELIM PROCESSED VTEM DATA (pp.1-22)

SM 9 LUFILIAN ARC FOLD-THRUST BELT(pp.1-15)

SM 10 MODAL MINERLOGY COMPARISON WITH MAB(pp.1-7)

SM 11 FAULTING IN PROSPECT LOCATION(pp.1-12)

SM 12 FERROUS OXIDE VARIATIONS (pp.1-5)

SM 13 DIAGRAMS FOR POSSIBLE NEW TARGETS IN SOUTH (pp.1-19)

SM 14 CU IN ZAMBIA (pp.1-25)

SM 15 QUARTELY REPORT DECEMBER 2007(pp.1-44)

SM 16 UPDATE NOVEMBER 2007(pp.1-8)

SM 17 THE MATCHLESS AMPHIBOLITE BELT IN NAMIBIA(pp.1-4)

SM 18 PRELIMINARY DRILL LOGS & ICP DATA – CF. MAB (NAMIBIA)(pp.1-60)