Paper Number: 51

The Alteration Index as a guide to base metal sulphide mineralisation in the Xixano Complex, Northern Mozambique.

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The regional geology of northern Mozambique and the Xixano Complex has been addressed in numerous publications, most recently by Boyd et al. [1]. Pan-African deformation, resulted in the accretion of Neoproterozoic volcanic arcs that were formed outward of the main Mesoproterozoic supracrustals. This event, locally known as the "Mozambican" or "Lurian" orogenic cycle, may also have introduced volcanogenic massive sulphide mineralization.

The Xixano Complex is a NNE-SSW trending terrain and includes mafic granulites. Dominant lithologies are paragneiss, biotite gneiss, mica schist, meta-arenite, granitic to tonalitic gneiss, amphibolite and marble. The metamorphic grade within the Xixano Complex is predominantly amphibolite to granulite facies. Recent research, and exploration by Rovuma geologists, suggests that the large-scale geometry of the Xixano Complex in NE Mozambique records at least three phases of deformation due to the pervasive overprint of the Pan-African orogeny.

Large et al. [2] provide a boxplot using the Alteration Index and the Chlorite-Carbonate-Pyrite index as a means of determining proximity to mineralization associated with volcanic rocks. The mineralization model is based on the typical alteration halos associated with these deposits. This study was undertaken to see whether the alteration Index could provide a vector for base metal mineralization in this area.

Rovuma geologists provided carefully selected whole rock samples, comprising mainly 'felsic' granulites and mafic granulites from the Mavala – Mpaca area for alteration index investigations.

The alteration boxplot shows a clear separation of mafic and felsic lithologies. The mafic samples, andesitic-basaltic in composition, are the least affected by alteration. The felsic rocks exhibit a trend developing towards chlorite-pyrite and chlorite-carbonate alteration, which suggests hydrothermal alteration. These rocks include garnet quartzite, gahnite quartzite and various quartz-garnet-biotite-feldspar-graphite rocks. The Rovuma Geologists subsequently identified chlorite-quartz-feldspar-garnet and quartz-feldspar-phlogopite as hanging wall and footwall markers to 'massive' base metal sulphide mineralisation.

References:

[1] Boyd R. et al. (2010). The Geology and Geochemistry of the East African Orogen in Northern Mozambique. S. Afr. J. Geol. 113.1: 87 -129.

[2] Large R. R. et al. (2001). The Alteration Boxplot: A simple approach to understanding the relationship between alteration mineralogy and lithogeochemistry associated with volcanic-hosted massive sulphide deposits. Econ. Geol. 96: 957-971.