The Omitiomire Copper Deposit - shear-zone hosted mineralization during return flow of basement rocks in the Southern Zone accretionary prism of the Pan-African Damara Belt, Namibia

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The Omitiomire copper deposit (+ 1 million tonnes contained copper metal), located 120 km northeast of Namibia's capital Windhoek, is a recent discovery in the Pan-African (550-500 Ma) Damara Belt of central Namibia (Steven et al., 2000; Maiden et al., 2013). The tectonic setting, host rocks, metamorphic grade and structural controls of the mineralization seem to defy common classification schemes. The deposit is situated in the amphibolite-grade, easterly trending fold-and-thrust belt of the Southern Zone of the Damara Belt that records the accretion of mainly trench sediments during northward subduction of the Kalahari Craton below the Congo Craton between ca. 600-520 Ma. Copper mineralization, however, is hosted by Mesoproterozoic (ca. 1100 Ma) amphibolite bands within tonalitic and dacitic gneisses. These gneisses, including the Ekuja Dome that hosts the Omitiomire deposit, represent structural windows through the basal parts of the Southern Zone accretionary prism into the underthrusted Kalahari Craton.

Gneisses of the Ekuja Dome are characterised by a shallowly-dipping, concentric gneissosity (S2) roughly parallel to the margins of the dome, and a pervasive, unidirectional, northerly trending rodding lineation. Copper mineralisation is hosted by a shallowly-dipping, anastomosing shear zone system contained within the regional S2 gneissosity on the eastern flank of the dome. The ore is dominated by chalcocite (> 90vol.% of sulphides), with only minor amounts of bornite, chalcopyrite and traces of covellite (Steven et al., 2000; 2001). Deformation and copper mineralization are closely associated with the retrogression of, in particular, metamafic rocks and the replacement of amphibole-plagioclase-garnet assemblages in amphibolites by biotite-epidote and biotite-chlorite-epidote schists. Abundant quartz veining also testifies to fluid infiltration during deformation. The syntectonic introduction of the copper mineralization is underlined by the intergrowth of chalcocite with biotite-epidote and chalcocite forming part of the mylonitic shear-zone fabric. On a deposit scale, ore-grade mineralization defines an overall lenticular, gently (<20°) east dipping ore body contained within the anastomosing retrograde shear zone. The linear, >3.5km N-S strike extent of the mineralization is parallel to the regional stretching lineation.

U-Pb ages from titanite intergrown with the retrograde biotite-epidote assemblage yield ages of ca. 520 - 485 Ma (Maiden et al., 2013). This underlines that deformation and associated fluid flow are related to Pan-African tectonism and correspond, on a regional scale, to the late-stage isothermal decompression path of metasediments of the overlying

prism metaturbidites (Kasch, 1986). We suggest that the structural inventory and late-stage, retrograde fluid flow and mineralization in the Ekuja Dome are related to the exhumation and return flow (expulsion) of basement gneisses in the subduction zone channel at the base of the Southern Zone accretionary prism during the waning stages of crustal convergence. Fluid flow and mineralization occur in narrow, extensional detachment zones related to the exhumation.

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