Exhumation of the Sucking-Dayman Massif, Papua New Guinea

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Extension, evident as seafloor spreading in the Woodlark Basin, is actively propagating into the continental crust of Eastern Papua New Guinea, where regional ductile shear zones and brittle faults have recently exhumed metabasite rocks of the Suckling-Dayman Massif (9.5-10°S, 149-150°E). Utilising field, petrographic microscope and electron microprobe analyses, we investigate the structural and kinematic evolution of the Dayman shear zone, as well as the mineral chemistry of key metamorphic assemblages that define the shear zone fabrics. The results of this investigation indicate that the Dayman shear zone is an extensional shear zone with top to the north-northeast transport. Macro- and micro-kinematic indicators in the ductile shear zone include common S-C fabric, mantled porphyroclasts, ‘mica' fish, pressure shadows on pyrite, grain-scale faults, and asymmetric micro-boudinage. Kinematic indicators display a very regular sense of shear consistent with a simple shear dominated shear zone. The shear zone fabric is defined by dominantly greenschist facies metamorphic assemblages including abundant chlorite, epidote, albite and quartz with or without actinolite, titanite and calcite. Low strain pods within the shear zone display relict mafic igneous textures and relict clinopyroxene. The pods may include metamorphic lawsonite and blue amphibole in the mineral assemblage, suggestive of high P/T metamorphism of the metabasite massif prior to exhumation. Sedimentary rocks of the hanging wall include the Gwoira Conglomerate that contains clasts of low-grade (prehnite-pumpellyite facies) sheared metabasite. Metamorphic minerals identified in clasts include prehnite, pumpellyite, chlorite, albite, quartz and epidote. Monomineralic clasts include clinopyroxene, albite and quartz. The majority of clasts are consistent with a low-grade metabasite source that may or may not be sheared. A minor component of the clasts include graphitic intergrowths of quartz and feldspar, consistent with a pegmatitic to felsic source. Rare horizons in the Gwoira Conglomerate contain abundant shallow marine fossils. These observations suggest that the provenance for the Gwoira Conglomerate may include early exhumed low-grade metabasite of the Suckling- Dayman massif and that Gwoira Conglomerate may have been deposited on the flanks of the actively exhuming massif. A lack of metamorphism or ductile deformation in the Gwoira Conglomerate supports this interpretation.