Link Between Deformation and Pegmatite Emplacement in the Mataki Greenstone Belt, North East Zimbabwe Craton

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The Mataki greenstone belt (MGB) in the north-eastern part of the Zimbabwe Craton hosts several pegmatite occurrences, including the Neoarchaean lithium-bearing Benson mine pegmatites. While the emplacement of structurally controlled pegmatites is fairly documented globally, the link between deformation structures and pegmatite emplacement remain poorly understood in the MGB. This study integrates structural mapping and petrographic analyses to assess the deformation history of the MGB and its influence on pegmatite emplacement. Three deformation events and pegmatite generations are recorded in the MGB. The earliest recognisable deformation event (D1) formed bedding-parallel schistosity S1 in thinly-laminated schists in the biotite zone of greenschist facies metamorphism. D2 folded bedding-parallel schistosity S1 into cm-m-scale tight to isoclinal folds F2 associated with moderately E-dipping fold axial planes and schistosity under upper greenschist to lower amphibolite facies metamorphism. Lithium-bearing pegmatites, including the Benson mine pegmatites were folded during D2 suggesting that they likely emplaced along S1 planes during the late stages of D1. The second generation of lithium-barren pegmatites crosscuts D2 structures. Lastly, D3 operated under medium amphibolite to granulite facies conditions in the greenstone belt and the structurally overlying migmatitic gneiss terrain. D3 formed moderately NNE-dipping schistosity and mylonitic foliation S3 carrying moderately ESE-plunging mineral and stretching lineations associated with top-up to the west sense of shear. The last generation of pegmatites emplaced along S3 planes and preserve foliation marked by preferred alignment of muscovite which is concordant to S3 in the host rocks. These pegmatites do not carry lithium in their system. Our findings suggest that the most prospective pegmatites for lithium in the MGB are the ones folded during D2.