

Unraveling the Age of HT Metamorphism in Eastern Senegal: Evidence from U-Pb *in-situ* Analyses on Monazite and Sm-Nd Garnet Geochronology

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Metasediments of the Paleoproterozoic Diale Dalem Basin are affected by a polyphase metamorphic evolution during the Eburnean Orogeny (2.25 - 2.00 Ga). The garnet-staurolite-sillimanite metapelites contain two generations of garnet. Garnet porphyroclasts wrapped in the S₃ schistosity contain inclusions of chlorite, epidote, biotite, ilmenite, plagioclase, and quartz that delineate the S₂ schistosity. The development of S₃ is coeval with the growth of inclusion-free rims around the garnet porphyroclasts and by garnet neoblasts. Garnet porphyroclast displays a zoning pattern typical of prograde metamorphism associated with decompression from 9 to 6 kbar and an increase in temperature from 550 to 620°C. Monazite neoblasts in the S₃ schistosity yield LA-ICP-MS U-Pb ages of 2052 ± 7 Ma and 2048 ± 8 Ma, whereas inclusions in staurolite yield an older age at 2090 ± 16 Ma.

Sm-Nd garnet geochronology yields a bulk garnet age of 2080.2 ± 7.7 Ma on garnet porphyroclasts and 2049.1 ± 3.1 Ma on neoblasts. The results highlight an agreement between U-Pb ages from monazites and Sm-Nd ages from metamorphic garnets. The oldest ages are interpreted as the age of the prograde regional metamorphism during burial, while the youngest are attributed to the thermal peak.

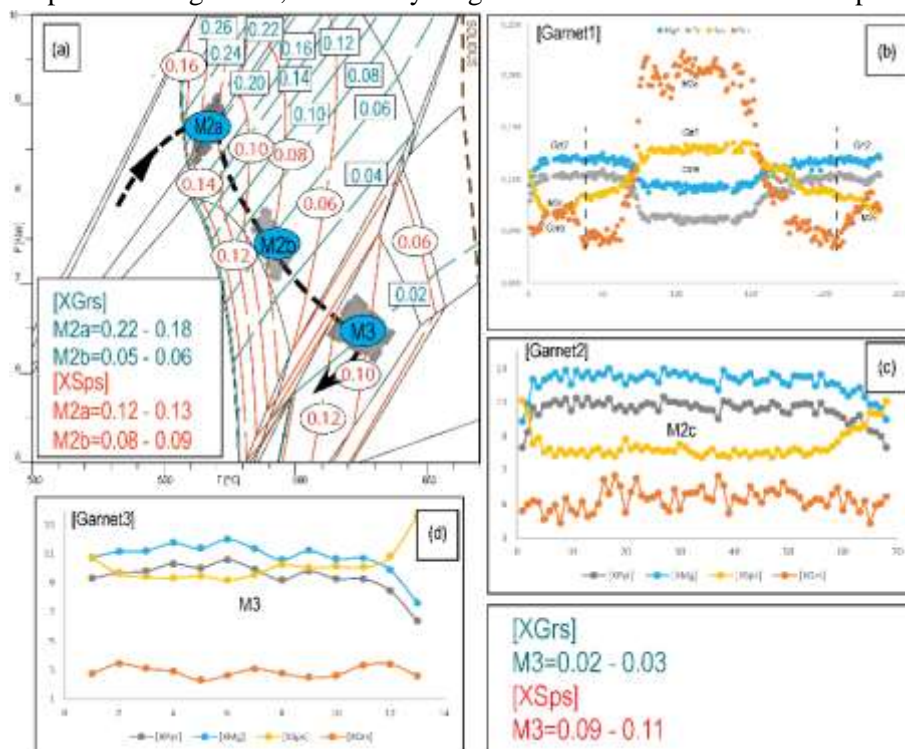


Fig. 1: MnNCKFMASHTi P-T pseudosection illustrating phase equilibria for metagreywacke sample 44a2 and the chemical composition variation along radial profiles generation garnets g1, g2, g3.