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Tectonothermal evolution of Meghalaya Gneissic Complex, NE India: a mimic of Chottanagpur Gneissic Complex during Grenvillian orogeny

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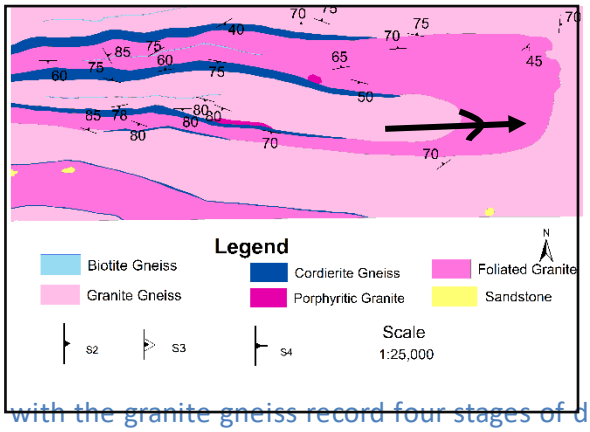
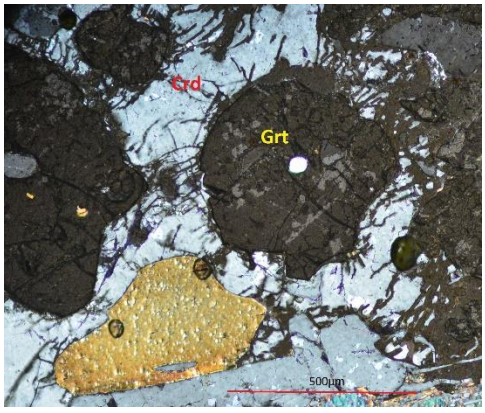
Figure 1: Geological map of the SW part of AMGC showing regional fold pattern and disposition of different lithounit.

Figure 2: Photo micrograph showing formation of cordierite after garnet during isothermal decompression.



Tectonothermal evolution of Meghalaya Gneissic Complex (MGC) lying in north east part of the peninsular India has significant correlation with Chottanagpur Gneissic Complex (CGC) during Grenvillian Orogeny. The gneissic complex exposed in the West Khasi Hills, south western part of Meghalaya records the tectono-metamorphic history during middle Proterozoic time. Large scale mapping (1:25000 scale) of 330km^2 area show that high grade granulite occur as enclaves within granite gneiss. This detached lensoidal bodies of high grade metasediments along with the granite gneiss record four stages of deformation (D_1, D_2, D_3, & D_4). Rock types exposed in the area include cordierite gneiss, biotite gneiss and granite gneiss, which were intruded by granites of different time and dimension. Early gneissic foliation (S_1) preserved in metasediments and granite gneiss are folded into very tight to isoclinal, reclined to recumbent folds (F_1) and records the earliest folding event of the area with a pervasive axial planar cleavage (S_2). Pre D_1 high grade assemblage (>750^{0}C & >4.5Kbar) in metasediments has passed through two stages of retrogradation viz. a) spinel-cordierite breaks down to garnet-sillimanite and b) garnet is rimmed by cordierite due to isothermal decompression during rapid upliftment from a depth of 4.5 to 2.5 Kb. Granite gneiss follows one prograde path during D_1 and D_2 where garnet formed at the expense of biotite, plagioclase and quartz, and granite emplacement took place syntectonically into the core of F_1 antiform. However the pre D_2 granulite facies assemblage of metasediments as reported by Chaterjee et al., 2007 [1] is pre D_1 in our record, while syn D_1 deformation and metamorphism in granite gneiss and metasediment is correlatable with amphibolite facies condition. D_3 event is responsible for folding of the entire litho package coaxially to the early deformation in a low to moderate easterly plunging regional antiform-synform with ENE-WSW axial plane. During that time biotite-sillimanite stabilized at the expense of cordierite and K-feldspar at 680-580^{0}C and 2.5-2Kbar in cordierite gneiss. D_4 results in broad



warping in map scale and cross folding with NNW-SSE axial planar cleavage where biotite, plagioclase and quartz stabilized at 600^0C below 2Kbar in both granite gneiss and metasediments. Tectonothermal evolution of MGC recording four stages of deformation is correlatable with the deformation pattern of CGC during Grenvillian time followed by Rodinia amalgamation and axial planner trend of the regional fold in MGC is exactly matching with the regional trend of CGC in further west.

References:

[1] Chatterjee N et al. (2007) Precambrian Research 152:1-26