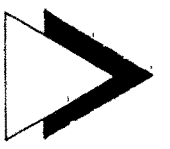
DISCUSSION



DISCUSSION

Before delving deep into the evolutionary history of the rocks of Danta area, it has become imperative to give a bird eye view of the previous investigations as this not only aquaints the reader with the nature of the work but creates a base on which a reader can appreciate the findings of the present worker in the study area. The main controversy is about the probable age of this granulite facies metamorphism in Danta area.

Crawford (1970) envisaged that metamorphism is most intense along the Aravalli lineament, where it is of amphibolite facies near Ajmer (Rajasthan) increasing

to granulite facies southwards into Gujarat. Subsequent investigations of Desai et al., (1978), Patel et al., (1985) and Desai & Patel (1986 ,1992) for the first time suggested that the rocks of the Balaram-Abu Road area, north of the present area show evidences of Pre-Delhi granulite facies metamorphism and that these high grade metamorphic rocks form the triangular shaped outcrops bounded by three major lineaments. There is no radiometric age data to support this contention. Sychanthavong and Merh (1984) and Powar & Patwardhan (1984) opined that this granulite facies metamorphism is related to Delhi deformation. Sharma (1988) however mentioned that the high temperature low pressure metamorphism in Balaram-Abu Road area appears to have been connected with the Erinpura granite intrusions. Sharma and Narayan (1975) reiterated that in Beawar area of central Rajasthan, there is a possibility of Pre-Delhi metamorphism. Fareduddin et al., (1991) reported the occurrence of tectonic slices of high grade granulite facies rocks in Pilwa-Chinwali-Arath area within the Alwar metasediments of amphibolite facies, 25 km NNW of Ajmer. Though these tectonic wedges of granulite facies rocks of 3.5 to 2.5 Ga are emplaced in the southern extremity of Delhi orogen, they have indicated that metamorphism and emplacement event took place during Delhi orogeny.

As is prevalent in South India, subsequent investigations along Aravalli mountain belt have neither substantiated nor refuted the progressive metamorphism from Rajasthan to Gujarat. Desai and Patel (1987) believe that inliers in Banaskantha and Sabarkantha district of North Gujarat occur as lensoid bodies concordant to regional structure and are strikingly analogous to the granulite facies rocks of Balaram - Abu Road area and the contact between the two is sharp and/or tectonic. The folding of Delhi, Pre-Delhi sequence and the subsequent erosion has exposed the Pre-Delhi sedimentaries to occupy anticlinal fold cores (?) and form inliers. In Danta area, these rocks are confined between paragneisses and the granites and it is difficult to establish about the nature of contact between them. The author therefore thinks that pelitic and calcareous granulites could be attributed to Pre-Delhi metamorphism but the formation of migmatitic gneisses and the related mineral assemblages has to be attributed to Delhi deformation and Erinpura granite activity. The existence of both pyroxene-hornfels and hornblende - hornfels facies in the close vicinity suggests the thermal metamorphic imprint on rocks of differing metamorphic grades formed (temporal and spatial variation in the type and grade of metamorphism).

Sharma (op.cit.) referred to Balaram-Abu Road area and suggested that Delhi rocks in the above area show thermal overprint on earlier regional recrystallization event and he has connected high temperature-low pressure metamorphism with the Erinpura granite intrusions. According to him the pressure temperature estimates of Desai et al., (1978) are in marked contrast with the P-T conditions estimated in the neighbouring areas of Deri and Ambaji (Deb, 1979), but Desai et al.,(1978) have already mentioned that in Balaram- Abu Road area, the metamorphism belongs to Pre-Delhi and Deri-Ambaji area falls strictly within the Delhi Supergroup. According to them [Patel et al., (1985)] on the basis of the presence of igneous textures and the absence of garnet in them. In the low pressure granulite belts of world, the charnockites are always devoid of garnet. He further suggested that these rocks escaped regional recrystallization or were emplaced later than this event. Quoting Desai et al., (op.cit.), Sharma (op.cit.) suggests that the occurrence of andalusite in the metapelites containing cordierite, Sillimanite, biotite and K-felspar together with hornfelsic texture are suggestive of pyroxene -hornfels facies and not pyroxene -granulite facies. However in the above paper Desai et al., (op.cit.) have reported the development of andalusite due to thermal metamorphism related to Erinpura granite. Subsequently Desai and Patel (1986)

have already indicated the existence of pyroxene hornfels facies in Balaram -Abu Road area. If the low pressure - high temperature metamorphism, according to Sharma (op.cit.), is related to Erinpura granite activity, it is difficult to explain the formation of hornfelses with andalusite. Is a low pressure high temperature metamorphism and development of hornfelsic texture synchronus with Erinpura granite activity or how much time has lapsed between the low pressure - high temperature regional metamorphism and thermal metamorphic event ? The explanation is ideally provided by the metamorphic rocks in Danta area, where such granulitic and amphibolite facies are intermingled. In an area like this it is thus more reasonable and logical to advocate the development of hornblende hornfels facies and pyroxene hornfels facies of thermal metamorphism in response to Erinpura granite activity. Wherever low pressure granulite rocks are found in different parts of world, the mineral assemblages suggest an environment intermediate between those of the pyroxene granulite subfacies, the hornblende hornfels facies and pyroxene hornfels facies of contact metamorphism. Wynne-Edwards (1967). Schreurs and Westra (1986), Young et al., (1989) and Dempster et al., (1991) believe that such low pressure assemblages are developed in both regional metamorphic rocks and in some thermal aureoles of contemporary granite pluton. They also

attribute low pressure high temperature metamorphism to synorogenic granite emplacement. In all these cases, there is a development of thermal aureole, but andalusite, a typical contact metamorphic mineral, is absent. Moreover to take this polymetamorphism as a single thermotectonic event is the remotest possibility. The only logical inference the author draws is to link this polymetamorphism to chronological sequence of events putforth earlier. In Danta area the restricted development of hornfelsic rock due to thermal overprint on granulite and amphibolite facies rocks leads the author to believe that granulite facies metamorphism has to be Pre-Delhi and the amphibolite facies metamorphism leading to the development of migmatitic rocks has to be coeval with Delhi deformation.

A parallel can be drawn with the other areas for e.g. 1) Sutton and Watson (1951) Scourie, Scotland 2) Wilson (1952), Australia 3) Cooray (1960, 1962), SriLanka 4) Sen (1959), East Manbhum, Bihar, India 5) Binns (1962), (W.Australia) 6) Windley (1972), West Greenland 7) Krupicka (1973), Devon Island, Canadian Shield 8) Wynne-Edwards (1967), Westport map area, Canada 9) Nelson front of Manitoba, Canada 10) Harris et al., (1982), Limpopo belt of South Africa 11) Hietanen (1947), Turku area, Finland where similar metamorphic history has been envisaged. It is possible that the time

relationship between the high grade rocks and the emplacement of granites may vary from area to area.

That this granulite facies metamorphism could be Pre-Delhi, is amply revealed by the presence of layered igneous bodies already referred to earlier, which shows granoblastic texture and triple junction (120°) within felspar and pyroxenes. This could be early metamorphism only and to suggest that it is has escaped the Delhi metamorphism and that they are intrusive into Delhi is fortuitous.

Delhi deformation is very conspicuous in entire Rajasthan. Most of the previous workers connect granulite facies metamorphism to Delhi folding. The Banded Gneissic Complex of Rajasthan showing the granulite facies metamorphism is Pre-Delhi stratigraphically, but shows strong imprint of the Delhi folding. Therefore, if the Delhi folding is responsible for causing all this metamorphism, the idea of Pre-Delhi metamorphism in Rajasthan becomes redundant.

In the concluding epilogue, the author has to state that the observations arrived at by him have unravelled very pertinent information in the study area. It is for the first time that such intermingling of granulite and amphibolite facies regional metamorphism has been reported from this metamorphic terrain. It is

not the intention of the author to mention that what all he has said is a final word, but he has definitely probed into the heart of the problem. He has opened up avenues on which future, work only may lend credence' to these views to solve the problem of geological evolution of this complex terrain of North Gujarat.