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COMMENT

Pressure temperature estimates of the basic granulites and conditions of metamorphism in Sargur terrain, Southern Karnataka and adjoining areas.

(A comment on the paper by A. S. Janardhan and D. Gopalakrishna, published in the Journal of the Geological Society of India, Vol. 24, No. 5, pp. 219-228.)

Two points raised by Janardhan and Gopalakrishna (1983) in their Discussion invite comment. First, they mention the occurrence of staurolite-bearing assemblages in the Dodkanya and Sargur supracrustals. Second, they mention the presence of two generations of kyanite in the Sargur supracrustals. High-grade metabasic rocks for these areas have provided temperatures of 737-786° and pressure of around 9 Kb.

The recorded temperatures lie well above the stability field of staurolite (Richardson, 1968; Hoschek, 1969). This presents a dilemma for interpretation of the thermal evolution of this parts of the South Indian Craton, as the semi-quantitative pelite geothermometers appear to contradict grossly those provided by basic granulites.

The presence of two generations of kyanite confirms a view we have adopted from petrographic study of Sargur metapelites: that disequilibrium textures reflecting at least two separate metamorphic events characterize the Sargur supracrustals. Earlier assemblages are syn- or pre-tectonic with the earliest deformation (D_1 of Chadwick *et al* 1981) and include early kyanite, sillimanite, garnet and hypersthene. Later assemblages are syn- or post-tectonic with the D_2 phase of Chadwick *et al* (1981) and it is at this stage that late kyanite and staurolite developed. It is clear from our thin sections that staurolite is post-D_2, as indeed are granulite assemblages from a number of areas in Karnataka and northwestern Tamil Nadu.

There are at least three possibilities that may explain the contradictory temperature fields:

a) The distribution of granulite facies assemblages reveals an apparently strong spatial correlation between them and steep to vertical zones of earlier Archaean shear deformation (Drury and Holt, 1980). Granulite metamorphism and its attendant expulsion of H_2O was probably determined by massive influx of CO_2 (Janardhan *et al* 1982), which undoubtedly transported heat to give transient convective geotherms (Harris *et al* 1982), Control of such fluid streaming by earlier shears may have produced thermal as well as P_{H_2O} heterogeneities, which may be represented by localities with low temperature staurolite-kyanite assemblages.

b) The low temperature conditions for staurolite-kyanite assemblages may reflect immediately post-granulite retrogression facilitated by hydrous fluids rising along the same shear belts after thermal relaxation. In fact reactions of the kind:

$$\text{garnet} + \text{K-feldspar} + H_2O \rightarrow \text{kyanite} + \text{biotite}$$

can be seen in Sargur thin sections.

c) The kyanite-staurolite assemblages may represent an entirely separate, post-granulite facies event which was superimposed on granulites by a process which is not recorded elsewhere in South India.

We favour (b), though (a) has some attractions, but reject (c). However, the polymetamorphic terrain around Mysore is obviously worth comprehensive study, the paper by Janardhan and Gopalakrishna (1983) forming an excellent starting point.

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AUTHORS' REPLY

We are thankful to Drury and Harris for their encouraging comments. We do agree that kyanite is later to F_2 deformation phase of Sargurs (Janardhan *et al* 1979). From the data available, clubbing of staurolite with kyanite as retrogressed product similar to their findings in Tamil Nadu may not apply to Sargurs. Work on staurolite as suggested by the authors need to be done before broad generalizations can be made. ASJ agrees that staurolite exists along with kyanite as a late product in the sapphirine bearing assemblages of Sittampundi, Tamil Nadu.

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