Petrogenesis and Significance of the High-K Calc-alkaline Meta-granitoids in the Kerala Khondalite Belt, Southern India

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The Kerala Khondalite Belt (KKB) is an important lower crustal Proterozoic segment in the southern Indian granulite terrain. Major rock types of the KKB are sodic and potassic gneisses, charnockite and garnet-sillimanite gneisses (khondalite). A remarkable lithological and petrological similarity exists between the KKB and the Highland Complex of Sri Lanka and southern Madagascar [1]. As such, KKB is a critical area for testing models of supercontinent amalgamation and dispersal. However, absence of well constrained petrogenetic models for KKB that compares with the evolution of lower crust in Highland complex and southern Madagascar has been a major impediment. We present here initial results from our ongoing studies on the origin and evolution of K-rich (potassic) gneisses of KKB in relation to Proterozoic supercontinent events. Our results show, in a major departure from earlier metasedimentary origin, that potassic gneisses are metamorphosed granitoids. They are metaluminous to weakly peraluminous showing mineralogical, petrographic and chemical characteristics distinctive of the high-K calc-alkaline suites. Typical of igneous suits, potassic gneisses show minor variation in chemical compositions with most oxides showing negative correlation with SiO_2. Highly differentiated REE patterns ($(La/Yb)_N$ = 10–35) with well-defined negative Eu anomaly suggest lower crustal origin related to partial melting [2]. Chemistry also illustrates distinctive features of arc-related magmas with LILE (K, Rb, Th, and U) and LREE enriched patterns and considerable troughs of Nb, Zr, and Ti. Overall the geochemical features are supportive of origin in relation to a convergent margin setting, possibly in a continental magmatic arc system, which can be connected to the amalgamation and dispersal of continental fragments in a supercontinent event. This study, therefore, provides a lead towards more robust comparisons between the Proterozoic supercontinent events and processes.

References

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