GEOLOGY AND EVOLUTION OF GRANITIC ROCKS OF PAN-AFRICAN AGE OF ORVINFEJELLA, CENTRAL DRONNING MAUD LAND, EAST ANTARCTICA*

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Extended Abstract

The Central Dronning Maud Land (cDML) in East Antarctica occupies a unique position since it is supposed to represent an important suture between East and West Gondwana continents. Recent studies on the geochronological and isotopic aspects of magmatic and metamorphic rocks of cDML have shown that the area probably represents the southern continuation of the Mozambique Belt into East Antarctica. Geological studies covering areas around Kurze, Skorvestallen, Holtedahl and Fenris Hill ranges in central part of Orvinfjella of cDML were carried out to elucidate the geology of East Antarctica during the 15th Indian scientific expedition to Antarctica. The ENE-WSW trending mountain chains of Orvinfjella expose a complex of high-grade metamorphic rocks of Grenville-age intruded by younger granitoids of Pan-African thermal event.

The older high-grade metamorphic rocks comprising migmatites, orthogneiss, banded charnockitic gneiss, paragneiss, boudinaged pyroxene granulite and amphibolite form the basement into which younger granitoids are emplaced. Among the older metamorphics, the banded charnockitic gneiss predominates. The banded charnockitic gneiss is highly deformed and well foliated and preserves relict igneous features, inverted pegmatite, partially melted xenoliths of older and ortho- and para-gneisses and pyroxene granulites indicating its intrusive nature and high temperatures of emplacement. The Rb-Sr whole rock analysis of the banded charnockitic gneiss has yielded an age of 1103±15 Ma related to Grenvillian orogeny.

The younger granitoids are represented by pink hornblende-biotite granite, fayalite-bearing greenish grey granite, leuco-granite and charnockite. The younger charnockite occurs as patches within the Hb-bt granite and shows almost gradational contact with granite. It is coarse grained, grey to greenish grey, massive and contains quartz, K-feldspar, plagioclase, orthopyroxene, hornblende, biotite, and opaques. Few of the charnockites contain only hornblende and biotite as mafic minerals that are developed after orthopyroxene. Dating by Rb-Sr isotopic method of whole rock samples of the charnockite has given an age of 483±53 Ma coinciding with the Pan-African thermal event.

The granitoids together with banded charnockitic gneiss constitute nearly 70% of the rocks exposed in Holtedahl and Fenris area. The granitoids are predominantly quartz monzonitic to granodioritic in composition and are coarse grained, pink coloured, porphyritic and contain quartz, K-feldspar, plagioclase, ferro-hornblende (ferropargasite to hastingsite) with accessory allanite, fluorite and apatite. Some minor variants of granites are grey to greenish grey, porphyritic and contain fayalite, biotite and hornblende as mafics and magnetite, ilmenite and sphene as accessories. The granitoids are meta-alumino-silicates, sub-solvus, post-tectonic, and characterized by marked enrichment of Y, Zr, Nb, Ce, Ba and Sr. Presence of abundant K-feldspar and sodic plagioclase, ferro-hornblende, annite, allanite and fluorite in the granites clearly establishes its affinity to A-type granites.

Recent investigations have shown that all the East Antarctica late- and post-orogenic intrusives were emplaced into granulite facies terrain. A-type granites commonly have high F contents attributed to breakdown of F-rich biotite or amphibole during partial melting of felsic granulite. High LILE content implies a derivation from a non-depleted crust. The field disposition and the petrographic and chemical signatures of granitoids indicate that they are generated by partial melting of relatively anhydrous felsic granulite lower crust. The granitoids were emplaced after the termination of Neo-Proterozoic granulite metamorphism coinciding with the Pan-African thermal event. This thermal even in East-Antarctica may have been associated with internal fracturing of Gondwanaland before eventual breakup.

The geological set up and occurrence of Mesoproterozoic crust in cDML with polyphase metamorphic imprints of Mes - Neo-Proterozoic is reported to be similar to the tectono-metamorphic situation in Mozambique Belt. The Gruber Anorthosite Massif and associated charnockites and A-type granites reported from outside the study area in cDML, is compared with the post-tectonic Pan-African igneous province characterized by anorthosite.

*Lecture delivered at the monthly meeting of the Geological Society of India at Bangalore on 24 April 2002.

JOUR.GEOL.SOC.INDIA, VOL.60, AUGUST 2002
and A-type granitoids reported from Mozambique. Pointing these similarities, recent workers have argued that the cDML could be a coherent part of Mozambique Belt within Gondwanaland, which is also supported by the documentation of sinistral transpression shear zones both in cDML and in Mozambique Belt.

Selected Bibliography

CORRESPONDENCE

DINOSAUR PARK – TO PROTECT THE NATURAL HERITAGE OF JABALPUR

When a complete fossils of Tyrannosaurus, 50 feet long and one of the biggest carnivorous dinosaurs in the world, was dug up in the Lameta Beds near Government Autonomous Science College, Jabalpur by Dr. Sankar Chatterjee from USA in December 1988, the urgent need was to establish a Dinosaur Park in the area. Unfortunately in December 1988 itself, the complete fossil had been taken away but where and by whom (?) is not known to the people of Jabalpur.

Bara Simla, Chota Simla and Pat Baba areas of Jabalpur are known world-wide for containing the dinosaur remains and their fossil eggs. The dinosaur fossils were first collected in India from the Lameta Beds (Upper Cretaceous period) in 1828 by William Sleeman. The fossils, however, were much fragmented and could not be properly recognized. These remains were identified as dinosaur fossils by Lydekker in 1877. Ever since, the dinosaur fossils have been regularly taken to places outside Jabalpur. Matley did systematic collection of the dinosaur fossils during his field work and mapping in the years 1921 to 1929. But the complete fossil of Tyrannosaurus discovered in 1988 is the best example.

The area was previously rich in the fossils of dinosaur eggs. The egg clusters have been dug up and taken for research work by palaeontologists coming to Jabalpur from various parts of the country and abroad. Many pits can now be seen after the digging and taking out of the fossil eggs.

The author has been successful in getting an egg cluster protected in Gun Carriage Factory area of Jabalpur with the cooperation of the Commissioner, Jabalpur Division, Shri M.M. Upadhyaya and General Manager of GCP Shri B. Dutta. But this is not enough. Let this natural heritage (dinosaur fossils and eggs) stretching back to 65 to 100 million years be preserved. The fossils should not be allowed anymore to be taken to other parts of the country or abroad. The establishment of a Dinosaur Park is the best solution. Will the concerned organisations come forward?

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