

ALKALINE MAGMATISM IN DELHI SUPERGROUP

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Abstract

Two periods of hot-spot related alkaline magmatism temporally and spatially confined to Aravalli-Delhi mobile belts at 1500-1100 Ma, and at 950-750 Ma have been recognised. The third period is related to the Deccan volcanic province. These three periods of alkaline magmatism correspond with three periods of widespread rifting events in most of the continents.

Introduction

The alkaline magmatism, though insignificant in areal extent, is very important because of tectonic environment it represents. Alkaline magmatism, continental rifting, and uplift are the expressions of the same fundamental process operating in the evolution of the earth's tectonic environment. In this paper an attempt is made to relate three periods of alkaline magmatism in the northern part of the Indian shield to hot-spot activity and intraplate rifting.

The Delhi Supergroup can be divided into Alwar Group quartzite, the intermediate Kushalgarh limestone and the Ajabgarh Group which is argillaceous in nature. The Supergroup has recorded two episodes of acid magmatism, widely separated in space and time. The older activity between 1700-1500 Ma is mainly recorded in the Alwar basin; the younger activity between 850-750 is recorded in the central and southern Aravalli sector (Gopalan and Choudhary, 1984). These two magmatic events are in general temporal agreement with the two episodes of hot-spot related alkaline magmatism.

Alkaline Magmatism

Table I summarises the distribution of alkaline magmatism in the form of ring intrusions in the northern part of the Indian shield. There are three periods of alkaline and related magmatism; two in the Precambrian at 1500-1100 Ma represented by nepheline syenites of Kishangarh, kimberlites in the Vindhyan sequence, and at 950-750 Ma represented by carbonatites and syenites of Newania, ankeritic carbonates of Kirana Hills (Davies and Crawford, 1971), carbonatites of Narnaul (Saxena *et al.*, 1984), Malani igneous suite (Kochhar, 1984). The third period during the Tertiary is related to the Deccan volcanic province and includes alkali granites and syenites of Mungeria and Sarnu, alkali granophyres of Barda Hill complex, lamprophyres and syenites of Girnar, carbonatites of Amba Dongar, carbonatites and syenites of Mundwara, nepheline syenites of Phenai Mata, and Warsak alkali granites and Koga alkali complex, Pakistan (Kempe and Qasim Jan, 1970).

Interestingly, the two periods of Precambrian alkaline magmatism correspond with the two episodes of acid magmatism in the Delhi Supergroup reported by Gopalan and Choudhary (1984). Kochhar (1984) has opined that the alkaline and related magmatism in the Supergroup is due to recurring hot-spot activity in the region.

TABLE I. Hot-spot related alkaline magmatism.

	Example	Type of intrusion	Rock association	Host Rock	Age
Alkaline Magmatism of Deccan Volcanics Centre	Warsak alk. granites, Tarbela and Koga alk. complex (W. Pakistan)	Arcuate intrusion	Gabbroic sills	Paleozoic metasediments	Late Tertiary
	Nepheline syenites of Phenai Mata	Plug	Gabbro granophyre, anorthosite	Deccan volcanics	Late Tertiary
	Carbonatites of Amba Dongar	Ring complex	Phonolite, nephelinite	Deccan volcanics	37 Ma
	Carbonatites, Syenites of Mundwara	Radial dykes cone sheets	Alk. gabbro, pyroxenite alk. olivine basalt	Erinpura granite	56 Ma
	Lamprophyres, Syenites of Girnar	Plug, Ring complex	Gabbro, basic dykes alk. olivine basalt, alk. basalt, granophyre basalt	Deccan volcanics	65 Ma
	Aegirine augite riebeckite granophyres, Barda Hill Complex	Ring intrusion	Rhyolites pitchstone felsite	Deccan volcanics	
	Alkali granites of Mungeria, Nepheline syenites of Sarnu, Dandali	Ring intrusion	Orthosyenite, trachyte aegirine phonolite	Malani volcanics	Post-Cretaceous
Alkaline magmatism of Delhi, Vindhyan and trans- Aravalli Vindhyan	Malani igneous suite	Ring complex	Peralkaline, peraluminous granite with cogenetic acid volcanics, minor basics	Aravalli slates	750 Ma
	Carbonatites of Narnaul	Dyke, lensoid bodies	Magnetite, apatite breccia, diopsidic fenite	Delhi paragneisses	Pre-Malani
	Ankeritic carbonate of Kirana Hills	Sheets, lenses	Acid volcanics, dolerites	Delhi quartzite	850 Ma
	Carbonatites and Syenites of Newania	Ring intrusion	Granite gneiss, syenites	BGC	950 Ma
	Kimberlites	Volcanic pipe	Agglomeratic tuff	Vindhyan shale, sst., conglomerate	1140 Ma
	Nepheline Syenites of Kishangarh	Arcuate sill	Gabbro, camptonite	Pre-Aravalli schist	1500 Ma

The third period of alkaline magmatism related to the Deccan volcanic province, controlled by the Narmada-Son lineament, and Cambay rift zone, is related to the northward movement of the Indian plate along the Ninety East ridge and the Laccadive-Maldive lineament (Bose, 1980; Misra, 1981). This magmatism was the manifestation of Reunion hot-spot.

These three periods of hot-spot related alkaline magmatism correspond with the three periods of rifting events in most of the continents (Sawkin, 1976).

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ERRATA

(1)

Through oversight the caption of Figures 4 and 5 on pages 138 and 140 of *Jour. Vol. 30, No. 2* (paper by V. J. Gupta and Yin Hongfu) on 'Otoceras and the Permian-Triassic Boundary' has got interchanged. Explanation of Figure 4 on page 138 should be replaced by caption for Figure 5 on page 140 and vice versa.

(2)

Vol. 30. p. 452: Figure captions for Figures 1 and 2 have got interchanged. Figure 1 is the sketch map of Zawar and Figure 2 that of Khetri. This correction may be noted.

(3)

Vol. 30, p. 374: There are two parts to Table IV. The top half of the Table is the analyses of water from the *Right Bank* and the bottom half relates to *Mid-stream*. This correction may be noted.