A NOTE ON RELATIONSHIP BETWEEN NARMADA RIFT VALLEY AND OCCURRENCES OF CARBONATITES

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CARBONATITE complexes occur along the Narmada Rift Valley at Netrang in Broach District, Ambadongar in Baroda District of Gujarat State in the west, and Barwaha in Khargone District of Madhya Pradesh in the east. These complexes are circular or oval in plan with 5 to 25 sq. km. area. The carbonatites are igneous rocks found as subvolcanic plugs consisting largely of carbonates usually calcite/dolomite. In these complexes, the carbonatites are associated with alkaline felspathoidal (nepheline and/or melilite bearing) rocks and with metasomatised country rocks known as fennites. Besides the above-mentioned noteworthy occurrences, several minor lenticular outliers of metamorphic carbonate rich rocks and metamorphic limestone are disposed in a linear en-echelon pattern in the Deccan traps all along the Narmada Valley, but these have not been proved to be carbonatites.

The association of carbonatites, alkaline felspathoidal syenites and basic suites of rocks of Deccan volcanic episode throws considerable light on the volcanic activity of the early Tertiary Era besides indicating their mutual intrusive time-phase relationship. Such relationship is clearly illustrated in the massive basic igneous complex at Phenaimata in Baroda District, which shows layers of gabbro and basalt intruded by leucite and nepheline-bearing felspathoidal suite of rocks. In Ambadongar area the traps are intruded by felspathoidal syenites which in turn are intruded by carbonatites. Such relationship indicates that the basic, felspathoidal and carbonatite suites of rocks were emplaced in three distinct magmatic phases of volcanic activity. The possibility of late solfataric phase succeeding the carbonatite magmatism cannot be ruled out, for, occurrences of pyrite associated with Bagh limestone are reported around Kathi area in Narmada Valley bordering Maharashtra.

The course of Narmada river and its tributaries is governed by fault systems of middle Eocene epoch. The fault system may be resolved into the following main groups in order of *their antiquity*: *(1)* E.N.E.-W.S.W. to E-W main rift faults with several parallel sympathetic faults. The southern rift faults hading 65° to 75° north have successive down-throw towards north resulting in step-like disposition of the Deccan traps and Infra-trappean rocks. The northern rift fault also associated with sympathetic faults have E.N.E-W.S.W. to E-W trend and hade 65° to 75° towards south causing successive down-throw towards south. These blocks faults in combination have caused a series of down-thrown blocks resulting in step-like topography of the rift valley. (2) A second set of high angle faults trending North-South to N.E.-S.W. and hading 75° to 85° towards west, north-west as well as towards east and south-east has produced successive southerly shift of the Narmada Valley when traced from Madhya Pradesh to Broach in Gujarat. A notable effect of this set of faults is that the 900-mile river course gradually drops from about 1000 m. height in Madhya Pradesh to sea-level at Broach and is marked by a series of natural rapids and waterfalls. (3) The third set of faults, offsetting the earlier two, has N.W.-S.E. trend with 65° to 75° dip and throw towards north-east. The above three sets of faults extend well into the Saurashtra region where these faults have caused extensive fissures along which the later basic intrusives have been emplaced.

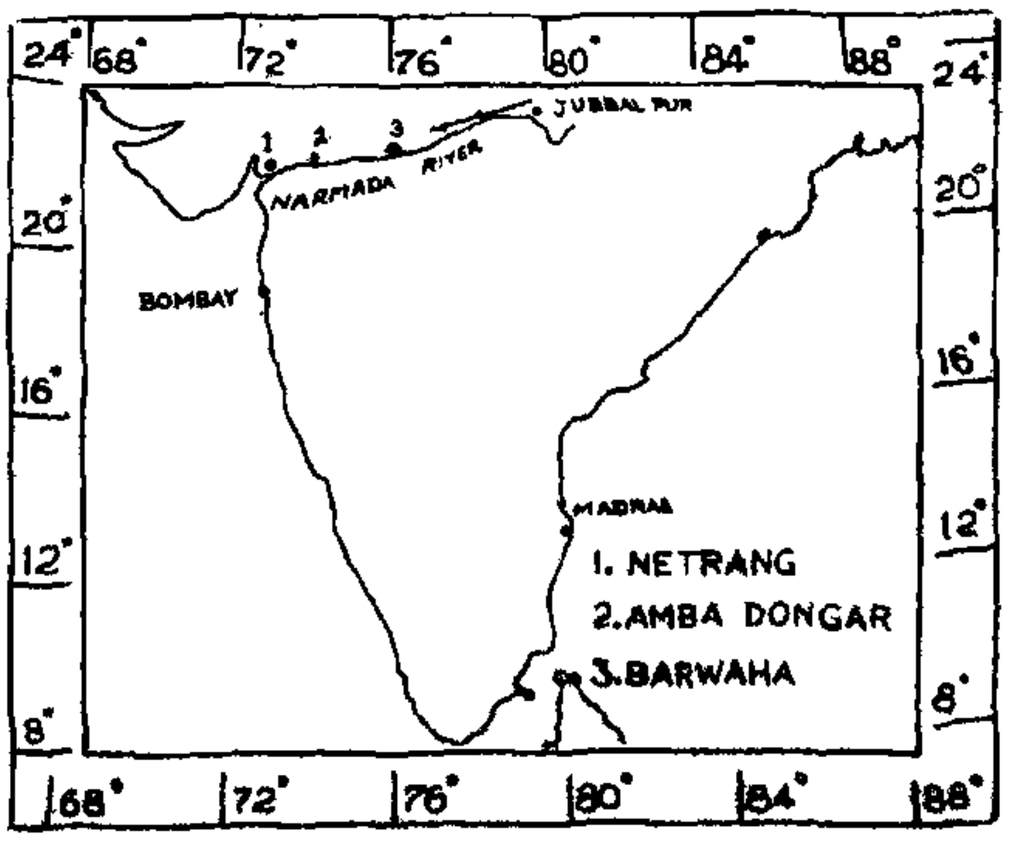

FIG. 1. Location map of carbonatite occurrences along Narmada valley.

The overall structural set-up of the Narmada Valley caused by the superimposed fault patterns enumerated above shows that the rift valley was a region of great crustal weakness

where deep crustal fractures accentuated volcanic activity during which the carbonatite complexes were emplaced in the form of plugs.

Detailed study of the Narmada Rift Valley may bring to light many more carbonatite complexes both in the from of plugs and dyke-like intrusions emplaced along fault planes, which may have great economic significance as the deposits of niobium (columbium), rare-earths (cerium group), atomic minerals, fluorspar and apatite are known to be associated with them.

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STRATIGRAPHIC SUCCESSION OF THE BIJAWAR ROCKS IN THE TYPE AREA (BETWEEN BIJAWAR AND SILON), CHHATARPUR DISTRICT, M.P.

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THE studies of the Bijawar rocks have remained a much neglected topic of research in Indian stratigraphy. H. B. Medlicott in 1860 (*Mem. Geol. Surv. Ind.*, 2, p. 6) proposed the name "Bijawar" for the sediments found above the Bundelkhand granites and below the lower Vindhyan beds. He remarked that "the Bijawar formation is too confused to allow of the safe or ready determination of subdivision". A note, published by S. M. Mathur in 1954 (*Rec. Geol. Surv. Ind.*, 86, pp. 539–544), gives an account of the earlier work on the area together with the lithology of the Bijawar formation and its relationships with the overlying and underlying rocks. He has also presented a tentative table of the stratigraphic succession. In the past, several attempts have been made to work out its exact lithologic sequence, but enough success was not achieved. Its stratigraphic position has still remained a controversial problem and the tectonic details have not been attempted. The senior author feels that identification and correlation of similar rocks present along the Narmada and the Son valleys are possible only after working out the stratigraphic sequence and tectonics of the Bijawar rocks of the type area in every detail.

In the Pre-Cambrian terrain of excessive and repeated orogenic disturbance it is often very difficult to ascertain with certainty the original order of superposition of beds, unless features indicating the original top or bottom of the sequence are discovered and properly analysed. In course of lithologic and structural mapping of the rocks between east of Bijawar Town and Silon, the authors have discovered several perfectly preserved sedimentary structures. Amongst the several inherited structures, cross-bedding, ripple-marks and graded bedding have best served as reliable top-and-bottom criteria.

By the proper utilization of the several top and bottom features in the sub-metamorphic rocks around Bijawar, it has been possible to establish the following order of superposition:

Carbonatite-alkalic complex

VINDHYAN ROCKS

Upper Bijawar	Quartzitic sandstone	Greyish-white quartzitic sandstone
	Chocolate shale with tillites (?)	Chocolate shale to slate with ash-coloured silt, grit and sandstone bands (locally tillites ?)
	Ferrugineous conglomerates	Medium-grained and heterogeneous ferrugineous conglomerate
Lower Bijawar	White quatzites	Friable and white sandstone; Gritty and pebbly sandstone; Hard and white quartzite with pebbles; Hard and white quartzite
	Homogeneous conglomerate	Homogeneous very coarse conglomerate
	Ferrugineous quartzite	Ferrugineous quartzite mottled with white quartzite; Ferrugineous quartzite with shale and grit bands
	Ferrugineous shale	Hard dark brown ferriferous and siliceous shale
	Cherty quartzites	Pink and white cherty quartzite with gritty bands; Brown cherty quartzite with bands of jasperite

Bundelkhand Granites