LENGTH-BREADTH AND ELONGATION STUDIES OF THE PROTEROZOIC ORTHOQUARTZITES AROUND RAHATGARH, SAGAR, M. P.

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ABSTRACT

The length-breadth and elongation studies have been carried out on the minerals occurring in the Proterozoic orthoquartzites around Rahatgarh, a village near Sagar, M. P. The studies were made on the minerals zircon and tourmaline. Fifty grains in each sample from eleven Vindhyan sections of Proterozoic age were studied. The scatter diagram of length versus breadth of zircon and tourmaline have been prepared after SMITHSON (1939). The length-breadth and elongation studies of zircons and tourmalines point that the tourmalines are more rounded than zircons. The elongation of zircon points that the sediment has suffered less wear and tear during the transport. The catena diagram of tourmaline falls between 1 : 1 and 1 : 2 ratios of length-breadths and has a wing like extension towards 3 : 1 and 1:1, which according to SMITHSON (1939) may be due to reworking of an older sediment. The length-breadth and elongation frequency diagram show normal curves and unimodal distribution which according to POLDERVAART (1958) points to well sorted nature of the sediment.

INTRODUCTION

The Vindhyans occurring at Rahatgarh (Lat. 23° 47′ N, and Long. 73° 28′ E) area belongs to 'Upper Rewa' sandstones of 'Rewa' Series of Proterozoic age, consisting of mostly hard, compact, massive, pink to red coloured orthoquartzites. These orthoquartzites outcrops as inliers and are visible owing to the erosion of comparatively less resistant Deccan Traps, which had covered all the Vindhyan topographic irregularities in the geological past.

The length-breadth and elongation studies have been carried out on the heavy minerals (zircon and tourmaline), from eleven Vindhyan sections. The length-breadth and elongation parameters were determined on (—)240 fraction, using a micrometer ocular. Length and breadths of 100 grains of each (zircon and tourmaline) have been determined in each sample from the eleven sections. The notable reference pertaining to the length-breadth and elongation studies of Vindhyan quartzites is by AWASTHY (1961).

The length-breadth and elongation frequency of zircon and tourmaline along with their mean are presented in Table-1. The scatter diagram of length versus breadth of zircon and tourmaline have been prepared after SMITHSON (1939) and presented in Fig. 1 (A—F).

RESULTS AND DISCUSSION

Though the studies have been instituted on eleven sections, for purposes of representation, only three principal sections designated as (V_1, V_2 and V_3) are chosen for graphical representation.

The catena in the case of tourmaline falls between 1 : 1 and 2 : 1 and has a wing like extension towards 3 : 1 (Fig. 1B) and 1 : 1 (Fig. 1C). Tourmalines are less elongated in comparison to zircons, which clearly indicate that the sediment has suffered less wear and tear during the transport. This feature is considered to be characteristic of water-laid deposits according to SMITHSON (1939) and AWASTHY (1961).

Table 1—Range of length, breadth and elongation ratios for zircons of 3 Vindhyan sections

Section	Zone	Range of Length (in mm)	Average	Range of breadth (in mm)	Average	Range of elongation ratio	Average (in mm)
V1	II	0.6—2.6	1.6	0.3—1.0	0.6	2.5—1.2	1.8
	III	0.8—3.3	2.0	0.3—1.3	0.8	3.6—1.0	2.3
	IV	0.8—2.0	1.4	0.3—1.3	0.8	3.4—1.2	2.3
V2	II	0.7—2.0	1.3	0.3—0.7	0.5	3.4—1.6	2.5
	III	0.8—1.9	1.3	0.2—1.0	0.6	4.0—1.1	2.5
	IV	1.2—1.6	1.4	0.6—0.8	0.7	2.5—1.5	2.0
V3	II	0.8—1.2	1.0	0.3—0.9	0.6	3.3—1.2	2.2
	III	0.8—1.9	1.3	0.3—1.2	0.7	2.5—1.5	2.0
	IV	0.9—1.0	0.9	0.3—0.7	0.5	2.6—1.4	2.0

Range of length, breadth and elongation ratios for tourmalines

V1	II	0.6—2.2	1.4	0.3—1.5	0.9	2.3—1.1	1.7
	III	0.9—2.2	1.5	0.7—1.5	1.1	2.5—1.0	1.7
	IV	1.2—2.4	1.8	0.7—1.9	1.3	2.3—1.0	1.6
V2	II	0.8—1.4	1.1	0.6—1.0	0.8	2.4—1.0	1.7
	III	0.8—2.4	1.6	0.3—1.3	0.8	2.5—1.0	1.7
	IV	1.0—1.6	1.3	0.7—1.4	1.0	1.7—1.0	1.3
V3	II	0.9—2.1	1.5	0.6—1.7	1.1	2.6—1.0	1.8
	III	0.8—2.4	1.6	0.6—1.5	1.0	2.8—1.0	1.9
	IV	0.9—1.9	1.4	0.7—1.5	1.1	2.1—1.2	1.6

The catena in case of zircons of the three sections (V_1, V_2 and V_3) rest between 2 : 1 and 3 : 1 hardly touching the 1 : 1 line (Figs. 1E, 1F). Plotting the lengths and breadths of zircons in these diagrams, show oval outlines, which may be due to reworking of older sediments according to SMITHSON (1939). Corroborating this statement, is the impoverishment of the labile constituent felspar, which according to PETTIJOHN (1956) indicates derivation from pre-existing sediments.

LENGTH-BREADTH, ELONGATION DIAGRAM

Fig. 2 represents the lengths, breadths and elongation frequency for the three Vindhyan sections (V_1, V_2 and V_3). It is seen from all these diagrams, that the curves are broad and well-defined showing unimodal characters. The elongation curves for the three sections are sharp and well-defined, which according to POLDERVAART (1958) points to well sorted sediments. POLDERVAART remarks "well sorted sediments yield zircon lengths or elongation frequency curves with one narrowly defined maxima". Besides,

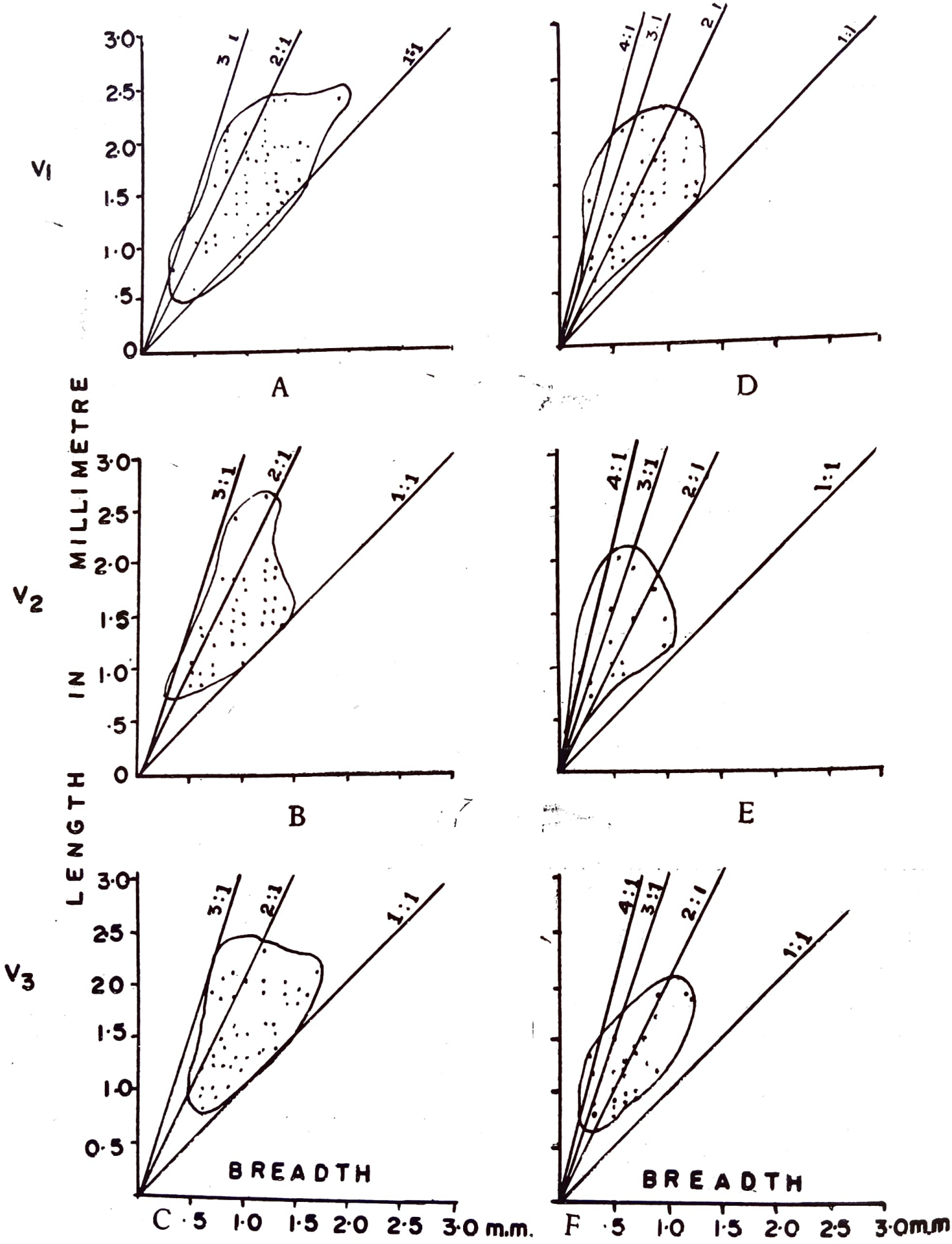
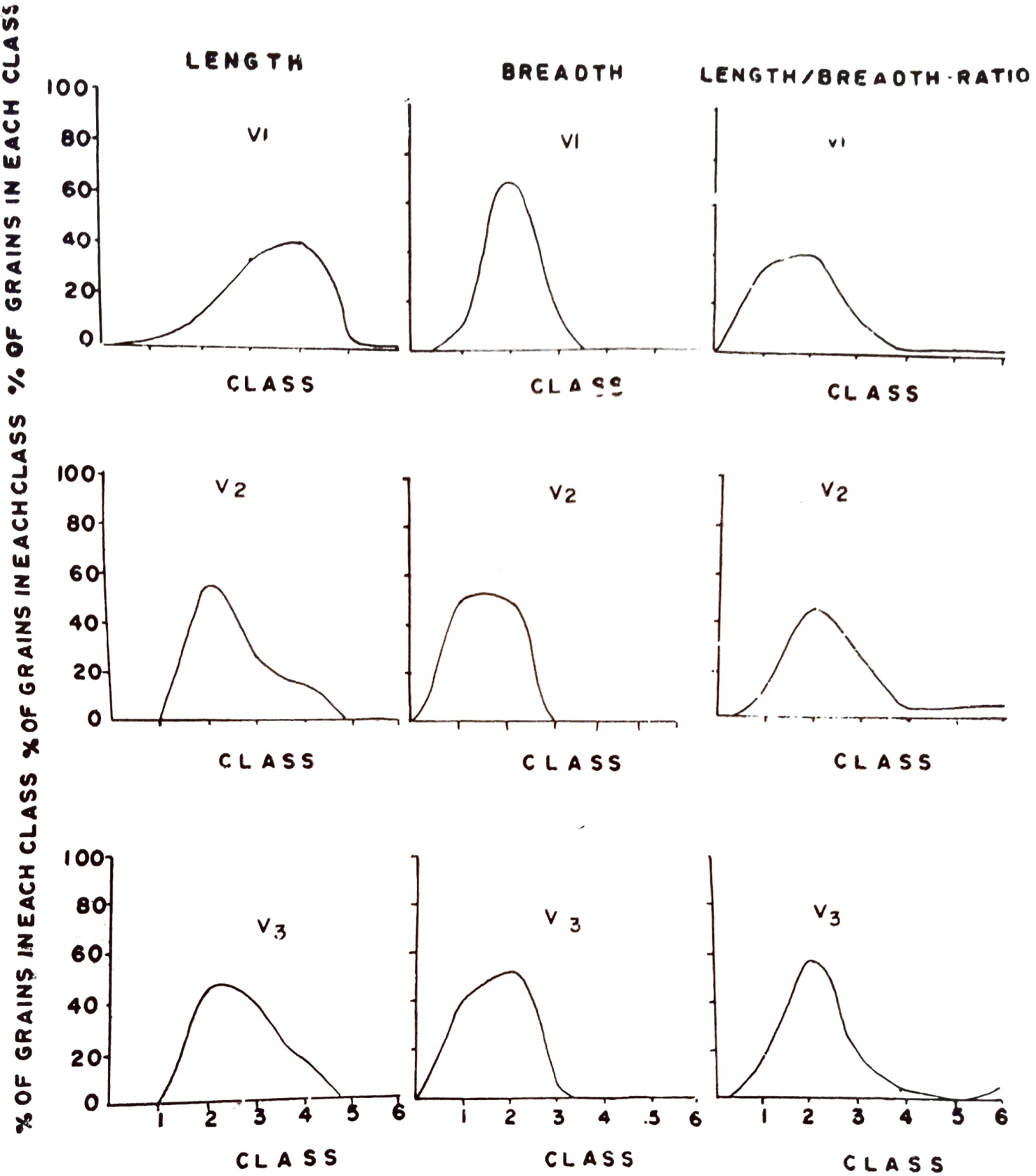

V1
V2
V3
LENGTH IN MILLIMETRE
BREADTH
BREADTH
A
B
C
D
E
F
3:1
2:1
1:1
4:1
0·5
1·0
1·5
2·0
2·5
3·0 m.m.

Fig. 1



CLASS- 1_0·0mm.TO 0·5mm.
2_0·5mm.TO 1·0mm.
3_1·0mm.TO 1·5mm.
4_1·5mm.TO2·0mm.
5_2·0mm TO2·5 mm.
6· 2·5mm TO3·0 mm

CLASS-1_1·0 mm TO 1·5mm
2-1·5 mm TO2·0mm
3-2·0mm TO2·5mm
4-2·5mm TO3·0mm
5_3·0 mm TO 3·5mm
6—3·5mm TO4·0mm

Fig. 2

the elongation ratio in tourmalines is less as compared to zircons, which again indicates that tourmalines were more worked out due to physical wear during the transport, in comparison to zircons.

CONCLUSION

The length-breadth and elongation studies of zircons and tourmalines point that the tourmalines are more rounded than zircons. The elonagtion of zircon points that the sediment has suffered less wear and tear during the transport. The catena diagram of tourmaline falls between 1 : 1 and 1 : 2 ratios of length-breadth and has a wing like extension towards 3 : 1 and 1 : 1, which may be due to reworking of an older sediment according to SMITHSON (1939).

The length-breadth and elongation frequency diagram show normal curves and unimodal distribution which according to POLDERVAART (1958) points to well sorted nature of the sediments.

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