PALAEOCURRENT ANALYSIS OF SOR SLATE (FORMATION), KATHPURIA CHHINA AREA, ALMORA DISTRICT, UTTAR PRADESH

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ABSTRACT

The palaeocurrent analysis of the Sor Slate formation is done. For this the large scale and small scale current bedding azimuthal readings of the sandstone are considered. In all seven rose diagrams are prepared. All the diagrams show bimodal to polymodal distribution and all of them show very wide scatter. The most dominant current direction is at right angle to the strike of the beds. Considering the regional dip of the beds to be in NNE direction, the main current direction is northerly. On the basis of the palaeocurrent study it is suggested that the Sor Slate formation is basically a tidal flat deposit.

INTRODUCTION

Palaeocurrents have been successfully used in finding out the nature of sedimentation basin, provenance and palaeoslope. Not much work has been done on palaeocurrent study of the Lesser Himalayan sedimentary sequences so far, though the sedimentaries occupy vast areas in the entire Himalayan belt and range in age from Precambrian to Recent. Study of the palaeocurrents of the rocks of the Lesser Himalaya was started only in the beginning of the seventies. Valdiya (1970) published some palaeocurrent analysis of the Simla Slates. Sharma (1972) has done palaeocurrent analysis in the Ladhiya quartzites in Nainital area. Tandon (1971) and Prasad (1977) have done palaeocurrent analysis of Siwalik sediments of Kumaun and Garhwal Himalaya and suggested a fluvial environment to the rocks. Recently Kumar *et al.* (1977) have done palaeocurrent studies of the entire Tethyan sediments ranging in age from Precambrian to Cretaceous of Malla Johar area in Pithoragarh—Chamoli district, U.P.

In the present paper an attempt has been made to study the palaeocurrent of the Sor Slate in the light of depositional environment. The Sor Slate for-

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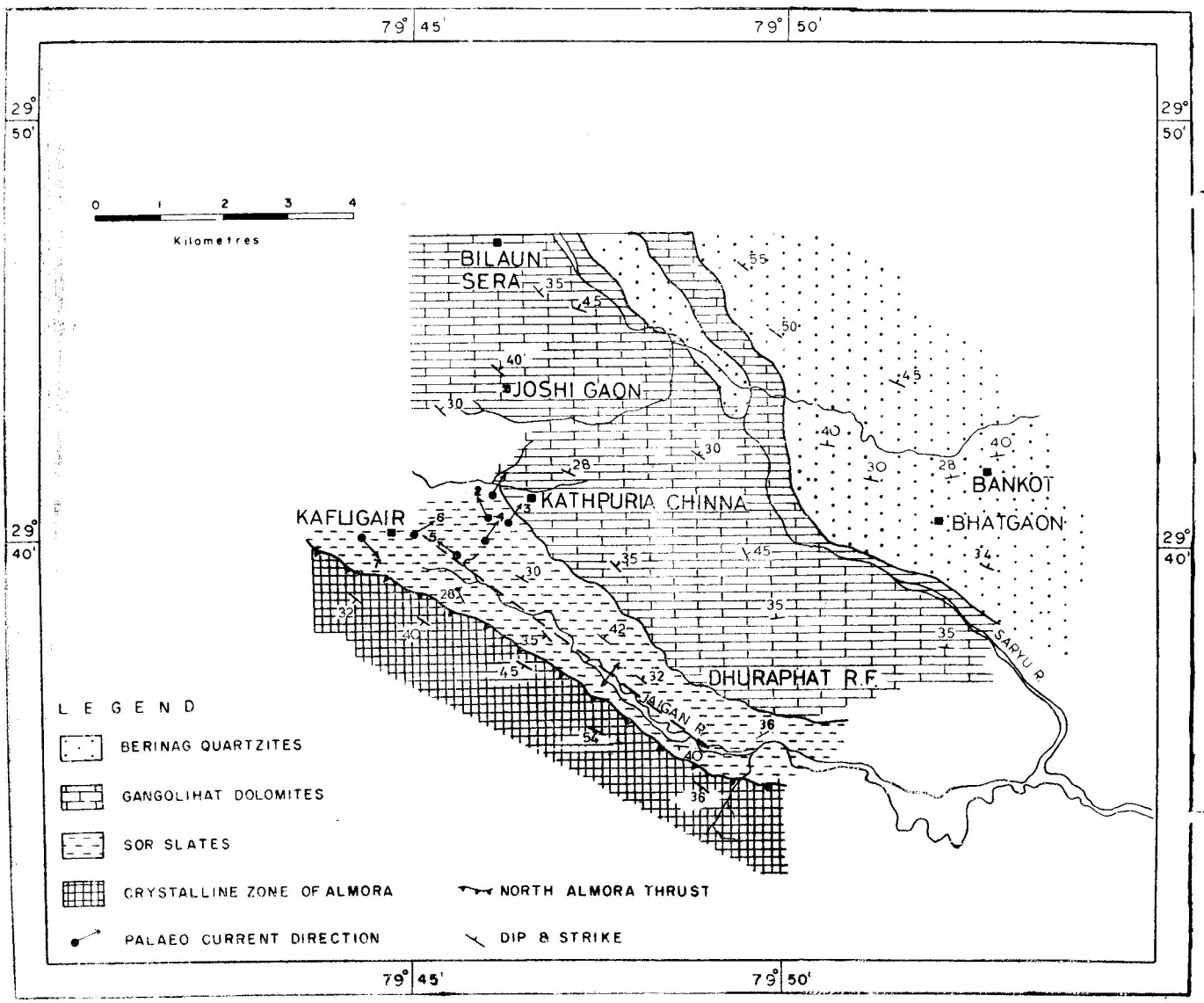

Fig. 1

Fig. 1. Geological and Palaeocurrent map of the area

mation is a thick sequence of sedimentary rocks represented by slates of various colours, orthoquartzites and protoquartzites. The rocks show effects of low grade of metamorphism and are moderately deformed. However, the primary sedimentary structures are still descernable and are surprisingly well preserved. Though any sedimentary structure having directional significance can be used for palaeocurrent study, however, in the present work only small scale and large scale cross bedding (Fig. 3, 1 & 2) have been considered as these are well preserved and extensively developed throughout the succession in respect to any other sedimentary structures having directional significance. The palaeocurrent measurements are taken on Almora—Kathpuria Chhina motor road.

Geological Setting

The Sor Slate formation belongs to the sedimentary succession of zone of Badolisera. The name 'Zone of Badolisera' has been introduced by Heim & Gansser (1939) for the sedimentary pile lying between the Crystalline Zone of Almora and the Central Crystallines. Valdiya (1962) subdivided this zone into two lithostratigraphic units, the Calc Zone of Pithoragarh and the Berinag Quartzite. (Table 1). He further subdivided the Calc. Zone into 4 lithostratigraphic formations.

In the present area only two lithostratigraphic formations of the Calc Zone are exposed. The Calc Zone has a thrusted contact with the Crystalline Zone of Almora and the rocks are folded. The Jaingan Antiform of Misra and Kumar (1968) extends further westward and is well exposed in the Jaingan valley. The axis of the anticline is occupied by the rocks of the Sor Slate formation. This formation is the product of shallow marine environment of deposition (Valdiya, 1968, Kumar, 1978) as suggested by the sedimentary structures found in lithounits of the Sor Slate formation. The Gangolihat Dolomite which includes dolomitic limestone, stromatolitic dolostone, slates, phyllites and lenses of magnesite overlies the Sor Slate. The sedimentaries are considered as normal in stratigraphic position and the different lithounits are in their normal order of superposition in the present area (Kumar and Tewari, 1977, 1978). However, Valdiya (1962, 64, 68) has considered the entire sedimentary Zone as inverted.

Palaeocurrent Analysis

In all 329 cross bedding azimuthal directions have been systematically taken from seven sectors (Fig. 1). The general dip of the bed is NNE. The azimuths of the cross bedding thus recorded have been reoriented for NNE

direction over the stereographic net to calculate the original direction of current bedding. The data has been classified into groups with 30° class interval and has been plotted in the form of rose diagrams. Mean vector azimuth (a), magnitude of the mean vector (r), vector strength in percentage (L)

Table-1

	Berinag Quartzite	Orthoquartzites and amphibolites
Zone of Badolisera	Calc Zone of Pithoragarh	Gangolihat Dolomite Sor Slate
——————————North Almora Thrust——————————		
Crystalline Zone of Almora		Schists and gneisses

strength in percentage (L), variance (S^2) and standard deviations (S) were cal-. culated for each sector by the formula suggested by Potter and Pettijohn (1963). The statistical parameters are given in Table 2.

The rose diagrams are shown in Fig. 2. All the rose diagrams are bimodal to polymodal with currents in all the directions. The rose diagrams in Fig. 2/1 and Fig. 2/4 show dominant current in NNE direction while it is NNW and NE in Fig. 2/2 and Fig. 2/3 respectively. In Fig. 2/5 the main current direction is westerly while in Fig. 2/6 it is easterly. In Fig. 2/7 the main current direction is southerly. Thus considering the entire sequence of Sor Slate it is evident that there is a wide scatter and there is no definite current pattern. However, the dominant current direction is generally northerly with respect to WNW-ESE trending coast line as the regional dip of the beds is taken as NNE.

VARIANCE OF CROSS BEDDING AND DEPOSITIONAL ENVIRONMENT

Jungst (1938) was the first to establish the possible environmental significance of cross bedding current roses and gave the range of cross bedding orientation in several major environments. Vector mean was considered for computation of variance.

The regional variances of cross bedding in the fluvial, marine and aeolian environments does not show any pronouced differences between them (Reiche,

1938; Pelletier, 1958), however they suggested some differences in the variance of fluvial-deltaic deposits and marine deposits. The variance of fluvial-deltaic deposits is in the range of 4,000 to 6,000 and for marine deposits the variance is in the range of 6000 to 8000 (Potter and Pettijohn, 1963). In the present case the variance is very high (Table 2) and suggests a marine environment of deposition.

The Sor Slate formation is considered as a product of shallow marine environment of deposition (Kumar, 1978). The bimodal to polymodal rose diagrames with large scatter also suggest the tidal flat environment of deposition for the Sor Slate (formation) as the palaeocurrent directioop ə u not necessa-

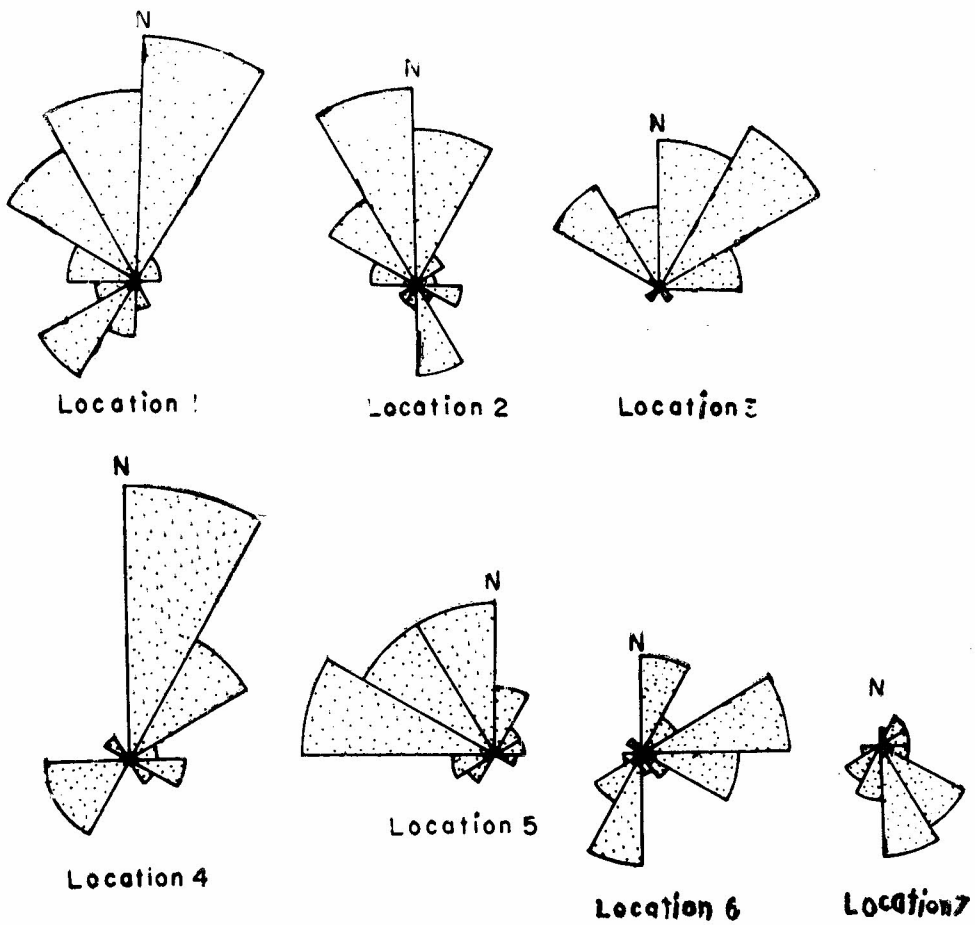

Fig. 2. Rose diagrams for the different sectors of the Sor Slate (formation), Kathpuria Chhina area, Almora district, U.P.

Table 2 : STATISTICAL PARAMETERS

S. No.	Strati-graphic Horizon	Locality	Number of Readings (N)	Mean Vector Azimuth (Q)	Magnitude of Mean Vector (r)	Vector Strength (L)	Variance (S^2)	Standard Deviation (S)
1.	Sor Slate	1	49	341	33.5	68.3	9206	95
2.	,,	2	80	294	24.69	30.8	16643	129
3.	,,	3	48	13	33.5	69.9	32649	180
4.	,,	4	26	19	8.4	34.4	18446	135
5.	,,	5	51	308	31.4	61.71	15251	123
6.	,,	6	45	125	19.1	42.4	6095	78
7.	,,	7	30	115	19.50	65.01	4396	66

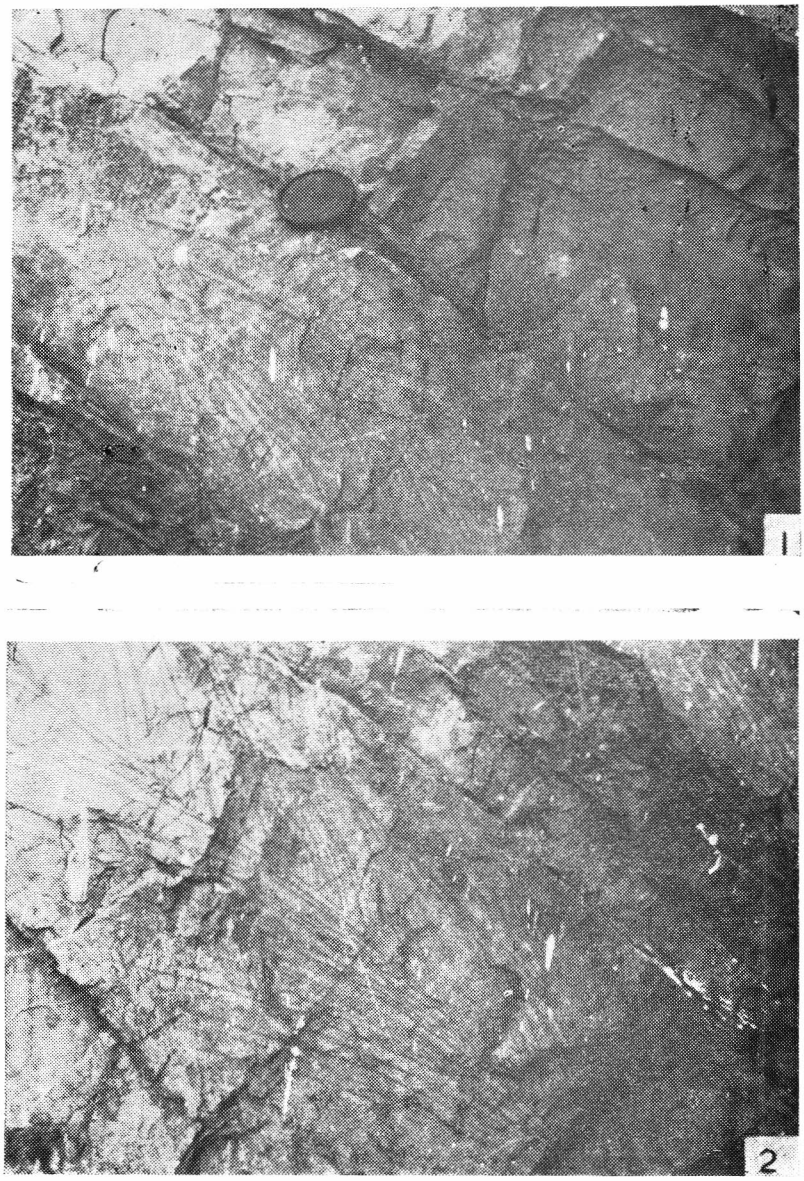

Fig. 3. (1&2) Small scale current bedding and large scale current bedding in the Sor Slate Formation, Kathpuria Chhina-Kafligair motor road.

rily correspond with the palaeoslope in a shallow marine environment and the current pattern is rather complex (Reineck and Singh, 1973, Singh, 1976 and Kumar *et al.* 1977). In this environment both current and wave are variable in both direction and intensity due to morphology of the area and wind direction etc. And, thus, nothing can be said about the palaeoslope during the deposition of the Sor Slate formation with respect to WNW—ESE trending coast line.

CONCLUSIONS

1. The rose diagrams with bimodal to polymodal distribution of current patterns indicate a tidal flat environment of deposition for the Sor Slate formation.
2. With the regional dip in NNE direction the coast line is taken trending WNW—ESE direction. With respect to WNW—ESE trending coast line the main current direction was northerly during the deposition of the Sor Slate formation.

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