

TIGHTLY APPRESSED RECLINED FOLDS IN JAMMU LIMESTONE (GREAT LIMESTONE) OF THE HIMALAYAN FOOTHILLS OF JAMMU AND KASHMIR

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The Jammu Limestone occurring as inliers within the Tertiary formations of the Himalayan foothills of Jammu & Kashmir (Fig. 1) was hitherto known to have undergone simple deformation resulting in open upright folds. According to Pascoe (1959, p. 813), 'The general structure of the limestone inliers is that of comparatively open dome with subordinate folding and warping but no isoclinal compression'. This was also the observation of Wadia (1937). Recent studies by the author has revealed the presence of tight reclined folds (Figs. 2, 3 & 4), within the Jammu Limestone, which also show later refolding.

The 'Riasi inlier' of Jammu Limestone which shows these folds comprises mainly massive thickly bedded dolomite with some argillaceous bands and three prominent stromatolitic horizons. However, there is a horizon in its lower part consisting of thinly bedded dark grey calcareous shales and slates and/or argillaceous calcilitite alternating with bands of light grey dolomite. This marker bed, exhibits tightly appressed reclined folds with thickened hinges and thinned limbs, and in cases, with detached noses (Figs. 2 & 3). The fold axis plunges 10° to 15° towards $N30^{\circ}W$ near Adhkumar ($33^{\circ}0'32'' : 74^{\circ}56'41''$), the axial plane dipping $10^{\circ} - 20^{\circ}$ towards $N20^{\circ}W$, i.e. the plunge of the fold-axis and dip of the axial plane are nearly sub-parallel (Fig. 4). Schistosity is weakly developed in the argillaceous bands. Another direction of folding has been found, the axial trend being almost E-W, with the axis plunging moderately towards $N80^{\circ}E$ to East. In a few exposures the axis of the reclined folds (F_1) are seen to be folded anew on this E-W axis (F_2). In places small scale depressions and culminations of fold axes or dome and basin structures have been formed due to the interference of one with the other (Figs. 5 & 6). However, field evidences indicate overturning of beds on mesoscopic scale. This too may be a regional feature within the Jammu Limestone and awaits further study.

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EXPLANATION OF FIGURES

- Figure 1. Map showing location and geological set-up of Jammu Limestone.
- Figure 2. Tightly appressed reclined fold in Jammu Limestone as viewed from south. The scale 15 cm long, shows the axis of the fold.
- Figure 3. Tightly appressed reclined fold with acute nose in Jammu Limestone. Dark grey argillaceous band shows development of axial plane cleavage. The pencil shows the trace of axial plane.
- Figure 4. Geometry of the tightly appressed reclined fold (after fig. 2). The axial plane dips 15° towards NNW.
- Figure 5. Dome and basin structure produced by interference of two sets of fold axes (the N-S axis is parallel to the dot-pen and the E-W axis is parallel to the pencil).
- Figure 6. Interference of the axis of two folds, F_1 and F_2 , that give rise to dome and basin structures (after figure 3).

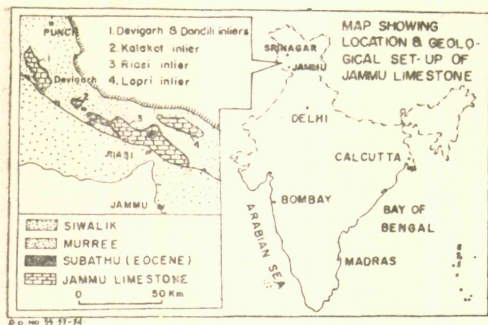


Fig. 1.



Fig. 2.



Fig. 3.

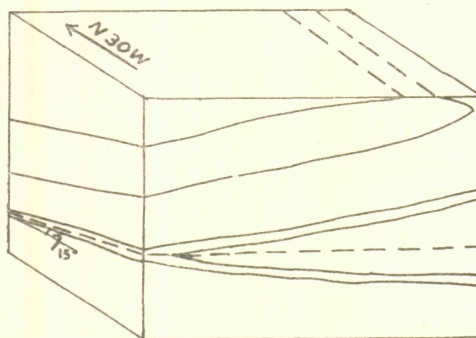


Fig. 4.



Fig. 5.

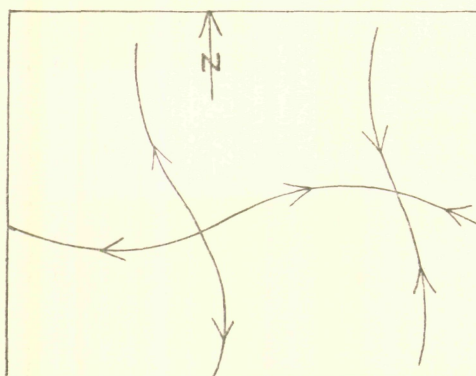


Fig. 6.

These types of folds are not found in the associated younger Tertiary rocks occurring with the Jammu Limestone in this area. Thus these tight folds with approximately N-S axis seem to be due to some older tectonic movement in this part of the Himalayan foothills. As the age of the Jammu Limestone which was earlier considered to be Permo-Carboniferous (Wadia, 1937) has been revised to Precambrian on the finds of Upper Proterozoic stromatolites within the same (Raha, 1972; Raha & Sastry, 1973), these tight reclined folds might be related to some Precambrian tectonic activity.

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