Proceedings of the Iowa Academy of Science

Volume 67 | Annual Issue Article 35

1960

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Abstract. Limestone from the Hampton Formation at Ferguson, Iowa, was studied in an effort to determine whether the vertical force of overburden had caused preferential orientation of crystals. Results are insufficient to indicate the extent of recrystallization caused by overburden; there is evidence that there has been horizontal influence also. Petrofabric diagrams are included.

The purpose of this study was to determine whether the vertical force of overburden has caused preferential orientation of crystals in limestone. The limestone which was studied was from the Hampton Formation at Ferguson, Iowa.

Because the three predominant types of limestone deposition (as aragonite oolites, calcite or aragonite shells, and calcite crystals) would result in random arrangement, it was assumed that the crystals were initially random in orientation. The vertical force of overburden probably has been far greater than any horizontal forces, since there are no recognizable structural complications in the area.

The thin sections which were used in the study were cut from a core in vertical planes whose azimuths were not known and were not necessarily alike. A universal stage was employed in determining orientations. Regular traverses of the slides were made; c-axis positions of all crystals which were on or near the crosshair and which were large enough to orient conveniently were determined and recorded on a Schmidt equal-area net. The results were contoured according to the number of points which fell within a circle whose area was 1 percent of that of the entire net. In the resulting petrofabric diagram, the space between any two contour lines represents a narrow range of densities of c-axis projections on the net. Two hundred crystals were included in the diagram for the section cut at a depth of 93.5 feet (section A); 160 points were used in the section cut at 102.5 feet (section B). There was no attempt to differentiate calcite and dolomite in this preliminary study.

In section A, there were several maxima which were arranged in two parallel, non-horizontal bands. The maxima occurred between 8 and 81 degrees from the horizontal. It may be significant that more irregular crystals than rhombic ones were large enough for

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convenient orientation, suggesting the dominance of calcite over dolomite in the petrofabric diagram. (Figure 1.)

Two well defined maxima, rather than bands, occurred in section B. These occurred in the ranges 14-18 and 24-36 degrees from the horizontal. In this section, most of the crystals which were large enough to orient were rhombic, so that dolomite was probably dominant over calcite in determining the density contours (Figure 2).

Due to insufficient evidence and complicating factors, the extent of recrystallization caused by overburden cannot yet be determined. It is now evident that there has been some horizontal influence, since vertical forces alone could be expected to produce horizontal bands as maxima, rather than spots as in section B or oblique bands of spots as in section A. The preliminary work points out two possible reasons for the greater degree of preferential orientation found in section B than in section A:

(1) The excess pressure caused by the additional nine feet of rock accomplished the greater degree of orientation.

(2) Forces were sufficient to cause a high degree of preferential orientation in dolomite crystallizing or recrystallizing after

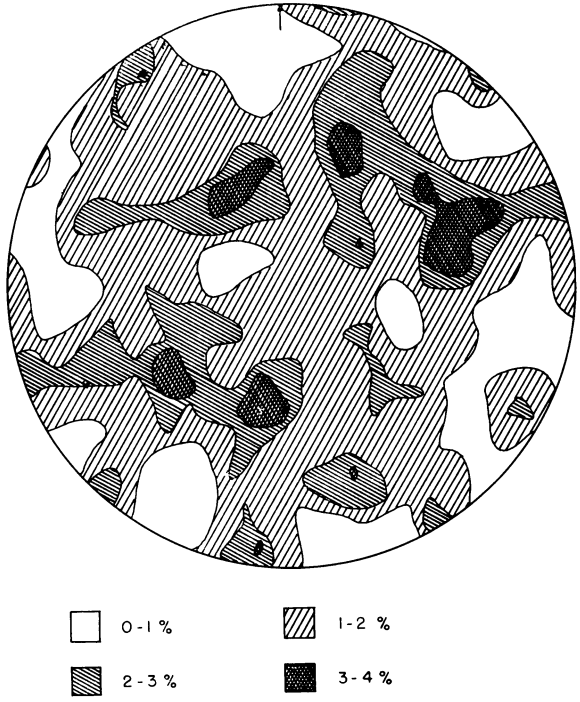

Figure 1. Petrofabric diagram of limestone, depth 93.5 feet.

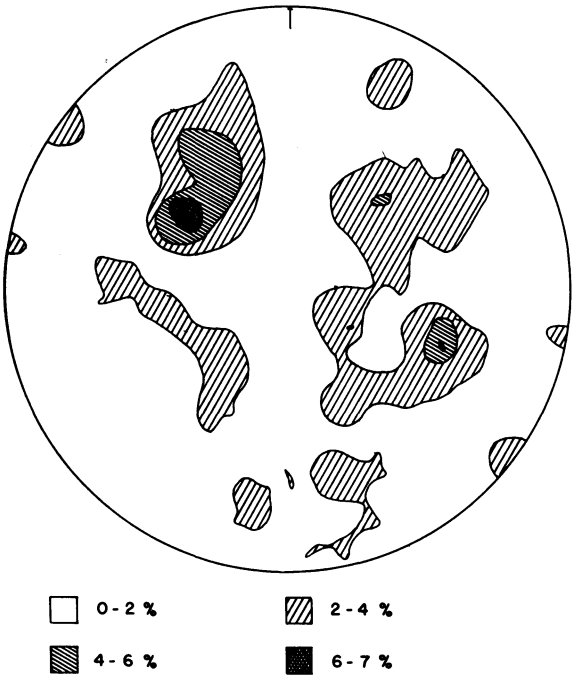

Figure 2. Petrofabric diagram of limestone, depth 102.5 feet.

deposition, but the original calcite was not so susceptible to reorientation.

The validity of these two possibilities will be tested in further study. Fully oriented thin sections will be used; studies will be made at a wide variety of depths to determine how much influence on degree of orientation is exerted by variations in amount of overburden. X-ray analyses will supplement the universal stage work in order to distinguish between calcite and dolomite and to eliminate any bias introduced into optical studies because of size limitations.