

significantly the trends described above. Deucalionis Regio displayed the greatest number of such lineations, possibly as a result of the greater detectability of features in this region than in Margaritifer Sinus and Meridiani Sinus. In particular, frames 6N17, 6N19, 6N21, and 6N23, which include Deucalionis Regio, have respective discernibility indices of 5.0–1.0, 2.0–1.1, 1.0, and 1.0, respectively. In contrast, frame 6N07 (Margaritifer Sinus) has discernibility indices ranging from 17 to 4, whereas frame 6N13 (Meridiani Sinus) has indices from 3.2 to 1.6. Consequently, the identification of specific morphologic form from Mariner 6 imagery, beyond positive or negative relief, will be more difficult in Margaritifer Sinus and Meridiani Sinus. The greater detectability in Deucalionis Regio, however, may not be offset by the ability to recognize the distinction between topographically controlled drainage features and structurally controlled features. As a result, the complex rose diagram for this region probably reflects the increased detail recognized and perhaps a distinctive geologic history.

Whereas the rose diagram for Deucalionis Regio and Aram is complex, the preferred lineation trends in Margaritifer Sinus are generally similar to those in Meridiani Sinus. A part of an enormous canyon, part of which corresponds to the photometrically lighter region Eos, is included in Margaritifer Sinus. The full extent of this chaotic-floored canyon has been revealed in the more recent Mariner 9 images [McCawley *et al.*, 1972]. It is part of a system of canyons that extends over 3000 km near the Martian equator between 24°W and 90°W and has been interpreted as a result of relatively recent and large-scale tectonic events [Sharp *et al.*, 1971]. The similarity between the regional trends ($w3-w2$ lineations) in Meridiani Sinus and Margaritifer Sinus suggests that the crustal weaknesses related to the formation of the canyon system extend to the east, beyond the eastern extension of the chaotic terrain. In addition, the azimuthal harmonics of $15^\circ \pm 2^\circ$ recognized for $w3-w2$ lineations in these regions suggest conjugate shear systems within the Martian crust.

The major trends recognized in Margaritifer Sinus and Meridiani Sinus also occur, among numerous other trends, in Deucalionis Regio. Consequently, it is possible that the inferred

equatorial shear zone crosses this region as well. Aside from the complex rose diagram, however, several features indicate that Deucalionis Regio and Aram have undergone additional geologic processes. Prominent rectilinear and curvilinear rilles accompany the contacts between Aram and Margaritifer Sinus (Figure 2) as well as Deucalionis Regio and Meridiani Sinus (Figure 10). These rilles are thought to reflect boundaries between tectonic provinces or contrasting topographies.

In addition, Deucalionis Regio exhibits a cratered terrain that morphologically resembles parts of the lunar surface. Frame 6N20 clearly reveals wrinkle-ridge-like features and a concentric crater 13 km in diameter, the latter appearing analogous to numerous lunar craters along the margins of maria. Such craters are interpreted as the result of volcanic modification of crater floors [Schultz, 1972]. Frame 6N19 includes several flat-floored craters with breached walls. The surrounding crater density does not appear great enough to degrade significantly such large craters, and the breached walls resemble lunar craters inundated during the epochs of mare emplacement. Consequently, Deucalionis Regio may be a region that has been modified significantly by an epoch (or epochs) of endogenic activity such as volcanically produced flooding of crater floors. Detailed morphologic comparison of Deucalionis Regio with other provinces is unwarranted owing to the large differences in discernibility indices from Mariner 6 and 7 imagery. The preservation of its cratering history, and possibly its multistage endogenic modification, would account, in part, for the complex frequency-azimuth distribution of lineations.

Binder and McCarthy [1972] noted that the rose diagram of lineations and crater wall segments in Meridiani Sinus was different from diagrams for the surrounding regions, and they attributed this difference to a locally distinct tectonic history, perhaps related to the low domical profile of Meridiani Sinus. The results presented here indicate that both Meridiani Sinus and Margaritifer Sinus are similar but that they are separated by a distinct region corresponding to Deucalionis Regio and Aram.

As the good cross correlations of unrectified photographs suggest, mismatches of preferred trends from $w1$ lineations and $w3-w2$ lineations