intervals $m = 0, 1, 2, \cdots, N$, N represents the total number of data points, x_i and x_{i+m} are the functional values at points i and $i + m$, respectively, $\bar{x}$ is the mean value for all data points, and σ_x^2 is the sample variance. In this case, Δt is 1° of azimuth, N is 180°, and x_i and x_{i+m} are the number of lineations at azimuths i and $i + m$, respectively. Because the data in this case are azimuths, the series ends at $N = 180°$; however, evaluation of the autocorrelation function only to this limit results in the elimination of possible correlations between lineations at 175° azimuth, for example, and 185° azimuth, which is simply 5°. Consequently, the autocorrelation function was modified to a 'cyclic' autocorrelation function

$$C(\tau = m \cdot \Delta t) = \left[\sum_{i=1}^{N} (x_i - \bar{x})(x_{i+m} - \bar{x}) \right] \Big/ (N\sigma_x^2) \quad (2)$$

in which lineations between 0 and $(i + m - 180°)$ were repeated where $i + m$ exceeded 180°. The autopower function is the Fourier transform of the autocorrelation function. In this study the fast Fourier transform algorithm was used to calculate the autopower directly from the data rather than from the autocorrelation function [*Webb*, 1970]. The resulting autopower corresponded to the autocorrelation discussed for (1) rather than (2).

The nonrandomness of these trends is confirmed both by comparing them with randomly generated orientations and by comparing the frequency of preferred trends from mapped lineations with a Poisson distribution. The significance of the trends with respect to their being actual surface features, however, can be tested by comparing cross correlations between two unrectified images with cross correlations of corresponding rectified pairs. The cross correlation between functions $x(t)$ and $y(t)$ is defined in terms of the sample cross covariance,

$$R_{xy}(\tau) = \frac{1}{N} \cdot \sum_{t=0}^{(N-1)-|\tau|} [x(t) - \bar{x}][y(t + |\tau|) - \bar{y}] \quad (3)$$

where N is the total number of data points, $\bar{x}$ and $\bar{y}$ are the mean values of the functions $x(t)$ and $y(t)$, respectively, and τ is the displacement, or lag, from the data point t. In this case, N is 180°, $x(t)$ and $y(t)$ are the number of lineations at azimuth t from two separate Mariner frames, x and y, respectively, and τ is the lag in degrees of azimuth. The cross correlation then is given by

$$C_{xy}(\tau) = R_{xy}(\tau)/[R_x(0) \cdot R_y(0)]^{1/2} \quad (4)$$

where $R_x(0)$ is the cross covariance at zero lag between $x(t)$ (i.e., simply the autocovariance); similarly, $R_y(0)$ is the autocovariance at zero lag for $y(t)$.

If mapped lineations represent residual trends resulting from imaging, a good cross correlation between frequency-azimuth distributions from unrectified image pairs should result, regardless of the picture format. On the other hand, if the lineations are true surface trends, a better cross correlation of rectified pictures might be expected if the surface trends are part of a generally well-defined system.

Straight-wall segments of polygonal craters and crater chain alignments supplied additional data for linear surface trends. Each straight-wall segment was weighted subjectively from 1 to 3, depending on the certainty of identification. Crater chains were divided into pairs of craters, and each pair was assigned a similar subjective weight from 1 to 3 according to their visibility. Straight-wall segments, in general, are thought to be the result of slumping along directions of structural weakness, whereas crater chains may be due to secondary ejecta or structurally controlled endogenic volcanism. Consequently, these two sets of data were treated separately both with respect to each other and with respect to mapped lineations.

Photometrically corrected versions of the mapped regions showed the contacts between low- and high-albedo provinces that have long been recognized through earth-based studies and recently compiled by *de Vaucouleurs* [1971]. The data from rectified imagery were grouped into their respective photometric provinces so that possible tectonic provinces could be revealed.

RESULTS

Figure 4 shows the frequency-azimuth distributions in polar coordinates (rose diagrams) for selected frames from Mariner 6. The most significant lineations ($w3$) were combined with the less significant lineations ($w2$) for a larger sample size ($w3$-$w2$). The lower half of each rose