produce a selection effect that will be revealed in rose diagrams (depicting the frequency and azimuth of lineations) by a broad lobe having a maximum in the north-south direction and a minimum in the east-west direction. This effect was used to distinguish between topographic and nontopographic features.

A detailed analysis of the detection of lineations was not the intent of this study. To a first approximation, Keene's results provide a qualitative check on the nature and reliability of mapped trends. Meaningful morphologic studies from photographic Mariner missions require such an appreciation for changes in discernibility across a single frame as well as between different frames.

The azimuth and length of mapped lineations were measured for both unrectified and rectified

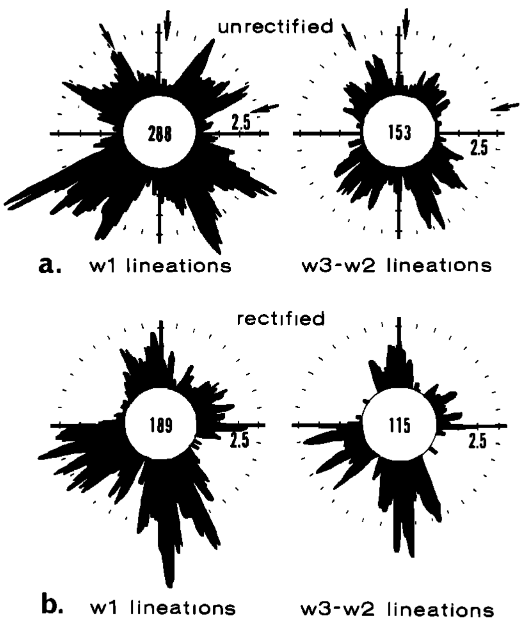

Fig. 3. Rose diagrams of lineations from the (*a*) unrectified version and (*b*) orthographically projected version of Mariner frame 6N09. The upper half of each rose diagram uses the number of lineations, whereas the lower half illustrates lineations weighted by their length. Lineations (*w*3-*w*2) recognized as topographic features are to the right; lineations (*w*1) not recognized as topographic features are to the left. Arrows on the rose diagrams in *a* note coherent noise trends on unprocessed photographs. Values within each rose diagram indicate the number of lineations used.

imagery. Lineations that exhibited abrupt changes in plan were segmented and treated as distinct lineation trends. In unrectified images, an arbitrary north direction corresponded to the vertical edge of the picture format, whereas, in rectified images, coordinate overlays from the Jet Propulsion Laboratory (JPL) [*Campbell*, 1970] gave the local north direction. Frequency-azimuth distributions of the lineations for each image and each lineation weight were compiled (Figure 3). Running means having a 4° window in azimuth smoothed the distributions in order to absorb human errors in azimuth measurements and to prepare the data for further statistical treatment.

Each lineation azimuth in the rectified photographs was also assigned one of three integral weights dependent on the lineation length. Lineations that are less than 21 km in length were assigned a weight of 1, those between 21 and 40 km a weight of 2, and those greater than 40 km a weight of 3. For the most significant set of lineations, this weighting scheme gives long topographically expressed features, such as major scarps or grabens, more importance than a short feature, such as a ridge produced by crater ejecta or a short offset segment of a rille. Weighting lineations strictly by their true length, however, gives too much importance to a few very large surface features. Therefore weighting lineations by a factor dependent on length sought to enhance but not overemphasize the more significant data.

Autocorrelation and autopower functions were used for each frequency-azimuth distribution from each image as a monitor for possible constant intervals between dominant trends. In addition, these functions provided a qualitative check on the reliability of the data by comparisons with functions from randomly generated azimuths where there were relatively few lineations. The autocorrelation function for discrete data is given by

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

where τ is the lag, which is expressed in terms of equally spaced (Δt) data points for increasing