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ITEM OF INTEREST

Prepared by

Aerospace Information Division

SUBJECT: Martian Continents and Seas

SOURCE : Koval', I. K. On the degree of smoothness of the continents and seas of Mars. IN: Akademiya nauk SSSR. Komissiya po fizike planet. Izvestiya, no. 1, 1959, 85-92.

Changes in the continent-sea contrast from the center to the limb of the Martian image were studied on the basis of photos obtained through the use of red and infrared light filters. The contrast on the surface of Mars is seen to decrease towards the limb of the disk. Since the influence of the Martian atmosphere on the results of measurement in the red and infrared may be disregarded, it is concluded that the curve of brightness change in the Martian seas from the center to the limb of the image has less curvature than the curve for the continents, i.e., $q_{sea} < q_{continent}$. The distribution of brightness along the radius of the visible disk is described by the formula

$$\rho_i = \rho_0 \cos^q i,$$

where ρ is the brightness factor and i is the angle of light incidence. This formula is valid when the phase angle $\alpha = 0°$ and the planetary sphere is illuminated by a parallel light beam. When $q = 1$ and $\alpha \neq 0$, ρ_{max} occurs on the equator of intensity at the point with $i = 0$, i.e., at the point where the angle of light reflection is $\varepsilon = \alpha$. If, however, $q < 1$, then $(\delta)_{max} > \alpha$.

On the basis of experimental photography of a cylindrical body the following formula is derived:

$$q = \cot[45° + 1.4\,(\varepsilon_{max} - \alpha)].$$

Following further observations at different α values, the more generalized form can be established:

$$(\varepsilon)_{max} = f(\alpha, q).$$

These relationships are then applied to curves of the brightness distribution along directions parallel to the equator of intensity on the continents and seas of Mars. It is seen that for the Martian continents $\varepsilon_{max} \approx \alpha$. This supports the opinion that Lambert's law is applicable to the Martian continents. In certain cases both increases and decreases in the q values are observed.

The images of Mars obtained in 1954 are held to be most satisfactory in determining the light reflection from continents, while those obtained in 1956 are most suitable for studying the seas. It is found that for the Martian seas $(\varepsilon)_{max} > \alpha$.

These investigations confirm the author's previously expressed opinion that the distribution of brightness on the Martian seas is different from that on the continents.