

EQUILIBRIUM CONDITIONS IN A TERRA AND A MARE REGION. L.B. Ronca\*, A.T. Basilevsky\*\*, V.P. Kryuchkov\*\*, and B.A. Ivanov\*\*\*; \*Wayne State University, Detroit, MI., USA; \*\*Vernadsky Institute, Moscow, Academy of Sciences, USSR; \*\*\*Shmidt Institute of Physics of the Earth, Moscow, Academy of Sciences, USSR. - Part of this research was conducted while L.B. Ronca was a participant in an exchange program between the Academy of Sciences, USSR and the National Academy of Sciences, USA.

Experimental and theoretical work indicates that equilibrium conditions are ultimately reached in the process of formation-destruction of craters [1], [2], [3], [4], [5]. The purpose of the present work is to apply a set of dimensionless equations [5], [6] to data obtained from both a terra and a mare surface, deduce the limits of the diameters of craters in equilibrium, and reach some conclusions on the rate of meteoroidal flux.

An area, within approximately  $170^{\circ}\text{E}$ - $140^{\circ}\text{W}$  and  $10^{\circ}\text{S}$ - $30^{\circ}\text{S}$ , was stereoscopically photographed by Zond 8. Craters larger than 1 km in diameter were counted and classified as belonging to class A (young), B (mature), C (destroyed) and D (highly destroyed). Comparisons with a set of standard craters were used for the classifications. These data were compared with those obtained from a typical mare area in Sinus Medius [1]. Fig. 1 and 2 show a selection of the curves.

The independent variable of the dimensionless equations is "normalized time", which is the absolute time of the area divided by the life expectancy of the craters. As the life expectancy of a crater increases with crater diameter, "normalized time" of an area will be different for each crater size, decreasing with increasing crater size. In other words, in terms of the dimensionless equations, the diameter axis is equivalent to a normalized time axis with normalized time increasing in the direction of decreasing diameter.

Mathematically, equilibrium signifies that an asymptotic plateau has been reached in the relationship number of (all, or young, etc.) craters versus time. In terms of normalized time, equilibrium is reached for crater diameters smaller than the value for which a plateau is apparent.

The cumulative plots and distribution of classes of the two areas show that in both cases the craters can be divided into three groups. Below a certain diameter the flattening of the cumulative curve indicates undercounting. These craters cannot be used. A diameter of approximately 5 km and 100 meters applies respectively to the terra and the mare area. The difference is an artifact due to the different resolutions in the photographs. Craters larger than these sizes should be significant. In both terra and mare craters, the distributions of classes show that below a certain diameter the fractions of classes are approximately constant. Because of the previously presented reasoning, it can be assumed that equilibrium exists below this diameter. In the case of the terra craters, equilibrium is reached up to a diameter of 50 to 100 km. In the case of the mare craters, up to a diameter of approximately 200 meters. This drastic difference between terrae and maria is probably due not only to the greater age of the terrae but more to the much greater meteoroidal flux during the terra phase. Assuming that the flux is proportional to the area of the smallest crater in equilibrium, then the terra phase flux is three to four orders of magnitude greater than the later flux.

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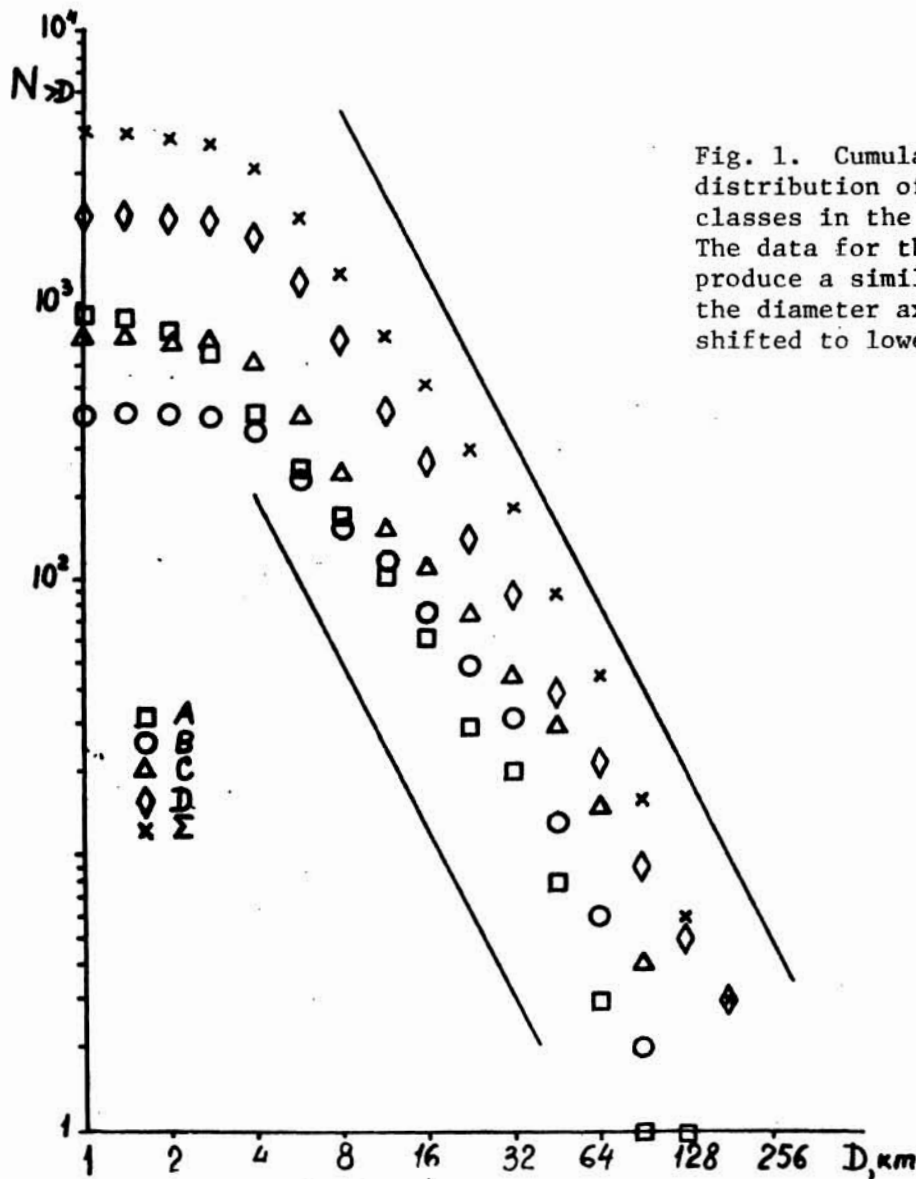


Fig. 1. Cumulative distribution of the crater classes in the terra area. The data for the mare area produce a similar plot, with the diameter axis values shifted to lower values.

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Fig. 2. The distribution of the fraction of crater classes for the mare area. For the terra area, the distributions are similar, except for the shift in diameter values.

