

OBSERVATIONS OF CRATERS WITH DOMED CENTRAL PIT ON
GANYMEDE. R. Bianchi and S. Pozio, I.A.S.-C.N.R., Reparto di Plan-
etologia, Viale dell'Università 11, 00185 Roma (Italy)

Impact craters on Ganymede exhibit a wider range of morphological features than those on Callisto or on other silicate bodies. Indeed, there are found typical bowl-shaped craters, flat-floored craters, craters with bowed-up floors as well as craters with central pits and/or peaks (1). Looking at craters of bigger dimension, we can find basins ($D > 150$ km) and palimpsests. This morphological variety is probably due to the complex surface evolution of the satellite, which has been more complex than that of Callisto (2).

We have concentrated our study on a particular kind of impact craters, like the one shown in Fig. 1. These generally appear to consist of an outer rim, a wide central pit and a circular dome inside the pit. The dome is a structure probably formed by endogenic modification of the crater after the impact (3). The morphology of these craters vary with their ages. In the youngest ones the morphological characteristics mentioned above are clearly shown. With increasing age, the viscous relaxation of the ice crust tends to flatten the topographic features of the craters. The crater shown in Fig. 1 is a typical example of a crater the rim of which is almost completely relaxed; craters like this have been already described by (1) and named "Type II Penepalimpsests". These penepalimpsests are not the oldest of this kind of craters; we have found older craters that we have called "remnants" (Fig. 2; white arrow), with the rim which has completely disappeared, while the central dome and the central pit are still visible. Sometimes the central pit appears like a halo, with a radial structure around the central dome.

We have measured the crater rim diameter, the central pit diameter and the dome diameter of 38 craters in order to determine the spread of these parameters, taking into account their age and the different geological units on which they lie. In Fig. 3 the values of the pit diameter are reported as a function of the rim diameter (obviously excluding the remnants whose crater rim could not be measured). The best fit is an exponential equation very similar to the one which (1) found for the craters with central pits. The only difference is due to the different dimension of the craters that we have examined. Looking at the different ages of the plotted craters, it is possible to note that most of the youngest craters tend to fall below the curve. This means that the pit is wider for the older craters and this is probably due to the variation of the crustal thickness during the history of Ganymede (4). The same plot was done considering different geological units and we noted that the pit diameter tends to increase moving from the grooved terrains to the cratered terrains.

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Fig.4 (the error bars are of the same order of magnitude as those plotted in Fig.3) shows the relationship between the dome diameter and the pit diameter (including the remnants). The best fit is a straight line and considering the ages of the craters, it would appear that the old ones are arranged very close to the best fit line, while the younger craters show a larger scattering. It could mean that, as mentioned before regarding the pit formation, the dome formation is linked to the different characteristics that the crust had during the satellite evolution. The scattering of the young craters become wider for the craters with larger central pits and it would appear that the position of the young craters on the plot is connected to their geographical position. In fact, most of the youngest craters lying on Nicholson Regio fall above the straight line, while the craters lying on Marius and Galileo Regio fall below it.

The behaviour of the surface with respect to the dome formation is different for different areas and presents us with an interesting problem which should be investigated to understand this regional variation of the modification of the craters.

Cited references:

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Fig.1, FDS 20637.44

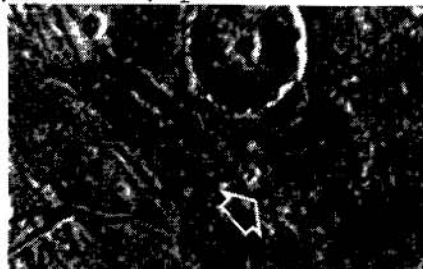


Fig.2,
FDS 20637.38

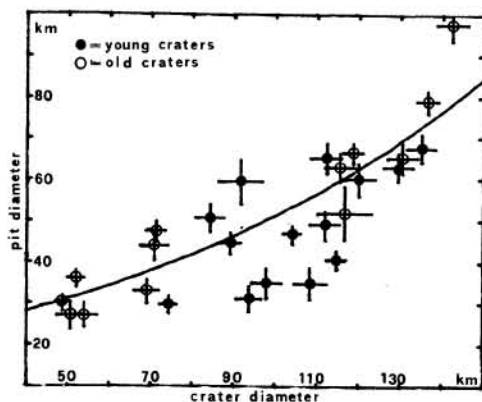


Fig.3

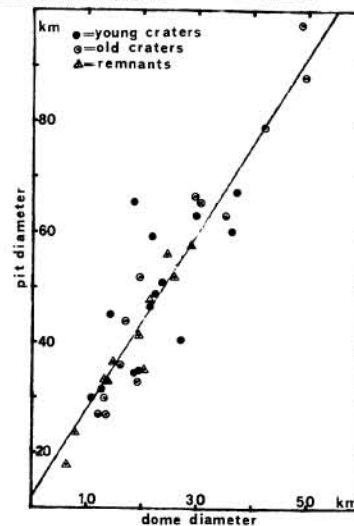


Fig.4