
Many of the impact craters on Mars and Mercury, and particularly the Moon, display a central peak. These central peaks are believed to be directly related to the hypervelocity impacts that form the craters. The relationship between the central peak height and crater diameter, as well as the transition from peaks to interior rings, have been used to support the theory that peaks form by rebound or shock refraction waves at the impact point (1, 2,3).

Hall (4,5) studied the orientation of the central peaks on the Moon. She found that a strong preferential orientation of elongation for linear central peaks exists at a selenocentric angle of 0°N, with a slightly weaker trend at about 20°-30° east and west. These trends were found to be significant on the near side of the Moon, while on the far side and polar regions the N-S trend appears dominant.

Wood and others (6) studied the martian craters which have central peaks in Chryse Planitia, Lunae Planum S-SE of Arsia Mons, S of Apollonius Patera, and NW of Hellas. They found that simple central peaks become increasingly more common as crater diameter increases. All fresh craters larger than 20 km in diameter have central peaks. Craters with diameter of 10-20 km which have no central peaks possess large central pits. The same authors morphologically classified the central pits into three types. They measured craters in smooth plains units separately from those in rugged, cratered terrain.

In general, craters with central peaks on Mars are not as common as on the Moon (Fig. 1). We measured 187 martian craters of varying ages with central peaks and having diameters larger than 20 km. Eleven mosaics produced by the U.S. Geological Survey as part of the "Atlas of Mars" at 1:2,000,000 scale were used in the measurements. These mosaics cover the Memnonia, southern half of Phoenicis Lacus, southern half of Coprates, and

Figure 1. Viking images of Memnonia region of Mars (MC-16) showing the relatively small number of craters that have central peaks and the elongate central peaks trending in a northwest direction within the largest craters.
northern half of Argyre areas.

Of the total number of 187 craters, 97 have elongate peaks; the rest are circular. The elongate peaks may be smooth-topped or sharp-peaked. The elongation was found to be mostly oriented N30°-50°W (35%) with a slightly weaker trend oriented N10°-20°W (13%) (Fig. 2). Only 98 craters have central pits. The pit diameter increases with increasing peak diameter up to 15 km peak diameter (Fig. 3). Peaks of 15-30 km diameter have pits ranging from 5 to 15 km diameter. The pit diameter ranges from 1/4 to 1/2 of the peak diameter. According to the morphologic classification of the variety of central peak/pit structure in martian craters (6) 83 craters have no pit (class A), 29 have relatively small summit pit (class B), 49 have massive central peak with large summit pit (class C), and 26 craters have nearly rimless central pit, replacing central peak (class D).

Peak diameter increases with increasing crater diameter (Fig 4). Craters of diameter 20-30 km have peaks ranging between 2 and 28 km in diameter. The > 30 km diameter craters have peaks with diameters from 5 to 40 km. Small numbers of craters have larger peaks, where a small or no crater floor surrounds the peaks. Also, the number of peaks decreases as crater diameter increase. Figure 5 shows the percent of different sized craters. The histogram is positively skewed. Small sized craters with central peaks are more frequent than the larger craters. Those craters that are 20-30 km in diameter are the most frequent.

Acknowledgments: We thank C. A. Wood for discussion and helpful comments.

References