CONES AND DOMES IN ARCADIA. H. Frey and M. Jarosewich, Geophysics Branch, NASA Goddard Space Flight Center, Greenbelt, MD 20771

As described first by Hodges (1), unusual domes and flow lobes occur in a portion of Arcadia Planitia. The region between 48 and 44°N latitude and 158 to 142°W longitude was imaged at good resolution by Viking (frames 115A11-40) at a range of 2200 km. Mottled plains with distinct flow lobes, ridges and conical and domical features exist in a region relatively free of fresh impact craters. Distinct albedo and texture changes occur at the boundaries of some flows; maar-like structures occur in one frame (115A15) at the distal edge of a flow.

In addition to large mound-like structures up to 8 km across (1), there are a variety of cone-like structures in this region which show obvious relief with respect to the plains on which they occur. While the large domes described by Hodges exist in crenulated terrain with levees extending from a trough-like structure with an axial ridge, the more conical structures are found in smoother terrain adjacent to and partly overlying the crenulated terrain. Many of the cones are subdued in appearance. The area appears blanketed to a large degree, and some of the positive relief features may be partially buried impact craters. Many have a steep morphology unlike that of buried craters, however, and often display central pits or craters. In some cases the pits are quite small relative to the cone-like structure, but in other cases the crater/cone ratio exceeds 50%.

We have measured base diameters and pit diameters for domes and cones which appear to be non-impact features. As done previously (2,3, previous abstract), these data are plotted as histograms of base diameter and crater/cone diameter ratio, and are shown in Figure 1. For comparison we include data for small cones from the Isidis and Utopia regions, which morphologically show little diversity and have a well defined crater/cone ratio distribution. These small cones from Isidis and Utopia are, as a group, much more uniform than the small cones in Cydonia (previous abstract). In particular, they cluster very tightly in a crater/cone vs. cone diameter diagram, as shown in Figure 2 (see below). The Isidis features are small, with a single dominant peak in Figure 1 in the 400-600 m bin. The Utopia subkilometer cones show a peak that covers two bins, from 400-800 m, but fall mostly between 500-700 m when examined in more detail (3). Both of these groups have similar crater/cone ratio distributions, with a strong peak in the 0.45-0.54 bin and a secondary peak in the next lowest bin that is characteristically about 45% as high (Figure 1). In this regard the small cones in Isidis and Utopia are similar to the small cones in Cydonia, as described in the previous abstract, especially in the central part of the region (3).

From Figure 1 it is clear that the domes and cones in Arcadia are quite different from the small cones in Isidis-Utopia. The diameters range from 500 to 8000 m (although Figure 1 cuts off at 4 km); the majority fall in the 800 to 2400 m range. The crater/cone ratio distribution is also quite unlike that for the small Isidis-Utopia cones, being broadly peaked in the two bins where crater/cone ratio = 0.25 to 0.44. The adjacent bins are roughly equal at 35% the number in the peak bins. This crater/cone ratio distribution is also different from that shown by the "steep" cones in Cydonia (previous abstract).

Figure 2 displays these data in the crater/cone ratio vs. cone diameter format. The data points are the 172 features we measured in Arcadia. In Figure 2A these are compared with the same data for the small and steep cones in Cydonia, as described in the previous abstract. In Figure 2B the Arcadia data are compared with the fields representing the Isidis and Utopia data. Note the restricted range of these latter fields. There is very little overlap between the Arcadia data and that for the small cones in Isidis-Utopia. Much greater overlap occurs between the Arcadia and Cydonia--steep cone data (Figure 2A), although the Arcadia domes and cones can be much larger and do not display some of the very small crater/cone ratio (<0.15) found in the Cydonia steep cones. Note the occurrence of a few large cones with large crater/cone ratios (>0.60). These are similar to maars or tuff rings in morphology, but too few examples exist for detailed morphometric comparisons (3). It seems likely that this region of Arcadia contains a number of different volcanic forms, some of which are similar morphologically and morphometrically to the "steep" cones in Cydonia, but most of which are morphometrically distinct from the small cones of Isidis and Utopia.

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Frey, H. and Jarosewich, M.

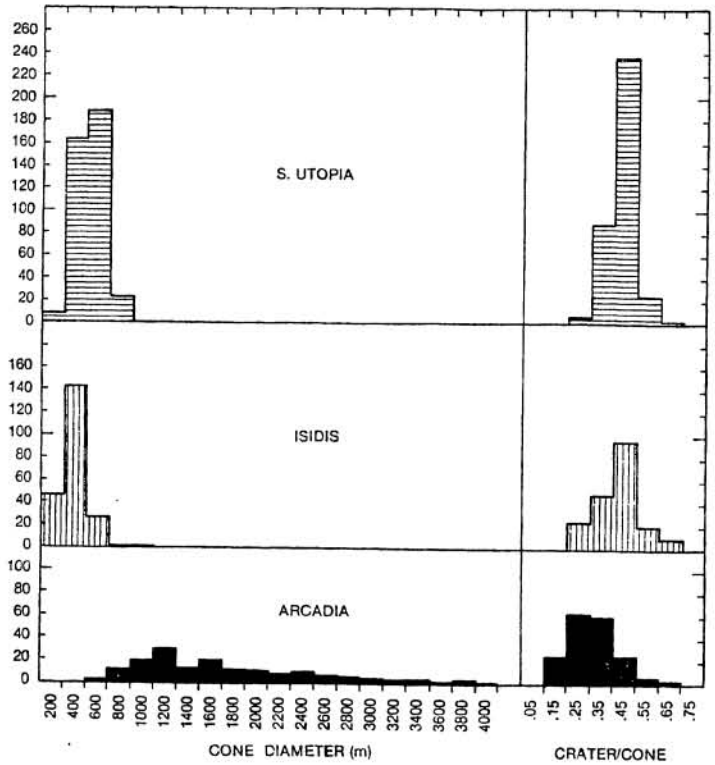

Figure 1: Cone diameters and crater/cone ratios for features in Arcadia, Isidis and Utopia.

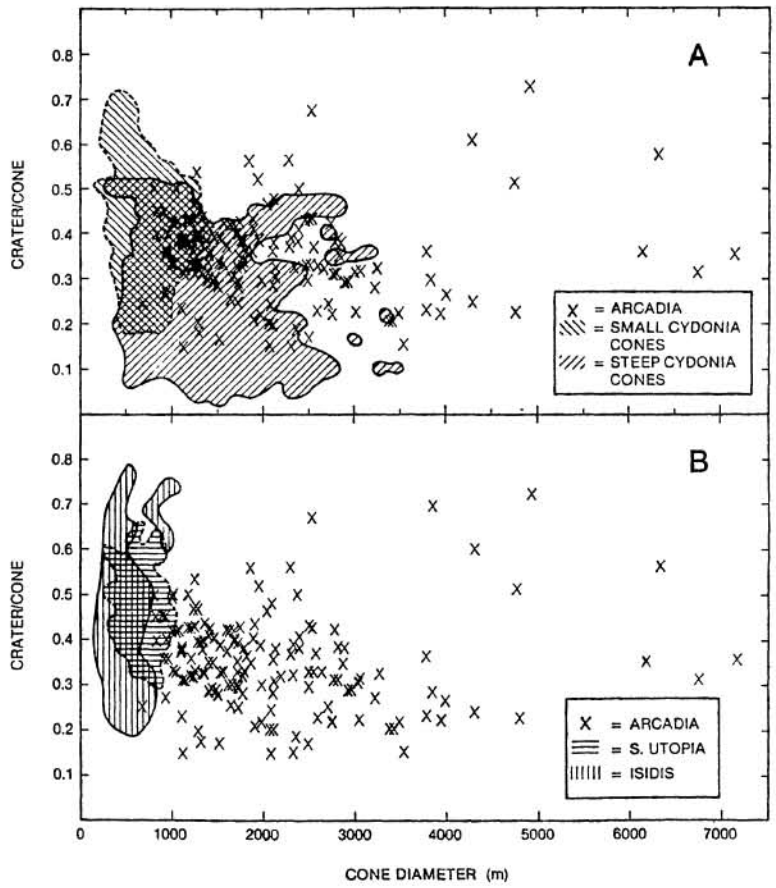

Figure 2: Crater/cone vs. cone diameter for Arcadia features compared with Cydonia, Utopia and Isidis cones.

REFERENCES:
(1) Hodges, C.A. (1980) NASA Technical Memorandum 81776, p. 184.
(2) Frey, H. and M. Jarosewich (1981) Third Intern. Coll. Mars, p. 84.
(3) Frey, H. and M. Jarosewich (1981) Submitted to JGR.