MARS: MORPHOLOGY OF SOUTHERN HEMISPHERE INTRACRATER DUNEFIELDS.

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Although most eolian dunes on Mars occur in the North Polar sand sea (Breed et al., 1979; Tsoar et al., 1979), there are important areas of dunes at mid to high latitudes in the southern hemisphere. At least 75% of these dunes occur within craters (Thomas, 1981; Peterfreund, 1985). In addition to the areas of dunes, many crater floors are mantled by material of probable eolian origins (Thomas, 1981; Christensen, 1983). A large cluster of intracrater dunefields lies in Noachis Terra between latitudes -40 to -48° and longitudes 330-340°, with major dune accumulations in the craters Kaiser, Proctor and Rabe. Dunes in this region were amongst the first to be recognised on Mars (Cutts and Smith 1973; Breed 1977), but have not been studied in detail on Viking Orbiter images.

The size of the dunefields ranges from 40 to 3600 km^2 and varies directly with crater size. Preliminary studies of Viking Oribiter images of intracrater dunefields reveals that they consist of two varieties. The most common type is composed of massed straight to slightly wavy crescentic dunes similar to those described by Breed (1977) and Breed et al. (1979). Dune fields of this type occupy more than 20% of the area of the crater floor, with the dunefield margins often marked by a large "dune wall" or rampart. Dune spacing ranges between 0.7 and 1.2 km. Slipface orientations suggest that dune forming winds were southeasterly. The second type of dune accumulation consists of clusters of large, widely spaced straight or curved ridges, which often intersect to create rectilinear patterns. Dunes are typically spaced 1.6-4 km apart with a mean spacing of 2.42 km. On the margins of some dunefields there are small (0.5-0.9 km spacing) cresentic dunes together with widely spaced barchans. Pyramidally shaped dunes are evident in some examples and many dunes appear to have multiple slip faces which face northwest or south. Dunefields of this type occupy a small proportion (2-10%) of the crater floor.

Terrestrial analogues for dunes in this region which are equivalent to those found in type 1 dunefields have been discussed by Breed (1977). The dunes of the type 2 dunefields appear to be dimensionally similar to large crescentic dunes in the Gran Desierto, Mexico and in central Asian sand seas. Many of the large crescentic dunes in the Gran Desierto are compound forms, with superimposed small dunes on their flanks. Others are complex forms, with reversing or stellate dunes developed on their crests (Lancaster et al., in press). Some of the type 2 dunefields are similar in size and arrangement of dune ridges to those in valleys of the Mojave Desert.

Terrestrial dunes which are analogous to those in the intracrater dunefields have developed in wind regimes in which dominant sand transporting winds are counteracted by seasonal winds from opposed directions. Thomas (1981) has suggested that winds in this region of Mars are strong southeasterly in spring, but southwesterly in winter. In addition, the craters may also generate local winds. In such situations, the existence of apparently complex dune forms may be expected.

Further research is planned to examine the morphology of intracrater dunefields in more detail and to assess their relationship to local geological settings. Wind tunnel modeling of dune-topography interactions will help to interpret the form of dunes developed in areas of complex topography.

References

Breed, C.S. 1977. Terrestrial analogues of the Hellespontus Dunes. *Icarus*, 30: 326-340.

Breed, C.S. Grolier, M.J. and McCauley, J.F. 1979. Morphology and distribution of common 'sand' dunes on Mars: comparison with the Earth. *Journal of Geophysical Research*, 84: 8183-8204.

Christensen, P.R. 1983. Eolian intracrater deposits on Mars: Physical properties and global distribution. *Icarus*, 56: 496-518.

Cutts, J.A. and Smith, R.S.U. 1973. Eolian deposits and dunes on Mars. *Journal of Geophysical Research*, 78: 4139-4154.

Lancaster, N., Greeley, R. and Christensen, P.R. in press. Dunes of the Gran Desierto, Mexico. *Earth Surface Processes and Landforms.*

Peterfreund, A.R. 1985. Contemporary aeolian processes on Mars: local dust storms. Unpublished Ph.D. dissertation, Department of Geology, Arizona State University.

Thomas, P. 1981. North-south asymmetry of eolian features in martian polar regions: analyis based on crater-related wind markers. *Icarus*, 48: 76-90.

Tsoar, H., Greeley, R. and Peterfreund, A.R. 1979. The north Polar sand sea and related wind patterns. *Journal of Geophysical Research*, 84: 8167-8182.