**A PRELIMINARY INVESTIGATION OF AEOLIAN FEATURES ON VENUS USING MAGELLAN DATA**; 

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A preliminary investigation of Magellan images of Venus has shown that certain regions of the planet exhibit aeolian features, such as wind streaks and sand dunes. In order to produce these features, there must be a supply of entrainable material, a suitable topographic obstacle that can disturb the wind flow, and a sufficiently strong wind capable of transporting material. Most of the wind streaks are clustered on the plains between 20-30 degrees north and 20-30 degrees south latitudes and 330-350 degrees longitude. The majority are located on the inferred lee sides of volcanic cones.

The Venera 9 and 10 landers measured surface wind speeds of 0.5-1.0 m/s at a height of about 1 m above the surface [1,2]. These speeds are well within the predicted range for particle entrainment thresholds based on theory and extrapolations of wind tunnel experiments [3]. Venera Lander images revealed rock fragments several centimeters and larger set in a mass of fine-grained material interpreted to be sand size or smaller [1]. Based upon these observations, Saunders et al. [4] predicted that wind streaks would be visible in Magellan images.

A cluster of wind streaks at 20-30 degrees north latitude and 330-335 degrees longitude indicate a wind direction from NE to SW toward the equator. The streaks are all radar-bright, though some have a radar-dark halo. Those with radar-dark halos (20-25 degrees lat.) have an average radar cross section of -17 dB and they appear to expose the underlying terrain, suggesting that downwind of obstacles, turbulence prevents deposition of sediment. In contrast, those wind streaks without dark halos (25-30 degrees lat.) have an average radar cross section of -13 dB, do not appear to expose underlying terrain, and may in fact be deposits of debris downwind of the obstacle.

At 20-30 degrees south latitude and 335-350 degrees longitude is another cluster of wind streaks. These seem to be associated with a radar-dark region that extends from the south and is visible in Arecibo images. This dark region shows up as a low in emissivity data as well. Situated in this radar-dark region are four large impact craters that may be the source for much of the radar-dark material. Figure 1 shows a mosaic of twelve Magellan orbits centered at 25 degrees south latitude and 339.5 degrees longitude at the north edge of the crater field. Evidence of aeolian activity in this image includes radar-dark (-21 dB) and -bright (-18 dB) wind streaks trending east-west. In the center of the image are two bright features trending north-south that outline an outflow channel from a 60-km diameter crater to the south. Near the end of the outflow channel are speckly features which may represent sand dunes. Radar images of sand dunes on earth also show specular reflections from smooth dune faces that are near-normal to the radar beam. Assuming an angle of repose of 33 degrees for the sand dunes, the look angle must be roughly equal to 33 degrees in order to produce strong backscatter from the dunes. A test to determine if these are in fact sand dunes would be to increase the incidence angle from 34 degrees at this latitude and see if the features disappear.

Figure 2 shows wind streaks deflected around the crater Carson and ridge terrain at 25 degrees south latitude and 345 degrees longitude, to the east of Fig. 1. Surrounding Carson is a dark parabolic feature (-15 dB at 45 degrees incidence angle) that may be debris associated with the impact [5] Wind streaks associated with this dark parabolic feature indicate that the wind is blowing from SW to NE south of Carson and is deflected to a SE-NW flow around the crater and the topographically high ridge terrain to the west. The majority of these wind streaks are radar-bright streaks with radar cross sections of -8 dB superimposed on radar-dark streaks with -19 dB cross sections. Analysis of radar images of terrestrial wind streaks indicates that bright streaks downwind of topographic obstacles are due to turbulent eddies in the wake of obstacles that prevent sediment deposition and smoothing of the surface [6]. These streaks of higher radar backscatter seen in Magellan images are also interpreted to be regions swept clean of loose material.

A map of the inferred dominant wind directions indicates that the dominant wind directions are an equatorward flow and an east-west flow, modulated by topography. As Magellan continues to map the surface of Venus, the identification of more aeolian landforms will be used to refine the global wind circulation model.

**References.** [1] Florensky et al., *Geol. Soc. Am. Bull.*, **88**, 1537-1545, 1977; [2] Ksanfomality L.V., N.V. Goroshovka, and V.K. Khondyrev, *Cosmic Res.*, **21**, 161-167, 1983; [3] Greeley et al., *Icarus*, **57**, 112-124, 1984; [4] Saunders, R.S., A. R. Dobrovolskis, R. Greeley, and S. D. Wall, *Geophys. Res. Let.*, **17**, 1365-1368, 1990; [5] Arvidson, R.E., V.R. Baker, C. Elachi, R.S. Saunders, and J.A. Wood, *Science*, in press; [6] Greeley R., P. Christensen, and R. Carrasco, *Geology*, **17**, 665-668, 1989.

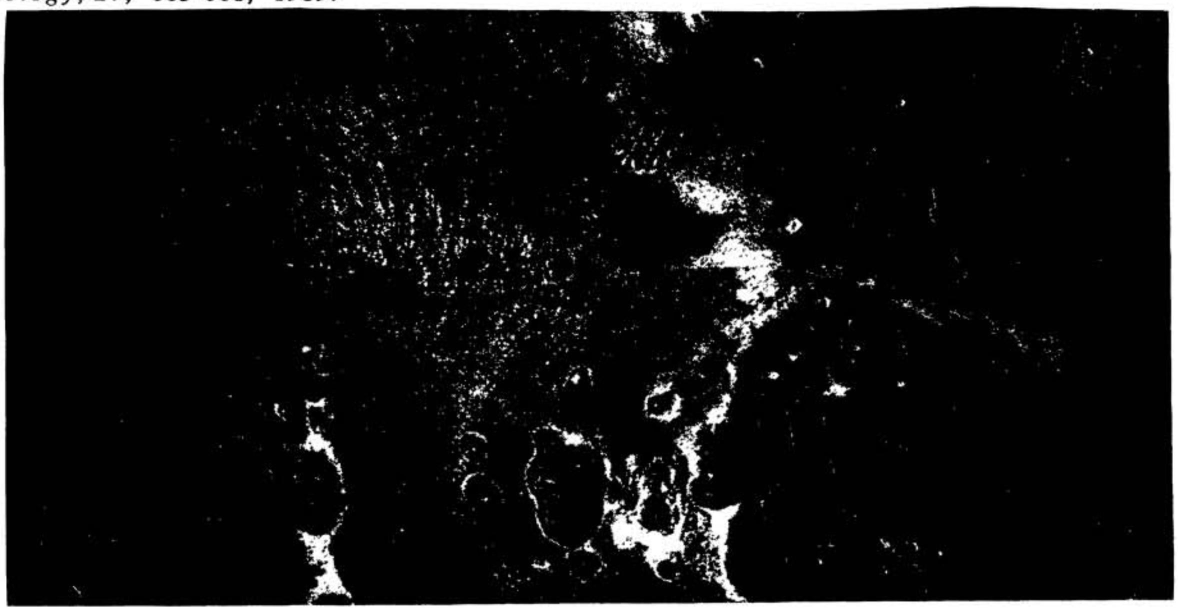

**Figure 1.** Mosaic of Magellan SAR data centered at 24 degrees south latitude and 340 degrees longitude. In the center of the image is an outflow channel. At the end of the channel (top) are speckly features which may represent sand dunes. The dark and bright lines trending east-west in the image are wind streaks. Image is 120 km across.

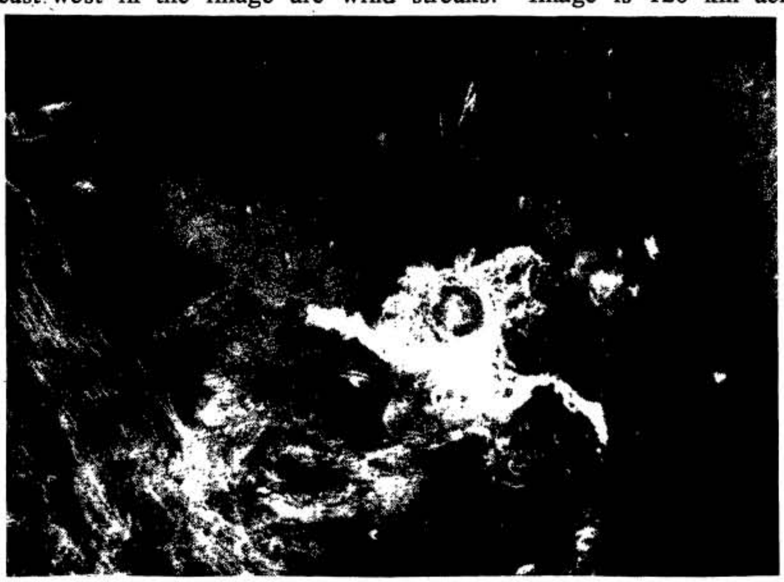

**Figure 2.** This mosaic is centered at 25 degrees south latitude and 345 degrees longitude. To the west are ridge terrain and in the center is the crater Carson. Surrounding Carson is a dark parabolic feature that has numerous wind streaks associated with it. Image is 340 km across.