WIND-RELATED FEATURES ON VENUS OBSERVED VIA MAGELLAN; R. Greeley, M.A. Geringer, *Arizona State University, Tempe, AZ,* Raymond E. Arvidson, *Washington University, St. Louis, MO,* Charles Elachi, Jeffrey J. Plaut, R. Stephen Saunders, Ellen R. Stofan, Stephen D. Wall, Catherine M. Weitz, *Jet Propulsion Laboratory, Pasadena, CA,* Gerald Schubert, *University of California, Los Angeles, CA,* and Eric J.P. Thouvenot, *CNES, Toulouse, France*

Magellan SAR data reveal numerous surface features that are attributed to aeolian, or wind processes [1,2]. Wind streaks are the most common aeolian feature [3]. They consist of radar backscatter patterns that are high, low, or mixed in relation to the surface on which they occur. A data-base of more than 3400 wind streaks show that low backscatter linear forms (long, narrow streaks) are the most common, and that most streaks occur between 23°S to 30°S and 23°N to 30°N on smooth plains. Moreover, most streaks are associated with deposits from certain impact craters and some tectonically-deformed terrains. We infer that both of these geological settings provide fine particulate material that can be entrained by the low winds on Venus. Turbulence and wind patterns generated by the topographic features with which many streaks are associated can account for differences in particle distributions and in the patterns of the wind streaks. Thus, some high backscatter streaks are considered to be zones that are swept free of sedimentary particles to expose rough bedrock; other high backscatter streaks may be lag deposits of dense materials from which low density grains have been removed (dense materials such as ilmenite or pyrite have dielectric properties that would produce high backscatter patterns).

Wind streaks generally occur on slopes < 2° and tend to be oriented toward the equator, supporting the Hadley model of atmospheric circulation. Data do not support Halley circulation patterns related to subsolar-antisolar heating contrasts, although observations are limited to test this possibility. In addition to wind streaks, other aeolian features on Venus include yardangs (?) and dune fields [3,4]. The Aglaonice dune field, centered at 25°S, 340°E, covers ~1,290 km^2 and is located in an ejecta flow channel from the Aglaonice impact crater. The Meshkenet dune field, located at 67°N, 90°E, covers ~17,120 km^2 in a valley between Ishtar Terra and Meshkenet Tessera. Wind streaks associated with both dune fields suggest that the dunes are of transverse forms in which the dune crests are perpendicular to the prevailing winds. Dunes on Venus signal the presence of sand-size (~60 to 2,000 μm) grains. Although most aeolian features are concentrated in smooth plains near the equator, the occurrence of wind streaks is widespread and some have been found at all latitudes and elevations. They demonstrate that aeolian processes operate widely on Venus. The intensity of wind erosion and deposits, however, varies with locality and is dependent on the wind regime and supply of particles.

In conclusion, the surface of Venus is characterized by low rates of erosion, primarily due to the lack of water on the surface. Mechanical erosion through tectonic deformation in ridge belts and regions of tessera may produce small amounts of particulate matter that can form aeolian features. Volcanic deposits may also play a small role in producing fine material on Venus--many streaks form in association with cones of probable volcanic origin. However, the primary contribution to the production of particulate matter on Venus is from impact cratering. Aeolian features form predominantly near impact craters, especially those with associated ejecta haloes or parabolas, or near dark deposits thought to be "failed" impacts [5].

Continuing analysis of the backscatter cross sections of aeolian features will provide further insight into erosional and depositional processes on Venus. Data from Magellan's extended mission will be used to assess the backscatter characteristics of aeolian features of different viewing geometries and to obtain a complete inventory of wind-related features on Venus. Most significantly, over the next several years, Magellan will provide the opportunity to detect changes in aeolian features or the formation of new features, providing further information on atmosphere/surface interactions and the nature and evolution of surface materials on Venus.

References:

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