VENUS: PRELIMINARY WIND TUNNEL SIMULATIONS OF AEOLIAN PROCESSES. *Greeley, R., Williams, S.H., Marshall, J.R., White, B.R., Iversen, J D., Leach, R.N., and Pollack, J.B., NASA-Ames Aeolian Consortium (Department of Geology, Arizona State University, Tempe, Arizona 85287)*

Aeolian (wind) processes are generally considered to occur on Venus, given its dynamic atmosphere and the apparent presence of particles in the size range appropriate for wind transport (1-6). The frequency of particle-moving winds and the magnitude of aeolian processes, such as wind erosion, are difficult to assess, especially in terms of the relative importance of aeolian activity in the modification and evolution of the venusian surface. Many aspects of aeolian processes require knowledge of the fundamental physics of windblown particles. Such knowledge has been gained on Earth and Mars through laboratory (principally wind tunnel) investigations. Using this same approach, a wind tunnel was fabricated at NASA-Ames Research Center which is capable of simulating (in part) the venusian environment (7). Preliminary experiments have been carried out to determine *particle threshold windspeeds* (minimum winds required to initiate grain motion), *particle flux* for given grain diameters and surface winds, and the *speeds of windblown grains.*

Experimental results for threshold (Fig. 1, showing wind friction speed vs. particle diameter) and particle flux (Fig. 2, showing mass in grams moving through a lane width of infinite height per sec) agree generally with theory based on extrapolations from experiments appropriate for Earth and Mars conditions. The difference between theory and the experimental data may be the result of experimental error (e.g., calibration of the wind tunnel is still underway) or may be due to incomplete theory. For example, the expressions for flux do not wholly take into account particle size, but this parameter may be critical. Additional experiments are in progress to address these uncertainties. Fig. 3 shows particle velocities (given both in m/s and as a % of freestream windspeed) with height above the surface determined by analysis of high speed motion pictures. In contrast to Earth and Mars (8), windblown particles quickly reach speeds equal to or exceeding the windspeed under venusian conditions, evidently a reflection of effective coupling between the high density of the atmosphere and the particle and elastic rebound of saltating grains.

Although analyses of the experiments are tentative, results have several implications for interpretation of venusian surface history: 1) estimates of flux yield rather high values, lending support to the model of Nozette and Lewis (9) that windblown particles may be important in geochemical 'buffering' of the atmosphere, and to the suggestions of Warner (10) that aeolian transport may play a key role in forming vast plains regions on Venus; 2) observations of particle transport and the development of sedimentary bedforms in the VWT show that *rolling* of grains along the surface at relatively low windspeeds may be an important mode of transport and one which is unique to Venus in the aeolian context; this may lead to the formation of unexpected bedforms and sedimentary structures; 3) ripples of 10-20 cm wavelength developed, in contrast to earlier predictions that ripples on Venus may be very small. Ripple size and geometry as functions of particle size and wind conditions need to be fully explored in order to predict radar signatures of aeolian terrain on Venus.

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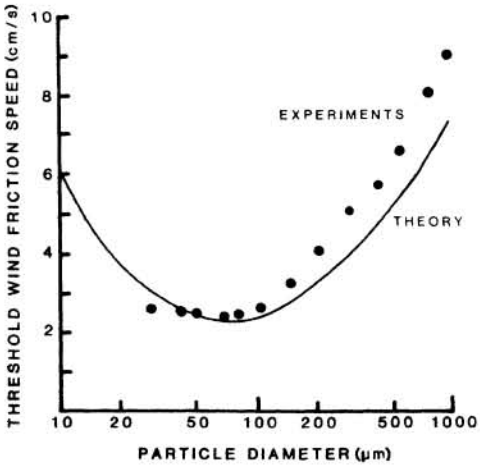

Figure 1. Threshold curves for Venus comparing experiments with theory.

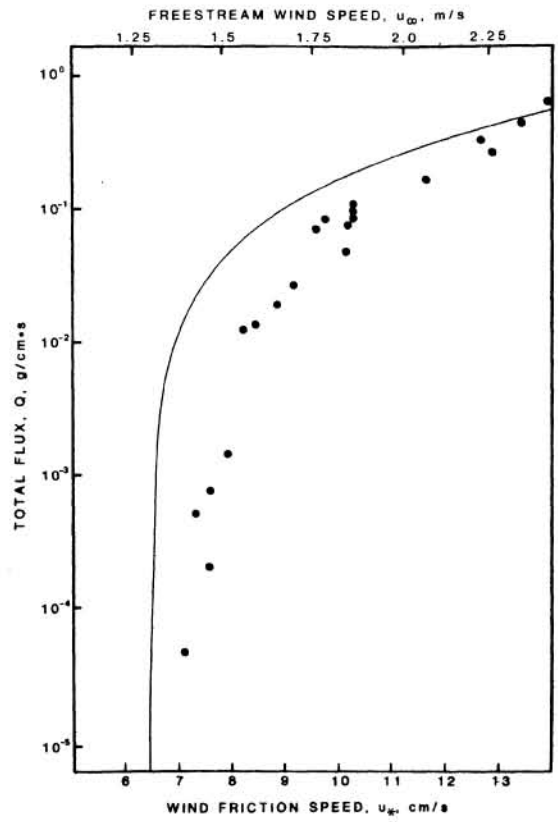

Figure 2. Particle flux on Venus for particles 500 to 600 μm in diameter, comparing experiments (points) with theory.

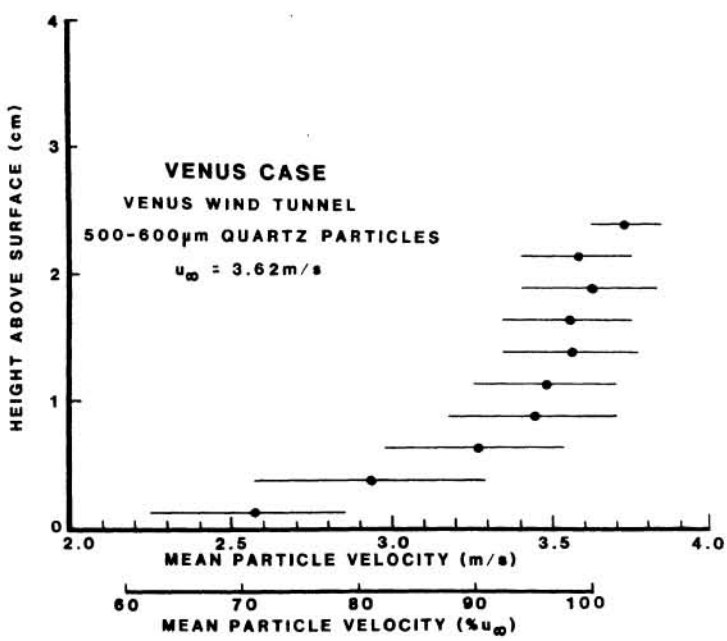

Fig. 3. Particle velocities as a function of height above the surface for a fixed windspeed; average velocity and range of velocities at each height are shown.