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Aeolian processes on Venus: Probabilistic study on threshold speeds

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Dust particles and haze formation on the surface of Venus have been observed and studied using several independent techniques onboard Venus lander missions. A possibility of mineral haze formation in highlands is supported by observations of high reflectivity and low emissivity features from Pioneer Venus Orbiter and Magellan radar experiments, while Venera 13 and 14 spectrophotometer analysis yields appreciable aerosol extinction at the same altitudes. In this work, we present threshold parameters for dust lifting from 1 μm to 1 cm sized dust particles over the globe using emissivity and surface topography data provided by Magellan radar. The threshold wind speeds have been derived using theoretical and experimental models and compared with the in-situ measurements reported earlier. Haze formation is less likely to occur solely due to wind shear by micron and submicron sized particles. The entrainment process and properties of the boundary layer also contribute to variation in threshold wind speeds and particle transport.