N91-27080

SAND AND DUST ISSUES FOR THE MESUR MISSION

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The presence of particles in the Martian atmosphere increases the rate of erosion of the heat shield during the entry phase of the MESUR mission. Preliminary analysis has shown that under certain conditions particles will penetrate the bow shock of the entry vehicle, impact and erode the heat shield, above the anticipated rate from the ablation process. Knowledge of the distribution, sizes, and composition of particles suspended in the atmosphere will permit the estimation of the heat shield recession both for a nominal Mars atmosphere and in dust storm conditions. Some key interests concerning sand and dust in the atmosphere can be summarized in the following questions.

1) What is the variation of atmospheric dust distribution for nominal atmospheric conditions as well as in dust storm conditions as a function of altitude, latitude & longitude, and season?
2) What level of predictive capability exists i) at present, and ii) with MO, to forecast the onset of a dust storm?
3) What is the ratio of dust to gas in the atmosphere?
4) What is the distribution of particle sizes?
5) What is the best estimate of the compositional nature of particles in the atmosphere, i.e. what percentage of the particles are silicate and what fraction is ice? This is important in estimating the fraction of particles that will impact the heat shield surface. Knowledge of the composition of the dust particles is also needed to determine the extent of their sublimation in the shock layer.

On the surface of Mars, sand and dust can effect of the operations and design of the science instruments (i.e. imaging) and lander subsystems (i.e. solar arrays). Distribution and deposition of sand and dust on the planet's surface will dictate the feasibility of using solar arrays as a power source for the lander. Furthermore, the potential abrasive nature of blowing particles must be understood in order to properly select suitable materials for lander structure and any components exposed to the environment. The selection of lander material may also be dictated by corrosive and chemically active properties of particles at a potential landing site. Some key interests concerning sand and dust on the surface can be summarized in the following questions.

1) What factors determine the distribution and deposition of sand and dust on the surface?
- winds
- local geography (for example, does landing on the leeward side of a mountain, hill, or just a big rock, greatly effect the distribution of dust either by winds or the presence of sand and dust sources)
- local geology (lava flows, craters, etc.)
- regions of active sand dunes
- other meteorological factors

2) What is the current state of knowledge concerning deposition of sand and dust on surface landers?
- electrostatic properties
- Viking design requirements
- deposition on solar arrays
- abrasion effects of blowing sand on s/c materials (design goal for up 8 earth-years on surface)

3) How could the Mars wind tunnel at Ames be best used during FY91 for determining answers to any of the above mentioned questions?