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LANDING SITE CONSIDERATIONS FOR ATMOSPHERE STRUCTURE AND METEOROLOGY. A. Seiff[1], R. Haberle[2], and J. Murphy[1], [1]San Jose State University Foundation, Mail Stop 245-1, NASA Ames Research Center, Moffett Field CA. 94035, USA, [2]NASA Ames Research Center, Moffett Field CA 94035, USA.

The goal of the ASI/MET experiments is to extend our knowledge of Mars atmosphere structure and meteorology over that established by the Viking mission. The two *in situ* soundings of Mars atmosphere by Vikings 1 and 2 were highly similar, but radio occultations and infrared soundings have shown large variability in atmosphere structure on Mars with latitude, season, and terrain elevation [1,2]. It would be of great interest to obtain an *in situ* sounding showing strong contrast in thermal structure with the Viking profiles. These would be expected to occur in the winter season, in the southern hemisphere, or at polar latitudes. These options are ruled out by Pathfinder Mission constraints, which place the entry in low, northern latitudes in mid summer, with small seasonal difference from the two Viking landers, and small latitude difference from Viking 1. The Pathfinder arrival date and latitude correspond to a seasonally equivalent Earth date of August 15, compared to June 21 for Viking 1 and July 17 for Viking 2, not a striking difference. (In the Pathfinder arrival season, however, the seasonal pressure variation on Mars is essentially at minimum, corresponding to a pressure of 5.9 mbar at the mean radius [2]. This will lead to somewhat increased parachute descent velocities. Also, the arrival will coincide with the occurrence of transient normal mode oscillations previously observed by Viking in several consecutive Mars years [4].)

Within the Pathfinder constraints, the best possibilities for extending observations to other conditions are to (1) maximize latitude contrast with Viking 1 by moving toward the equator; (2) study the influence of prominent terrain features on structure and the general circulation; or (3) examine the effect of dark-albedo features on the overlying structure, since radiative equilibrium with the surface controls the temperature structure to first order [3]. Landing sites satisfying the above criteria are discussed below.

Near-equatorial sites, from 0° to 10°N latitude, are available in the region from 235°W to 150°W, with the eastern end in Elysium Planitia. This terrain is of mixed albedo, variegated light and dark. It would thus present a terrain contrast with Viking 1, in addition to a significant latitude difference. This region is south of Cerberus Rupes.

To study the influence of a prominent terrain feature, what better to choose than Olympus Mons? A site in Amazonis Planitia due west of Olympus at 150°W, 18°N has an elevation of –1.5 km. This terrain will certainly affect the atmospheric circulation below 20 km, and radiation effects from the inclined terrain could also influence the thermal structure. The descending terrain at this site will have a slope wind signature. It is an interesting site.

Another terrain influence possibility occurs in Isidis Planitia, directly east of Syrtis Major, which rises to an elevation of 4 km within a few hundred kilometers of a possible landing site at – 2 km, an ideal location for the study of slope winds as well as terrain influence.

Within Isidis farther from Syrtis Major, the primary goal for atmosphere structure would simply be to look for temporal change from 1976 and the effect of the small seasonal change. Centered at 270°W, there is a smooth, bland region with a large area below –2 km (>10° diameter) in which the terrain appears to be very similar to that in Chryse on the USGS maps. Other sites apparently similar to Chryse lie east of Chryse Planitia extending as far as 20°W longitude. A generally interesting target in this region is the upper region of Ares Vallis, which looks like a broad, dark-albedo flood plain, and therefore presents a difference. The Tui Valles region at about 13°N and 33°W also has some interesting characteristics. It is at the required low elevation, and is a valley centered on a river channel in a region of albedo contrasts.

Two members of the Science Advisory Team who worked extensively on analysis of Viking data favored continuation of the Viking 1 dataset as close as possible to the Viking 1 landing site. This would no doubt be valuable. However, it can be argued that the exploration of other sites is more likely to lead to major advancements in understanding of Mars meteorology.

To satisfy the third objective, a site within the unnamed but prominent dark-albedo feature about 350 km wide, which sweeps across Elysium Planitia from northeast to southwest, is suggested. At 15°N, where the center of this feature is at 245°W, terrain elevation is –1 km. The width of this feature nearly matches the horizontal region sampled by the structure experiment, so that sampling entirely within the vertical region overlying this feature is possible.

Assigning priorities to these options, we suggest, from the standpoint of atmosphere structure, the following sites: (1) Amazonis Planitia, 18°N, 150°W, elevation –1.5 km; (2) Isidis Planitia, 13°N, 278°W, elevation –2 km; (3) Ares Vallis, 16°N, 32°W, elevation –2 km; (4) Cerberus Rupes region in Elysium Planitia, 5°N, 190° to 197°W, elevation –2 km; (5) dark feature in Elysium Planitia, 15°N, 246°W, elevation –2 km.

By and large, site selection factors for atmosphere structure, to define the effects of latitude, terrain, and soil temperature, are also important to landed meteorology. Viking established that slope winds are dominant in summer, and their study would be continued at sites 1, 2, and 3. To further examine the pressure fluctuations associated with traveling baroclinic disturbances, seen at the two Viking sites, a site at midlatitudes is preferred [4]. The five sites we list are not optimum from this standpoint, but are well suited to monitoring such tropical phenomena as thermal tides, Kelvin waves, normal modes, and Hadley circulations.

Winds at several landing sites have been examined using the NASA Ames GCM [5]. Ten-day average winds at the two sites near the large terrain obstacles are ~20 m/s with extremes of 5 and 35 m/s, much larger than mean winds at the two Viking sites. Certainly, a key objective of the Pathfinder experiment will be to see if these predicted winds are verified by measurements. If so, it will establish the validity of the GCM not only for understanding Mars circulation, but also as a tool for future mission design.

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