STRATEGIES AND RECOMMENDED TARGETS FOR MARS SURVEYOR PROGRAM LANDING SITES.

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Introduction

Engineering criteria (latitude, elevation, surface slopes, rock and dust coverage) constrain and dictate to a certain extent where a lander/rover spacecraft can safely land. Scientist must "live" within these guidelines and work to find a geologically interesting landing site. Models of thermal inertia and rock abundance [1,2] are often used to limit regions for candidate landing sites. However, one must remember that the thermal inertia and rock abundance models are averages and bins are 2 by 2 degree lat, lon and 1 by 1 degree lat, lon, respectively. It is this investigators view that hi-res imagery, of an area in question, should take precedence over models in determining the fitness of landing sites. For instance, numerous hi-res MOC images in the Elysium region exhibit a dust free surface yet the models predict low thermal inertias (fine grained materials/dust). Additionally, there is no evidence for drifts or dunes of fine grained materials in this region of Elysium. The surface in this region has been interpreted to be the result of fluid volcanism [3], however [4] interpret this as being the deposit of ice charged mudflows.

Uniform Geology vs. Compact Geology:

The two major competing scientific strategies for selecting a landing site are: geologically uniform simple sites and geologically diverse complex sites. Simple sites contain regions with extensive, uniform surface materials that are a typical representation of a widely occurring type of terrain of clear global importance (Hr: Hesperian ridged plains material).

Complex sites contain regions with compact geology, which is defined as regions with a wide variety of surface materials in terms of age and origins (Avf: Amazonian Ganges Chasma floor material). The obvious advantage of a site with compact geology is the availability of a maximum variety of materials and ages. However, the geologic history of a complex site might prove to be very difficult to decipher.

One caveat regarding the sampling of Martian crater ejecta deposits for stratigraphy should be noted: namely ejecta mixing and destruction of the systematic pattern seen on the Moon due to the Martian atmosphere. The present day Martian atmosphere can cause this affect to occur [5] and a thicker earlier atmosphere would only accentuate this process.

Most of these candidate landing sites have been proposed by the author before this meeting and are referenced.

Mars Surveyor Program Candidate Landing Sites

Site: ***Terra Sirenum*** [6]
Science Objectives: Highland-lowland dichotomy site with valley networks, fan-deltas, lava flows, fresh crater ejecta, fluvial deposits (fan-deltas) may be good locales for preservation of biogenic materials.
Location: 4.9° to 5.2° S; 147.0° to 147.5° W
Elevation: 1 km
Geologic Setting: Noachian ridged plateau (early crust), Hesperian intercrater plains: lava flows, Amazonian/Hesperian Tharsis Montes Fm: lava flows, Amazonian lava flows, Amazonian/Hesperian valley network fluvial deposits (fan-deltas at Abus and Isara Vallis), ejecta blanket of 10 km diam. Amazonian crater.
Landing Site: Smooth, flat Outwash Plains of Valley Networks, Abus and Sensus Valles. This site is located along the hemispheric dichotomy and would provide an ideal compact geology site. Hazards would be minimal on these small outwash plains.
Rock Abundance: 7%
Thermal Inertia (10-3 cgs units): 0
Fine Component (10-3 cgs units): 2.4
Albedo: 0.2970
Slope: 0°

Site: ***Aeolis Mensa***
Science Objectives: Investigate the nature of this layered terrain in the ancient highlands. Layered Material may be good locale for burial and preservation of any biogenic material.
Location: 6° to 9° S; 214° to 216° W
Elevation: -1 to 1 km
Geologic Setting: Ancient highlands: Noachian plateau sequence material.
Landing Site: Ancient Highlands with smooth, flat layered plains of Aeolis Mensa. This site is located south of the hemispheric dichotomy.
Rock Abundance: 7 to 9%
Thermal Inertia (10-3 cgs units): 5.1
Fine Component (10-3 cgs units): 5.2 to 6.0
Albedo: 0.2630
Slope: 0° to 1°

Site: ***SE Terra Meridiani*** [7]
Science Objectives: Investigate the nature of these Noachian and Hesperian layered ancient highlands and valley network /lacustrine deposits.
Location: 0° to 12° S; 340° to 356° W;
Landing site: 7°S, 347°W
Elevation: 1 to 2 km
Geologic Setting: Ancient highlands 130 km southwest of Schiaparelli crater. Noachian plateau material dissected by numerous valley networks. Valley networks flow down the southern and eastern rims of this region into the smooth plain (lacustrine). Smooth featureless plains embay isolated hills and massifs.
Landing Site: Smooth plains, this site may be a paleolake basin.
Rock Abundance: 4 to 8%
Thermal Inertia (10-3 cgs units): 5.2 to 6.2
Fine Component (10-3 cgs units): 4.8 to 5.4
Albedo: 0.1620 to 0.2090
Slope: 0° to 2°

Site: ***Schiaparelli Crater Floor*** [8]
Science Objectives: Investigate the nature of the deposits on the floor of Schiaparelli. Brazos Valles empties into this crater basin, lobes of material (fan-deltas) are observed along the southern half of the crater floor/rim interface.
Location: 0° to 6° S; 339° to 347° W;
Landing site: 5°S, 342°W
Elevation: 1 to 2 km
Geologic Setting: Floor of Schiaparelli crater.
Landing Site: fan-delta deposits from Brazos Valles.
Rock Abundance: 3 to 5%
Thermal Inertia (10-3 cgs units): 2.0 to 4.9
Fine Component (10-3 cgs units): 3.3 to 4.9
Albedo: 0.2270 to 0.2580
Slope: 0° to 5°

Site: **Elysium Basin** [9]
Science Objectives: Investigate the nature of the floor of Elysium Planitia
(volcanic, lacustrine, fluvial, mudflows) and possible shorelines.
Location: 0° to 3°S; 195° to 200°W;
Landing site: 2°S, 196°W
Elevation: -2 to 0 km
Geologic Setting: Extremely young (40my) Elysium basin floor nestled against ancient highlands.
Landing Site: Near margin of Elysium basin floor and cratered highlands.
Rock Abundance: 4 to 7%
Thermal Inertia (10-3 cgs units): 3.6
Fine Component (10-3 cgs units): 3.2 to 3.8
Albedo: 0.2740 to 0.2800
Slope: 0°

References:
[1] Palluconi, F.D. and H.H. Kieffer, 1981, Icarus, 45, 415-426. [2] Christensen, P.R., 1986, Icarus, 68, 217-238. [3] McEwen, A.S., K.S. Edgett, M.C. Malin, L. Keszthelyi, and P. Lanagan, Abs. with Programs, GSA Annual Meeting, v. 30, n. 7, October 1998. [4] Parker, T.J. and J.W. Rice, Jr., 1999, this volume. [5] Schultz, P.H, 1988, LPI Tech. Rept. 88-07, 149-150. [6] Rice, J.W., Jr. and D.H. Scott, 1998, Mars Surveyor 2001 Landing Site Workshop, (V. Gulick, Ed.), NASA Ames Res. Center. [7] Rice, J.W., Jr., 1991, Mars Landing Site Catalog, (R. Greeley, Ed.), p.69-70. [8] Rice, J.W., Jr., 1992, Mars Landing Site Catalog (R. Greeley, Ed.), p. 65-66. [9] Rice, J.W., Jr., 1996, Conference on Early Mars, LPI Contribution No. 916, p. 68-69.