PHYSICAL PROPERTIES OF THE ARES VALLES (PRIMARY) AND TROUVELOT CRATER (BACK-UP) LANDING SITES FOR MARS PATHFINDER: THERMAL INERTIA AND ROCK ABUNDANCE FROM VIKING IRTM OBSERVATIONS. *K.S. Edgett,* Department of Geology, Arizona State University, Box 871404, Tempe, Arizona 85287-1404, U.S.A.

Summary: Albedo, rock abundance, and thermal inertia derived from *Viking* Infrared Thermal Mapper (IRTM) observations allow for comparison of the proposed Ares Valles and Trouvelot Crater (back-up) landing sites for *Mars Pathfinder* with the *Viking* lander sites of 1976. The Ares site is likely to be about as rocky as the *Viking 1* site, but might have some dark sand (missing at the *Viking 1* site) and somewhat less bright red dust than the *Viking 1* site. The Trouvelot Crater site could be about as rocky as the *Viking 1* site, but with more dark, windblown sand than found at the Ares or *Viking 1* sites. Assessment of surface properties at these sites using high resolution (2-10 km) IRTM data is underway.

Introduction: *Mars Pathfinder* is scheduled to land on July 4, 1997. The primary landing site is located at approximately 19.5°N, 32.8°W, at the north end of the Ares Valles outflow channel system. The second choice, or back-up site, is just south of Trouvelot Crater near Oxia Palus (12.4°N, 14.3°W). The alternative site was selected in the event that new radar observations planned to be obtained during the 1994/95 Mars opposition show the Ares site to be too rough or dangerous for *Mars Pathfinder*. Ironically, the Ares Valles site is near the primary site chosen for the once anticipated July 4, 1976, *Viking 1* landing [see 1]. The *Viking 1* lander had been targeted for the Ares-Tiu Valles area at site "A-1," 19.5°N, 34°W. Upon further analysis, site A-1 appeared to be too dangerous for *Viking 1*, and another Ares Valles site, "A-1 South," (19.35°N, 32.5°W) was also considered (among others). Eventually, the Ares sites were rejected for *Viking 1*, and the landing was delayed to July 20, 1976, and occurred on Chryse Planitia at 22.5°N, 48.0°W.

Site Selection: The Ares Valles landing site for *Mars Pathfinder* was chosen at the end of a process that began with a workshop held in Houston, Texas, in April 1994 [2]. The site was selected by vote of key *Mars Pathfinder* personnel in June 1994. The site was specifically proposed at the April 1994 workshop by several investigators [3, 4]. The scientific rationale for the Ares Valles site is the potential that the channel system has brought a wide variety of rocks, including those representing the martian highlands, to the landing site. The Trouvelot Crater site (chosen as the main back-up) emerged during the discussions held toward the end of the April 1994 workshop [2]. The Trouvelot site would satisfy the combined desires of sampling a highlands surface that also has dark, windblown sand (sand might clean dust off of rocks exposed at the site, allowing spectral characterization of the rocks) [*e.g.*, 5-7].

Surface Properties from IRTM: Critical to the assessment of the proposed landing sites for *Mars Pathfinder* is estimation of the general physical properties of the surface. Here, data from the *Viking* IRTM are used to characterize the Ares and Trouvelot sites and compare them with the *Viking 1* lander site. This report describes the combined albedo [8], thermal inertia [9, 10], and rock abundance [11], derived from IRTM data obtained in 1976-1980. These parameters are mapped in 1°, 0.5°, and 1° (respectively) latitude-longitude bins [8-11].

Moderate Resolution Mapping Results: Table 1 compares the albedo, thermal inertia, and rock abundance for the Ares, Trouvelot, and *Viking 1* sites as derived directly from the map products described above [8-11]. The Ares and *Viking 1* sites have about the same rock abundance, which suggests that in terms of the percent surface area covered by rocks, these sites might look similar. Unfortunately, the rock abundance model does not allow the ability to predict the size of the rocks at the Ares site. The albedo of the Ares site is slightly lower than at the *Viking 1* site, and the thermal inertia is higher. The higher thermal inertia might

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indicate that the fines present at the Ares site are coarser-grained than at the *Viking 1* site. The Ares site occurs just south of the southern margin of the low albedo, sandy region, Acidalia Planitia. It seems likely that the Ares landing site will have a combination of dust, low-albedo sand, and rocks, and that the rocks might have less dust cover on them than at the *Viking 1* site. The exact nature of the Ares landing site will depend upon where the lander actually sets down within the landing ellipse. The back-up site south of Trouvelot Crater has the same thermal inertia as the Ares site, but a lower rock abundance and lower albedo. The Trouvelot site occurs on a dark wind streak emanating from Trouvelot Crater, which merges to the south with the Oxia Palus dark region. The lower albedo and lower rock abundance at the Trouvelot site suggests that the region might have drifts of windblown sand. Seen from the surface by a lander, the area would probably be about as rocky as the *Viking 1* site, but the rocks will appear to have less of a dust coating and some might be partly covered by dark aeolian sand drifts and ripples.

High Resolution Mapping: Work is underway to (a) examine higher ground-resolution (2-10 km) IRTM observations that pass near the proposed landing sites and (b) determine how these observations correspond to features seen in *Viking* images. Examination of high resolution IRTM observations is important in particular for further characterizing the properties of the Ares Valles site. Using high resolution IRTM data, Henry and Zimbelman [12] found a general "downstream" decrease in thermal inertia along Ares Valles, consistent with a decrease in clast size. However, the outflow channels all show a general increase in rock abundance at their mouths [11], and *Viking* orbiter images of the Ares site show knobs (approximately 100 - 900 m in size) which could be interpreted as extremely large boulders.

Table 1: Physical Properties of Viking 1 and Mars Pathfinder Sites

Location	*Lat., Lon.*	*Thermal Inertia**	*Rock Abundance*	*Albedo*
Viking 1	22.5°N, 48°W	350 (8.4)	19 %	0.25
Ares Valles	19.5°N, 32.8°W	450 (10.8)	18 %	0.22
Trouvelot	12.4°N, 14.3°W	450 (10.7)	13 %	0.18

* Kieffer model [13] thermal inertias from map by Christensen [9, 10]. Units are J m^{-2} $s^{-0.5}$ K^{-1}, units in parentheses are 10^{-3} cal cm^{-2} $s^{-0.5}$ K^{-1}. The Haberle-Jakosky model [14] thermal inertias for dust opacity of 0.4 are: Viking 1 and Ares = 390 (9.4), Trouvelot = 300 (7.2).

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