tions of an Elysium lava flow. The flow is part of a geologic unit of planetary significance. The proposed site appears suitable for landing, and lava surfaces should be accessible to the Pathfinder instruments. By analogy to terrestrial flood basalts, any lava analyzed by Pathfinder is likely to be representative of the entire Elysium province.

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MARS PATHFINDER AND THE EXPLORATION OF SOUTHERN AMAZONIS PLANITIA.

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The southern region of Amazonis Planitia provides a variety of target terrains for a roving vehicle such as the Mars Pathfinder Mission. A landing site is proposed at 4°N latitude 162°W longitude. This area has a reference altitude of between 0 and –1 km and consists of relatively smooth Amazonian-aged deposits within the entire 100 × 200 km landing ellipse. The proposed landing site is within the Upper Member Medusae Fossae Formation deposits (Amu) and near the boundary with Middle Member Medusae Fossae Formation deposits (Amm) and Member 1 Arcadia Formation plains (Aa_1). Slightly further afield are 107-km-diameter Nicholson crater, its ejecta deposits, and knobby terrain of proposed Hesperian age (HNu) [1]. Depending on the exact landing site of the spacecraft and the traverse distance of the rover, these materials also may be sampled.

Regional Geologic Setting: The Medusae Fossae Formation consists of a series of fine-grained, layered deposits of enigmatic origin generally within the area 12°N–11°S and 127°–190°W. The fine-grained nature of the material is revealed through low thermal inertia values [2,3], little to no radar return [4], greater than expected crater depth-diameter ratios for fresh impact craters [5], and the presence of eolian erosional features such as yardangs [6]. The origin of this material remains controversial—theories include ignimbrite deposits from explosive volcanic eruptions [7], ancient polar deposits that have ended up in their present location as a result of extensive polar wander [8], an exhumed chemical boundary layer caused by a subregolith paleowater table [4], or simply thick deposits of eolian-emplaced debris [1]. Analysis of the chemical composition of the material may help to resolve the origin of this mysterious and unique martian terrain.

The proposed landing site lies within the Upper Member of the Medusae Fossae Formation, a discontinuous region of deposits that tend to be smooth and flat to gently rolling. In some locations, this material has been sculpted by eolian processes into ridges and grooves, which may allow direct observation of different layers within the material. To the west lies the Middle Member of the Medusae Fossae Formation, which is similar to the Upper Member except for appearing rougher and more deeply eroded. The rover probably will have difficulty traversing this terrain and therefore sampling of only the outlying regions is desired for comparison with the Upper Member.

To the northwest of the proposed landing site is the Member 1 Arcadia Formation plains. These plains are characterized by smooth, flat topography occasionally interrupted by knobs and hills of presumed Hesperian- or Noachian-aged material. Mare-type wrinkle ridges are common, suggesting that these plains are of volcanic origin. Since this area is located to the southwest of Olympus Mons, the volcanism of the region is likely related to volcanism of the Tharsis region. The Member 1 plains are the oldest unit of the Arcadia Formation and are stratigraphically similar in age to portions of Alba Patera and the Olympus Mons aureole [1,9].

Approximately 200 km southwest of the proposed landing site is the 107-km-diameter crater Nicholson. Although relatively fresh in appearance, Nicholson is partially embayed by the Medusae Fossae deposits and therefore appears to be intermediate in age between the Member 1 Arcadia formation on which it is superposed and the Upper and Middle Members of the Medusae Fossae Formation. The ejecta blanket of the crater is still preserved although slightly reworked. Analysis of this ejected material should provide information about changes in target composition with depth in this vicinity.

Information from Mars Pathfinder Rover: The instruments onboard the Mars Pathfinder Rover can help address several questions regarding the terrain in this region. Among these questions are: (1) What are the chemical composition and mineralogy of the different geologic units at the landing site and within the traverse distance of the rover? (2) Are there regional variations in chemical composition/mineralogy within the same stratigraphic unit? (3) What is the magnetic susceptibility of the material at the lander site? (4) What is the ratio of fine-grained to rocky material at each location? (5) What is the composition of the dust that will probably accumulate on the rover during its traverse? (6) What is the appearance of different geologic features from surface level and what can the resolution of the imaging system reveal about layering in, erosion of, and possible origin of these features? (7) What is the trafficability of the different units traversed by the rover?

The camera systems and the APXS sensor will provide the answers to most of these questions. The ability of the APXS sensor to analyze both soil and rocks should provide a much better understanding of the materials composing the martian surface in this region. Analysis of exposed layers within ridges, grooves, and hills by the APXS and multispectral capabilities of the imaging system can provide information about chemical and mineralogic variations within the near-surface region. This information will provide constraints on the potential origin(s) of the features studied.

This particular landing site was selected primarily to address the question of the composition and possible origin of the Medusae Fossae Formation deposits. These deposits appear to be a unique landform on Mars and have intrigued a large number of investigators. Why are the deposits concentrated in this region of the planet? The crater density and superposition relationship to surrounding terrain suggests a young age for this material. What process or processes occurred to create this material in relatively recent time? Do these deposits imply anything about possible environmental changes for Mars? It is hoped that the instruments onboard the Mars Pathfinder lander and rover can provide new constraints on the theories advanced about this enigmatic region of Mars.

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METEOROLOGICAL OBSERVATIONS OF SYNOPTIC DISTURBANCES: SENSITIVITY TO LATITUDE. J. R. Barnes, College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis OR 97331, USA.

The Mars Pathfinder MET experiment will make pressure, temperature, and wind measurments on the surface of Mars. The Viking Lander Meteorology Experiment measurements were marked by the presence of variations associated with synoptic weather disturbances throughout the fall and winter seasons. These variations were characterized by periods in the broad range of about 2–10 days, and were most prominent at the midlatitude (48°N) Viking Lander 2 site. The synoptic disturbances were observed to essentially disappear during the summer season. At the subtropical (22.5°N) Viking Lander 1 site, variations with similar periodicities were seen, but the amplitudes of these were reduced in comparison to those at Lander 2 by factors of 2–3 or more. The identification of the weather variations has been helped greatly by numerical simulations of the Mars atmospheric circulation performed with various models.

These models show that the winter midlatitudes are the center of activity for traveling disturbances of planetary scale, disturbances that have their fundamental origin in the baroclinic instability of the wintertime Mars atmospheric circulation. The numerical studies are consistent with the Viking observations in that the disturbances decay in amplitude toward lower latitudes; direct comparisons of the models with the Viking data are quite favorable, although the models seem to produce larger amplitudes in the subtropics than were seen at the Lander 1 site. If Mars Pathfinder is able to survive for 2–3 months, then it will observe the transition from the very quiescent summer season into the much more active winter season. The further north it is located, the more clearly will it be able to detect the signatures of the midlatitude weather systems. The basic mission constraint of a low-elevation landing site should favor the observation of the weather disturbances: The model simulations show that the weather activity is enhanced in the subtropics in the three low regions of the northern hemisphere.

This is at least partly due to the presence of "standing eddies" in the circulation that are forced by the topography. A landing site close to 15°N should allow measurement of the weather disturbances, along with observations of the thermal tides, slope winds, and the relatively steady winds associated with the general circulation—the "trade winds" of Mars. Model simulations show that the latter can be very strong in certain locations, especially near the western edges of low-elevation regions. A landing site near 15°N would be significantly further equatorward than the Viking Lander 1 site, and thus would provide more of a view of tropical circulation processes. There could be some "surprises" in such observations.

IMPLICATIONS OF HIGH-SPATIAL-RESOLUTION THERMAL INFRARED (TERMOSKAN) DATA FOR MARS LANDING SITE SELECTION. B. H. Betts, San Juan Capistrano Research Institute, 31872 Camino Capistrano, San Juan Capistrano, CA 92675, USA.

Thermal infrared observations of Mars from spacecraft provide physical information about the upper thermal skin depth of the surface, which is on the order of a few centimeters in depth and thus very significant for lander site selection. The Termoskan instrument onboard the Soviet Phobos '88 spacecraft acquired the highest-spatial-resolution thermal infrared data obtained for Mars, ranging in resolution from 300 m to 3 km per pixel [1–3]. It simultaneously obtained broadband reflected solar flux data. Although the 6°N–30°S Termoskan coverage only slightly overlaps the nominal Mars Pathfinder target range, the implications of Termoskan data for that overlap region and the extrapolations that can be made to other regions give important clues for optimal landing site selection.

For example, Termoskan highlighted two types of features that would yield high lander science return: thermally distinct ejecta blankets and channels. Both types of features are rare examples (on Mars) where morphology correlates strongly with thermal inertia. This indicates that evidence of the processes that formed these morphologic features probably still exists at the surface. Thermally distinct ejecta blankets (Fig. 1) are not significantly mantled by eolian material, and material ejected from depth should be exposed at the surface [4]. In addition, their unmantled surfaces should still contain morphologic clues to the exact process that formed the uniquely martian fluidized ejecta blankets. Thermally distinctive channel floors (e.g., Fig. 2) probably have material exposed from various stratigraphic layers and locations. In addition, the possibility that flat channel floors owe their enhanced inertias to water-related processing (bonding) of fines makes these sites intriguing

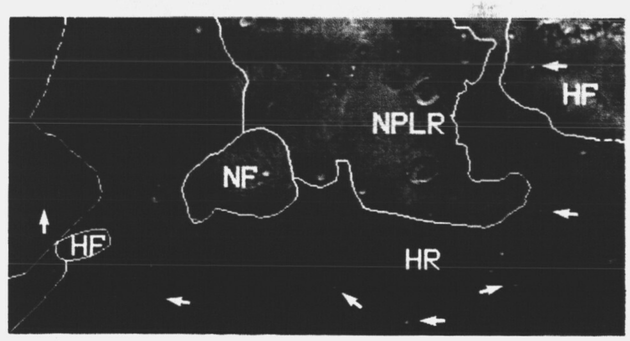

Fig. 1. Ejecta blankets distinct in the thermal infrared (EDITHs): Termoskan thermal infrared image. North is top. A small part of Valles Marineris appears at top right. Time of day is near local noon. Darker areas are cooler, lighter areas are warmer. Note the thermally distinct ejecta blankets, which appear as bright or dark rings surrounding craters (examples denoted by arrows). EDITH boundaries usually closely match fluidized ejecta termini. White lines are geologic map boundaries (from [6,7]). Throughout the data, almost all EDITHs observed are on Hesperian-aged terrains with almost none on the older Noachian units, presumably due to a lack of distinctive layering in Noachian terrains (see [4] for more information). EDITHs are excellent locations for future landers because of relatively dust-free surface exposures of material excavated from depth.