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SCIENTIFIC RATIONALE FOR SELECTING NORTHERN EUMENIDES DORSUM (9°–11°N LATITUDE, 159°–162° LONGITUDE) AS A POTENTIAL MARS PATHFINDER LANDING SITE. T. J. Parker, Jet Propulsion Laboratory, California Institute of Technology, Pasadena CA 91109, USA.

The proposed site is the northernmost occurrence of the Medusae Fossae Formation (MFF), and lies at or below the –2-km contour. The MFF is the famous radar "stealth" deposit that extends from south of Olympus Mons westward across southern Amazonis Planitia to southern Elysium Planitia. The MFF appears to be composed of some kind of wind-eroded friable material, the origin of which is very problematic. It appears to be a radar-absorbing material [1], whereas Mars' south polar layered deposits appear bright in the same scenes. Synthetic aperture radar images of young terrestrial ash deposits in the Andes also appear relatively bright. The MFF's radar signature appears to require a uniformly fine-grained material (on the order of dust-sized to fine sand-sized) at least several meters thick, in order not to transmit reflections off underlying terrain or internal reflective horizons. A number of very different hypotheses have been proposed over the years to explain this formation. It has been interpreted as either a large, wind-blown volcanic ash deposit [2] or other wind-blown material trapped along the escarpment between highlands and lowlands [3,4]; ancient polar layered deposits [5] requiring a massive change in the planet's rotation axis; and finally as carbonate platform deposits [6] or banks of low-density volcanic material deposited in an ocean [7].

Accumulation of tens to thousands of meters of unwelded, friable ash blankets, necessary to avoid formation of internal reflectors, would seem to require a large number of discrete, relatively thin deposits. The radar signature, therefore, seems inconsistent with the volcanic ash and polar layered material interpretations. The "stealth" requirement may be met by an uncemented sand or loess material, thus supporting the suggested eolian hypothesis. It might also be met by inferring chemically precipitated but largely uncemented carbonates. If correct, this last model would have important implications with regard to search strategies for fossil organic materials or the environments that might be conducive to their development. In 1991, I suggested that the surface morphology of the MFF is comparable to terrestrial carbonate platform deposits [6]. The best modern analogs would be oolitic deposits, such as found over large regions of the Bahama Banks. To fit the observed morphologies and radar signature, a process akin to inorganic oolite precipitation and transport by oceanic currents or agitation by waves [8,9], with little cementation, was proposed. An oolitic grain size is necessary both to provide the "stealth" radar signature and to allow the development of sand wavelike bedforms visible in some high-resolution images of the deposit. A largely uncemented state is also needed to explain the radar signature, requiring relatively rapid deposition and little to no subsequent cementation or diagenesis.

This requirement probably can be met because ocean transgressions on Mars were likely short-lived and separated by long periods with temperatures below freezing, thus preventing dissolution and cementation through rain or groundwater migration within the deposit. Finally, carbonate precipitation would have taken place fairly rapidly when liquid water was present due to the planet's high atmospheric CO_2 content. Surface science that can address the chemical/mineralogical composition and physical properties of this material would be very important to understanding a relatively recent (Amazonian) volcanic or paleoclimatic process that resulted in a 2,700,000-km^2 deposit along the martian equator. Based on assumptions about the average thickness of this deposit, this area corresponds to a total volume of material on the order of 27,000–2,700,000 km^3. The proposed Pathfinder landing site lies on a relatively smooth, "unmodified" portion of the MFF, more than 100 km away from its northern and western edges, which exhibit evidence of eolian etching in the form of closely spaced yardangs. There are no large craters or steep slopes within a few hundred kilometers of the landing site.

References: [1] Forsythe R. D. and Zimbelman J. R. (1990) *LPS XXI*, 383–384. [2] Scott D. H. and Tanaka K. L. (1982) *JGR, 87*, 1179–1190. [3] Lee S. W. et al. (1982) *JGR, 87*, 10025–10041. [4] Thomas P. (1982) *JGR, 87*, 9999–10008. [5] Schultz P. H. and Lutz-Garihan A. B. (1988) *Icarus, 73*, 91–141. [6] Parker T. J. (1991) *LPS XXII*, 1029–1030. [7] Mouginis-Mark P. (1993) *LPS XXIV*, 1021–1022. [8] Halley R. B. et al. (1983) *Bank Margin Environment*, 464–506, AAPG. [9] Bathurst R. G. C. (1971) *Carbonate Sediments and Their Diagenesis*, Chapter 7, Elsevier.

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SCIENTIFIC RATIONALE FOR SELECTING NORTHWEST ISIDIS PLANITIA (14°–17°N LATITUDE, 278°–281° LONGITUDE) AS A POTENTIAL MARS PATHFINDER LANDING SITE. T. J. Parker[1] and J. W. Rice[2], Jet Propulsion Laboratory, [1]California Institute of Technology, Pasadena CA 91109, USA, [2]Department of Geography, Arizona State University, Tempe AZ 85282, USA.

The northwest Isidis Basin offers a unique opportunity to land near a fretted terrain lowland/upland boundary that meets both the latitudinal and elevation requirements imposed on the spacecraft. The landing site lies east of erosional scarps and among remnant massif inselbergs of the Syrtis Major volcanic plains. The plains surface throughout Isidis exhibits abundant, low-relief mounds that are the local expression of the "thumbprint terrain" that is common within a few hundred kilometers of the lowland/upland boundary. These typically occur in arcuate chains, often with a summit pit or trough. They have been variously interpreted as volcanic cinder cones or psuedocraters [1], pingos [2], or eolian deposits that formed at the edge of a sublimating ice sheet [3]. We have used photoclinometry to measure similar mounds in Cydonia, using photoclinometry, at no more than a few tens of meters high, implying very gentle slopes. Cinder cones should exhibit slopes determined by the ballistic emplacement of unconsolidated material, and so they commonly approach the angle of repose.

Pingos are typically conical-shaped ice cored hills up to 100 m high and 600 m in diameter [4]. Many pingos often exhibit dilation cracks radiating from the apex of the hill. These fractures are created as a result of the growth of the ice core. This process exposes the ice core and allows it to thaw out, thereby producing a collapsed summit area. Pingos are usually located in lowland areas, especially lake beds and deltas. Lander and rover observations should be able to confirm whether these landforms are pingos or cinder cones based on the presence of dilation cracks or slopes approaching the angle of repose. The discovery of pingos would be of high importance to