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A MARS PATHFINDER LANDING ON A RECENTLY DRAINED EPHEMERAL SEA: CERBERUS PLAINS, 6°N, 188°W. G. R. Brakenridge, Surficial Processes Laboratory, Department of Geography, Dartmouth College, Hanover NH 03755, USA.

Along a 500 km-wide belt extending between 202° and 180°W and lying astride the martian equator, moderately low-albedo, uncratered smooth plains exhibit low thermal inertia and potentially favorable conditions for the preservation of near-surface ice. The Cerberus Plains occupy a topographic trough as much as 2 km below the planetary datum [1,2], and the denser atmosphere at these altitudes would also favor long residence times for near-surface ice once emplaced [3]. The plains have previously been interpreted as the result of young (Late Amazonian) low-viscosity lava flows [4] or similarly youthful fluvial deposition [5,6]. However, the plains are also included in maps of possibly extensive martian paleoseas or paleolakes [7,8]. Ice emplaced as such seas dissipated could still be preserved under thin (a few tens of centimeters) sedimentary cover [9]. In any case, and if a sea once existed, aqueous-born interstitial cementation, probably including hydrated iron oxides and sulfate minerals, would have been favored and is now susceptible to investigation by the Pathfinder alpha proton X-ray spectrometer and multispectral imager.

There is interesting supporting evidence indicating an aqueous origin for the Cerberus Plains. On Viking Orbiter high-resolution images, some near-shoreline portions of the plains exhibit intersecting, very-low-relief linear or curvilinear ridges that may define ridge-interior, polygon-shaped, angular-to-rounded ice cakes and ice flows [10]. Lead- and pressure-ridge-like forms can be mapped, although local relief is very low. The shelf icelike pattern outlines flows that are similar in size to those that occur on Earth, and the general fragmental character is quite different from the smooth surface morphology imaged at Viking resolution on unmantled plains confidently known to have formed by lava flows. Finally, a suite of landforms elsewhere considered to be coastal in origin [11] occur along the southern margin of the plains: These are compatible with a marine or lacustral model but not with a lava flow origin. Such landforms include peninsulas and bays, spits, strandlines, and stepped massifs, and all are consistent with a maximum sea level reaching to ~–1000 m altitude.

For example, at 3°S, 197°W, the dark-albedo, low-thermal-inertia plains unit embays and overlaps the knobby terrains to the south along or very close to the –1000-m contour. Four hundred kilometers to the northeast, the "sea floor" plain reaches to below –2000 m, implying maximum stage water depths of at least 1000 m. In the deep region, two isolated massifs (Hibes Montes) extend to above –1000 m altitude, and both exhibit topographic steps at that altitude: These may be wave-cut or other coastal features. In contrast, if lava extrusions were instead centered in this deepest part of the basin and formed the Cerberus Plains [4], these lavas must have flowed uphill and at relatively steep gradients to reach the southern margin of the plains. Either the topography as now mapped is greatly in error (and there is no trough), or water is the more likely fluid to have formed the embayment features along the southern margin.

A 180-km-wide outflow channel typical in its morphology but unusual in its youthfulness (it too is uncratered) extends from the Cerberus Plain trough northeastward to a "spillway" at 24°N, 172°W. The spillway lies at –1000 m altitude and some 1100 km from the Hibes Montes islands. In agreement with [4], streamlined interchannel islands indicate fluid flow to the northeast, from Cerberus and into Amazonis Planitia and the deeper (–3000 m altitude) basin therein. This could not have occurred unless fluid levels reached over the spillway; again, the basin must have once filled to ~–1000 m altitude, and this too suggests water and not lava as the fluid involved. The Cerberus Sea probably formed in much the same manner as did the outflow channels, but the surface discharge occurred within a topographic basin, and the basin itself was first filled before overtopping the lowest spillway and discharging excess water and ice into Amazonia Planitia. Slow filling, perhaps under a perennial ice cover, could instead have occurred if a global groundwater system exists [12] or if regional geothermal sources such as recently present at Elysium or Orcus Patera stimulated large-scale hydrothermal circulation [7] and water discharge along faults and fractures (in this case, at Cerberus Rupes). Whether filling was slow or rapid, much evidence indicates that an ice-covered sea recently existed at the location of the present-day Cerberus Plains, and this poses unique opportunities for a Pathfinder landing that would investigate the sedimentary and soil geochemical traces of the planet's water cycle.

At the suggested landing location, shelf ice may still exist, and be frozen together into extensive grounded composite flows and thinly mantled by cemented low-thermal-inertia eolian deposits. Alternatively, sediment-laden and perhaps mantled shelf ice existed here late in Mars history and has since sublimed or melted. In either event, the present sedimentary cover is resistant to wind erosion and thus probably cemented. There exists here the uncertain possibility of detecting near-surface ice, but the probable opportunity to analyze in detail chemically cemented fine sediment and thus learn much about interstitial water characteristics.

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PHYSICAL PROPERTIES (PARTICLE SIZE, ROCK ABUNDANCE) FROM THERMAL INFRARED REMOTE OBSERVATIONS: IMPLICATIONS FOR MARS LANDING SITES. P. R. Christensen and K. S. Edgett, Department of Geology, Box 871404, Arizona State University, Tempe AZ 85287-1404, USA.

Critical to the assessment of potential sites for the 1997 Pathfinder landing is estimation of general physical properties of the martian surface. Surface properties have been studied using a variety of spacecraft and Earth-based remote sensing observations [1,2], plus *in situ* studies at the Viking lander sites [2,3]. Because of their value in identifying landing hazards and defining scientific objectives, we focus this discussion on thermal inertia and rock abundance derived from middle-infrared (6–30 μm) observations. Used in conjunction with other datasets, particularly albedo and Viking