THE POLAR REGIONS AND THE SEARCH FOR EVIDENCE OF LIFE ON MARS. C. P. McKay[1]. [1]NASA Ames Research Center, Moffett Field, CA, 94035, cmckay@mail.arc.nasa.gov.

Introduction: The search for life on Mars and evidence for past life connects to polar exploration in two important ways. First the polar regions on Mars are sites of possible liquid water today, and hence possible locations for extant life. Secondly, ancient permafrost may preserve evidence of the nature of martian life.

Polar Life: There is direct evidence that Mars had liquid water early in its history. A plausible comparison with the early Earth and evidence that life appeared quickly on the Earth have lead to a focus on the search for life on Mars. However, on Mars today the presence of liquid water is the limiting ingredient for a favorable environment for extant life. The northern polar regions in the summer are arguably the best location for finding liquid water on the surface of Mars today. This is due to the low altitude (2 to 4 km below the datum and hence the surface pressure in the north polar regions is always above the triple point of water), the presence of massive exposed ice, and the continuous sunlight available for heating the polar ice. If a case is to be made for liquid water and life on the surface of Mars today the northern PLD are probably the best location.

Permaforst Preservation: The microbiology of permafrost locations on Earth have been investigated and it has been shown that viable microorganism can be recovered from Siberian permafrost that is ~3.5 Myr old [1]. New work in Beacon Valley, Antarctic indicates the presence of recoverable microorganisms in ice that is thought to be 8 Myr old.

On Mars there may be extensive permafrost that dates back 3 to 4 Gyr. Recent data from the Mars Oddessy spacecraft have confirmed the suggestion that the polar regions of Mars are rich in ground ice [2]. The south polar regions, but not the polar cap deposits themselves, are of particular interest because this region contains ancient cratered terrain presumably dating back to the end of the heavy bombardment, 3.8 Gyr ago. The actual polar cap deposits are probably much younger. One region of particular interest is centered on 80°S, 180°W. Here the terrain is heavily cratered, there is ground ice present and furthermore there is strong crustal magnetism in the surface materials [3,4]. The presence of strong crustal magnetism confirms the antiquity of these terrains and suggests that they have been relatively unaltered since their initial deposition. This location may represent the site of the oldest, coldest, undisturbed permafrost on Mars. Martian microorganisms may be trapped and preserved in this permafrost.

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