MARS POLAR TARGETS FOR THE COMPACT RECONNAISANNCE INFRARED SPECTROMETER FOR MARS. A. J. Brown[1], J. L. Bishop[1] and R. O. Green[2], [1]SETI Institute, 515 N. Whisman Rd, Mountain View, CA 94043 email: abrown@seti.org, [2]Jet Propulsion Laboratory, M/S 306-336, 4800 Oak Grove Dr., Pasadena, CA

Introduction: The Martian Polar regions are among the most dynamic regions of the red planet. Seasonal sublimation and deposition of water and carbon dioxide ice contribute to making the poles a challenging target for observation. During the mission of the Compact Reconnaissance Infra Red Spectrometer for Mars (CRISM) [1], several puzzling regions will be targeted in order to learn more about the surface and atmospheric interactions at the Martian poles.

CRISM: Mars Reconnaissance Orbiter is designed to have a low polar orbit 300km above the surface of Mars, therefore the CRISM instrument will have unprecented spatial resolution – global mapping at 100m per pixel and high resolution maps of 1% of the surface at around 18m pixel size. Since the polar regions will be crossed every orbit, fine grained temporally variable targeting will be possible in these areas. CRISM is sensitive to light from 0.3-4.1μm. The instrument will commence data collection in September 2006.

Northern Pole Targets: The smaller northern pole contains several targets of interest, some of which are introduced below.

Northern Polar Sand Sea Gypsum deposit. Discovered by the OMEGA instrument [2]. Hypothesized to have been formed during a melting event at high obliquity. CRISM's high spatial and spectral resolution will pinpoint the location of the gypsum and attempt to assess its purity.

Chasma Boreale and Boreale Tongue. The largest Chasma in the Northern Polar Cap lies next to the largest tongued ice deposit. The relationship of the chasma to the tongue is poorly understood – is the Chasma a structural feature or is the tongue flow controlled by surface-atmosphere dynamics? Periodic observations of these features by CRISM may shed light on the growth processes of the Boreale Tongue.

Mrs. Chippy's Ring. Persistent ice deposits lying away from the North Polar Cap termed "Mrs. Chippy's Ring" show seasonal variation in visible albedo measured by TES [3]. The high spectral resolution of CRISM will allow further examination of these deposits and may help determine factors controlling their seasonal persistence.

Southern Polar Targets: The Martian southern polar cap is more extensive than the north since it currently endures longer, milder summer periods. Several south pole targets are introduced below.

Mountains of Mitchel. The Mountains of Mitchel are a seasonally persistent icy peninsular joined to the Martian southern polar cap. MOLA data suggests they are not excessively high, so their persistence may not be due to altitude. MOC data has suggested the water ice here is particularly bright. Using CRISM, we may be able to determine whether the purity of the Mitchel ice may be contributing to its persistence.

Inca City. An arcuate ridge deposit close to the South Pole has been hypothesized to represent resistant dykes formed by volcanic activity due to a large polar impact. The high spectral resolution of CRISM will allow us to examine the mineralogy of this deposit and determine if it is indeed volcanic in nature.

Cryptic Terrain containing Dalmatian Spots, Fried Eggs and Spiders. The South Polar region contains diurnally variable "cold and bright" anomalies that have been studied by the MOC and THEMIS instruments. They may be sand plume deposits controlled by wind [4]. The high spatial and spectral resolution of CRISM may assist in determining the mineralogy and nature of these comet-like trails.

Swiss Cheese Deposits. The Mars South Polar residual CO_2 ice cap displays interannually variable 'Swiss cheese deposits' which have been extensively imaged by the MOC camera. These deposits are thought to be caused by a thin layer of CO_2 ice atop a more stable layer of H_2O ice [6]. The high spatial resolution of the CRISM will allow us to examine the spectral response of individual Swiss cheese deposits..

Polar Layered Terrain and the global CO_2/H_2O cycle. Both North and South Mars Polar regions display enigmatic 'layered' terrain. These layers may have been lain down in response to climate forcing due to obliquity excursions [5]. The high spatial resolution of the CRISM will allow us to examine the spectral response of individual layers on both Poles, and may assist in learning more about obliquity cycles, historic dust conditions and the history of the atmosphere-surface hydrologic/CO_2 cycles on Mars.

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