landing-site geomorphology. A short-period seismometer and a wide-angle camera complete the payload to achieve these objectives.

The Naiades mission strongly resonates with the main "Follow the Water" theme of the MEP, but in ways that are not currently within the scope of the MEP or that of NASA's international partners. The combination of established terrestrial methods for groundwater exploration, robust flight systems, and cost effectiveness proposed for the Naiades is a relatively low-risk approach to answering key questions about water on Mars within the Scout framework.

P12A-0369 1330h POSTER

Mars CryoScout: Subsurface Exploration of the North Polar Cap

R. Stephen Saunders[1] (818 354 2867; saunders@jpl.nasa.gov)

Michael H. Hecht[1] (818 354 2774; michael.h.hecht@jpl.nasa.gov)

[1]Jet Propulsion Laboratory, MS 264-255 4800 Oak Grove Drive, Pasadena, CA 91109

The well documented layering of the Mars PLDs suggests that the polar caps, and the north polar cap in particular, are repositories of a climate archive that possibly spans many millions of years. Far more accessible, terrestrial ice sheets have been studied by coring to retrieve the pristine record of past chemical and physical properties, and to evaluate modification induced by time and stresses within the ice. On Mars' north polar cap, thermal probes are feasible and can provide a means, analogous to coring, of making subsurface observations. To explore the dominant climate cycles, it is postulated that tens of meters of depth, corresponding to the vertical separation of the major "MOC" layers, should be explored. Optical and spectroscopic analyses of the layers, which are presumably demarcated by embedded dust, contributes to the reconstruction of a timeline. Meltwater analysis is a convenient way to determine the soluble chemistry of that embedded dust, and to monitor gradients of the isotopic ratios of hydrogen and oxygen that reflect atmospheric conditions at the time the layer was deposited. As on Earth, local thermal measurements can be used to determine bulk mechanical properties of the cap, as well as estimating the geothermal gradient. A proposed mission that performs these observations will be described.

P12B MCC: Hall D Monday 1330h

New Results From Mars Odyssey II Posters *(joint with C, G)*

Presiding: **A McEwen,** University of Arizona**; A B Ivanov,** Jet Propulsion Laboratory

P12B-0370 1330h POSTER

Thermophysical and Morphologic Unit Mapping of Gusev Crater Using THEMIS Infrared and Visible Imaging

Keith A Milam[1] (kmilam@utk.edu); Livio L Tornabene[1] (sirleonis@earthlink.net); Karen R Stockstill[1] (kstockst@utk.edu); Harry Y McSween[1] (mcsween@utk.edu); Jeffrey E Moersch[1] (jmoersch@utk.edu); Michael B Wyatt[2]; Phil R Christensen[2] (phil.christensen@asu.edu); . THEMIS team

[1]Department of Geological Sciences University of Tennessee, 306 GSB, Knoxville, TN 37996, United States

[2]Department of Geological Sciences Arizona State University, Moeur Building, Tempe, AZ 85287, United States

Gusev Crater (160 km diameter) is hypothesized to have been a lacustrine depocenter, making it a prime landing site candidate for Mars Exploration Rover (MER) missions. Primary flow and sediment transport originated from Ma'adim Vallis, a large channel that debouches into Gusev, with outflow through the NW crater rim. Interior units of Gusev have been interpreted as deposits from fluvial resurfacing during the Noachian, Hesperian, and early Amazonian periods. Previous crater counting work suggests that the Gusev-Ma'adim hydrologic system was active from 0.7-2 Ga. Geomorphic and topographic features in Gusev and Ma'adim Vallis are critical to the hypothesis that water emptied and ponded periodically in the basin. MOLA topography indicates Gusev's floor <2500 m below the adjacent highlands. Some interpretations of Viking imagery suggest shoreline terraces, dissected deltaic deposits, and sedimentary structures consistent with deposition in an ice-covered lake. Higher-resolution MOC images, however, reveal no obvious lacustrine features. Mars Odyssey's Thermal Emission Imaging System (THEMIS) provides visible (18 m/pixel) imagery, and when compared to Viking and MGS-MOC data, shows low-albedo material being re-distributed over the last 25 years. Visible imagery also reveals multiple (4+) wind directions. THEMIS visible and thermal infrared (100 m/pixel) data were also used to delineate 8 units based on thermophysical and morphologic properties. Thermophysical units were qualitatively characterized by albedo and daytime-nighttime IR determined temperature differences. Morphologic units were characterized by topography, crater densities, erosional features, lineations, etc. Six of the 8 units lie within the MER landing ellipse. Use of both THEMIS and MGS-MOLA data allows a stratigraphic sequence to be inferred; however, uniquely lacustrine features have not been identified. Comparisons with previous photogeologic maps of Gusev show some discrepancies between mapped units, which may relate to lithologic characteristics only observable in thermal emission data at high spatial resolution.

P12B-0371 1330h POSTER

THEMIS Spectral Mapping of Melas Chasma, Mars

Amy Trueba Knudson[1] ((480) 727-7806; aknudson@asu.edu)

Philip R Christensen[1] ((480) 965-7105; phil.christensen@asu.edu)

Shannon M Pelkey[2] ((303) 492-6527; pelkey@lasp.colorado.edu)

[1]Arizona State University, Dept. of Geological Sciences Box 876305, Tempe, AZ 85287, United States

[2]University of Colorado, Laboratory for Atmospheric and Space Physics Campus Box 392, Boulder, CO 80309, United States

The Melas Chasma trough, in the central complex of Vallis Marineris, provides an ideal site for testing a preliminary approach of deriving surface emissivity from the thermal infrared data produced by the Thermal Emission Imaging System (THEMIS) on the Mars Odyssey spacecraft. Melas Chasma exhibits layered deposits, regional collapse deposits descending from amphitheatres in the walls of the canyon, and various aeolian features. This variety of morphologic features indicates a complex geologic history and a likelihood of compositional heterogeneity in the deposits. The Thermal Emission Spectrometer (TES) on Mars Global Surveyor (MGS) reveals some of the expected spectral variability in this region. However, the 3 km x 6 km pixel resolution of the instrument makes it difficult to associate these variations with geomorphic units visible in the MGS Mars Orbiter Camera (MOC) images or in the THEMIS temperature images. The 100 m pixel size of the THEMIS infrared bands should provide the spatial resolution to associate spectral variability with geomorphology and provide insight into the geologic history of this site.

THEMIS data is processed to produce calibrated radiance using the most current calibration model. Camera reflections and other image artifacts are removed or minimized in this process. Geometric corrections of the data are applied to co-register the bands and allow for accurate spectral analysis. Emissivity is produced through a Temperature/Emissivity Separation algorithm. An empirical atmospheric correction using TES derived surface emissivity is used as a proxy for the radiative transfer model atmospheric correction that is not yet available for THEMIS data analysis. Spectral maps are produced from the resulting THEMIS data and the spectral characteristics compared with atmospherically corrected TES and the uncorrected THEMIS data to assess the accuracy of this technique. Evaluation of the nature and composition of these deposits from spectral analysis will follow after a thorough assessment of the accuracy of our emissivity data and atmospheric corrections.

P12B-0372 1330h POSTER

Using THEMIS Visible and Infrared Data for Crater Population Studies of Mars

Melissa D. Lane[1] (520-622-6300; lane@psi.edu)

Philip R. Christensen[2] (480-965-1790; phil.christensen@asu.edu)

. THEMIS Team

[1]Planetary Science Institute, 620 North 6th Avenue, Tucson, AZ 85705, United States

[2]Arizona State University, Dept. of Geological Sciences, Tempe, AZ 85287-6305, United States

Aboard the currently orbiting Mars Odyssey spacecraft is the Thermal Emission Imaging Spectrometer (THEMIS) that acquires both visible (VIS) and thermal (IR) wavelength images of the surface. The visible images can be used to conduct crater population studies as is traditional with visible photographic planetary data. However, this study shows that infrared images also may be utilized successfully for crater population studies. THEMIS collects both daytime (VIS and IR) and nighttime (IR only) data, but the nighttime data are less useful for the crater counting analyses than are either daytime data set because counts using the nighttime images are routinely underestimating the number of craters present. For this study, the THEMIS data were utilized to study the Sinus Meridiani landing site crater population.

P12B-0373 1330h POSTER

THEMIS Observations and TES Surface Compositions of Low-Albedo Intracrater Materials and Wind Streaks in Western Arabia Terra

Michael B. Wyatt[1] (480-965-1789; mwyatt1@utk.edu)

Harry Y. McSween[2] (mcsween@utk.edu)

Phillip R. Christensen[1] (phil.christensen@asu.edu)

[1]Department of Geological Sciences, Arizona State University PO BOX 876305, Tempe, AZ 85287-6305, United States

[2]Department of Geology, University of Tennessee, Knoxville, TN 37996-1410, United States

High-resolution thermal infrared images (100m/pixel) from the Mars Odyssey Thermal Emission Imaging System (THEMIS) are used for thermophysical analyses of low-albedo intracrater materials and wind streaks in Western Arabia Terra and comparisons with Mars Global Surveyor (MGS) Thermal Emission Spectrometer (TES) derived surface compositions.

Atmospherically corrected thermal emissivity data from TES have been used to identify two global-scale spectral surface units. The Surface Type 1 end-member is interpreted as largely unweathered basalt while the Surface Type 2 end-member has been interpreted as andesite and/or partly weathered basalt. Deconvolved TES spectra of low-albedo intracrater materials reveal both Surface Type 1 and 2 compositions within individual craters. Surface Type 1 compositions form a central core in dark features on crater floors while Surface Type 2 compositions form a surrounding arc on the dark downwind sides of crater walls. The transition between these compositions appears to occur near the floor-wall interface and is correlated with a transition from high-thermal inertia dune materials to low thermal inertia dune-free materials. Surface Type 1 and 2 compositions are also observed in adjacent low albedo wind streaks; however, a mixing trend is not as evident as within the impact craters.

THEMIS day/IR observations of low-albedo intracrater materials appear to show relatively lower average temperatures for Surface Type 1 compared to Surface Type 2 while THEMIS night/IR observations appear to reveal higher average temperatures for Surface Type 1 compared to Surface Type 2. There does not appear to be a discernable temperature trend for surface materials in adjacent low-albedo wind streaks.

Temperature variations observed in THEMIS images can be produced by a combination of topographic (solar heating) and thermophysical (thermal inertia and albedo) effects; however, combining multiple datasets can minimize uncertainties. The transition from Surface Type 1 to Surface Type 2 intracrater materials is interpreted to reflect decreasing particle sizes controlled by mineralogic differences between an unweathered basalt component and an andesite/altered basalt component. Relatively coarse dune materials are cool (dark) during the day while finer dune-free materials are warmer (bright). Intracrater floor materials are interpreted as eolian sediment blown into craters while wall materials are interpreted as either eolian sediment sorted by particle size, or eroded material from in-place crater wall lithologies.

P12C MCC: 131 Monday 1330h

Outer Planet Satellite Interiors II *(joint with GP, T, V)*

Presiding: **W B McKinnon,** Washington University**; T Spohn,** Westflische Wilhelms-Universitt

P12C-01 1330h INVITED

Inside Jupiter's Galilean Satellites: Uncertainties Abound

Gerald Schubert (3108254577; schubert@ucla.edu)