P52B-0584 1330h POSTER

Libyan Desert (Impact) Glass: Sr and Nd Isotopic Systematics and new Evidence for Target Material

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Libyan Desert Glass (LDG) is an impact-related, light yellow to greenish, natural silica glass of still unknown target material. It is irregularly distributed in an area of approximately 6,500 km2 between N-S striking dunes of the Great Sand Sea in western Egypt. The estimated quantity of exposed LDG exceeds 1,400 tons, with fragments ranging from sand-sized grains to pieces heavier than 25 kg. We have determined Rb-Sr and Sm-Nd isotopic ratios from seven LDG samples and five associated sandstones from the LDG strewn field in the Great Sand Sea, Western Egypt. Planar deformation features were recently detected in quartz from these sandstones. 87Sr/86Sr ratios, epsilon-Nd values for LDG are between 0.71219 and 0.71344, -16.6 and -17.8, respectively, and hence distinct from the less radiogenic 87Sr/86Sr ratios of 0.70910 - 0.71053 and epsilon-Nd values from -6.9 to -9.6 for the local sandstones from the LDG strewn field. Previously published isotopic ratios from the Libyan BP and Oasis crater sandstones are generally incompatible to our LDG values. LDG formation undoubtedly occurred at 29 Ma (fission-track data), but neither the Rb-Sr nor the Sm-Nd isotopic system were rehomogenised during the impact event, as we can deduce from Pan-African ages of 560 130 Ma and 520 130 Ma, defined by regression lines from a total of 14 LDG samples from this work and the literature. Together with similar Sr and Nd isotopic values for LDG and granitoid rocks from NE Africa west of Nile, these findings point to a sandy matrix target material for the LDG derived from a Precambrian Pan-African crystalline basement, ruling out the Cretaceous sandstones of the former "Nubian Group" as possible precursors for LDG.

P52B-0585 1330h POSTER

Modeling Aqueous Iron Chemistry at Low Temperatures, with Application to Mars

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Iron has played an important role in the surficial evolution of Mars. Surficial iron chemistry on Mars probably passed through three or four phases: dissolution of primary ferrous minerals, possible precipitation of secondary ferrous minerals, oxidation of ferrous to ferric iron, and ultimately, hydrolysis of ferric iron to insoluble oxide minerals such as hematite. The evolution of iron chemistry on Mars is closely tied to primary mineralogy, low-temperature aqueous geochemistry, which includes complex redox reactions, and interactions with atmospheric carbon dioxide, hydrogen, and oxygen. In this work, we incorporated iron solubility products and Pitzer-equation binary and ternary interaction parameters for iron with hydrogen, sodium, potassium, magnesium, calcium, chloride, sulfate, and bicarbonate/carbonate into the FREZCHEM model. Then we used the model to estimate constraints on surficial Martian iron chemistry. Model fits to FeCl2, FeSO4, and FeCO3 solubility data are excellent. Under reducing c

P52B-0586 1330h POSTER

Lithologic Mapping in the Southern Soda Mountains, Mojave Desert, Using ASTER Data

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The Southern Soda Mountains (35.14°N, 116.19°E) in the Mojave Desert, CA, consist of an uplifted block of dacitic volcanic rocks. Local hydrothermal alteration has produced relatively small outcrops (meters to 10s meters wide) exhibiting extensive kaolinite alteration. A 14 band (9 VISIR bands from 0.52 to 2.43 and 4 TIR bands from 8.125 to 11.65 micrometers) ASTER scene, acquired in June 2000, was calibrated to reflectance for the VISIR and emissivity for the TIR bands to evaluate the extent to which the data can be used to identify and map lithologic units within the study area. Fieldwork, consisting of several traverses and acquisition of reflectance spectra, was accomplished after initial analyses of the calibrated data. Further, lab-based emission spectra (courtesy ASU Planetary Exploration Laboratory) and XRF spectra were acquired for key samples. Results demonstrate that: (a) ASTER 4 band emission data, and ASTER simulations generated from the lab spectra, show only very subtle spectral variations for the study site. The reason is that the spectral behavior in the ASTER TIR wavelengths for the study site is dominated by Si-O vibrations associated with framework silicate minerals (e.g., feldspars). The narrow compositional range (approximately 63 to 70 percent silica) precludes significant spectral variety. Further, kaolinite outcrops are too small to be properly sampled by the 90 meter/pixel thermal data. Lab-based spectra demonstrate that extending the spectral coverage of the ASTER TIR bands from 11.65 to 25 micrometers would greatly increase the ability to discriminate and map units in this region, including the presence of volcanic glass; (b) ASTER 9 band VISIR data show significant spectral variety and were successfully mapped to the three major units present. Relatively gray rocks have reflectance spectra dominated by opaque mineral contents, red rocks have spectra controlled by the presence of dispersed ferric oxides, and hydrothermally altered white rocks have spectra indicative of kaolinite. Overall, results demonstrate that ASTER data can be very useful in litholgic mapping, even in fairly homogeneous units. This is particularly true if results are verified by field work and if spectral patterns are understood from first principles. Implications for analysis of THEMIS observations from the Mars Odyssey Orbiter are clear.

P52C MC: 309 Friday 1530h

Deep Space One's Encounter with Comet Borrelly *(joint with G, SH, HG)*

Presiding: **R M Nelson,** Jet Propulsion Laboratory

P52C-01 1530h

Featured Presentation: Overview of the Deep Space One mission and the nature of the flyby of Comet Borrelly

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There is no abstract available for this presentation.

P52C-02 1545h

Featured Presentation: Comet Borrelly Imaging science results

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There is no abstract available for this presentation.

P52C-03 1600h

Composition of Plasma Inside the Coma of Comet 19P/Borrelly

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On September 22, 2001, the Deep Space 1 spacecraft flew through the coma of Comet 19P/Borrelly, coming within 1500 km of the central nucleus at a relative velocity of 17 km/s. We report here on initial analysis of ion composition data obtained from the Plasma Experiment for Planetary Exploration (PEPE), a plasma energy-angle-mass/charge spectrometer that simultaneously measures ions and electrons over the energy range few eV to 32 keV/q and the M/Q range 1 to 100 amu/e. From earlier ground-based observations we anticipate a Borrelly gas production rate of 6 x 10^{28} molecules/s, about 3% that of Halley (the latter is the only other comet for which there is data comparable to ours obtained during a direct flyby of the nucleus). The parent composition of Borrelly is known to reflect a volatile inventory relatively poor in C_2 and C_3 (10% of the Halley ratio of C_n/H_2O), but with normal abundances of CN and NH2. In addition to observations of coma composition, we also anticipate measuring the admixture of solar wind ions that charge exchange with the neutral coma. The latter lead to X-rays that should be observable by the Chandra telescope.

P52C-04 1615h

Deep Space One Measurements of the Interaction between the Solar Wind and Commet Borrelly

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On September 22, 2001, the Deep Space One spacecraft flew past the comet, Borrelly, with a closest approach distance of 2000 km in the sunward direction. We present the densities, velocities and composition of the plasma in the comet's environment, as measured by the PEPE instrument on Deep Space One. These results will be compared to theoretical and numerical models of the interaction between the solar wind and the comet.