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Although H_2O is certainly the most common ice material in the Solar System, other molecules are present and of interest. Our laboratory work has shown that space weathering, by vacuum-UV photons and MeV ions, will result in a very rich chemistry among known ice components, such as H_2O, N_2, CO, and CH_4. Acid-base reactions, electron transfer, and free-radical chemistry will all play a role in transforming icy surfaces into active regions of organic and pre-biological chemistry. In this presentation I will review some of our recent results concerning the radiation chemistry and photochemistry of known ice molecules, emphasizing organic materials as opposed to H_2O-dominated chemistry. Comparisons will be made among known surface ices and a few predictions of new molecules and ions will be made. Similarities in chemical reactions among families of molecules will be presented. Finally, some suggestions will be made for data needed to better understand the nature and extent of weathering and its role in astrobiology.

P61B MCC: Hall D Saturday 0830h

Fundamental Discoveries in Planetary Science: The Color of Worlds II Posters *(joint with V)*

Presiding: **C R Chapman,** Southwest Research Institute; **J M Sunshine,** Science Application International Corporation

P61B-0347 0830h POSTER

Dawn Discovery Mission: A Journey to the Beginning of the Solar System

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In December 2001, NASA announced the selection of the Dawn mission to Vesta and Ceres as the next mission to be undertaken in the Discovery series. Dawn examines the role of size and water content in planetary evolution, contrasting the primitive and apparently wet protoplanet, Ceres, with its dry and highly evolved neighbor, Vesta. Dawn maps the surface in visible and infrared wavelengths to determine its mineralogical composition and crustal properties, uses gamma ray and neutron spectroscopy to determine its elemental composition and magnetometry and radio science to probe the interior and laser altimetry to provide precise topography. Dawn is a partnership between UCLA, representing the science team members, the Jet Propulsion Laboratory, Orbital Sciences Corporation, the German Aerospace Center, DLR and the Italian Institute for Space Astrophysics, IAS. The mission uses ion propulsion to fly to Vesta, orbit it at a variety of altitudes for close to a year, leave Vesta orbit, fly to Ceres and orbit it similarly. The spacecraft carries a framing camera provided by DLR's Institute of Space Sensor Technology and Planetary Exploration in Berlin; a mapping spectrometer provided by the Istituto di Astrofisica Spaziale in Roma, a gamma ray and neutron spectrometer provided by the Los Alamos National Laboratory, a laser altimeter provided by NASA's Goddard Space Flight Center and a magnetometer provided by UCLA. This paper summarizes the mission goals, and the trajectory, orbits, and instruments that enable the mission to attain those goals.

P61B-0348 0830h POSTER

Searching for Evidence of Aqueous Processes on Mars Through Spectral Identification of Alteration Minerals

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The surface mineralogy on Mars holds information about the environmental and geochemical records on that planet and may provide clues to past aqueous processes there. Analysis of the kind of chemical alteration that has taken place on Mars provides insights into major climate and environmental factors such as when and how much water was present on the surface of Mars. Surface images taken by Odyssey-THEMIS and MGS-MOC have introduced the possibility that aqueous processes have occurred in recent martian history and evidence from GRS on Odyssey for H2O-ice and/or hydrated minerals supports this as well. However, little evidence for alteration minerals on Mars is available from the spectral images to date. Work is underway in the lab and in the field in order to characterize the spectral properties and formation conditions of these minerals in volcanic and hydrothermal sources on Earth so that these minerals may be revealed in future spectral datasets of Mars if present. Determining whether or not hydrated iron oxides and sheet silicates are present in the dust on Mars is important for assessing potential aqueous and hydrothermal processes that may have occurred there. Sheet silicates and hydrated iron oxides typically require water for formation and specific sheet silicates are favored depending on the degree of moisture, temperature and other conditions. These minerals are frequently observed in altered volcanic material and hydrothermal springs on the Earth and would be expected on Mars if water was present. The motivation for this study is to gain information about possible aqueous processes on Mars through analysis of the chemical alteration that has taken place there. Identification of aqueous alteration on Mars would imply the presence of water and, thus, would have important implications for astrobiology, climate, and geoscience on Mars.

P61B-0349 0830h POSTER

The Lunar Crash of 1953: A Crater is Identified

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In 1953 an amateur astronomer observed and photographed a flash on the Moon (Stuart, 1956). This event is the only unambiguous record of the rare crash of an asteroid-sized body onto the lunar surface. We estimate that the energy of the event was about 0.5 megatons, resulting in a 1-2 km sized impact feature, and that the radius of the impacting body was about 20 m. Such an event occurs every 10-50 years. Although below the resolution limit of ground-based telescopes, this crater should be visible on space-based images of the Moon obtained by the Lunar Orbiter and Clementine missions. A search of images from the Clementine mission reveals a 1.5 km feature with a high-albedo, blue, fresh-appearing ejecta blanket at the location of the flash. Spectral analysis of the crater reveals it to be bluer and fresher than other young craters. Our results suggest that the effects of space weathering occur rapidly on the Moon.

Work performed in part at the Jet Propulsion Laboratory California Institute of Technology under contract to the National Aeronautics and Space Administration. Funded in part from NSF grant AST-0074555.

Stuart, L. (1956). The Strolling Astronomer. Vol 10, 42-43.

P61C MCC: Hall D Saturday 0830h

Planetary Atmospheres Posters *(joint with A)*

Presiding: **A Toigo,** Cornell University; **D A Brain,** Laboratory for Atmospheric and Space Physics, University of Colorado

P61C-0350 0830h POSTER

Fractionation of the Early Terrestrial Atmospheres: Dynamical Escape

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Hydrodynamic escape may have played a significant role in the early fractionation of the atmospheres of the terrestrial planets. This possibility has been demonstrated in the last two decades by numerous models that show radial, transonic flow of hydrogen can occur in the presence of sufficient solar EUV flux, thought to exist in the first few 100 Myr. The models show that the larger the solar flux the greater the mass of the fractionating species, which are accelerated to escape speeds by the hydrogen wind through drag processes. As the atmospheres evolve and the solar EUV flux wanes, the maximum mass of flowing gas constituents decreases until all gases become static. We show that fractionation can continue beyond this point when non-radial flow and dynamically enhanced Jeans escape are considered. For example, the early terrestrial atmospheres are thought to have had large hydrogen contents, resulting in exobase altitudes of a planetary radius or more. In this case, rotational speeds at the exobases of Earth and Mars would be large enough for light constituents to "spin" off and fractionate, especially at equatorial latitudes. Also, in the presence of transonic flow of hydrogen only, non-radial expansion throws heavier gases to high altitudes in the exosphere, accompanied by strong bulk speeds at the exobase, which results in enhanced thermal escape fluxes and fractionation.

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P61C-0351 0830h POSTER

A Cold Jovian Arctic Polar Vortex: Evidence from Infrared Imaging

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A prominent cold arctic airmass in Jupiter is revealed by thermal images taken at NASA's Infrared Telescope Facility (IRTF) during Jupiter's northern summer in 1999. This cold airmass is well defined by a sharp 4-degree thermal gradient in both the stratosphere and the upper troposphere and tropopause regions. The latitude boundary of the cold airmass oscillates in longitude with principal wavenumber 5–6. This longitudinal oscillation is coincident with the oscillation of the boundary of the thick polar hood that is detectable in reflected sunlight that is sensitive to particles around Jupiter's tropopause ($\sim$100 mbar pressure), using IRTF 2.3-μm and HST WFPC2 890-nm images. The sinusoidal boundaries slowly rotate prograde with respect to the interior. The proximity and similarity of the thermal and particle boundaries suggests that the phenomenon is a classical polar vortex of the same type as seen in the Earth's antarctic. Testing of possible gaseous entrainment within the vortex' area would verify or refute similarities with polar vortices in the Earth, Venus, Mars and possibly Titan. This phenomenon is relevant to studies of terrestrial meteorology by measuring the extent to which stratospheric phenomena can drive tropospheric properties. Detailed