41st Lunar and Planetary Science Conference
March 1–5, 2010

Highlighted Abstracts

Oral Presentations:

* Asterisks denote speaker

Monday Morning, March 1, 2010

MARTIAN ALTERATION PROCESSES: IN THE LABORATORY, FROM ORBIT, AND IN SITU
8:30 a.m. Waterway Ballroom 4

8:30 a.m. Kraft M. D. * Rogers A. D. Fergason R. L. Michalski J. R. Sharp T. G.
Spectral and Geomorphic Evidence for Chemical Weathering in the Icy Plains of Acidalia Planitia, Mars **[#2600]**
Known compositional differences in high-silica materials of Acidalia Planitia are explored in detail with THEMIS data. They are closely correlated to periglacial features, suggesting aqueous alteration in icy soil environments in northern Acidalia.

10:15 a.m. Noe Dobrea E. Z. * Swayze G.
Acid Pedogenesis on Mars? Evidence for Top-Down Alteration on Mars from CRISM and HiRISE Data **[#2620]**
We present evidence that suggests that at least some parts of Mars underwent a period of acid pedogenic alteration.

Tuesday Morning, March 2, 2010

GROUND TRUTH GALORE: TERRESTRIAL IMPACT CRATERS
8:30 a.m. Waterway Ballroom 5

9:30 a.m. Kalleson E. * Dypvik H. Riis F.
The Ritland Impact Structure, Western Norway **[#1326]**
The Ritland impact structure is 2.5 km in diameter and 350 m deep. Based on the geological setting, an age between 500 and 600 Ma is proposed for the impact. Impactites include brecciated basement and minor amounts of a melt-rich unit.

SPECIAL SESSION: A NEW MOON: LCROSS, CHANDRAYAAN, AND CHANG'E-1 RESULTS
8:30 a.m. Waterway Ballroom 6

8:30 a.m. Colaprete A. * Ennico K. Wooden D. Shirley M. Heldmann J. Marshall W. Sollitt L. Asphaug E. Korycansky D. Schultz P. Hermalyn B. Galal K. Bart G. D. Goldstein D. Summy D.
Water and More: An Overview of LCROSS Impact Results **[#2335]**
This talk reviews the current results from the LCROSS impact as observed by the instrument suite on the LCROSS Shepherding Spacecraft.

8:45 a.m. Heldmann J. L. * Colaprete T. Ennico K. Shirley M. Wooden D. Science Team LCROSS.
Lunar Crater Observation and Sensing Satellite (LCROSS) Mission: Results from the Visible Camera and UV/Visible Spectrometer Aboard the Shepherding Spacecraft **[#1015]**
This paper will report on science results from the visible camera and UV-visible spectrometer aboard the LCROSS shepherding spacecraft.

9:00 a.m. Wooden D. H. * Colaprete A. Ennico K. Shirley M. H. Heldmann J. L. LCROSS Science Team
Lunar Crater Observation and Sensing Satellite (LCROSS) Mission: Results from the Nadir Near-Infrared Spectrometer Aboard the Shepherding Spacecraft **[#2025]**
The nadir-viewing Near-Infrared Spectrometer (1.17–2.45 μm) on the LCROSS Shepherding Spacecraft observed 4 min of the impact plume/curtain from the Centaur impact inside Cabeus Crater. We present identifications of water and other absorption bands.

9:15 a.m. Hong P. K. * Sugita S. Okamura N. Sekine Y. Terada H. Takatoh N. Hayano Y. Fuse T. Kawakita H. Wooden D. H. Young E. F. Lucey P. G. Furusho R. Watanabe J. Haruyama J. Nakamura R. Kurosawa K. Hamura T. Kadono T.
Hot Bands Observation of Water in Ejecta Plume of LCROSS Impact Using the Subaru Telescope **[#1939]**
We observed infrared spectra of LCROSS impacts using the Subaru telescope to find H_2O hot band emission lines. Although there was no clear sign of H_2O line detected, the upper limit of H_2O mass is much lower than pre-impact predictions.

9:30 a.m. Hayne P. O. * Greenhagen B. T. Paige D. A. Foote M. C. Siegler M. A.
Diviner Observations of the LCROSS Impact **[#2484]**
With its synoptic-scale view of the LCROSS impact site from orbit, combined with excellent sensitivity across a broad range of temperatures, Diviner provides an important set of constraints on the impact process and subsequent evolution.

Tuesday Afternoon, March 2, 2010

UREILITIC ASTEROIDS: INSIGHTS FROM ALMAHATA SITTA
1:30 p.m. Waterway Ballroom 1

1:30 p.m. Herrin J. S. * Ito M. Zolensky M. E. Mittlefehldt D. W. Jenniskens P. M. Shaddad M. H.
Thermal History and Fragmentation of Ureilitic Asteroids; Insights from the Almahata Sitta Fall **[#1095]**
We detail the thermal history of recovered fragments of asteroid 2008 TC3 (the Almahata Sitta ureilite) and compare the size of fragments within TC3 to those initially dislodged from the ureilite parent body.

IMPACT MODELS, EXPERIMENTS, AND IMPACT DEPOSITS
1:30 p.m. Waterway Ballroom 5

1:45 p.m. Price M. C. * Burchell M. J. Miljkovic K. Kearsley A. T. Cole M. J.
Shock Synthesis of Organics from Simple Ice Mixtures? **[#1830]**
Preliminary results from a programme of impact experiments on simple ice mixtures (CO_2, NH_3 and H_2O) give a tantalising suggestion of the successful shock synthesis of complex organics — including glycine.

3:15 p.m. Wünnemann K. * Lynett P. Weiss R.
The Impact-induced Tsunami Hazard — Insight from Numerical Modeling of the Eltanin Event **[#2220]**
We present numerical models to simulate the Eltanin impact and assess the hazardous potential of generated tsunami waves. We combine hydrocode modeling with wave propagation models to quantify wave generation and decay as a function of distance from point of impact.

4:30 p.m. Lowe D. R. Byerly G. R. *
Did LHB End Not with a Bang but a Whimper? The Geologic Evidence **[#2563]**
We present evidence for three new major impacts from our geologic studies of the 3.55 to 3.25 Ga Barberton greenstone belt, increasing the number of major impacts to seven.

Tuesday Afternoon, March 2, 2010 (continued)

SPECIAL SESSION: WATER IN THE SOLAR SYSTEM: MOON
1:30 p.m. Waterway Ballroom 6

1:30 p.m. Clark R. * Pieters C. M. Green R. O. Boardman J. Buratti B. J. Head J. W. III Isaacson P. J. Livo K. E. McCord T. B. Nettles J. W. Petro N. E. Sunshine J. M. Taylor L. A.
Water and Hydroxyl on the Moon as Seen by the Moon Mineralogy Mapper (M^3) **[#2302]**
A new water+hydroxyl map was constructed using M^3 data which shows that the water and hydroxyl detected by M^3 is more extensive than first reported and in better agreement with the VIMS and Deep Impact results.

1:45 p.m. McCord T. B. * Taylor L. A. Orlando T. M. Pieters C. M. Combe J.-Ph. Kramer G. Sunshine J. M. Head J. W. Mustard J. F.
Origin of OH/Water on the Lunar Surface Detected by the Moon Mineralogy Mapper **[#1860]**
We present characteristics of the M^3 3-μm OH/H_2O spectral feature across the observed Moon and explore solar-wind induced surface chemistry as the source.

3:30 p.m. Greenwood J. P. * Itoh S. Sakamoto N. Taylor L. A. Warren P. H. Yurimoto H.
Water in Apollo Rock Samples and the D/H of Lunar Apatite **[#2439]**
Hydrogen isotopes of lunar water in apatite are measured in Apollo rock samples for the first time. The Moon has a unique D/H.

3:45 p.m. McCubbin F. M. * Steele A. Nekvasil H. Schnieders A. Rose T. Fries M. Carpenter P. K. Jolliff B. L.
Detection of Structurally Bound Hydroxyl in Apatite from Apollo Mare Basalt 15058,128 Using TOF-SIMS **[#2468]**
Using TOF-SIMS, we have shown that hydroxyl is present within apatite in lunar mare basalt 15058,128. This is the first find of water in a lunar magmatic mineral, and this result holds important implications for the water content of the lunar interior.

VESTA AND DAWN
3:15 p.m. Waterway Ballroom 1

3:15 p.m. Raymond C. A. * Russell C. T. Dawn Science Team
Exploring Asteroid 4 Vesta with the Dawn Mission **[#2155]**
Dawn reaches Vesta in August 2011. Science observations planned during the one-year stay using cameras, visible/infrared and gamma ray/neutron spectrometers, and radiometric tracking are discussed in the context of the mission's science goals.

3:30 p.m. Nugent C. R. * Margot J. L. Russell C. T. Nolan M. C. Magri C. Giorgini J. D.
SHAPE Modeling of (4) Vesta for Dawn Mission Support and SHAPE Inversion Validation **[#2637]**
This work supports the Dawn mission by using SHAPE software to invert radar images, light curves, and optical images of Vesta to generate a 3-D model of an asteroid as well as characterize its spin state.

3:45 p.m. Reddy V. * Gaffey M. J. Kelley M. S. Nathues A. Li J.-Y. Yarbrough R.
Rotationally-resolved Compositional Study of Asteroid (4) Vesta's Southern Hemisphere: Implications for the DAWN Mission **[#1373]**
We present results from the first rotationally-resolved spectroscopy of Vesta's Southern Hemisphere including the South Pole Crater. Existence of olivine in this crater will be explored.

4:00 p.m. Jutzi M. * Asphaug E.
Impacts on Vesta **[#2129]**
We present three-dimensional SPH simulations of impacts on asteroid 4 Vesta using a new model to simulate the granular flow of post-impact regolith.

4:15 p.m. Schmidt B. E. * Moore W. B.
Giant Impacts Can Drive Asteroid Dynamics: Lessons for Vesta **[#2700]**
We present the result of geophysical modeling of Vesta to determine its interior state prior to impact and the subsequent surface deformation and rotational and thermal evolution of the asteroid.

4:30 p.m. Bills B. G. * Nimmo F.
Are the Spin Poles of Ceres and Vesta Fully Damped? **[#2604]**
We examine the possibility, and implications, of fully damped spin poles for Ceres and Vesta. Their spin poles are close to estimates of damped states. If confirmed, damped spin poles would yield estimates of moments of inertia.

Wednesday Morning, March 3, 2010

EXPLORING THE MARTIAN CRUST: GEOLOGY, MINERALOGY, AND GEOCHEMISTRY
8:30 a.m. Waterway Ballroom 4

8:45 a.m. Crumpler L. * Arvidson R. Squyres S. Yingst A. McCoy T. DesMarais D. Cabrol N. Schröder C. Cohen B. Rice J. Jr. Ruff S. Morris R. Yen A. McEwen A. deSouza P. Athena Science Team
Overview of the Field Geologic Context of Mars Exploration Rover Spirit, Home Plate and Surroundings **[#2557]**
This work provides field context for APXS, MB, MI results of Spirit at Home Plate. High silica /sulfates, nanophase iron oxides, and hematite occur mostly in the lowest stratigraphic unit exposed along the axis of breached antiformal bedding.

10:15 a.m. Ehlmann B. L. * Mustard J. F. Murchie S. L.
Geologic Setting of Serpentine Deposits on Mars **[#2235]**
Analyses of CRISM, HiRISE, and CTX data acquired to date show serpentine deposits on Mars are small, rare, and restricted to Noachian terrains. We detail the distribution of serpentine and the three distinct geologic settings in which it is found.

NATURE OF THE LUNAR REGOLITH
8:30 a.m. Waterway Ballroom 6

8:45 a.m. Bandfield J. L. * Ghent R. R. Vasavada A. R. Paige D. A.
Mapping Lunar Surface Rock Abundance and Regolith Thermophysical Properties Using LRO Diviner Data **[#2012]**
Rock abundance and regolith fines temperatures are derived from nighttime Diviner multispectral thermal infrared measurements of the lunar surface. These data products can be used to determine and map the physical properties of the lunar regolith.

Wednesday Afternoon, March 3, 2010

IMPACTS ON THE MOON, MARS, AND BEYOND
1:30 p.m. Waterway Ballroom 5

3:45 p.m. Schwenzer S. P. * Abramov O. Allen C. C. Clifford S. Filiberto J. Kring D. A. Lasue J. McGovern P. J. Newsom H. E. Treiman A. Vaniman D. T. Wiens R. C. Wittmann A.
Exploring Martian Impact Craters: What They Can Reveal About the Subsurface and Why They are Important in the Search for Life **[#1589]**
On Noachian Mars, impact craters were frequent, could have penetrated an existing cryosphere and potentially hosted hydrothermal systems. Therefore, they are important targets to explore the subsurface and potential habitats on Noachian terrain.

Thursday Morning, March 4, 2010

SOLAR WIND, VOLATILE ELEMENTS, AND ORGANICS
8:30 a.m. Waterway Ballroom 1

10:15 a.m. Kallio A. P. A. * McKeegan K. D. Jarzebinski G. Mao P. H. Kunihiro T. Coath C. D. Heber V. S. Burnett D. S. Wiens R. C.
Nitrogen Isotopic Composition of Solar Wind Returned by the Genesis Mission **[#2481]**
New nitrogen isotopic data from a silicon carbide target of the Genesis solar wind concentrator.

Thursday Afternoon, March 4, 2010

SPECIAL SESSION: CHARACTERIZING NEAR-EARTH OBJECTS
1:30 p.m. Waterway Ballroom 4

1:30 p.m. Cheng A. * Barnouin O. S.
Eros and Itokawa Comparisons: NEAR Shoemaker and Hayabusa **[#2747]**
NEAR and Hayabusa have studied two S-type near-Earth asteroids with similar compositions, but with distinct internal structures and surface geologies. What does surface geology, in the form of lineaments, craters, and small surface features, tell us about strength and cohesion?

2:00 p.m. Yoshikawa M. * Kawaguchi J. Yano H.
Asteroid Sample Return Mission Hayabusa, Its Engineering Challenges and Scientific Results **[#2746]**
Asteroid explorer Hayabusa will come back to the Earth in June 2010. We overcame many engineering difficulties and obtained many scientific data about the tiny S-type asteroid Itokawa. We summarize engineering and the scientific results of Hayabusa.

2:30 p.m. Benner L. A. M. *
Arecibo and Goldstone Radar Imaging of Near-Earth Asteroid **[#2748]**
Radar is the most powerful ground-based astronomical technique for studying the physical properties of near-Earth objects and for refining their orbits, principally through its ability to achieve resolutions as fine as several meters/pixel that can spatially resolve small objects.

3:00 p.m. Mainzer A. K. * Bauer J. M. Masiero J. Grav T. Cutri R. McMillan R. Walker R. Wright E. L. WISE Team
NEOWISE — The WISE Near Earth Object Survey **[#2534]**
The WISE spacecraft is expected to observe roughly 700 near-Earth objects, more than a third newly discovered. These measurements will provide a relatively unbiased and uniform sampling of this small body sub-population down to sizes of a few hundred meters.

Thursday Afternoon, March 4, 2010 (continued)

SEVERAL SPECIES OF VARIOUSLY SIZED ICY CHUNKS GATHERED TOGETHER AROUND GIANT PLANETS AND EVOLVING OVER TIME
1:30 p.m. Waterway Ballroom 5

4:15 p.m. Langhans M. * Jaumann R. Stephan K. Brown R. H. Buratti B. J. Clark R. Baines K. H. Nicholson P. D. Lorenz R. D. Sotin C.
Valley Formation from Methane Convective Storms on Titan **[#1709]**
Precipitation in the form of episodic thunderstorms is suspected to cause fluvial erosion at the surface of Titan. Valley morphology provides hints to verify whether episodic storm events accounts for the presence of valleys.

SPECIAL SESSION: A NEW MOON: LUNAR VOLCANISM AND IMPACT CHRONOLOGY
1:30 p.m. Waterway Ballroom 6

1:30 p.m. Spudis P. D. * Bussey D. B. J. Butler B. Carter L. Chakraborty M. Gillis-Davis J. Goswami J. Heggy E. Kirk R. Neish C. Nozette S. Patterson W. Robinson M. Raney R. K. Thompson T. Thomson B. J. Ustinov E.
Results of the Mini-SAR Imaging Radar, Chandrayaan-1 Mission to the Moon **[#1224]**
The Mini-SAR imaging radar on India's Chandrayaan-1 mission mapped more than 90% of both poles of the Moon. Scattering properties suggest that water ice is present in some permanently shadowed craters near the north pole.

Friday Morning, March 5, 2010

MARTIAN IGNEOUS PROCESSES
8:30 a.m. Waterway Ballroom 5

9:30 a.m. Filiberto J. * Dasgupta R. Kiefer W. S. Treiman A. H.
High Pressure Phase Equilibrium Investigation of the Home Plate Pyroclastic Basalt Fastball and Application to Melting in the Martian Mantle **[#1238]**
We have investigated the phase equilibria of a Home Plate pyroclastic basalt and show that it is represents a primary mantle-derived magma, estimate the plausible mantle melt fraction, and constrain the potential temperature of the martian mantle.

Friday Afternoon, March 5, 2010

PETROLOGIC CHARACTERIZATION OF THE MOON
1:30 p.m. Waterway Ballroom 6

2:30 p.m. Sunshine J. M. * Besse S. Petro N. E. Pieters C. M. Head J. W. Taylor L. A. Klima R. L. Isaacson P. J. Boardman J. W. Clark R. C. M3 Team
Hidden in Plain Sight: Spinel-rich Deposits on the Nearside of the Moon as Revealed by Moon Mineralogy Mapper (M^3) **[#1508]**
The Moon Mineralogy Mapper has revealed a new, unique, and unexpected spinel-rich lithology on the central nearside. These spinel-rich deposits are found only among the Sinus Aestuum pyroclastic deposits and are notably absent from nearby Rima Bode.

2:45 p.m. Pieters C. M. * Boardman J. Buratti B. Clark R. Combe J. P. Green R. Goswami J. N. Head J. W. Hicks M. Isaacson P. Klima R. Kramer G. Kumar K. Lundeen S. Malaret E. McCord T. B. Mustard J. Nettles J. Petro N. Runyon C. Staid M. Sunshine J. Taylor L. A. Thaisen K. Tompkins S. Varanasi P.
Identification of a New Spinel-rich Lunar Rock Type by the Moon Mineralogy Mapper (M^3) **[#1854]**
Diffuse and widely separated regions along the highly feldspathic inner ring of Moscoviense Basin exhibit unusual mineral components. One composition is a new rock type dominated by Mg-spinel with no detectible mafic silicates (<5%).

Poster Presentations:

Tuesday, March 2, 2010, Poster Session I

SMALL BODY MISSIONS
7:00 p.m. Town Center Exhibit Area

Nathues A. Reddy V. Schaeff S. Wiegand A. Michelsen R. Sanchez J. A. Boehnhardt H.
Ground-based Mineralogical Characterization of low Δv ASTEX Mission Targets **[#1047]**
ASTEX is an *in situ* exploration mission study to two near-Earth asteroids for which we have identified target candidates. Since many of the potential targets are without compositional information we have started a spectral survey.

Murdoch N. Rozitis B. Michel P. Losert W. de Lophem T-L. Green S. F.
AstEx Microgravity Experiment: Simulating Asteroid Regoliths **[#1715]**
This experiment aims to characterise the response of granular material to rotational shear forces in a microgravity environment in order to help design an asteroid sampling mechanism and interpret the fascinating geology found on asteroids.

A NEW MOON: GEOLOGIC PROCESSES ON THE MOON
7:00 p.m. Town Center Exhibit Area

Marchi S. Bottke W. F.
New Insights on the Cratering History of Lunar Farside **[#1314]**
In order to achieve a better understanding of the early evolution of the Moon, we performed new crater counts on the oldest terrains on the lunar farside. Derived crater counts are here presented and analysed.

Thomson B. J. Spudis P. D. Bussey D. B. J. Carter L. Kirk R. L. Neish C. Patterson G. Raney R. K. Winters H. Mini-RF Team
Roughness and Radar Polarimetry of Lunar Polar Craters: Testing for Ice Deposits **[#2176]**
Results from the Mini-SAR radar instrument on Chandrayaan-1 indicate certain north polar craters on the Moon have polarization signatures consistent with ice. Roughness effects alone appear insufficient to explain the observations.

Mest S. C. Berman D. C. Petro N. E.
Geologic Mapping of Impact Crater Floor Deposits Near the Lunar South Pole **[#2363]**
Geologic mapping of impact crater floor deposits in the lunar South Pole quadrangle (LQ-30) is revealing (1) smooth, dark deposits interpreted to be mare, and (2) brighter, densely cratered deposits consisting of impact melt and/or mantled mare.

Thursday, March 2, 2010, Poster Session II

BOOM! HIGH-ENERGY IMPACTS
7:00 p.m. Town Center Exhibit Area

Korycansky D. G. Plesko C. S.
Re-aggregation Times of Potentially Hazardous Object Fragments After a Hazard Mitigation Impulse **[#1456]**
We examine re-accretion times for potentially hazardous objects following the outcome of mitigation strategies, by modeling the disruption and re-aggregation of polyhedron-element rubble piles after the application of an impulsive applied velocity field.

ICE AND DUST
7:00 p.m. Town Center Exhibit Area

Reach W. T.
Structure of the Zodiacal Cloud Along the Earth's Orbit **[#1499]**
Using Spitzer Space Telescope observations of the brightness of the ecliptic poles, we measured the structure of the Earth's resonant dust ring, showing Earth is trailed by a cloud 0.2 AU away and 0.08 AU wide, along the Earth's orbit.

SATELLITES AND THEIR PLANETS
7:00 p.m. Town Center Exhibit Area

Cheng A. F. * Weaver H. A. Nguyen L. Hamilton D. P. Stern S. A. Throop H. B.
A New Ring or Ring Arc of Jupiter? **[#2549]**
New Horizons LORRI observations of Himalia reveal a streak-like, extended emission feature that is interpreted as a new ring of Jupiter.