

Thursday, March 15, 2007

POSTER SESSION II: MARS SEDIMENTS AND GEOCHEMISTRY: ANALOGS AND MINERALOGY
6:30 p.m. Fitness Center

Osburn M. R. Fernández-Remolar D. C. Arvidson R. E. Morris R. V. Ming D. Prieto-Ballesteros O. Amils R. Stein T. C. Heil-Chapdelaine V. Friedlander L. R. Herndon B. Marlow J. Rosenberg S. Schepker K. Steiner A.

Geomorphic and Aqueous Chemistry of a Portion of the Upper Rio Tinto System, Spain [#1740]

We present results from a study of a portion of the Rio Tinto, Spain, focusing on geomorphology, clastic sediment transport, and acidic aqueous processes, and lay out lessons-learned for understanding sulfate formation and alteration on Mars.

Fernández-Remolar D. C. Prieto-Ballesteros O. Osburn M. R. Gómez-Ortíz D. Arvidson R. E. Morris R. V. Ming D. Amils R. Friedlander L. R.

Mars Sulfate Formation Sourced in Sulfide-enriched Subsurface Fluids: The Río Tinto Model [#1580]

In this work we suggest a new scenario for the extensive generation of sulfates in Mars based on the observation of seasonal changes in the redox and pH of subsurface waters enriched in sulfur that supply the acidic Mars process analog of Rio Tinto.

Sutter B. Golden D. C. Amundson R. Chong-Diaz G. Ming D. W.

Calcium Sulfate in Atacama Desert Basalt: A Possible Analog for Bright Material in Adirondack Basalt, Gusev Crater [#1775]

Calcium sulfate that occurs in vesicles of Atacama Desert basalt will be discussed as a potential analog to the bright material observed in Adirondack basalt at Gusev Crater.

Chavdarian G. V. Sumner D. Y.

Cracks as Evidence for Water Evaporation and Condensation Associated with Temperature Changes in Hydrous Sulfate Sands [#2246]

Mineral-atmospheric water cycling promotes crack formation in the hydrous sulfate (gypsum) sands at White Sands National Monument, New Mexico. A similar water cycling process may promote crack formation in sulfate outcrops on Meridiani Planum, Mars.

Chan M. A. Seiler W. M. Ford R. L. Yonkee W. A.

Polygonal Cracking and "Wopmay" Weathering Patterns on Earth and Mars: Implications for Host-Rock Properties [#1398]

Terrestrial analogs exhibit shallow polygonal crack patterns interpreted as weathering features. Similar polygonal crack patterns on Wopmay rock and at Endurance Crater suggest tensile stresses in porous host rock, subjected to weathering conditions on the surface of Mars.

Vaniman D. T. Chipera S. J. Bish D. L.

Geochemical and Mineralogical Analysis of a "Simple" Evaporite with Organic Carbon Associations: A Rover's-Eye View of the Todilto Formation [#1404]

The Todilto formation of New Mexico and Colorado provides a setting with chemical and mineralogical characteristics relevant to what may be found by the 2009 Mars Science Laboratory rover, including an association with bituminous organic material.

Crowley J. K. Kargel J. S. Marion G. M. Hook S. J. Thomson B. J. de Souza Filho C. R. Bridges N. T. Brown A. J.

Detecting Reduced Zones in Oxidized Fe-rich Sedimentary Rocks: Spectral Clues to Organic Matter Concentrations? [#1274]

This paper outlines the mineralogical and spectral characteristics of terrestrial red bed sedimentary rocks and considers their possible utility as an analog for martian sedimentary deposits.

Tosca N. J. McLennan S. M.

An Experimental Approach to Evaporation Processes at the Martian Surface [#1893]

Results from experimental evaporation studies are described. Solid solution behavior in evaporite minerals is quantified to better understand mineral chemistry at the martian surface.

Halevy I. Zuber M. T. Schrag D. P.

A Sulfur Dioxide Climate Feedback on Early Mars [#1173]

We describe an early martian SO₂ climate feedback, providing a mechanistic explanation for the existence of liquid surface water on early Mars, for the observed mineral assemblage and for the transition to a cold, arid, acidic Mars ~3.5 Ga.

Nelson M. J. Newsom H. E. Bullock M. Moore J.

Chemical Results for Minerals Reacted in Mars Aqueous Laboratory [#2112]

Minerals reacted in aqueous chambers under martian conditions for up to one year have been investigated for evidence of alteration. Small spherules on altered surfaces, and evidence for dissolution were found along with S-rich coatings.

McAdam A. C. Zolotov M. Yu. Mironenko M. V. Sharp T. G.

Acid Weathering of Basaltic Lithologies: Equilibrium Modeling and Applications to Mars [#2198]

Comparisons of equilibrium weathering models with Mars observations suggest alteration of martian materials in a broad range of pH.

McAdam A. C. Zolotov M. Yu. Mironenko M. V. Sharp T. G.

Preferential Low-pH Dissolution of Pyroxene in Plagioclase-Pyroxene Mixtures and Implications for Martian Low-Albedo Regions [#1871]

Acid weathering could be responsible for elevated plagioclase/pyroxene ratios and high silica phases observed in northern low-albedo regions.

Rao M. N. Nyquist L. E. Wentworth S. J. Garrison D. H. Herrin J. S.

Salt-Formation by Progressive Evaporation of Brine Waters in the Endurance Crater Basin at Meridiani [#1348]

The sulfate/chloride vs. Cl and chloride/bromide vs. Br relationships in the salt-assemblages on Meridiani (RAT) rock-rinds indicate that these salts likely formed by progressive evaporative concentration of brine waters filling the Endurance Crater basin at Meridiani.

Xu W. Tosca N. J. McLennan S. M. Parise J. B.

Relative Humidity-induced Phase Transitions of Fe-Sulfate Minerals: In-Situ X-Ray Diffraction Studies [#1860]

In situ X-ray diffraction studies investigating relative humidity induced phase transitions of Fe-sulfate minerals are described.

Chipera S. J. Vaniman D. T. Bish D. L.

The Effect of Temperature and Water on Ferric-Sulfates [#1409]

Ferric-sulfates subjected to variable temperatures, humidity, and liquid water, were found to produce numerous crystalline phases, an amorphous phase, and extremely viscous and gelatinous forms that could be problematic to rovers and instruments.

Poulet F. Arvidson R. E. Gomez C. Bibring J.-P. Morris R. V. Langevin Y. Gondet B.

Surface Composition of Terra Meridiani and Western Arabia Terra from OMEGA [#1219]

We use OMEGA hyperspectral data to provide mineralogical inferences for the surface of Terra Meridiani and Arabia Terra.

Barge L. M. Petruska J.

Iron Precipitation Patterns in Gels: Implications for the Formation of Hematite Concretions at Meridiani Planum, Mars [#1676]

Iron diffusion experiments in gels produce precipitation patterns that are dependent on the conditions under which they were formed; this has implications for the interpretation of the hematite spherules discovered at Meridiani Planum.

Schneider A. L. Mittlefehldt D. W. Gellert R. Jolliff B.

Compositional Constraints on Hematite-rich Spherule (Blueberry) Formation at Meridiani Planum, Mars [#1941]

The Opportunity rover APXS data is used to model the composition of hematite-rich spherules found at Meridiani Planum.

Jolliff B. L. Gellert R. Mittlefehldt D. W. Athena Science Team

More on the Possible Composition of the Meridiani Hematite-rich Concretions [#2279]

Compositional trends among concretion-rich soil targets at Meridiani Planum measured with Opportunity's APXS indicate the maximum amount of hematite in the spherules to be 65–70 wt%, consistent with a replacive-inclusive growth mechanism.

Upadhyay C. Klingelhöfer G. Fleischer I. Schröder D. Rodionov D. Panthöfer M. Jung-Pothmann R. Tahir N. Hager T. Tremel W.

Classification of Martian Jarosite [#1835]

For the classification of Jarosite identified on Mars by Mössbauer spectroscopy we studied natural and synthetic Jarosite samples. The results indicate that the martian jarosite probably is a mixed phase jarosite, and may have a well developed zoned composition of two end members.

Podratz L. A. Gunter M. E. Williams T. J. Dyar M. D. Tosca N. J.

Refinement of the Jarosite-Alunite Cell Parameters as a Function of Compositional Variance [#2274]

The main goal of this project is to determine whether the cell parameters in the alunite mineral group vary systematically as a function of composition and if that variation is conclusive enough to use as a method for precise mineral identification.

Burger P. V. Shearer C. K. Papike J. J. Karner J.

Trace Element Crystal Chemistry of Jarosite: An Ion Microprobe Pilot Study [#1985]

In this study, we document the major, minor, trace and REE composition of two terrestrial jarosites using EMP and SIMS. Results will help increase our understanding of martian surface processes, and our ability to interpret current martian datasets.

Robertson K. Bish D.

The Dehydration Kinetics of Gypsum: The Effect of Relative Humidity on Its Stability and Implications in the Martian Environment [#1432]

Gypsum shows a sluggish response to dehydration due to its high thermal stability. Results are presented that revise the dehydration behavior of gypsum under varying relative humidity, suggesting a resistance to desiccation in the present diurnal relative humidity cycle on Mars.

Wang A. Freeman J. J. Jolliff B. L.

Formation Rate of Amorphous Magnesium Sulfates at Low Temperatures Approaching the Current Surface Conditions on Mars [#1195]

Low-T experiments on the dehydration of Mg-sulfate under current martian surface water-vapor pressures indicate extremely low rates of amorphization. The amorphization half life is on the order of two months to ten years at current surface temperatures, and crystalline starkeyite may form instead.

Freeman J. J. Wang A. Jolliff B. L.

MgSO₄•11H₂O — Powder XRD, Raman, and VIS-NIR Spectroscopic Characterization [#1197]

Raman and VIS-NIR characterizations were done on MgSO₄•11H₂O samples, confirmed by powder XRD. This phase can be a major Mg-sulfate stable at low temperatures on Mars, especially in polar regions. The distinct NIR features can help its identification based on OMEGA and CRISM spectra.

Gavin P. Chevrier V. Rochette P.

Thermally Transformed Nontronite as a Component of the Red Dust Layer on Mars [#2295]

Thermal treatment of nontronite shows the formation of red iron oxides and exotic magnetic phases both relevant to the properties of the martian red dust. Associated cristobalite and sillimanite could contribute to the properties of the dust.

Burt D. M. Knauth L. P. Wohletz K. H.

Sedimentary Concretions vs. Impact Condensates: Origin of the Hematitic Spherules of Meridiani Planum, Mars [#1922]

The uniform spherical shape, severe size limitation (about 5 mm), wide distribution, and Ni-enrichment of Meridiani hematitic spherules far more resemble characteristics of typical products of impact vapor condensation than they do characteristics of sedimentary concretions.

Aubrey A. D. Parker E. Chalmers J. H. Lal D. Bada J. L.

Ironstone Concretions — Analogs to Martian Hematite Spherules [#2053]

We report herein physical and chemical characterization of a new terrestrial analog to the martian “blueberries” found throughout San Diego County.

Potter S. L. Chan M. A.

Textural Characteristics of Spheroidal Iron Oxide Concretions: Terrestrial Analogues for Mars [#1896]

Terrestrial analog iron oxide concretions of the Navajo Sandstone are classified by internal structure as rind, layered or solid. These represent likely end members in the formation process.