Institutional Support

Lunar and Planetary Institute
Universities Space Research Association
NASA Engineering and Safety Center (NESC)
NASA Jet Propulsion Laboratory
The College of William and Mary

Conveners

Joel S. Levine, Ph.D.
The College of William and Mary
Daniel Winterhalter, Ph.D.
NASA Jet Propulsion Laboratory

Science Organizing Committee

Joel S. Levine, Ph.D.
The College of William and Mary
Daniel Winterhalter, Ph.D.
NASA Jet Propulsion Laboratory
Russell Kerschmann, M.D.
NASA Ames Research Center (Retired)
Abstracts for this meeting are available via the meeting website at

www.hou.usra.edu/meetings/marsdust2017/

Abstracts can be cited as

## Guide to Sessions

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* Coffee Breaks will be daily at 10:30 a.m. and 3:30 p.m.*
Program

Tuesday, June 13, 2017
WELCOME AND INVITED PRESENTATIONS
9:00 a.m. Lecture Hall

Levine J. S. * Winterhalter D. *
Welcome and Logistics
Goals and Objectives of the Workshop
Introduction of Breakout Panel Moderators and Recorders

Zurek R. W. *
The Spatial and Temporal Distribution of Dust in the Atmosphere of Mars [#6019]
Dust is widely spread in the Mars atmosphere, but it varies spatially, seasonally, and from year-to-year. This presentation gives an overview of the dust distribution, with emphasis on the roles of local, regional and planet-encircling dust storms.

Ming D. W. * Morris R. V.
Chemical, Mineralogical, and Physical Properties of Martian Dust and Soil [#6027]
Chemical, mineralogical, and physical properties of martian dust and soil are reviewed from data returned by robotic landers and rovers.

McCoy J. T. * Ryder V. E. Lam C. W. Scully R. R. Romoser A. A.
Martian Dust Toxicity: Should We Believe the Headlines? [#6004]
Martian dust has received significant attention, and with good reason. However, it is important to keep toxicity in proper context, and to avoid overstating crew health risks. Are perchlorates and other stressors really martian show-stoppers?

Farrell W. M. *
Regarding Electrified Martian Dust Storms [#6020]
We examine the dynamic competition between dust devil/storm charging currents and dissipating atmospheric currents. A question: Can high-current lightning be a dissipation product of this competition? Most likely not but there are exceptions.

Darquenne C. * Prisk G. K.
Reduced Gravity and Aerosol Deposition in the Human Lung [#6008]
Studies during parabolic flights showed a significant effect of gravity on the amount and site of aerosol deposition in the lung, which may affect subsequent clearance and greatly increase the toxicological impact of inhaled lunar or martian dust.

Rucker M. A. *
Dust Storm Impacts on Human Mars Mission Equipment and Operations [#6013]
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This presentation briefly reviews NASA's current approach to human exploration of Mars and key features placed on locations (referred to as Exploration Zones) for these activities. Impacts of dust and dust storms on selecting an EZ are discussed.

The upcoming MOXIE experiment will be the first to ingest large volumes of dust-laden martian atmosphere for processing, and will serve as a test case for translating our understanding into mitigation practices.
All participants, regardless of their assigned method of presentation, are encouraged to contribute during the breakouts, as all community input is essential to a positive outcome.

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David W. Beaty  
**Recorder:** Brandi Carrier

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Kass D. M. * McCleese D. J. Kleinenthal A. Schofield J. T. Heavens N. G.  
**Mars Climate Sounder (MCS) Observations of Martian Dust — A Decade-Long Record** [#6030]  
We describe the Mars Climate Sounder (MCS) observations of atmospheric dust. The instrument acquires infrared observations to produce a 5.75 Mars Year (>10 Earth year) climatology global of dust, including its vertical distribution.

Bell J. F. III Wellington D. F.  
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We describe recent as well as historic albedo variations on Mars as observed by space-based telescopes, orbiters, and surface missions, and speculate that some regions might offer fewer dust-related problems for future human explorers than others.

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MSL MAHLI images and other observations regarding particles deposited from eolian suspension and potential local dust sources (wind-eroded mudstone) at the Curiosity field site in Gale Crater, Mars.

Ogohara K. *  
**Regionality of Dust Haze Transport in the Mars Atmosphere Revealed by Ensemble Simulations** [#6014]  
Regionality of dust haze transport in the Mars atmosphere is investigated by ensemble simulations using a GCM. It is turned out that processes of dust haze dispersion by advection are categorized into a few cases.
Vincendon M. *

Observation of Interannual Variability of Dust Surface/Atmosphere Exchange on Mars [#6029]
Transfer of Mars dust between surface and atmosphere occurs on Mars with various timescales. Orbital observations of surface albedo change by OMEGA onboard Mars Express are used to assess the timing and extent of dust deposition and removal events.

Morozhenko A. V. Vidmachenco A. P. *

Optical parameters of Martian Dust and Its Influence on the Exploration of Mars [#6010]
Flight to Mars is dangerous because of large amount of toxic dust. During dust storm particle size was 1–20 μm; at its highest activity ~8–10 μm, at the end ~1 μm; real part of refractive index was 1.59, which corresponded to their silicate nature.

Montabone L. * Forget F.

Forecasting Dust Storms on Mars: A Short Review [#6032]
In this article we provide a short review focusing on the current and future capabilities of forecasting martian dust storms for robotic and human missions.

Wang A. * Yan Y. C. Wu Z. C.

Electrochemical Reaction at Surface Induced by Electrostatic Discharge During Mars Dust Storm and Dust Devils [#6012]
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Kuroda T. * Kadowaki M.

Simulation of the Small-Scale Dust Activities and Their Mutual Interactions on the Atmospheric Dynamics Using a High-Resolution Mars General Circulation Model [#6015]
We show the simulation results of our high-resolution Mars general circulation model including the dust lifting processes for the investigations of the meteorological features which invoke dust storms and subsequent enhancement of small-scale waves.

Spry J. A. * Rummel J. D. Race M. S. Conley C. A.

Three Faces of Martian Dust: Dust for Cover, Dust to Breathe, and Dust Everywhere [#6035]
While detailed approaches are mature for robotic missions, only guidelines are available for how planetary protection might be implemented on human missions. More dust-related data is needed before adequate mitigations can be identified and deployed.

Levine J. S. *

Dust in the Atmosphere of Mars and Its Impact on Human Exploration: A Review of Earlier Studies [#6007]
The impact of Mars atmospheric dust on human exploration has been a concern for many years, e.g., NRC (2002) and MEPAG (2005). The impact of Mars atmospheric dust on human exploration is a multi-faceted problem and will be reviewed in this paper.

Wadhwa M. * Leshin L. Clark B. Jones S. Jurewicz A. McLennan S. Mischna M. Ruff S. Squyres S. Westphal A.

A Low-Cost, Low-Risk Mission Concept for the Return of Martian Atmospheric Dust: Relevance to Human Exploration of Mars [#6028]
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Carrier B. L. * Beatty D. W. Hecht M. H.

The Potential Value of Returning Samples of Martian Dust and Other Granular Materials for Analysis in Earth Laboratories to Preparing for the Human Exploration of Mars [#6037]
In order to construct quantitative models for the behavior of dust on Mars, we need to understand the geological processes by which dust is created, transported, and deposited.
All participants, regardless of their assigned method of presentation, are encouraged to contribute during the breakout sessions, as all community input is essential to a positive outcome.

Moderator: Russ Kerschmann
Recorder: Pamela Sparks

Kerschmann R. L. *

What Questions Should We ask About the Health Effect of Mars Dust? Lessons from the Lunar Dust Experience [#6034]

The toxicology of lunar dust has been studied over the last decade and standards set by NASA for exposure. This summary reviews that data and proposes to reapply the strategy employed there to future research on the health effects of Mars dust.

Darquenne C. * Prisk G. K.

Reduced Gravity and Aerosol Deposition in the Human Lung [#6008]

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The Current MEPAG Representation of Potential Dust-related Hazards as They May Relate to the Human Exploration of Mars [#6022]

The MEPAG Goals Document presents investigations that may correlate with dust risk to humans and human operations in potential future Mars missions. We list these here, together with their respective priority rankings, and invite community input.

Sim P. A. *

Martian Dust and Its Interaction with Human Physiology: An Emergency Physician's Perspective [#6009]

Martian dust has known physical and chemical characteristics which portend adverse effects when humans are exposed. An emergency physician briefly summarizes the potentially harmful components and offers some mitigating and treatment measures.

Kamakolanu U. G. *

The Impact of Mars Atmospheric Dust on Human Health [#6033]

The martian dust impact can be considered as an exposure to ultra fine particles of martian dust. Direct nose to brain pathway of particulate matter can affect the fine motor skills and gross motor skills, cognition may be affected.


Acute Meteorite Dust Exposure and Pulmonary Inflammation — Implications for Human Space Exploration [#6024]

Geochemical and toxicological evaluations performed on six meteorite samples of mixed origin allow for toxicological risk assessments of celestial materials and clarification of important correlations between geochemistry and health.
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MARS DUST: MECHANICAL SYSTEMS AND SURFACE OPERATIONS
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Human Mars Mission Overview and Dust Storm Impacts on Site Selection [6031]
This presentation briefly reviews NASA’s current approach to human exploration of Mars and key features placed on locations (referred to as Exploration Zones) for these activities. Impacts of dust and dust storms on selecting an EZ are discussed.

Hecht M. H. * McClean J. B. Pike W. T. Smith P. H. Madsen M. B. Rapp D. MOXIE Team
MOXIE, ISRU, and the History of In Situ Studies of the Hazards of Dust in Human Exploration of Mars [6036]
The upcoming MOXIE experiment will be the first to ingest large volumes of dust-laden martian atmosphere for processing, and will serve as a test case for translating our understanding into mitigation practices.

Yun P. Y. *
Martian Dust Impact on Human Exploration [6018]
Understanding martian atmospheric electricity, and dust impact on human health, surface mechanical systems and surface operations are critical to reduce the risks of the human exploration on Mars.

O’Hara W. J. IV *
Summary of Martian Dust Filtering Challenges and Current Filter Development [6016]
Precursor and manned mission ISRU systems, habitat and rover ECLS systems, and airlock systems will include dust filtering in their design. This paper summarizes the challenges of filter development, and the status of the progress made in this area.

Baker M. M. * Lewis K. W. Bridges N. Newman C. Van Beek J. Lapotre M.
Aeolian Transport of Coarse Sediment in the Modern Martian Environment [6021]
We use Mastcam images from Curiosity’s change detection campaigns to trace surface winds and examine seasonal variability of aeolian sediment transport.

Guzewich S. D. * Bleacher J. E. Smith M. D. Khayat A. Conrad P.
Astronaut-Deployable Geophysical and Environmental Monitoring Stations [6011]
Geophysical and environmental monitoring stations could be deployed by astronauts exploring Mars to create a broad network that would collect high-value scientific information while also enhancing astronaut safety.

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Estimation of the Saltated Particle Flux at the Mars 2020 In-Situ Resource Utilization Experiment (MOXIE) Inlet [6025]
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