



# Lunar Surface Innovation

C O N S O R T I U M

## LSIC Dust Mitigation Focus Group

Monthly Meeting

August 18, 2022



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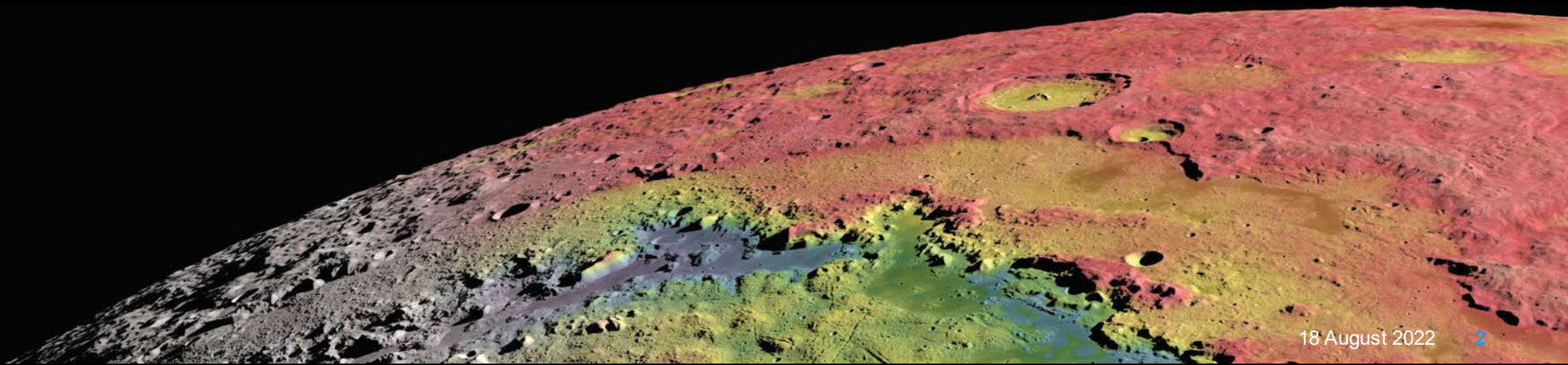
APL LSIC Dust  
Mitigation Team:

Lindsey Tolis  
Mark Perry  
Richard Miller  
Sarah Hasnain

18 August 2022

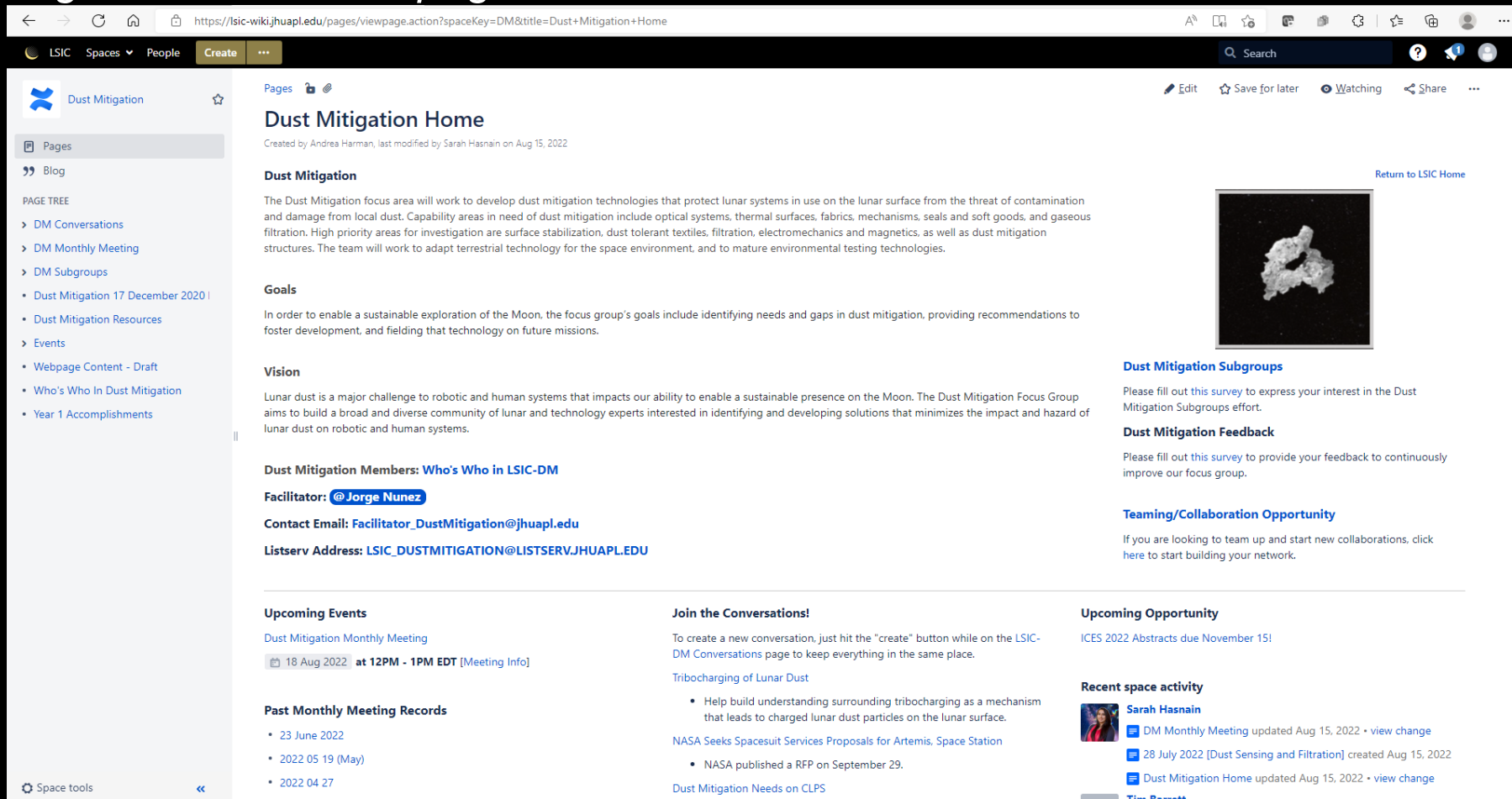
# Agenda

- Welcome, LSIC and Focus Group Updates
- Upcoming Opportunities and Meetings
- LSIC Data Buys Survey (Ben Bussey)
- Featured Technology Presentation:
  - AJ Gerner, Co-Founder & CTO of Lunar Outpost
    - “Particle Detection, Quantification, and Testing in Simulated Lunar Environments at Lunar Outpost”
- Discussion on Testing in Dusty Environments



# LSIC Dust Mitigation Confluence Site

- Please contact Andrea Harman ([ams573@alumni.psu.edu](mailto:ams573@alumni.psu.edu)) to get set up with an account!
- *Dust Mitigation Discussion page and wiki*



The screenshot shows the Confluence page for the Dust Mitigation Home. The page is titled "Dust Mitigation Home" and was created by Andrea Harman, last modified by Sarah Hasnain on Aug 15, 2022. The page content includes:

- Dust Mitigation:** The Dust Mitigation focus area will work to develop dust mitigation technologies that protect lunar systems in use on the lunar surface from the threat of contamination and damage from local dust. Capability areas in need of dust mitigation include optical systems, thermal surfaces, fabrics, mechanisms, seals and soft goods, and gaseous filtration. High priority areas for investigation are surface stabilization, dust tolerant textiles, filtration, electromechanics and magnetics, as well as dust mitigation structures. The team will work to adapt terrestrial technology for the space environment, and to mature environmental testing technologies.
- Goals:** In order to enable a sustainable exploration of the Moon, the focus group's goals include identifying needs and gaps in dust mitigation, providing recommendations to foster development, and fielding that technology on future missions.
- Vision:** Lunar dust is a major challenge to robotic and human systems that impacts our ability to enable a sustainable presence on the Moon. The Dust Mitigation Focus Group aims to build a broad and diverse community of lunar and technology experts interested in identifying and developing solutions that minimizes the impact and hazard of lunar dust on robotic and human systems.
- Dust Mitigation Members: Who's Who in LSIC-DM**
- Facilitator:** @Jorge Nunez
- Contact Email:** [Facilitator\\_DustMitigation@jhuapl.edu](mailto:Facilitator_DustMitigation@jhuapl.edu)
- Listserv Address:** [LSIC\\_DUSTMITIGATION@LISTSERV.JHUAPL.EDU](mailto:LSIC_DUSTMITIGATION@LISTSERV.JHUAPL.EDU)

The page also features several sections on the right side:

- Dust Mitigation Subgroups:** Please fill out [this survey](#) to express your interest in the Dust Mitigation Subgroups effort.
- Dust Mitigation Feedback:** Please fill out [this survey](#) to provide your feedback to continuously improve our focus group.
- Teaming/Collaboration Opportunity:** If you are looking to team up and start new collaborations, click [here](#) to start building your network.

At the bottom of the page, there are three columns of information:

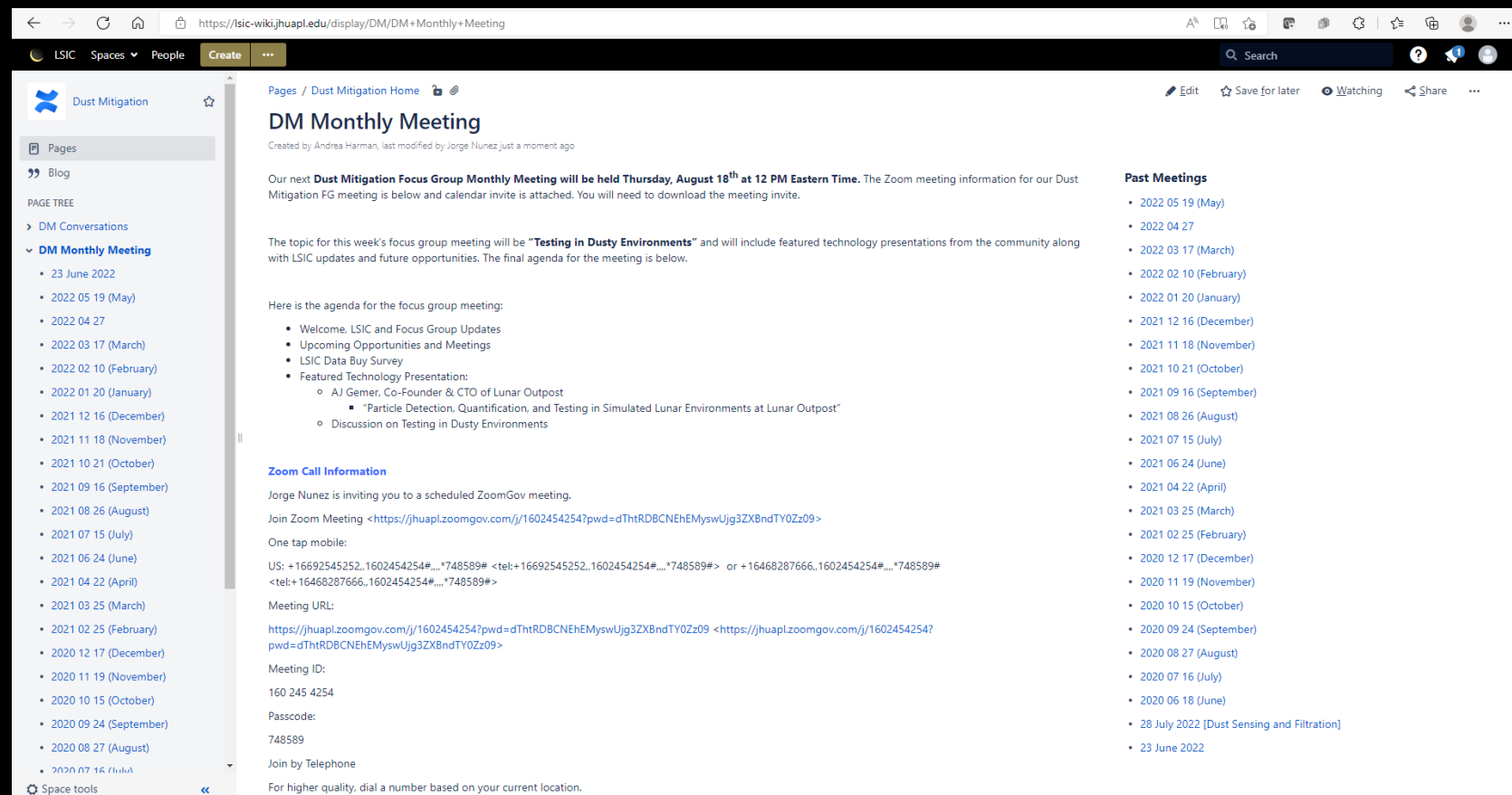
- Upcoming Events:** Dust Mitigation Monthly Meeting on 18 Aug 2022 at 12PM - 1PM EDT [Meeting Info]
- Past Monthly Meeting Records:**
  - 23 June 2022
  - 2022 05 19 (May)
  - 2022 04 27
- Join the Conversations!** To create a new conversation, just hit the "create" button while on the LSIC-DM Conversations page to keep everything in the same place.
  - Tribocharging of Lunar Dust
    - Help build understanding surrounding tribocharging as a mechanism that leads to charged lunar dust particles on the lunar surface.
  - NASA Seeks Spacesuit Services Proposals for Artemis, Space Station
    - NASA published a RFP on September 29.
  - Dust Mitigation Needs on CLPS
- Upcoming Opportunity:** ICES 2022 Abstracts due November 15!
- Recent space activity:**
  - Sarah Hasnain: DM Monthly Meeting updated Aug 15, 2022 • view change
  - 28 July 2022 [Dust Sensing and Filtration] created Aug 15, 2022
  - Dust Mitigation Home updated Aug 15, 2022 • view change
  - Tim Barrett



# Join the Discussion on Confluence Site

- Please contact Andrea Harman ([ams573@alumni.psu.edu](mailto:ams573@alumni.psu.edu)) to get set up with an account!
- *Dust Mitigation Discussion page and wiki*

- 1. Sign-in to add a comment
- 2. Add comment at bottom of page
- 3. You can comment before, during, or after today's meeting



The screenshot shows a web browser displaying the 'Dust Mitigation' Confluence page. The page title is 'DM Monthly Meeting'. The main content area contains the following text:

Our next **Dust Mitigation Focus Group Monthly Meeting** will be held **Thursday, August 18<sup>th</sup> at 12 PM Eastern Time**. The Zoom meeting information for our Dust Mitigation FG meeting is below and calendar invite is attached. You will need to download the meeting invite.

The topic for this week's focus group meeting will be **"Testing in Dusty Environments"** and will include featured technology presentations from the community along with LSIC updates and future opportunities. The final agenda for the meeting is below.

Here is the agenda for the focus group meeting:

- Welcome, LSIC and Focus Group Updates
- Upcoming Opportunities and Meetings
- LSIC Data Buy Survey
- Featured Technology Presentation:
  - AJ Gemer, Co-Founder & CTO of Lunar Outpost
    - "Particle Detection, Quantification, and Testing in Simulated Lunar Environments at Lunar Outpost"
  - Discussion on Testing in Dusty Environments

**Zoom Call Information**

Jorge Nunez is inviting you to a scheduled ZoomGov meeting.

Join Zoom Meeting <<https://jhuapl.zoomgov.com/j/1602454254?pwd=dThRDBCNhEhEYm9Ujg3ZXhndTY0Zz09>>

One tap mobile:  
 US: +16692545252,,1602454254#...\*748589# <tel:+16692545252,,1602454254#...\*748589#> or +16468287666,,1602454254#...\*748589# <tel:+16468287666,,1602454254#...\*748589#>

Meeting URL:  
<https://jhuapl.zoomgov.com/j/1602454254?pwd=dThRDBCNhEhEYm9Ujg3ZXhndTY0Zz09> <<https://jhuapl.zoomgov.com/j/1602454254?pwd=dThRDBCNhEhEYm9Ujg3ZXhndTY0Zz09>>

Meeting ID:  
160 245 4254

Passcode:  
748589

Join by Telephone  
For higher quality, dial a number based on your current location.

On the right side of the page, there is a 'Past Meetings' section with a list of dates from 2022 to 2020.

# Updates and Communications

- Monthly LSIC newsletter – New edition came out early August 2022; September coming out
  - <http://lsic.jhuapl.edu/Resources/>
- Mailing list
  - The listserv goes to all participants. Use with caution. But feel free to use!
  - Please make sure to add [LSIC\\_DUSTMITIGATION@LISTSERV.JHUAPL.EDU](mailto:LSIC_DUSTMITIGATION@LISTSERV.JHUAPL.EDU) to safe senders list.
  - If we need smaller, focused lists we can set those up
- Updates to the webpage - <http://lsic.jhuapl.edu/Focus-Areas/Dust-Mitigation.php>
  - Notes, slides, recordings from telecons posted here
- Wiki is ready!
  - Confluence is free to you and available to all registered LSIC members
  - To request an account, please email Andrea Harman: [ams573@alumni.psu.edu](mailto:ams573@alumni.psu.edu)
- Lightning Talks at monthly focus group meetings
  - Anyone can volunteer to give a featured talk (~15 mins)
  - Email me if you want to sign up: [Facilitator\\_DustMitigation@jhuapl.edu](mailto:Facilitator_DustMitigation@jhuapl.edu)

## Follow the Code of Conduct for all Focus Group communications

[http://lsic.jhuapl.edu/Resources/files/Code%20of%20Conduct\\_05222020.pdf](http://lsic.jhuapl.edu/Resources/files/Code%20of%20Conduct_05222020.pdf)

# Space Technology Funding Opportunities

## Current Tech Development Opportunities

- [Space Technology Announcement of Collaboration Opportunity \(ACO\) »](#)
  - Mini proposals due: 03/31/2022; Final proposals due: 07/28/2022
- [Break the Ice Lunar Challenge - Phase 2 »](#)
  - Registration Closes: 30 September 2022
- [Space Technology Research Institutes \(STRI\) Solicitation »](#)
  - Preliminary Proposals Due: 03 August 2022 - Invited Full Proposals Due 03 November 2022

## Future Solicitation and Opportunities

- [NASA Innovation Corps Pilot »](#)
  - Proposals may be submitted at any time through March 29, 2023, but applications will be reviewed in intervals on the following dates: July 22, 2022; Sept. 16, 2022; Nov. 17, 2022; and Jan 20, 2023



# NASA STMD RFI: On Enabling Industry Efforts for Space Nuclear Systems and Capabilities (80HQTR22ZOA3L\_SNPP)

- The Space Technology Mission Directorate (STMD) Request for Information “On Enabling Industry Efforts for Space Nuclear Systems and Capabilities” is available via the NASA Solicitation and Proposal Integrated Review and Evaluation System (NSPIRES) at <https://nspires.nasaprs.com> by searching on solicitation number **80HQTR22ZOA3L\_SNPP** or via the link provided below. This STMD RFI does not constitute a commitment, implied or otherwise, that the National Aeronautics and Space Administration (NASA) will take action in this matter.
- NASA invites industry to submit responses to this RFI to assist the Agency in analyzing the feasibility of paths to facilitate private sector investment in space nuclear systems and capabilities development for potential use on future government and commercial space missions. Private sector investment may include, but may not be limited to, nuclear systems and capabilities in direct support of human missions and exploration activities. NASA also invites responses that identify other important areas of private-sector interests associated with space nuclear technology developments or applications that may be outside programmed investment, otherwise not directly addressed in the RFI, or considered important to private-sector alignment.
- **Respondents are requested to focus on and provide responses to some or all the questions presented in Section 5.0 of the RFI.**
- **Responses to this RFI are due October 15, 2022 at 5:00 p.m. ET.** Responses to this RFI must be submitted electronically using NSPIRES at <https://nspires.nasaprs.com/>. Any questions to this RFI may be submitted to [STMDRFI@nasaprs.com](mailto:STMDRFI@nasaprs.com) at any time before the due date for responses.
- STMD is seeking responses not to exceed 20 pages, and should be uploaded as a single PDF file attachment not to exceed 10MB at the NSPIRES website (<https://nspires.nasaprs.com>).
- **To view the RFI and instructions on how to submit a response, visit:**
- <https://nspires.nasaprs.com/external/solicitations/summary.do?solid={3EB0D5BE-0468-3426-A3CA-29585EE5BA38}&path=&method=init>

# LSIC Activities

## *Recent and Upcoming LSIC Meetings and Workshops (<https://lsic.jhuapl.edu/Events/>)*

- Designing for the Extremes Workshop (08/05)
  - Presentations and recordings will be posted workshop page
  - <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=232>
- LSIC Dust Mitigation Focus Group Meeting (09/15)
  - Topic: Dust Testing Facilities
- LSIC Fall Meeting (11/02 – 11/03)
  - University of Texas – El Paso
  - Call for abstracts and registration posted on LSIC website
  - <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=350>

## *Other Recent and Upcoming Dust Mitigation Related Workshop and Meetings*

- Annual LEAG Meeting (08/23-25; at APL, Laurel, MD)
  - <https://www.hou.usra.edu/meetings/leag2022/#nav>
- 73rd International Astronautical Congress (09/18-22)
  - <https://www.iafastro.org/events/iac/iac-2022/>
- AIAA ASCEND Conference (10/24-26)
  - <https://www.ascend.events/>
- Commercial Lunar Payload Services Survive the Night Technology Workshop (12/06-08)
  - Cleveland, OH/Virtual; Abstracts Due 09/22
  - <https://www.hou.usra.edu/meetings/clps2022/>



# LSIC Fall Meeting

- Dates: November 2-3, 2022
- Venue: Virtual and In-Person, University of Texas at El Paso (UTEP),
- The LSIC 2022 Fall Meeting will concentrate on understanding NASA's plans and technology investments relevant to building a sustained presence on the lunar surface. The event will feature interrelationships between the six focus areas identified by the Consortium, with a specific focus on how they relate to excavation and construction.
- The fall meeting will feature individual invited talks, group and panel discussions, as well as poster sessions, breakout groups, and networking opportunities.

## Call for Abstracts

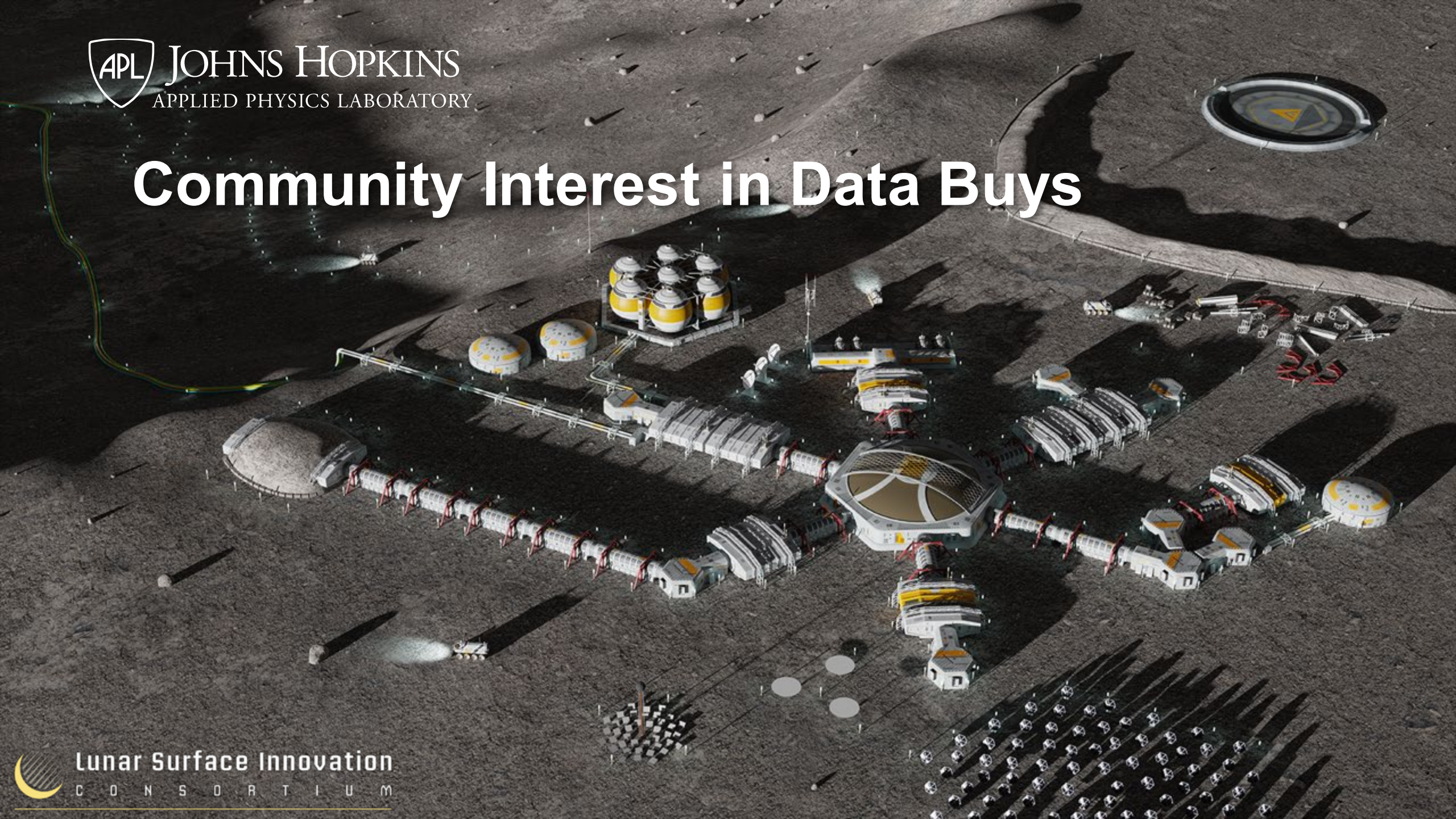
- We invite abstracts from the community describing technical capabilities within the six LSIC focus areas, as well as those that identify lunar surface technology needs and assess the readiness of relative systems
- Other topics of interest include defining the parameters and constraints of the architecture required to support a sustained presence on the lunar surface, as well as economic and policy considerations.
  
- Abstract Submission Deadline: September 13, 2022
- **Registration Deadline: April 6, 2022 (for in-person); April 25, 2022 (for virtual attendance)**
- Fall Meeting Website: <https://lsic.jhuapl.edu/Events/Agenda/index.php?id=200>

# Get Involved with Dust Mitigation

- Sign-up to Receive LSIC and Dust Mitigation FG Updates:
  - Fill out the LSIC Survey and indicate interest in Dust Mitigation to receive news and event invitations:
  - <https://lsic.jhuapl.edu/News/Sign-Up.php>
- Help us improve the Dust Mitigation Focus Group!
  - Feedback survey:  
[https://docs.google.com/forms/d/e/1FAIpQLSdjuTIK\\_TLMnCM4\\_aSMLAzLS762qtzbgmcOd2fgizlCsab6KQ/viewform](https://docs.google.com/forms/d/e/1FAIpQLSdjuTIK_TLMnCM4_aSMLAzLS762qtzbgmcOd2fgizlCsab6KQ/viewform)
- Join one of the Dust Mitigation Subgroups!
  - Dust Mitigation Subgroup Membership/Leaders survey:
  - <https://docs.google.com/forms/d/e/1FAIpQLScB6iT2fgPqj2zlaP0s-rwWQDQ04TPfgVyiC5zn0AQPAT5CZA/viewform>
  - Still looking for subgroup lead for Monitoring and Filtration Subgroup!
- Interested in Teaming/Collaborating with Others?
  - Add yourself to our Who's Who page: <https://lsic-wiki.jhuapl.edu/display/DM/Who%27s+Who+In+Dust+Mitigation>
- Looking for info on lunar dust or dust mitigation resources?
  - Checkout our resources page on the Dust Mitigation Wiki page on Confluence: <https://lsic-wiki.jhuapl.edu/x/94Rf>



# Community Interest in Data Buys





# LSII | Data Buys

- NASA is interested to learn more about the interest in the LSIC community of NASA conducting data buys from commercial providers
- There are two types of data to consider
  - Data acquired as a by product of landing on the Moon
  - Dedicated data that require a specific instrument to be flown
- What kind of data access is required?
  - Does NASA buy an entire data set and put it in PDS?
  - Do users buy data directly from the providers?

# LSII | By-Product Data

- Data acquired as a by product of landing on the Moon
  - Environmental Data
    - Radiation, thermal, illumination, dust, volatiles
  - Descent & Landing Imagery
    - Images of terrain during descent, surface panorama after landing
  - Landing & Post-landing effects
    - Plume/surface interactions
  - Technology/System Performance
    - Navigation performance, comm performance, landing precision, hazard detection and avoidance
- Are there additional data sets you would want?
- Are there data sets the lander will naturally acquire, but perhaps you need a variation of those data, e.g. a certain data set to be acquired at a higher cadence?

# LSII | New Data Sets

- What data would enhance your ability to plan lunar surface operations?
- Data sets that require a dedicated instrument to be flown
  - E.g. New topography, or mineral map data sets
  - Could be either an orbital or surface data set
- Monitoring Data for Situational Awareness
  - Rover locations and movement
  - Charging operations
  - Search and Rescue for lost rovers
  - Comm quality/performance



# LSII | General thoughts/questions

- Are there any Data privacy, Intellectual Property or Distribution Concerns
- Are these data global or regional in nature?
- Is there a different financial value for different data qualities, e.g. spatial or spectral resolution?
- What does this data set enable?
- How do you put a value on a data set (financial or otherwise)?
- What is the value of this data set to your LSIC/STMD/ESDMD, etc. mission?
- If you are a potential provider, what level of funding, if successful, is required for you to consider acquiring these data?
- Is the data you want a one-time acquisition? Every landing?
- Do you need it only for a particular region

# LSII | Our Survey Says.....

<https://forms.gle/tuhzwAUaQLDivQ2D7>

# Today's Technology Presentation

## “Particle Detection, Quantification, and Testing in Simulated Lunar Environments at Lunar Outpost”



**AJ Gemer**

Co-Founder & CTO of Lunar Outpost

[AJ@LunarOutpost.com](mailto:AJ@LunarOutpost.com)

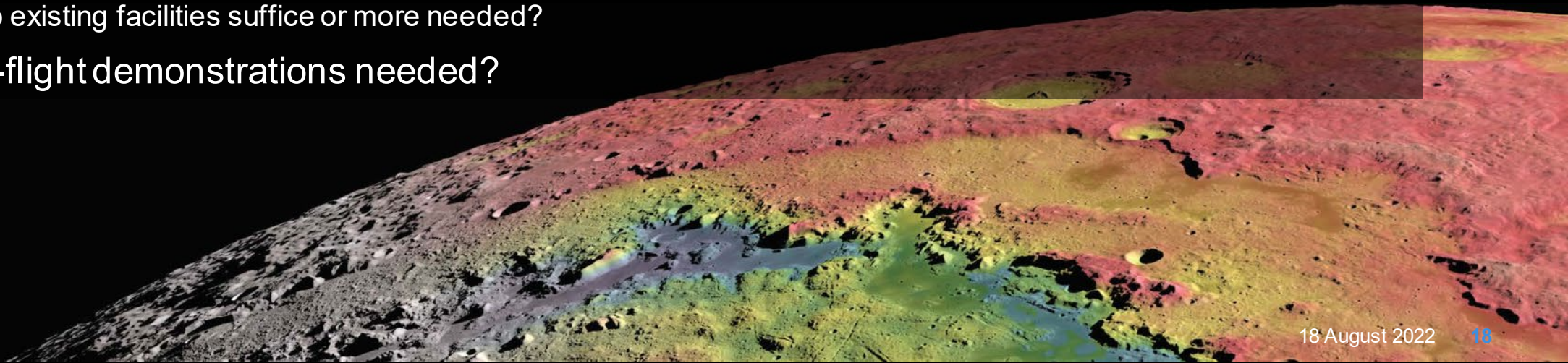
[www.lunaroutpost.com](http://www.lunaroutpost.com)





# Testing in Dusty Environments Discussion

- What gaps exist in our understanding of lunar dust and dust environment, and what data do we still need?
- What plans are in place to ensure we get the data we need to close those gaps?
- Do upcoming CLPS missions help get the data we need?
- Are there priority technology areas for testing in dusty environments that are in need of investment?
- Achieving ultra-high vacuum with dust is very challenging, with limited number of facilities available
  - Are some tests that can only be accomplished with UHV, or can lower vacuum suffice?
  - Do existing facilities suffice or more needed?
- Are in-flight demonstrations needed?





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