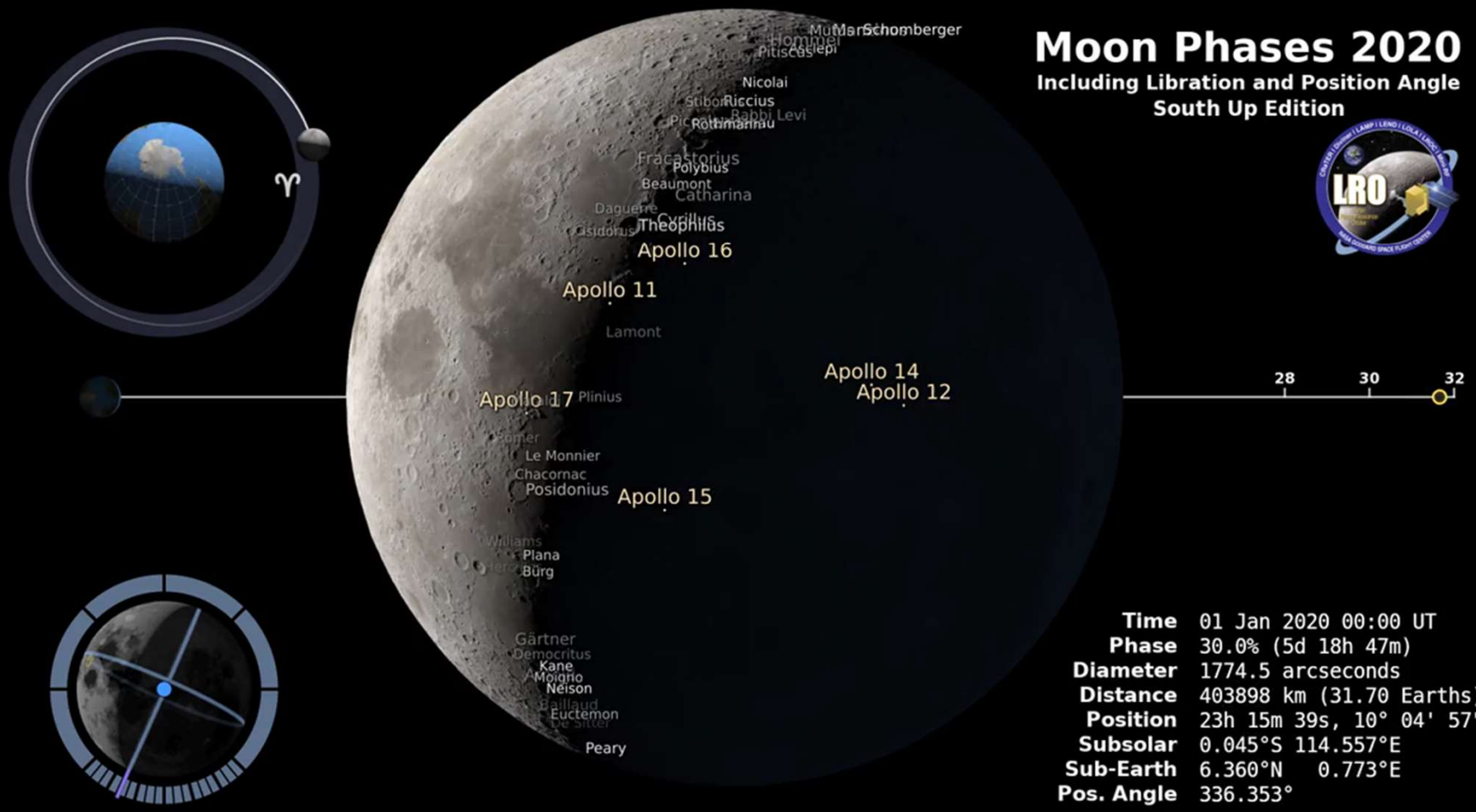
Laboratory Support Services and Operations
Kennedy Space Center, Florida

# The Lunar South Pole Environment

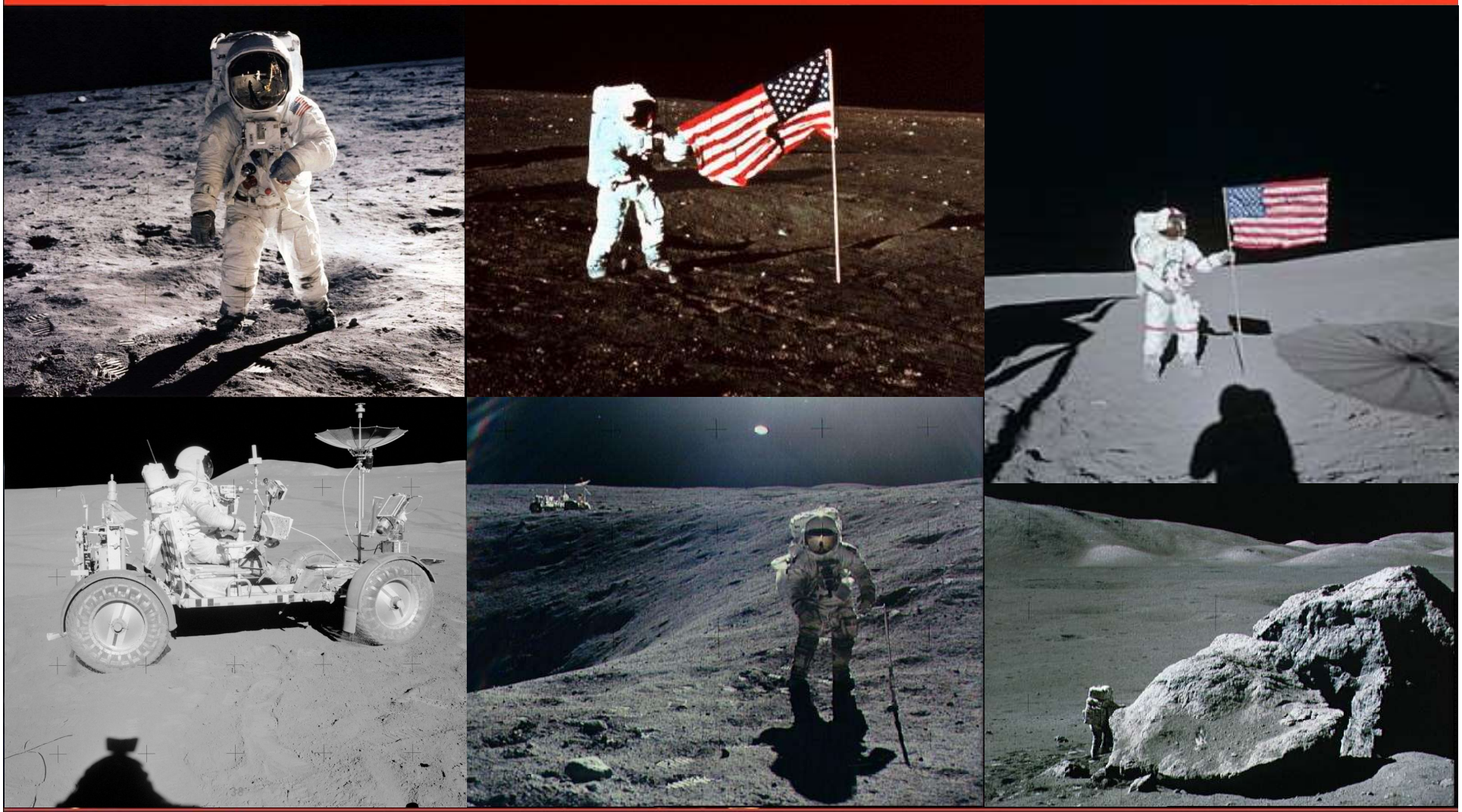
Daniel Batcheldor, Ph.D.
SURA, LASSO-URS Federal Services Inc.
Kennedy Space Center

# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

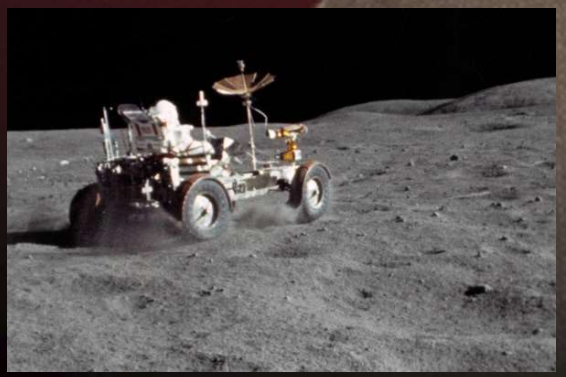
https://svs.gsfc.nasa.gov/4768

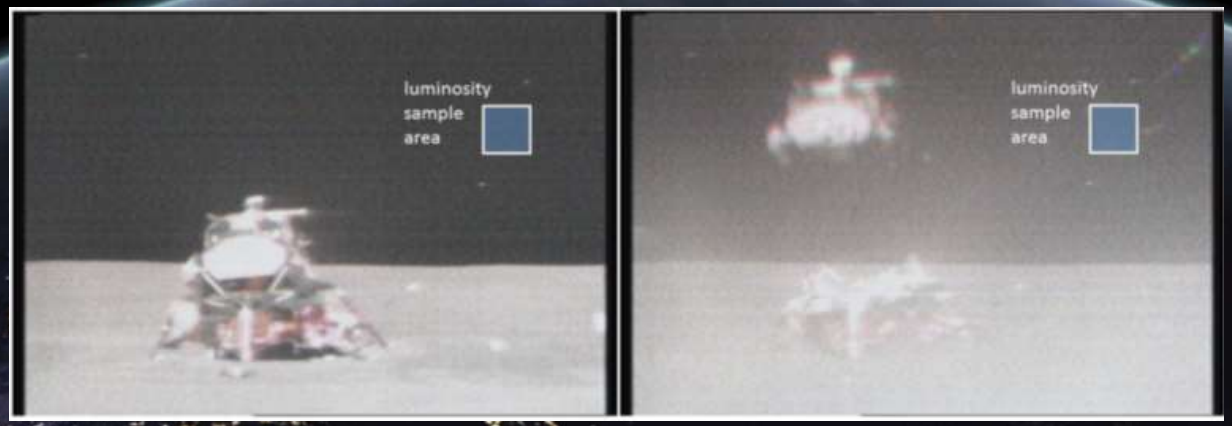


# Laboratory Support Services and Operations
## Kennedy Space Center, Florida



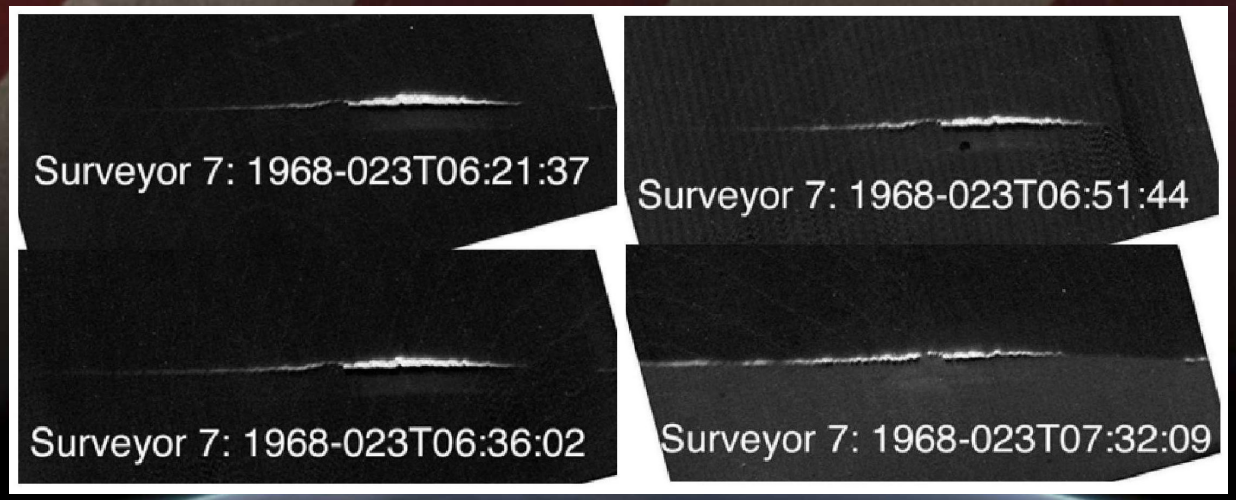
# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

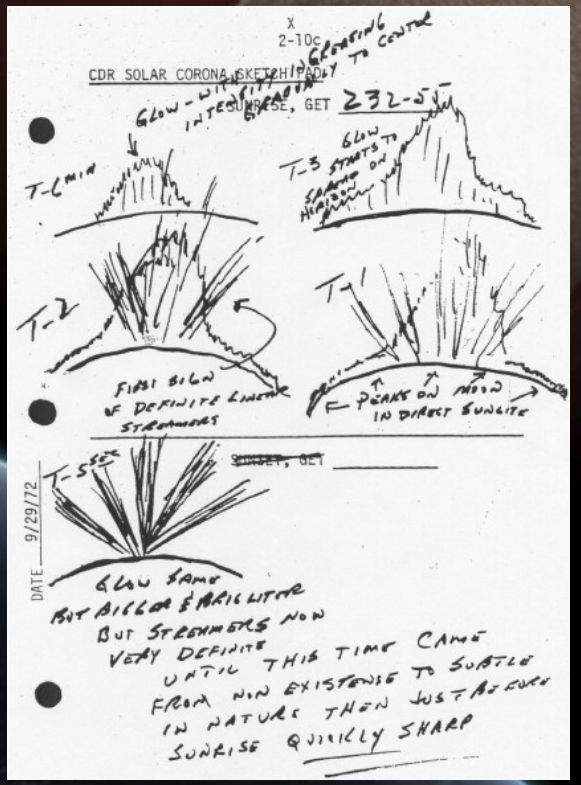






Lane & Metzger (2015).

# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

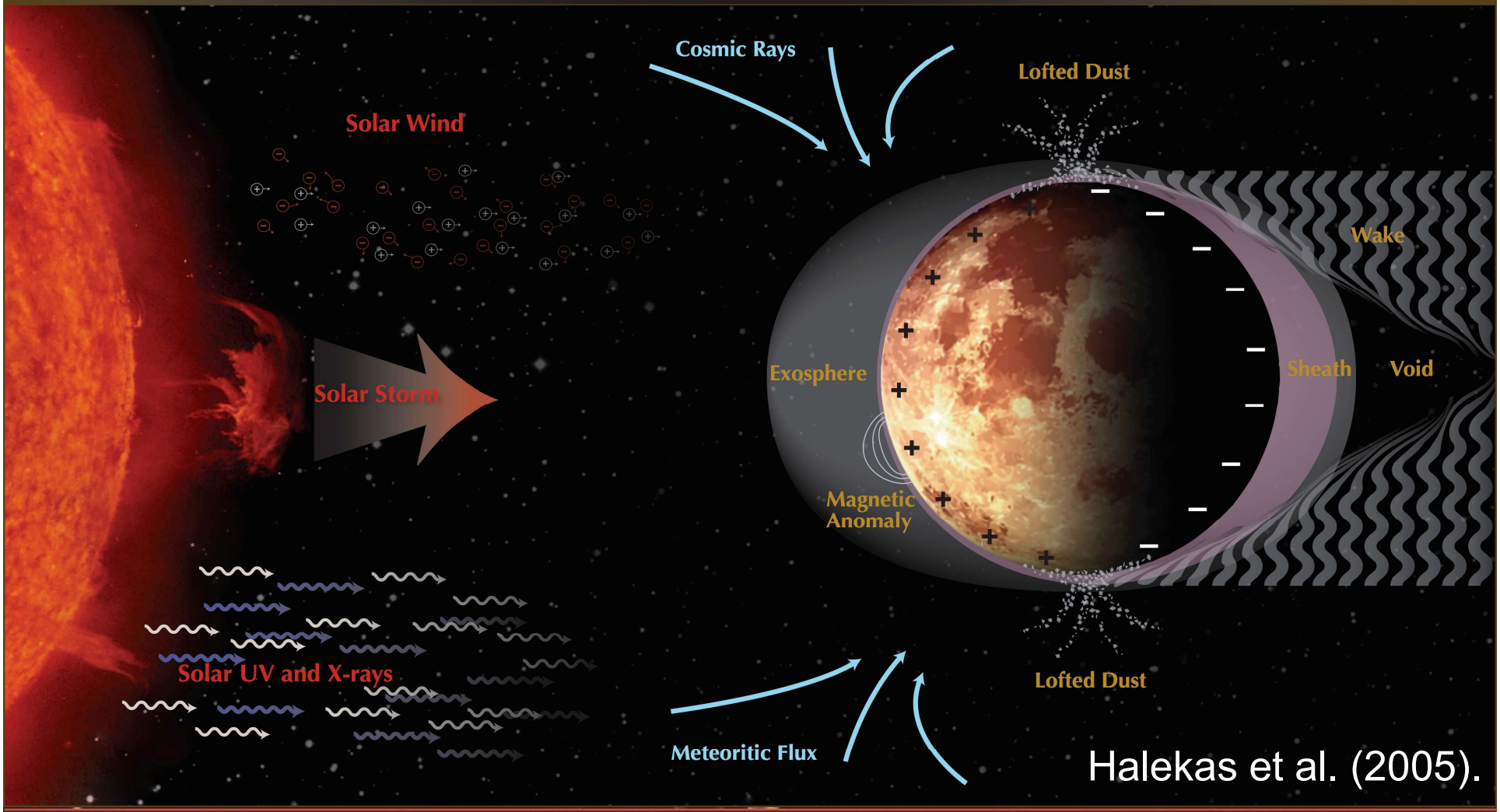



Criswell (1973), Glenar et al. (2011, 2014).

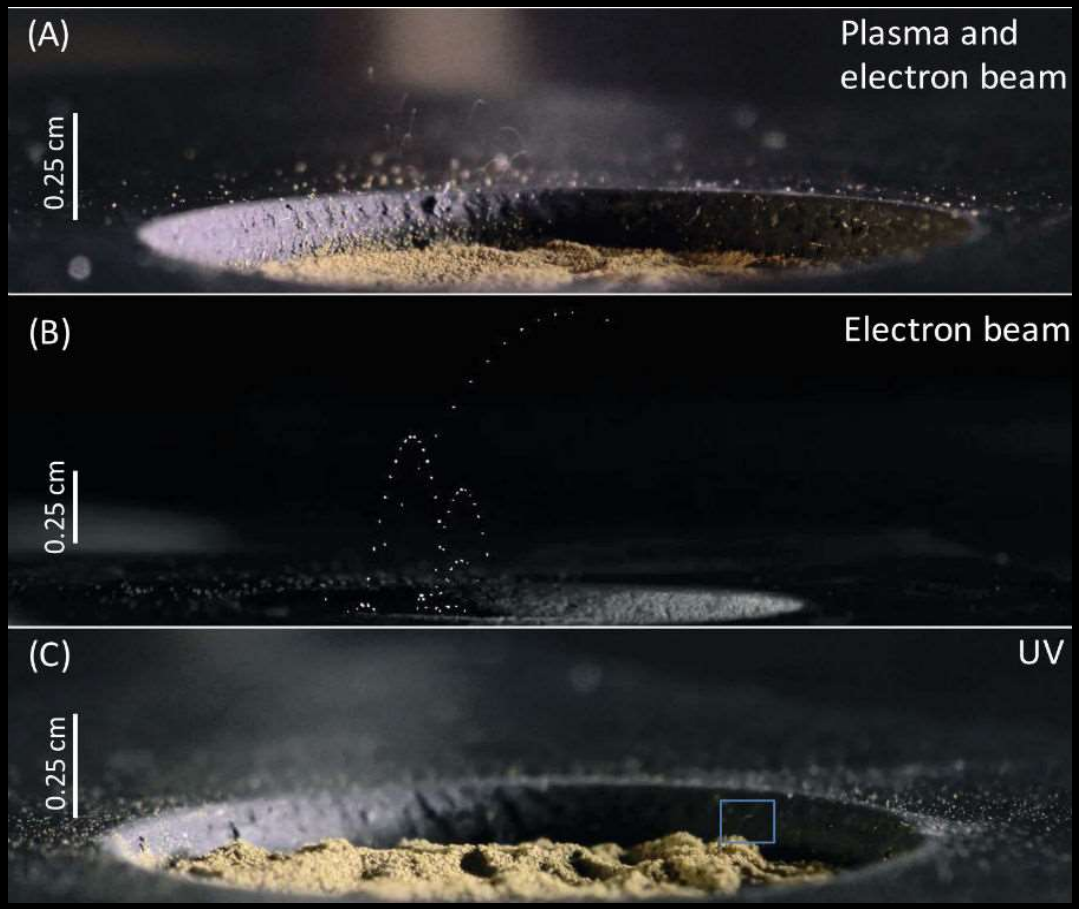
# Laboratory Support Services and Operations
Kennedy Space Center, Florida

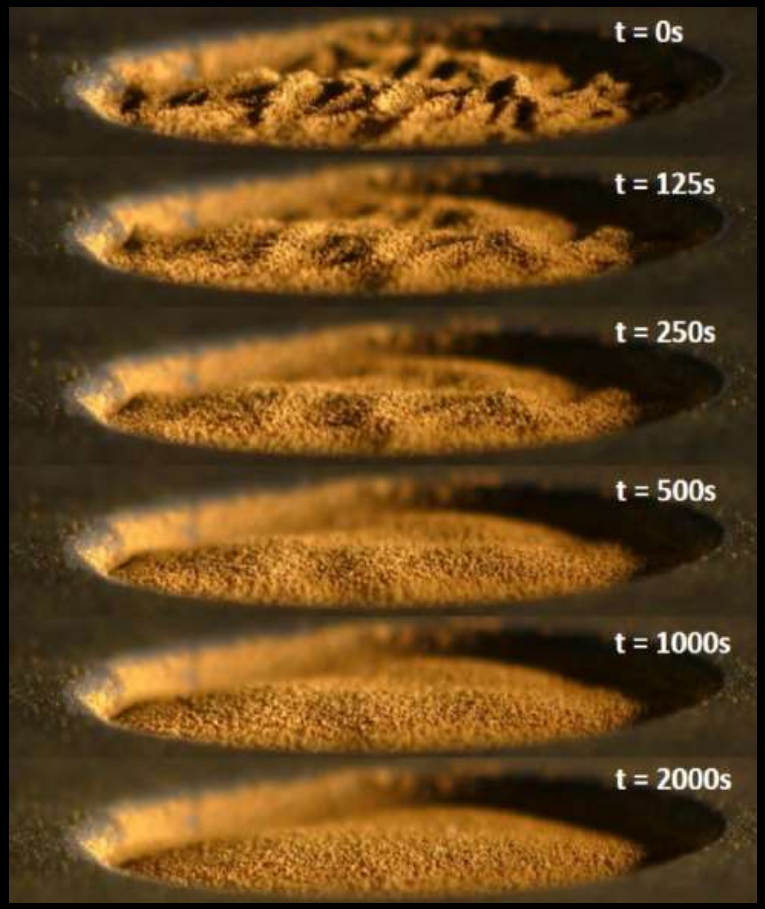
## A Dynamically Coupled System




Halekas et al. (2005).

# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

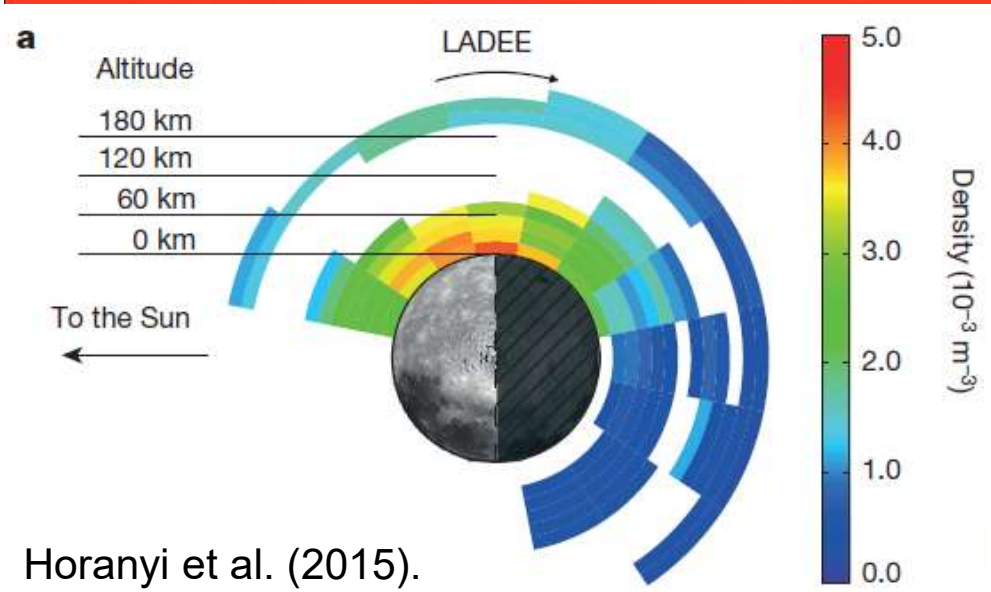


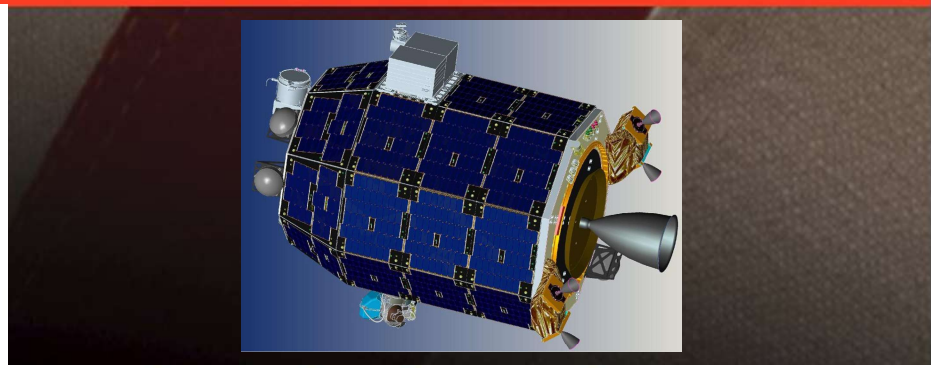

Wang et al. (2018).

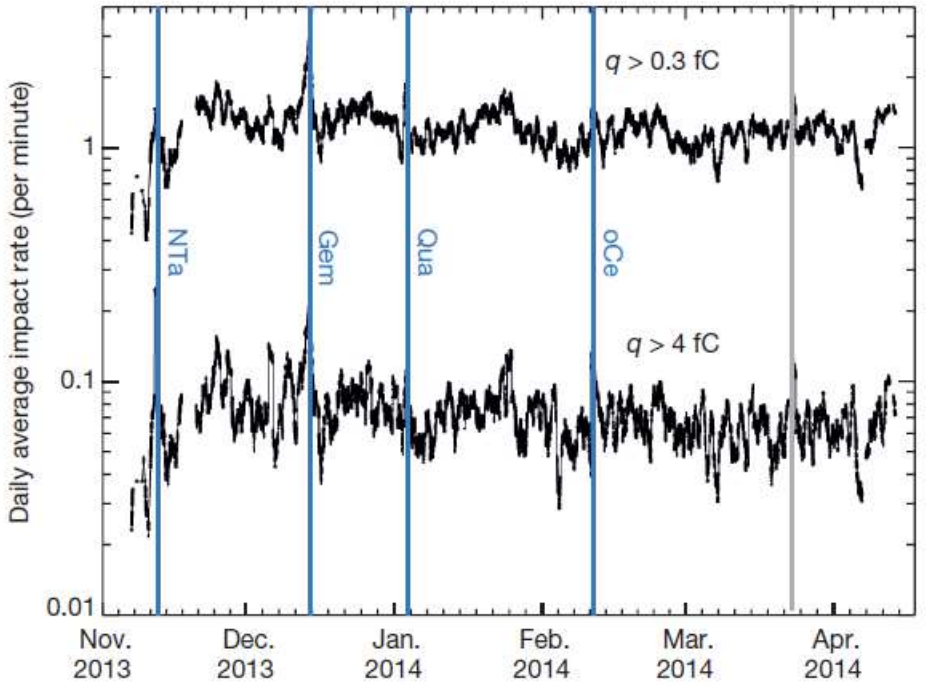
# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

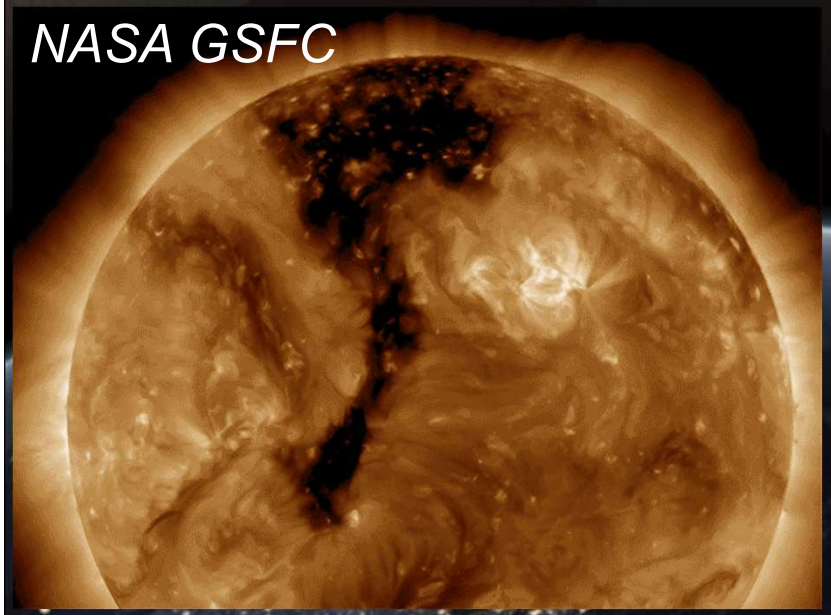


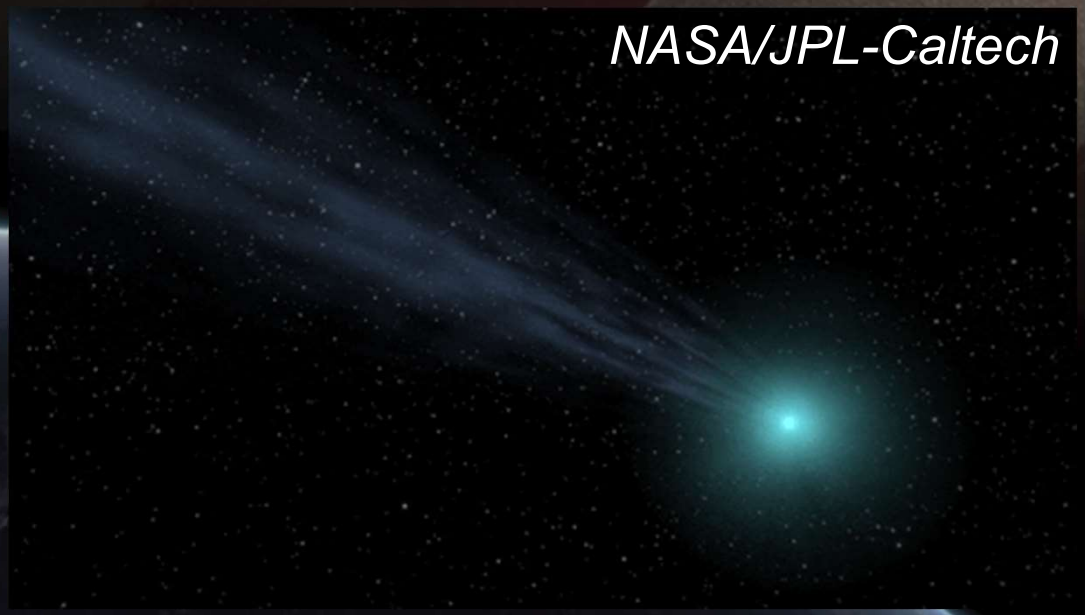

Horanyi et al. (2015).



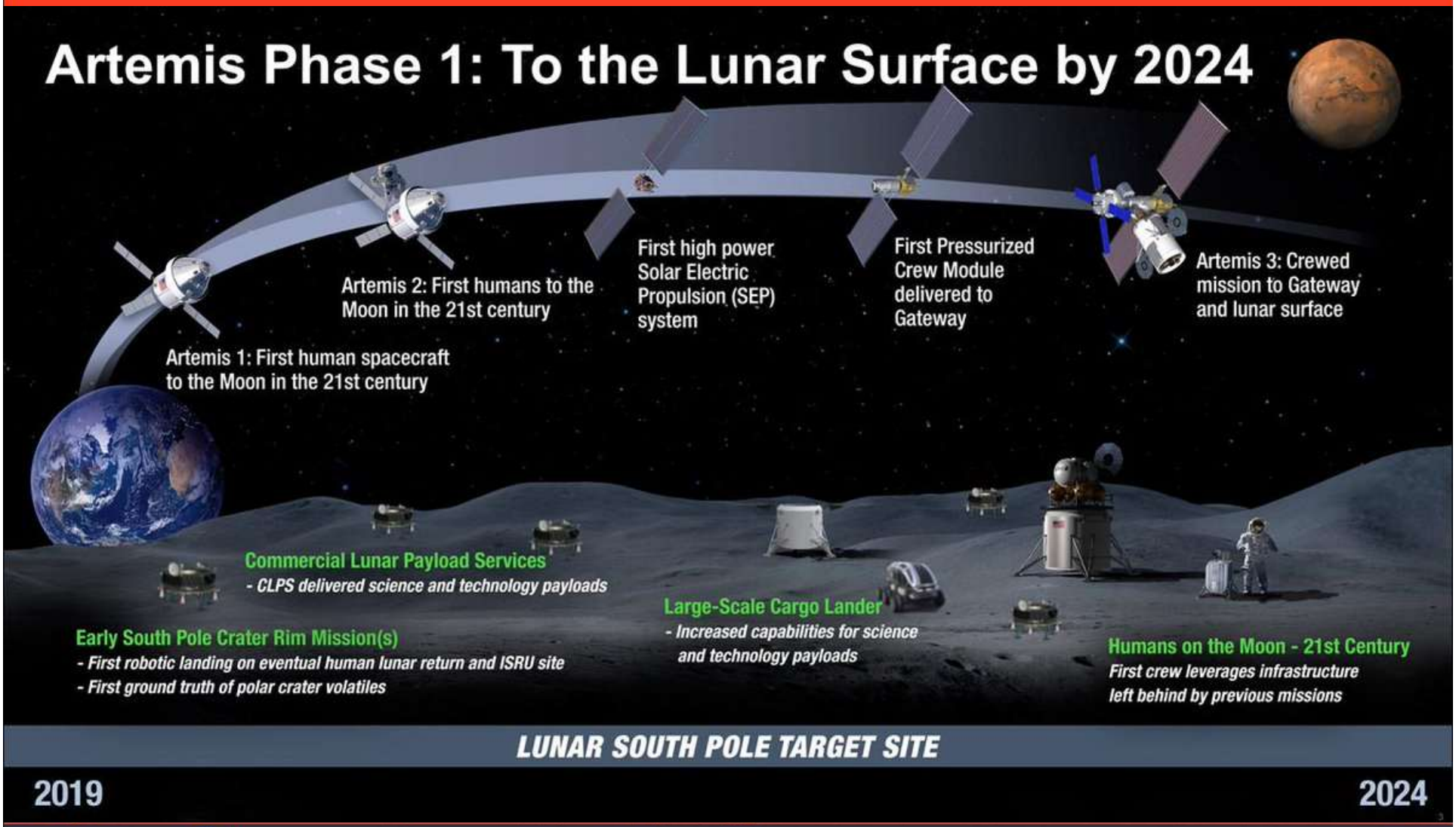
# What dominates regolith dynamics?

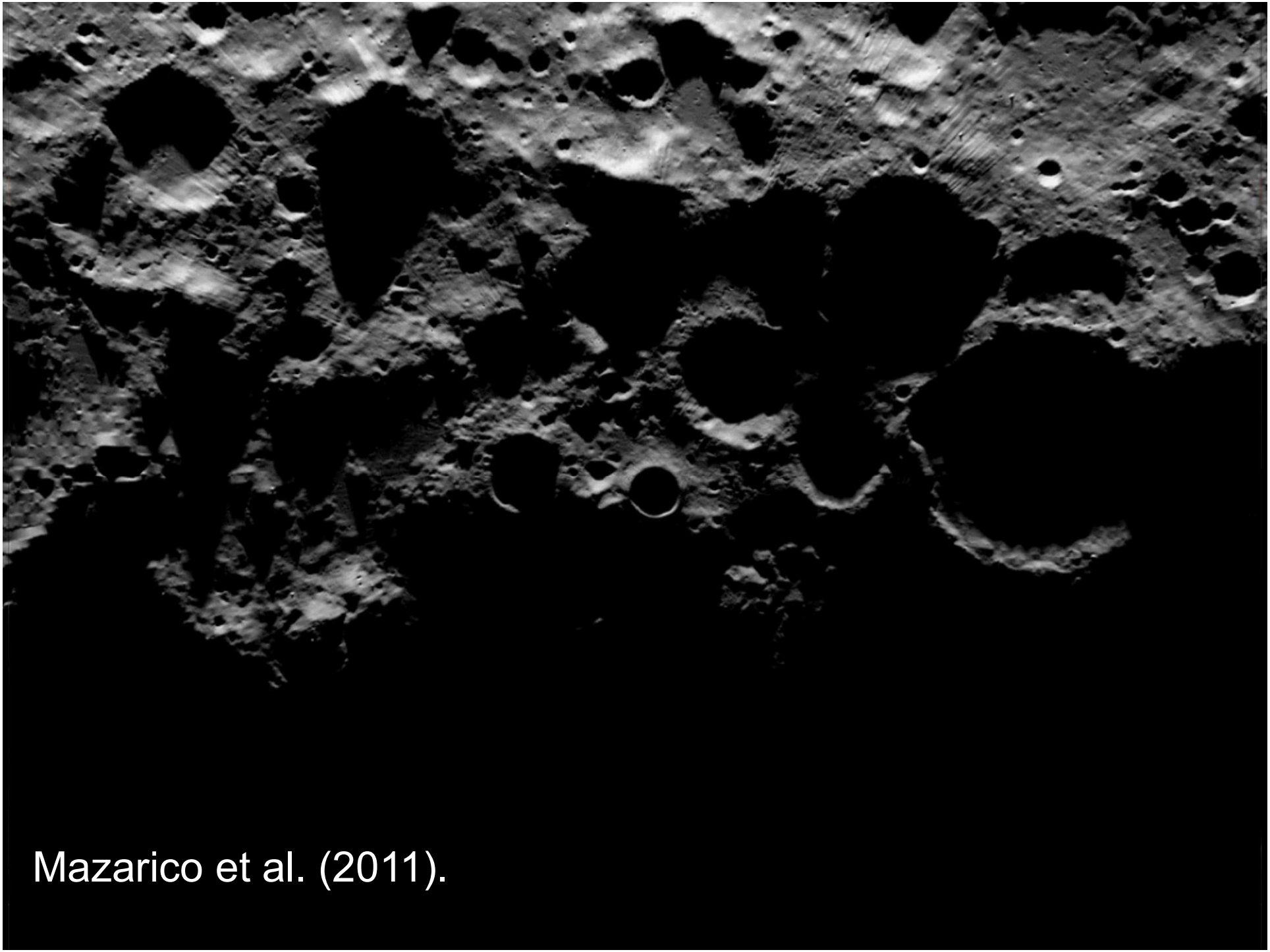



# How will this impact exploration?

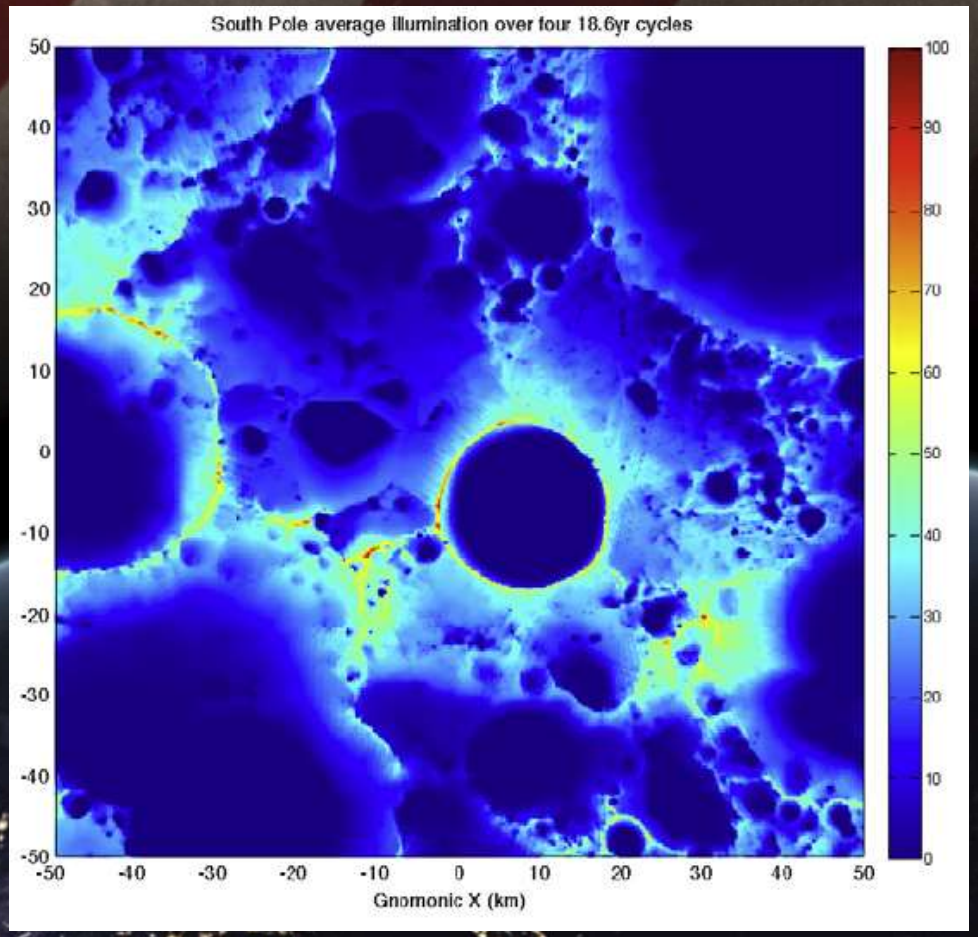
# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

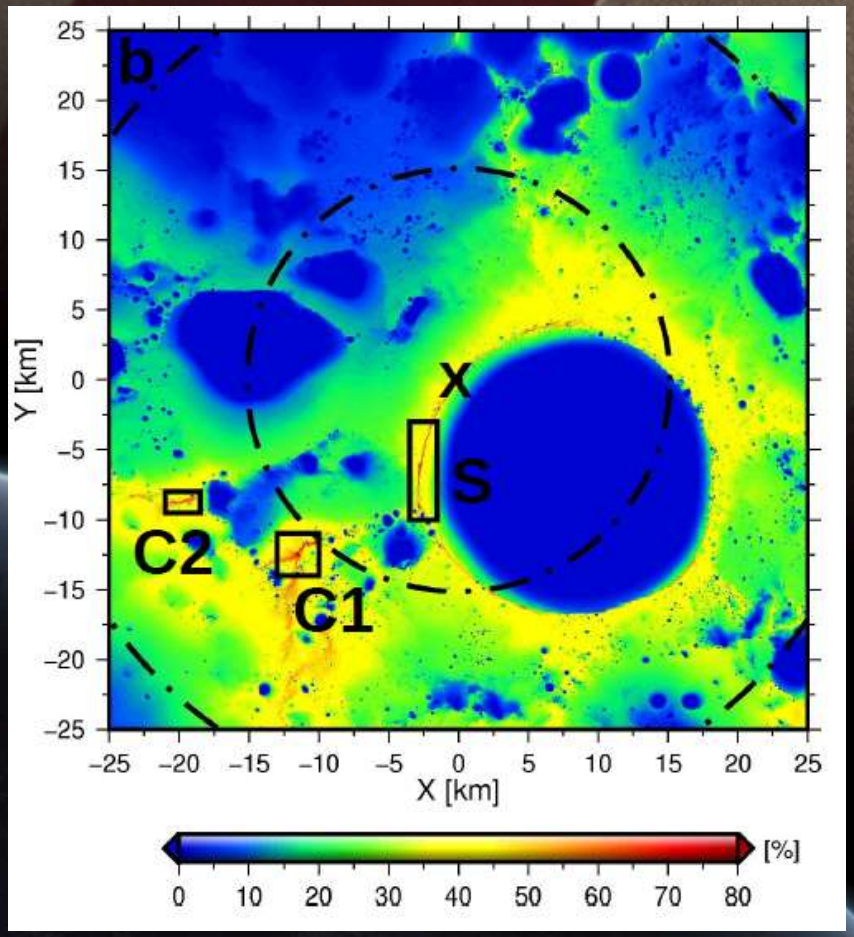




Mazarico et al. (2011).

# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

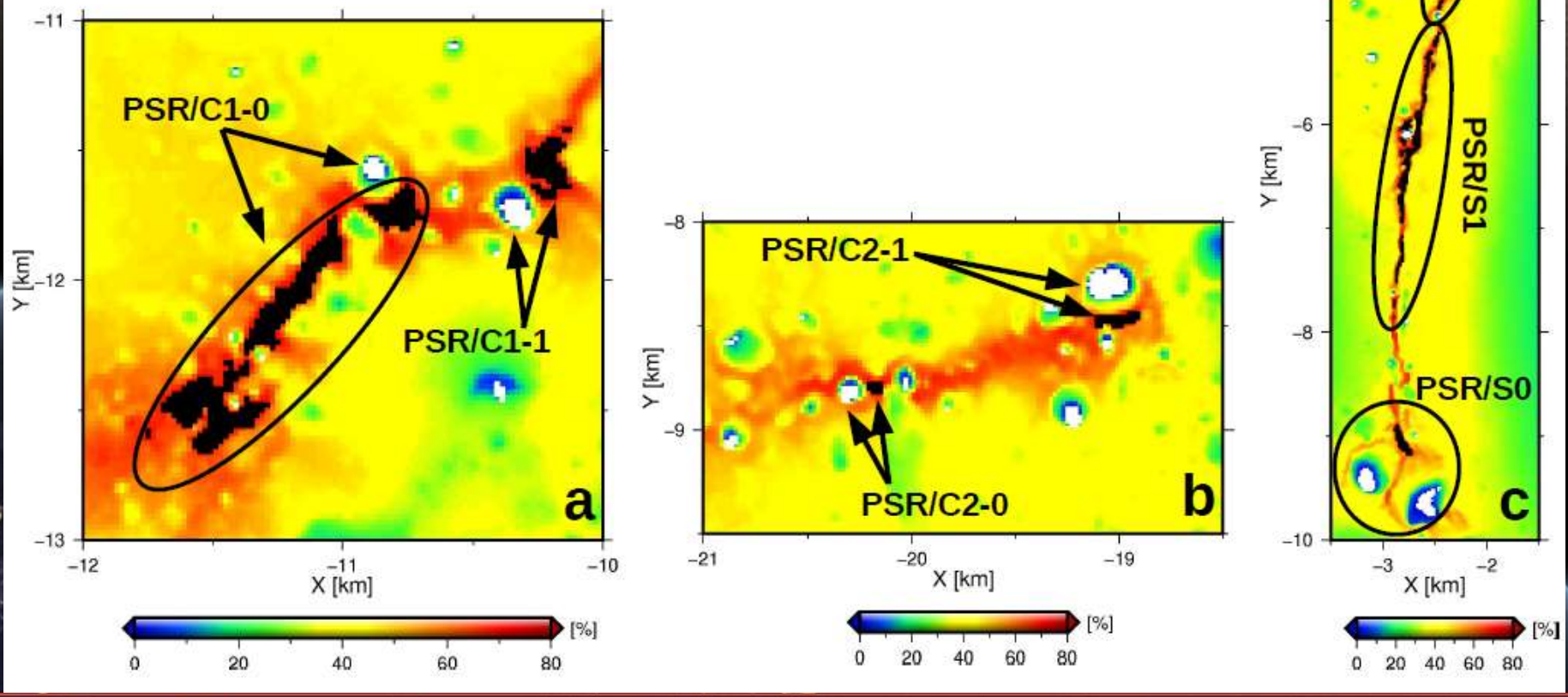


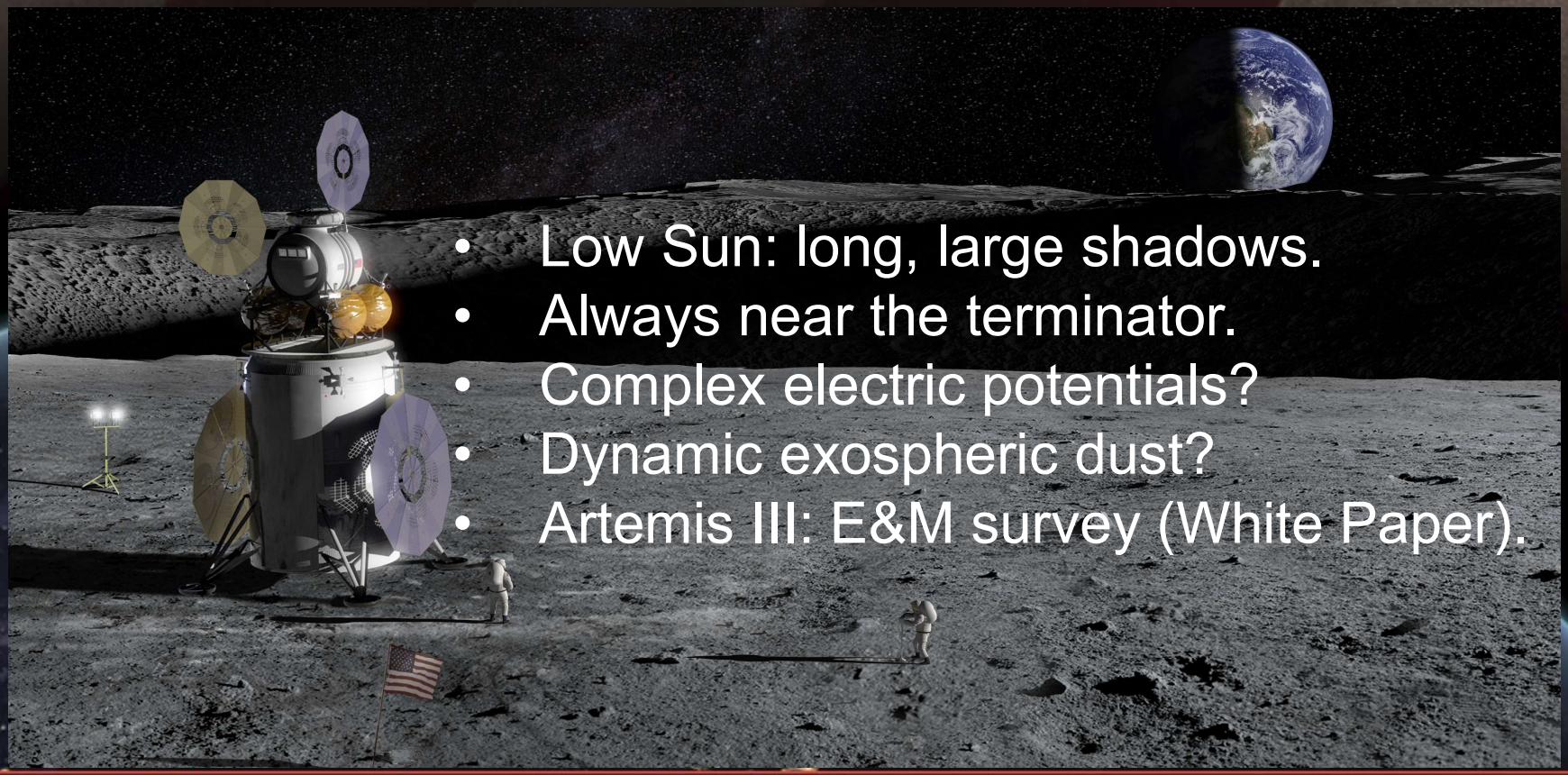

Glaser et al. (2017).

# Laboratory Support Services and Operations
Kennedy Space Center, Florida

Glaser et al. (2017).



# The Complex Electromagnetic Environment at the Lunar South Pole



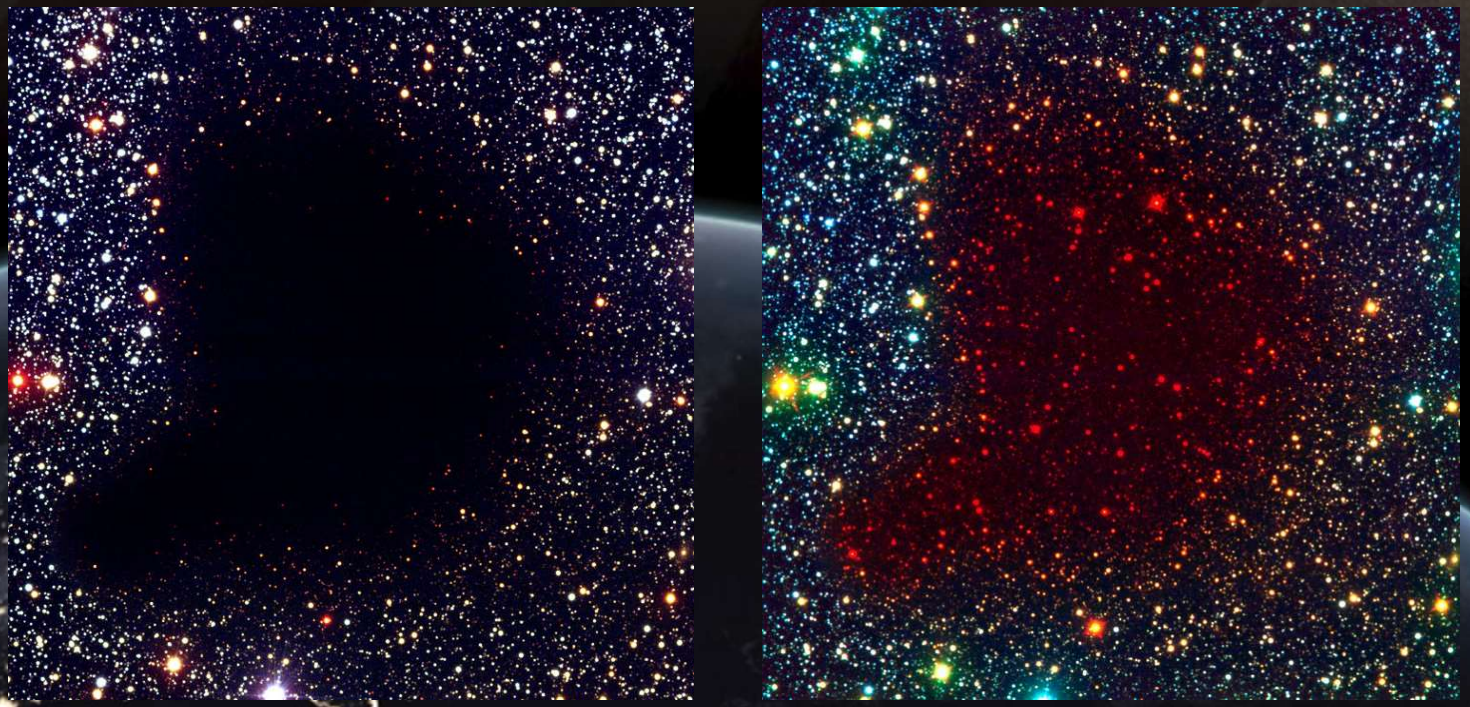
- Low Sun: long, large shadows.
- Always near the terminator.
- Complex electric potentials?
- Dynamic exospheric dust?
- Artemis III: E&M survey (White Paper).

# Laboratory Support Services and Operations
## Kennedy Space Center, Florida

Glenar et al. (2014).

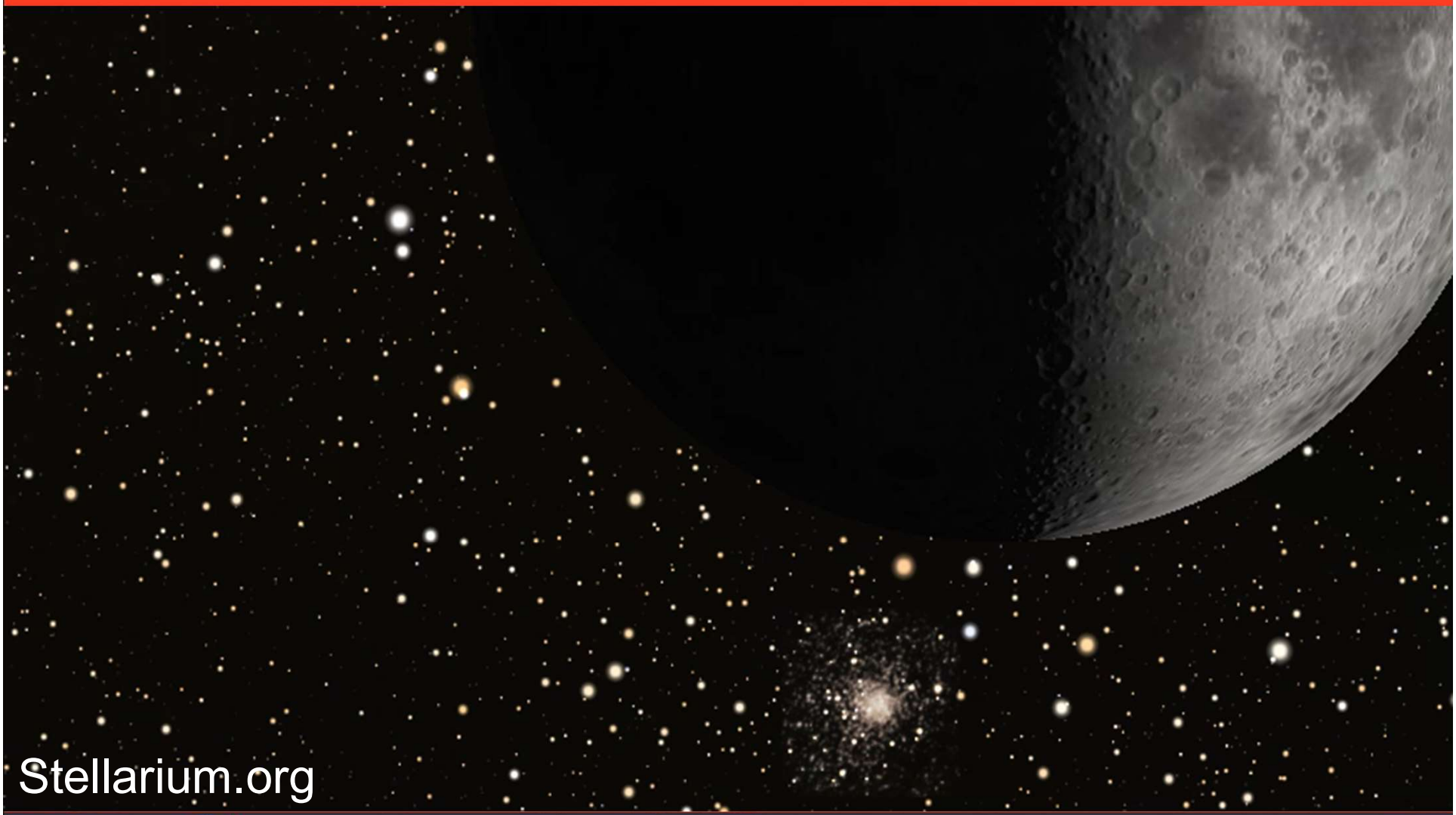
# Scattering of Background Starlight

Particulates interact with light.



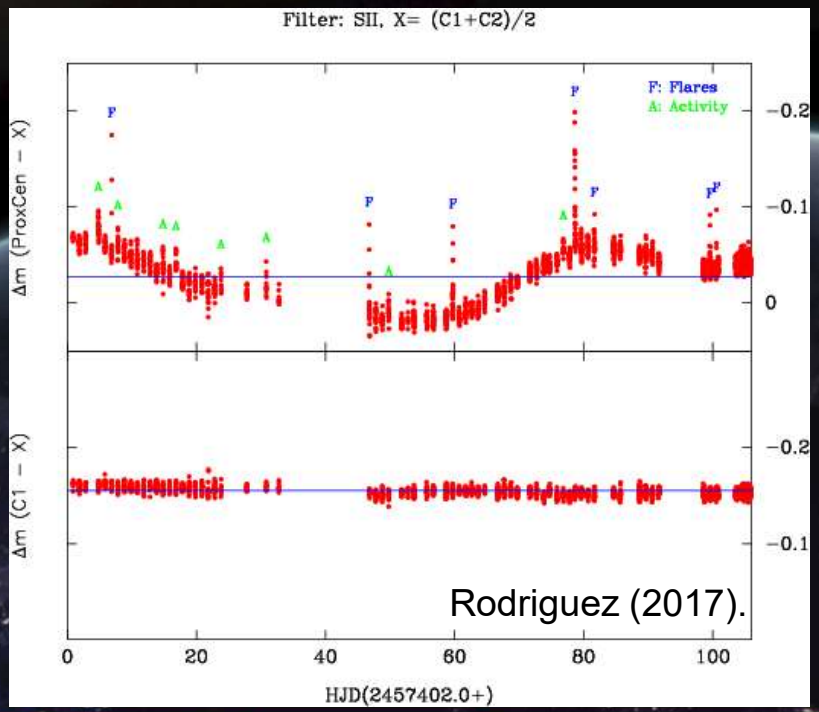
*European Southern Observatory, VLT*

# Laboratory Support Services and Operations
## Kennedy Space Center, Florida



# Differential Photometry

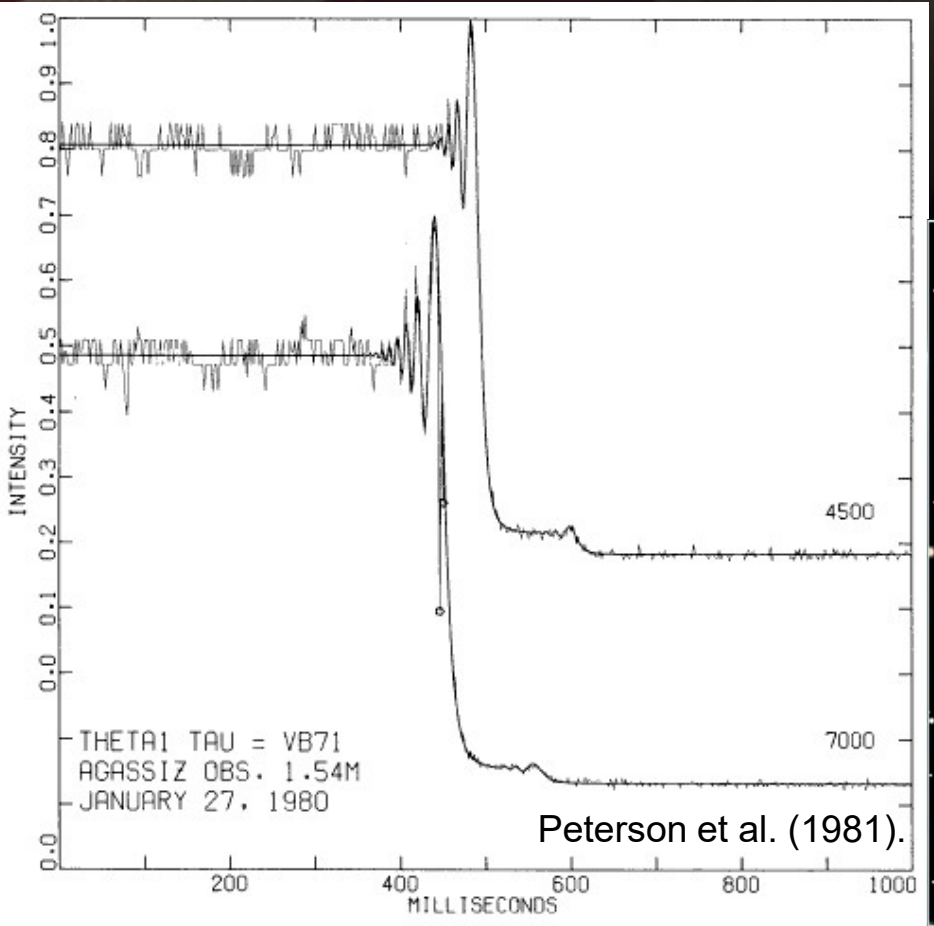
Exoplanets, variable stars, active galactic nuclei, comets and asteroids.




Rodriguez (2017).

Stellarium.org

# Differential Photometry




Peterson et al. (1981).

Stellarium.org

# Differential Photometry

Other considerations:

- Lunar topography.
- Star type (color).
- Parallax.

# Parallax and Citizen Science

**Atlanta** **Titusville**




# Summary

- The Lunar South Pole environment may be have an exosphere with a high dynamic dust density.
- This could negatively impact surface exploration.
- An Artemis III E&M surface survey will help understand the processes responsible.
- Exospheric dust density may be constrained from Earth using lunar occultations.


Laboratory Support Services and Operations
Kennedy Space Center, Florida
The Lunar South Pole Environment
Daniel Batcheldor, Ph.D.
SURA, LASSO-URS Federal Services Inc.
Kennedy Space Center
DISCOVER • EXPLORE • DEVELOP • ENABLE