Opportunity Title: Mars surface/atmosphere energy exchange modeling; application to regolith properties determination and volatile mapping
Opportunity Reference Code: 0211-NPP-JUL24-JPL-PlanetSci

Organization National Aeronautics and Space Administration (NASA)

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Application Deadline 7/1/2024 6:00:59 PM Eastern Time Zone

Description Over the last 5 decades, NASA missions to Mars have returned a wealth of measurements characterizing its surface's thermal state. These datasets, used in conjunction with planetary surface heat transfer algorithms, have been crucially important to certify landing sites or prepare rover traverses by deriving regolith thermophysical properties. Future robotic and human missions to Mars will continue to rely on this type of work. However, new needs are emerging as the potential for in situ resource utilization will become an increasingly important criterion for landing site selection. In particular, demonstrating the presence of shallow ice is going to become necessary in some cases, but proving its absence will also sometimes become desirable (planetary protection).

We seek a candidate who can help us improve numerical tools used to map the presence of shallow ice, and other surface layer attributes from thermal infrared data at selected locations of interest for possible future human exploration; this activity will include upgrading the current atmospheric treatment of an existing well-established planetary regolith model with a state-of-the-art preexisting 1D radiative transfer model in order to refine the heat exchange treatment at the atmosphere/surface interface. Other improvements will involve coupling the subsurface with a full GCM. The resulting improved thermal model will be used to reanalyze temperature datasets at selected sites of interest for upcoming missions to Mars. The results of the research would be disseminated through publications and at domestic and international conferences.

This research opportunity would be most suitable for individuals with experience developing scientific applications with programming languages; willing to manipulate preexisting scientific algorithms; able to work independently; interested in working at the interface between fundamental research and planetary mission work; knowledgeable about atmospheric physics.

Relevant References:

Piqueux, et al., Widespread Shallow Water Ice on Mars at High Latitudes and Mid Latitudes, **2019**, *Geophys. Res. Let.*, doi.org/10.1029/2019GL083947.

Bandfield, J. L., and W. C. Feldman, **2008**, *J. Geophys. Res. Plan.*, Martian high latitude permafrost depth and surface cover thermal inertia distributions, 113, E08001, doi:10.1029/2007JE003007.

Kieffer, H. H., **2013**, *J. Geophys. Res. Plan.*, Thermal model for analysis of Mars infrared mapping, 118, 451-470, doi:10.1029/2012JE004164.

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Location:
Jet Propulsion Laboratory
Pasadena, California

Field of Science: Planetary Science

Advisors:
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Applications with citizens from Designated Countries will not be accepted at this time, unless they are Legal Permanent Residents of the United States. A complete list of Designated Countries can be found at: https://www.nasa.gov/oiir/export-control.

Eligibility is currently open to:

- U.S. Citizens;
- U.S. Lawful Permanent Residents (LPR);
- Foreign Nationals eligible for an Exchange Visitor J-1 visa status; and,
- Applicants for LPR, asylees, or refugees in the U.S. at the time of application with 1) a valid EAD card and 2) I-485 or I-589 forms in pending status

Eligibility Requirements

- **Degree:** Doctoral Degree.