

**Opportunity Title:** Remote sensing of Aerosols in the Atmosphere of Mars

**Opportunity Reference Code:** 0184-NPP-NOV23-JPL-PlanetSci

**Organization** National Aeronautics and Space Administration (NASA)

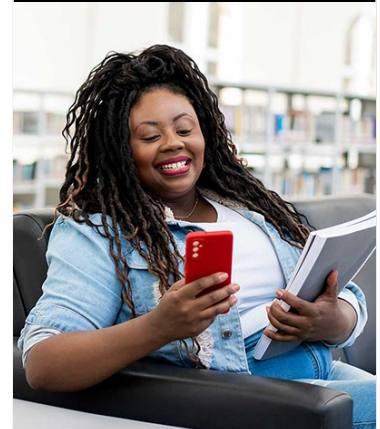
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**Application Deadline** 11/1/2023 6:00:59 PM Eastern Time Zone

**Description** Dust and cloud ice aerosols have a profound impact on the structure and circulation of the atmosphere of Mars [1] and are active areas of current research. Questions to be addressed by the research include the lateral and vertical distribution of dust and its temporal variability, which ties into the formation and development of regional and global dust storms, factors that can trigger such dust events, and their impact on the atmospheric temperatures and circulations [2]. Water ice clouds are widespread in the martian atmosphere but only recently has it been realized that they exert a significant radiative influence on the atmosphere, increasing the meridional overturning circulation and modifying the structure of atmospheric thermal tides [3]. CO<sub>2</sub> ice clouds are unique to the martian atmosphere. In the lower atmosphere of the winter polar region they can grow to large particle sizes that sediment out of the atmosphere and have profound effects on the polar radiative balance [4]. In the middle atmosphere the occurrence of CO<sub>2</sub> ice clouds is often associated with temperature minima caused by gravity waves and tides, hence providing a unique window for characterizing these features in the martian atmosphere [5]. The research will focus on the synergistic use of atmospheric data from the Mars Climate Sounder instrument [6,7] on Mars Reconnaissance Orbiter with data from other instruments and missions, e.g. upper atmospheric data from the MAVEN mission.

References:

[1] Smith, M. D., Bougher, S., Encrenaz, T., Forget, F., Kleinböhl, A., "Thermal Structure and Composition", in: Haberle, R. M., et al., The Atmosphere and Climate of Mars, Cambridge University Press, 2017. [2] Kass, D. M., A. Kleinböhl, D. J. McCleese, J. T. Schofield and M. D. Smith, Interannual similarity in the Martian atmosphere during the dust storm season, *Geophys. Res. Lett.*, 43, 6111-6118, 2016. [3] Kleinböhl, A., R. J. Wilson, D. Kass, J. T. Schofield, and D. J. McCleese, The semi-diurnal tide in the middle atmosphere of Mars, *Geophys. Res. Lett.*, 40, 1952-1959, 2013. [4] Hayne, P. O., D. A. Paige, J. T. Schofield, D. M. Kass, A. Kleinböhl, N. G. Heavens, and D. J. McCleese, Carbon dioxide snow clouds on Mars: South polar winter observations by the Mars Climate Sounder, *J. Geophys. Res.*, 117, E08014, 2012. [5] Stevens, M. H., et al., Martian mesospheric cloud observations by IUVS on MAVEN: Thermal tides coupled to the upper atmosphere, *Geophys. Res. Lett.* 44, 3493-3501, 2017. [6] Kleinböhl, A., Schofield, J. T., Kass, D. M., Abdou, W. A., Backus, C. R., Sen, B., Shirley, J. H., Lawson, W. G., Richardson, M. I., Taylor, F. W., Teanby, N. A., McCleese, D. J., Mars Climate Sounder Limb Profile Retrieval of atmospheric Temperature, Pressure, Dust and Water ice opacity, *J. Geophys. Res.*, 114, E10006, 2009. [7] Kleinböhl, A., A. J. Friedson, and J. T. Schofield, Two-dimensional radiative transfer for the retrieval of limb emission measurements in the Martian atmosphere, J.



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Quant. Spectrosc. Radiat. Transfer, 187, 511-522, 2017.

**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/oair/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.