

Opportunity Title: Study Impacts of Aerosol Types on Cloud, Circulations and Climate

Opportunity Reference Code: 0055-NPP-NOV23-JPL-EarthSci

Organization National Aeronautics and Space Administration (NASA)

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

Description Contemporary satellites keep increasing their capability in characterizing physical properties, chemical compositions, and spatial distributions of atmosphere aerosols. Meanwhile, in the newly developed global climate models (GCMs), their awareness and sophistication of aerosol effects on cloud, convection, and circulation have been enhanced.

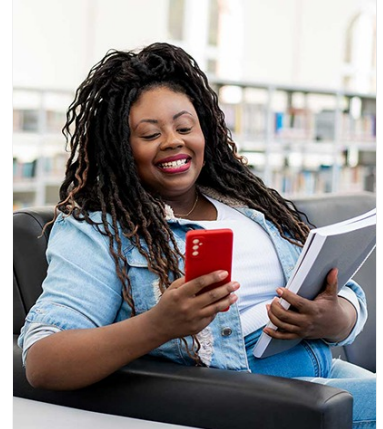
This project is to evaluate aerosol properties in GCMs using NASA satellite products and available satellite simulators. We will assess how aerosols of different types influence atmospheric radiation, convective cloud development, precipitation, and even tropical cyclone genesis over different regions by quantifying their relationships in the models, and validate the results against satellite observations. An inter-comparison of different global aerosol-climate models with different aerosol parameterization schemes will provide insight on key processes in model to reproduce more realistic aerosol field and aerosol-cloud-radiation interactions.

The overarching goal of this project is to improve our process- and system-level understanding on the impacts of different types of aerosols on cloud, convection, radiation, and general circulations using climate models and satellite observations. Three detailed objectives include: evaluation of aerosol types, 3D spatial distribution, and radiative properties in GCMs using satellite retrievals and an aerosol simulator; investigation of the impacts of different aerosol types on convective cloud, precipitation and cyclone genesis over different regions; quantification of the climatic influence of different aerosol future evolutions on the large-scale circulations and global hydrological cycle. To achieve the objectives, GCM model (e.g. NCAR CSEM) experiments will be conducted by perturbing the aerosol physical and optical properties and emission factors over different regions for present and future emission scenarios. Key scientific questions to be answered include: non-monotonic and competing impacts of absorbing and scattering aerosols on convective cloud development, Sahara dust on the environment of tropical cyclone genesis, the influence of future emission changes on large-scale circulations and flows from different types of aerosols.

Reference: Jiang, J.H., H. Su, L. Huang, Y. Wang, S. Massie, B. Zhao, A. Omar, and Z. Wang, Contrasting effects on deep convective clouds by different types of aerosols, *Nature Communications*, 9, 3874 (2018).
<https://doi.org/10.1038/s41467-018-06280-4>.

Location:

Jet Propulsion Laboratory
Pasadena, California



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Field of Science:Earth 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/oiiir/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.