

**Opportunity Title:** Geologic sources of carbonaceous gasses and their impacts on terrestrial ecology

**Opportunity Reference Code:** 0147-NPP-MAR26-ARC-EarthSci

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

**Reference Code** 0147-NPP-MAR26-ARC-EarthSci

**How to Apply** All applications must be submitted in [Zintellect](#)

Please visit the NASA Postdoctoral Program website for application instructions and requirements: [How to Apply | NASA Postdoctoral Program \(orau.org\)](#).

A complete application to the NASA Postdoctoral Program includes:

1. Research proposal
2. Three letters of recommendation
3. Official doctoral transcript documents

**Application Deadline** 4/2/2026 6:00:59 PM Eastern Time Zone

**Description** About the [NASA Postdoctoral Program](#)

The [NASA Postdoctoral Program \(NPP\)](#) offers unique research opportunities to highly-talented scientists to engage in ongoing NASA research projects at a NASA Center, NASA Headquarters, or at a NASA-affiliated research institute. These one- to three-year fellowships are competitive and are designed to advance NASA's missions in space science, Earth science, aeronautics, space operations, exploration systems, and astrobiology.

**Description:**

Geologic sources of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) to the atmosphere are important components of the Earth System, with direct atmospheric impacts and indirect feedbacks to local ecology and global carbon cycling. Geologic emissions of CO<sub>2</sub> and CH<sub>4</sub> occur naturally and are also directly and indirectly affected by human activities, e.g. resource extraction. Detection and accurate quantification of geologic CO<sub>2</sub> and CH<sub>4</sub> emissions on large scales are challenged by the remoteness of emission sites, inaccurate attribution of emission sources, emission variability, and insufficient monitoring. These challenges amount to large uncertainties in the global budgets of geologic CO<sub>2</sub> and especially CH<sub>4</sub> emissions, with estimates for the latter ranging between 1.6 and 63 Tg per year (1), a factor of 40.

A new cadre of satellite and airborne remote sensing platforms, termed 'plume imagers,' is demonstrating increasing ability to detect geologic emissions of CH<sub>4</sub> and CO<sub>2</sub> emissions from space. Unlike 'area mappers,' such as TROMOPI, GOSAT, OCO-2 and -3, MethaneSat, and others, plume imagers sacrifice observation precision in gas concentration to greatly improve spatial resolution, enabling geolocation of emission on scales relevant to source attribution. Spaceborne plume imagers of note are the



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commercial GHGSat platform(s), the Carbon Mapper Coalition's instrument onboard Planet's Tanager-1, and NASA's EMIT imaging spectrometer on the International Space Station (ISS). GHGSat has demonstrated the ability to observe CH<sub>4</sub> point source emissions from geologic sources in Indonesia (2) and Africa (3). With similar or better spectrometer specifications, NASA's EMIT spectrometer, and the Carbon Mapper instrument are expected to share this capability, though this remains understudied. Sensitivity and resolution are enhanced further with the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS)-class instruments, albeit with the coverage limitations inherent to airborne surveys. AVIRIS-classic, AVIRIS-NG, and AVIRIS-3 have all demonstrated the capability for precise plume imaging of both CO<sub>2</sub> and CH<sub>4</sub> (4,5,6,7,8).

This project seeks to synthesize available plume imaging datasets to address scientific problems related to quantifying CO<sub>2</sub> and CH<sub>4</sub> from natural hotspot sources (e.g. geologic vents, wetlands, etc.) and the feedbacks they impart to local ecology and potentially global greenhouse gas budgets. A major advantage of plume imagers is that many of them are hyperspectral and cover a broad range of VSWIR wavelengths, enabling detailed investigations of surface reflectance in the same spectra what were used to retrieve gas enhancements. We seek candidates with backgrounds in Earth and environmental science, especially those with experience using remote sensing data to study ecological phenomena. Backgrounds in atmospheric modelling of trace gas emissions are also considered a strength. We encourage research proposals to explore questions around the use of plume imaging technology to geolocate and quantify natural emissions of CH<sub>4</sub> and CO<sub>2</sub> and their potential feedbacks to local, regional, and potentially global systems.

The Earth Science Division at NASA Ames Research Center in Silicon Valley at Moffett Field spans science expertise in atmospheric composition and dynamics, biospheric science (carbon cycle science, coastal and oceans ecosystems research, ecology), volcanic emissions, the NASA Earth Exchange (NEX), the Airborne Science Program with its UAS fleet, the Earth Science Projects Office, and the Airborne Sensor Facility, and is associated with related local capabilities in intelligent systems, supercomputing, flight engineering, mission design and operations, and aeronautics. The Ames sister divisions of Space Science & Astrobiology, and Space Biosciences include additional capabilities in volcanology and ecology. USGS Moffett Field (formerly Menlo Park) with its California Volcano Observatory, the Geology, Minerals, Energy, and Geophysics Science Center, the Western Ecological Research Center, and the Earthquake Science Center are co-located at NASA Ames. A multitude of partnerships and -opportunities with state, federal, academic, and industry partners create a thriving cross-cutting innovation hub.

<https://www.nasa.gov/centers/ames/earthscience>

References and Recommended Reading:

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1. Saunois, M., et al., 2024. Global methane budget 2000–2020. Earth System Science Data Discussions, 2024, pp.1-147.
2. Mazzini, A., et al., 2021. Relevant methane emission to the atmosphere from a geological gas manifestation. Scientific Reports, 11(1), p.4138.
3. Online article: Volcano in Ethiopia is releasing unusually large plumes of methane. James Dinneen. 20 February 2025. New Scientist.  
<https://www.newscientist.com/article/2468644-volcano-in-ethiopia-is-releasing-unusually-large-plumes-of-methane/>
4. Thorpe, A.K., et al., 2014. Retrieval techniques for airborne imaging of methane concentrations using high spatial and moderate spectral resolution: application to AVIRIS. Atmospheric Measurement Techniques, 7(2), pp.491-506.
5. Duren, R.M., et al., 2019. California's methane super-emitters. Nature, 575(7781), pp.180-184.
6. Thorpe, A.K., et al., 2024, July. Attributing Methane and CO2 Plumes by Emission Sector with the EMIT and AVIRIS-3 Imaging Spectrometers. In IGARSS 2024-2024 IEEE International Geoscience and Remote Sensing Symposium (pp. 324-330). IEEE.
7. Elder, C.D., et al., 2021. Characterizing methane emission hotspots from thawing permafrost. Global Biogeochemical Cycles, 35(12), p.e2020GB006922.
8. Cawse-Nicholson, et al., 2018. Ecosystem responses to elevated CO2 using airborne remote sensing at Mammoth Mountain, California. Biogeosciences, 15(24), pp.7403-7418.

**Field of Science:** Earth Science

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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/oior/export-control>.

Eligibility is currently open to:

- U.S. Citizens;

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- 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

**Questions about this opportunity?** Please email [npp@orau.org](mailto:npp@orau.org)

**Qualifications** A doctoral degree in the Earth and environmental sciences (e.g. Earth System Science, Atmospheric Science, Geography, etc.) or closely related field is required. Expertise in remote sensing, greenhouse gas observations and/or modeling, and use of large datasets will be considered as strengths.

**Point of Contact** [Mikeala](#)

**Eligibility Requirements** • **Degree:** Doctoral Degree.