Opportunity Title: ICAR – Investigating Ocean Worlds: a systems level approach to understanding organic carbon cycles
Opportunity Reference Code: 0044-NPP-MAR26-ABProg-Astrobio

Organization National Aeronautics and Space Administration (NASA)

Reference Code 0044-NPP-MAR26-ABProg-Astrobio

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**

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Description:

The 2023-2032 Planetary Science and Astrobiology Decadal Survey has prioritized missions to seek evidence for life at ocean worlds in the outer solar system and those mission concepts feature organic analysis as a primary means of detecting life. To optimize the science yield of such missions, it is critical to understand processes that govern maturation of organic matter prior to sampling and analysis. In this project, accordingly, we will seek to address the question: How do the physical, chemical and (potential) biological processes active on ocean worlds shape the nature of the organic "signal", including evidence for life, that is presented to an observing spacecraft?

On Earth, abundant solar energy fuels a tremendous influx of biologically derived organic carbon to the ocean, yet compounds typically sought as evidence of life comprise only a tiny fraction of the dissolved organic carbon (DOC) pool. On ocean worlds, this 'needle-and-haystack' paradigm may be accentuated: the organic content of chondritic and cometary materials from which ocean worlds form constitutes a potentially vast reservoir of abiotic carbon, which could be both challenging and immensely informative for life detection efforts. In parallel, any ocean word biological productivity will almost certainly fall orders of magnitude below that on

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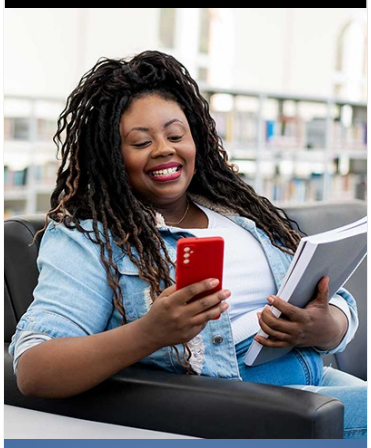

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Earth, leading to lower concentrations of target compounds and/or longer residence times - increasing the role that abiotic degradation could play in obscuring evidence of biogenicity.

Our study will investigate organic maturation across three domains of an ocean world's hydrosphere:

- the **subseafloor domain**, where fluid circulation through silicates can both liberate chondritic organics and modify/react oceanic DOC.
- the **ocean domain**, where suspended particulates could serve to concentrate organics and catalyze their reactions.
- the **cryosphere domain**, where partitioning of organics across phase boundaries and post-depositional modification could alter and fractionate the organic "signal" presented to observing spacecraft.

Each of these domains are interconnected by flows of heat, fluid, and chemicals. It is for this reason that our study will implement a "systems-level" approach consistent with the team's strong grounding in Earth-based oceanography and polar research together with planetary science and astrobiology. Within each investigation, our interdisciplinary approach will encompass: physical modeling of heat, fluid, and mass transport; the use of both modelling and laboratory studies to explore the corresponding implications for chemical reactivity and fluxes; and an evaluation of the implications for biology as both a sink and a source term for organic carbon cycling - again via a combination of modeling and laboratory experimentation.

Field of Science: Astrobiology

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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

Questions about this opportunity? Please email npp@orau.org

Point of Contact Mikeala

Eligibility Requirements

- **Degree:** Doctoral Degree.