DONALD M GLASER **PhD**

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EDUCATION

PhD: Chemistry (Advisor: Hilairy Hartnett) *2015 - 2022*
School of Molecular Sciences
Arizona State University: Tempe, Arizona
Thesis Title:
The Habitability of Hyperarid Environments:
The Physico-Chemical Dynamics of Water in Extremely Water-Limited Systems

Bachelor of Science: Environmental Science *2012 - 2015*
School of Interdisciplinary Arts and Sciences
University of Washington: Tacoma, Washington

APPOINTMENTS

Postdoctoral Researcher *2025 - Present*
Goddard Institute of Space Studies: New York, New York

NASA Postdoctoral Fellow (Advisor: Michael Way) *2023 - 2025*
Goddard Institute of Space Studies: New York, New York

RESEARCH INTERESTS

Arid Environments

- ◇ Physical and biogeochemical processes affecting habitability in hyperarid environments
- ◇ Hyperarid environments as astrobiologically-relevant planetary analogs of Mars and putative dry exoplanets

Exoplanet Habitability

- ◇ Constraining orbital, geological, and atmospheric parameters relevant to supporting habitable conditions
- ◇ Investigation of the habitability of the subsurface or other refugia on an otherwise uninhabitable or 'subhabitable' planet

Biosignatures

- ◇ Biosignatures in the context of water-limited and carbon-limited systems

- ◇ Quantification of biosignature detectability (i.e., identification of feasible biosignature targets within the abiotic, environmental context)
- ◇ Investigation of the potential of biosignatures on 'subhabitable' exoplanets

FUNDING

($198,404 Total)

NASA Postdoctoral Program Fellowship ($198,404) 2023 - 2025
Arid Planets Are Likely Habitable and may be Fruitful Targets for Biosignature Investigation

PUBLICATIONS

Published & In Press

6. **DM Glaser**, I Aleinov, T Leboissetier, and M Way. 2025. Continental Orientation and the Climate of Land-Dominated, Arid Planets. *The Planetary Science Journal*. DOI: 10.3847/PSJ/adccb6

5. MJ Styczinski, ZS Cooper, **DM Glaser**, O Lehmer, V Mierzejewski, and J Tarnas. 2024. The Astrobiology Primer 3.0: Chapter 7: Assessing Habitability Beyond Earth. *Astrobiology*. DOI: 10.1089/ast.2021.0097

4. MJ Styczinski, **DM Glaser**, M Hooks, TZ Jia, K Johnson-Finn, GA Schaible, and MJ Schaible. 2024. The Astrobiology Primer 3.0: Chapter 11: Astrobiology Education, Engagement, and Resources. *Astrobiology*. DOI: 10.1089/ast.2021.0098

3. MJ Schaible, N Szeinbaum, G Ozan Bozdag, L Chou, N Grefenstette, S Colón-Santos, LE Rodriguez, MJ Styczinski, JL Thweatt, ZR Todd, A Vázquez-Salazar, A Adams, MN Araújo, T Altair, S Borges, D Burton, JA Campillo-Balderas, EM Cangi, T Caro, E Catalano, K Chen, PL Conlin, ZS Cooper, TM Fisher, S Mestre Fos, A Garcia, **DM Glaser**, et al. 2024. The Astrobiology Primer 3.0: Chapter 1: Introduction. *Astrobiology*. DOI: 10.1089/ast.2021.0129

2. **DM Glaser**, HE Hartnett, H Cadillo-Quiroz, D Finn, S Perez-Montaño and SJ Desch. 2022. Water Vapor Adsorption Provides Daily, Sustainable Water to Soils of the Hyperarid Atacama Desert. *Astrobiology*. DOI: 10.1089/ast.2021.0171

1. **DM Glaser**, S Desch, HE Hartnett, C Unterborn, AD Anbar, S Buessecker, T Fischer, S Glaser, S Kane, CM Lisse, C Millsaps, S Neuer, JG O'Rourke, N Santos, S Walker, and M Zolotov. 2020. Detectability of Life Using Oxygen on Pelagic Planets and Water Worlds. *The Astrophysical Journal*. DOI: 10.3847/1538-4357/ab822d

Submitted & In Revision

- CM Guimond, N Coltice, C Lineweaver, S Olson, M Lingam, T Spohn, **DM Glaser**, S Berdyugina, P Byrne, and P Cawood. Water Versus Land on Temperate Rocky Exoplanets. submitted to: *Space Science Reviews*.

In Preparation

- **DM Glaser**, I Aleinov, T Leboisetier, N Kiang, M Way. Assessing Global Extent of Euhabitability: An Approach to Quantify the Relative Euhabitability of Exoplanet Climate Simulations. in preparation for *Astrobiology*.
- C Ostberg, O Clarkson, E Miles, **DM Glaser**, S Kane, M Way. A Climatic and Observational Overview of Two Potential ExoVenuses. in preparation for *Astrophysical Journal*.
- **DM Glaser** and HE Hartnett. Mineral Composition Affects Water Vapor Adsorption in Arid Soils. in preparation for *Journal of Geophysical Research: Planets*.
- **DM Glaser**, S Olson, M Lingam, T Spohn, J Lustig-Yaeger, S Berdyugina, P Byrne, and P Cawood. Euhabitability: A New Term to Move Beyond Liquid Water Habitability. in preparation for *Space Science Reviews*.
- JP Perlwitz, SD Guzewich, K Tsigaridis, I Aleinov, ET Wolf, **DM Glaser**, and M Way. Simulating Atmospheric Dust on Mars with NASA GISS ROCKE-3D. in preparation for *Journal of Geophysical Research: Planets*.
- C Till, AD Anbar, **DM Glaser**, M Guild, K Iacovino, A Johnson, J Leong, C Ostrander, and HE Hartnett. Solid-Earth processes are key drivers in the evolution of Earth's redox state. in preparation for *Earth & Planetary Science Letters*.

PRESENTATIONS

⋆: Invited †: Presenting Author ‡: Published Abstract

2024

†‡ *The Temperate Climate of Extremely Water-Limited Exoplanets*. **DM Glaser**, T Leboissetier, I Aleinov, and M Way. American Geophysical Union Fall Meeting. Abstract #P24A-07

† *The Unexpected Habitability and Biosignature Detectability of Arid Exoplanets*. **DM Glaser**, T Leboissetier, I Aleinov, K Tsigaridis, J Perlwitz, and M Way. New York Area Exoplanets Meeting.

†‡ *The Climate of Single-Continent, Land-Dominated Planets: Preliminary Results*. **DM Glaser**, T Leboissetier, I Aleinov, K Tsigaridis, J Perlwitz, and M Way. AbSciCon. Abstract #1500294

⋆† *The Effects of Continental Distribution on the Climate and Habitability of Exoplanets.* **DM Glaser**. ISSI Meeting: The Geoscience of (Exo)planets.

†‡ *Mars as an Exoplanet: Constraining Potential Climate Scenarios Using the ROCKE-3D GCM.* **DM Glaser**, T Leboissetier, I Aleinov, K Tsigaridis, J Perlwitz, and M Way. LPSC.
Abstract #2750

2023

†‡ *Mars Climate Modeling with GISS ROCKE-3D GCM: Polar Processes and Dust Cycle.* I Aleinov, JP Perwitz, K Tsigaridis, SD Guzewich, **DM Glaser**, M Way, and ET Wolf. American Geophysical Union Fall Meeting.
Abstract #P51E-2742

†‡ *Mineral Composition Affects Water Vapor Adsorption in Unsaturated Soils.* **DM Glaser** and HE Hartnett. Goldschmidt.
Abstract #18333

2022

†‡ *Mineralogy of Particles Affects Soil Water Capacity in Unsaturated Soils.* **DM Glaser** and HE Hartnett. Astrobiology Science Conference: AbSciCon.
Abstract #444-07

‡ *Seasonal Patterns in Net Ecosystem Production (NEP) in a Human-constructed Urban Lake.* HE Hartnett, E Sauer, and **DM Glaser**. ASLO - Joint Aquatic Sciences Meeting.
Abstract #1944

2021

⋆† *Mineralogy May Play a Major Role in Water Vapor Adsorption.* **DM Glaser**. AZ Astrobiology Research Symposium.

†‡ *Mineralogy Affects Water Vapor Adsorption and Water Content in Experiments Simulating Atacama Soil Conditions.* **DM Glaser** & HE Hartnett. Goldschmidt.
Abstract #6534

† *The Effects of Mineralogy on Water Vapor Adsorption Capacity.* **DM Glaser** & HE Hartnett. Southern California Geobiology Symposium.

2020

†‡ *Water Vapor Adsorption may Provide as much Water into Hyperarid Soils as Rainfall.* **DM Glaser**, D Finn, H Cadillo-Quiroz, S Perez-Montano, SJ Desch, HE Hartnett. American Geophysical Union Fall Meeting.
Abstract #H122-10

†‡ *How a Low-Cost Arduino System can Start a New Project and Save an International Field Season.* **DM Glaser** & HE Hartnett. American Geophysical Union Fall Meeting.
Abstract #H013-0010

2019

†‡ *Microenvironments of Habitability in the Hyperarid Atacama Desert.* **DM Glaser**, D Finn, H Cadillo-Quiroz, S Perez-Montano, SJ Desch, HE Hartnett. American Geophysical Union Fall Meeting.
Abstract #B11K-2205

‡ *The Biogeosciences are a Critical Step on the Path Toward Detecting Life on Exoplanets.* HE Hartnett, NR Hinkel, AD Anbar, SJ Desch, T Fisher, H Furukawa, **DM Glaser**, JG Okie, CT Unterborn, P Vergeli, SI Walker, P Young. American Geophysical Union Fall Meeting.
Abstract #B13C-11

†‡ *Understanding the Water Limitations of Life in the Hyperarid Atacama Desert.* **DM Glaser**, D Finn, H Cadillo-Quiroz, S Perez-Montano, SJ Desch, HE Hartnett. Astrobiology Science Conference: AbSciCon.
Abstract #343-373

† *Towards a New Understanding of Water Scarcity in Hyperarid Environments.* **DM Glaser**, D Finn, H Cadillo-Quiroz, S Perez-Montano, HE Hartnett. Southern California Geobiology Symposium.

2018

⋆† *Hyperarid Extremophiles: Searching for Chemical Signatures of Life in the Atacama Desert.* **DM Glaser**, D Finn, H Cadillo-Quiroz, S Perez-Montano, HE Hartnett. UW Tacoma Environmental Science Seminar Series.

† *Hyperarid Extremophiles: Searching for Chemical Signatures of Life in the Atacama Desert.* **DM Glaser**, D Finn, H Cadillo-Quiroz, S Perez-Montano, HE Hartnett. Southern California Geobiology Symposium.

2017

⋆† *Biosignature Gases of Hyperarid Soils: Preliminary Results.* **DM Glaser** & D Finn. Universidad Cathólica San Pablo.

†‡ *Biological Soil Crusts and the Great Oxidation Event: Results from Laboratory Experiments.* **DM Glaser** & HE Hartnett. Astrobiology Science Conference: AbSciCon.
Abstract #3399

HONORS & AWARDS

- AbSciCon 2024 Creative Writing Contest (2nd) — Apr 2024
- ASU Graduate College Travel Grant — Jan 2022
- ASU Graduate College Completion Fellowship* — 2021-2022
- ASU Graduate College Completion Fellowship — 2020-2021

- ASU School of Molecular Science's John Holloway Memorial Scholarship Spring 2020
- ASU School of Molecular Science's Distinguished Teaching Assistant Award 2019-2020
- ASU Graduate & Professional Student Association Travel Grant 2019
- UW Tacoma Amanda Dauron Memorial Scholarship 2015, 2014
- UW Tacoma Chancellor's Research Scholarship 2014

*Completion fellowship application was open to previous awardees due to the impacts of the COVID-19 global pandemic

TEACHING & MENTORING

Teaching

Invited Lectures

◇ Are Water Worlds Habitable? Can We Detect Life on Water Worlds? (300-level) Fall, 2021

◇ Water Planet? The Water Cycle in Earth's Drylands (100-level) Spring, 2020

Graduate Teaching Assistant

◇ Environmental Chemistry (300-level) Fall, 2019

◇ Geochemistry (400/500-level) Spring, 2016

◇ General Chemistry I Recitation (100-level) Fall, 2015

Students Mentored

- Tazbid Ajhor Summer 2025
  Advanced Science Research Program: JFK High School, Bellmore, NY
  - Mentored in the development of a research project to assess the effects of Mars soils on agricultural plants.

- Jason Fitzgerald Summer 2024
  NASA Internship Program
  - Mentored as a co-advisor for a NASA internship project related to the spectral features of Proxima Centauri b.

- MacKenzie Smits Summer 2024
  NASA Internship Program
  - Mentored as a co-advisor for a NASA internship project comparing the putative climates of TRAPPIST-1 d & e.

- Charlie Priebe Summer 2023
  NASA Internship Program
  - Mentored as a co-advisor for a NASA internship project related to the effects of wind speed on erosion and deposition on Mars.

- Christina Herrera Summer 2023
  NASA Internship Program
  - Mentored as a co-advisor for a NASA internship project related to the effects of temperature and salinity on ocean currents for the putative aqua planet Proxima Centauri b.
- Chanel Vidal 2021 - 2022
  ASU School of Earth and Space Exploration: PhD Student
  - Mentored as an incoming first-year PhD student to ease transition during COVID-19 pandemic.
- Kayla Perry 2020 - 2021
  ASU School of Molecular Sciences: PhD Student
  - Mentored as an incoming first-year PhD student to ease transition during COVID-19 pandemic.
- Alexander Whittus 2019 - 2020
  ASU Barrett Honors Scholar: Computer Science
  - Designed a weighing microlysimeter using arduino for field deployment as a part of honor's thesis.
- Elinor Sauer 2018 - 2020
  ASU Barrett Honors Scholar: Environmental Chemistry
  - Committee member for honor's thesis defense: *Comparative Analysis Between Lab and Novel dataSONDE Measurements in Tempe Town Lake*
- Kyle Brown 2017 - 2018
  ASU Barrett Honors Scholar, Astrobiology
  - Committee Member for Honor's Thesis Defense: *Biotic vs. Abiotic Processes in Hyperarid Exoplanetary Atmospheres*
- Nikita Kowal 2015 - 2017
  ASU Barrett Honors Scholar, Chemical Engineering
  - Assisted with NASA space grant project on the particulate organic carbon of Tempe Town Lake.

SERVICE

Science

Review Panelist

- NASA ROSES: Habitable Worlds 2024
- NASA ROSES: Habitable Worlds 2023

Journal Peer Reviewer

- Journal of Geophysical Research: Planets
- The Planetary Science Journal
- Nature Communications

Organizing Committee Member

- Arizona Astrobiology Symposium (AZ AstroBio) 2020 - 2024
  Founding member and chair
  - AZ AstroBio is a regional, student-focused and organized symposium to communicate research across institutional boundries and serves the students of the astrobiology community by providing a venue for development of career skills and communication of astrobiology-relevent research.

Conference Session Convener

- AbSciCon 2024: Convener & Chair May 2024
  Exoplanet Climatology & Habitability: The Effects of Orbital Dynamics, Geophysical Processes, and Atmospheres
- AbSciCon 2022: Convener & Chair May 2022
  Alien Ecosystems: Integrating Ecology into Astrobiology

Poster Contest Reviewer

- Outstanding Student Poster Award: AGU 2024 Dec 2024
- GLOBE International Virtual Science Symposium Spring 2024
- Chandler High School Science Fair 2016

Science Communicator

- NASA NExSS Science Communication Working Group 2019 - 2021
  Sub-group to facilitate the communication of NExSS-funded science between the NExSS teams

Community

Riverside Park Conservancy Volunteer 2023-Present

- General park maintainance and cleanup

State of Arizona COVID-19 Vaccination Program April 2021

- Volunteer assistance with patient check-in (2 shifts)

ASU Biodesign Institute COVID-19 Response Summer 2020

- Face Shield Production to increase COVID-19 testing in Arizona, protect healthcare workers, and protect nursing care staff during the COVID-19 global pandemic.

OUTREACH

Scientist in Residence: New York Academy of Sciences 2024-2025

- Worked with instructor at the High School for Environmental Studies to develop an experiment to assess the habitability of exoplanets using duckweed as an analog.

New York Academy of Sciences After School Mentor Program 2023-2024

- The NYAS mentor program is an afterschool program for elementary and middle school aged students to foster interest in STEM and provide hands on scientific and engineering learning opportunities in underserved communities.

ASU Open Door 2021

- Outreach event geared for K-12 student and their parents. Produced a video demonstrating the biogeochemistry of Tempe Town Lake.

ASU Earth and Space Exploration Day 2016, 2018, 2019

- Public engagement event of the School of Earth and Space Exploration. Created and carried out hands-on, hypotheses-based demonstrations of environmental science topics such as water density and conductivity.

COMPUTATIONAL TECHNIQUES

ROCKE-3D Planetary Climate Model

- A three-dimensional general circulation model, with heritage from GISS ModelE2, capable of simulating the climate of a diverse array of planetary targets.

Planetary Spectrum Generator (PSG)

- A suite of radiative transfer models to simulate observational retrievals of planetary objects used to generate observables from climate simulations.

USGS RockJock

- A program to interpret bulk X-ray diffraction spectra to quantify individual mineral abundances using a library of pure mineral spectra.

RELEVANT SOFTWARE SKILLS

Proficiency: ●○○○ Low ●●●● High

- ●●●● R
- ●●●○ Arduino IDE
- ●●●○ LaTeX
- ●●○○ C++
- ●●○○ Blender CAD
- ●●○○ ImageJ
- ●○○○ MatLab
- ●○○○ Python
- ●○○○ FORTRAN

FIELD RESEARCH EXPERIENCE

Atacama Desert; Arequipa, Perú 2017

Four week-long campaign funded by NASA Nexus for Exoplanet System Science (NExSS) grant (PI: Steven Desch)

Designed and executed field plan with the goals to:

- Deploy long-term soil temperature and relative humidity sensor arrays
- Investigate soil in situ CO_2, CH_4, and H_2 flux across an aridity gradient from hyperarid to semiarid
- Collect soil samples for laboratory characterization of:
  - Soil Texture
  - Carbon and Nitrogen
  - Major Ions
  - Soil pH
  - Bulk Mineralogy
  - Surface Area
  - Porosity

LABORATORY INSTRUMENTATION & TECHNIQUES

Gas Phase Measurements

- Peak Laboratories GC-RCP: H_2 & CO
- SRI Instruments 310 GC-FID: CO_2, CH_4, & other Hydrocarbons

Solid & Liquid Phase Measurements

- Tristar II 3020: BET Surface Area & Microporosity
- Siemens D5000 & Bruker D8 X-ray Diffractometer: Bulk Mineralogy
- Micromeritics AccuPyc 1330: Porosity & Density
- Costech ECS 4010 GC-TCD: Carbon & Nitrogen
- Bruker IFS 66v/S Vacuum FT-IR: RAMAN Spectroscopy

Aqueous Phase Measurements

- Agilent 6430 LC-MS/MS: Trace Organics
- Dionex DX 120 IC: Major Ions (Ion Chromatography)
- Shimadzu TOC-V/TN: Dissolved Organic Carbon & Total Nitrogen
- Horiba Spectrofluorometer: Dissolved Organic Carbon Characterization

Techniques

- Hydrometer Method: Soil Texture
- Cryogenic Vacuum Extraction: Small volume soil water content

PRESS & MEDIA COVERAGE

Scientific American: *Why Is NASA Shuttering This Iconic Institute in New York City?* — *2025*
scientificamerican.com

ASU News: *The edge of habitability: Tracking water in the world's driest desert* — 2022
news.asu.edu

ASU News: *Exoplanets: How we'll search for signs of life* — 2020
news.asu.edu

ScienceDaily: *Exoplanets: How we'll search for signs of life* — 2020
sciencedaily.com

CNN Perú: *La NASA estudia la superficie de Marte... en Perú* — 2017
cnnespanol.cnn.com

SOCIETY MEMBERSHIP

American Geophysical Union

Geochemical Society

New York Academy of Sciences