

# Stanford

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## Steffen Buessecker

Postdoctoral Scholar, Earth System Science

 Curriculum Vitae available Online

### Bio

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#### BIO

After graduating from high school (Gymnasium) in Bammental, Germany, I completed my undergraduate degree in Geoecology at the University of Tuebingen. I then moved to Tempe, Arizona, for my Ph.D. in Environmental Life Sciences at Arizona State University before joining Stanford as a postdoc.

#### HONORS AND AWARDS

- NASA Postdoctoral Program (NPP) Fellowship, NASA (2021-2024)
- USAID Global Development Research scholarship, USAID (2017-2018)
- APS/NAI Lewis & Clark Fund for Exploration and Field Research in Astrobiology, American Philosophical Society (2017)
- ASU's Graduate and Professional Association Outstanding Mentor Award, Arizona State University (2016)
- NASA (NAI) Astrobiology Early Career Collaboration Award, NASA (2016)
- DAAD (German Research Exchange Service) Doctoral fellowship, German Research Exchange Service (2014-2015)

#### STANFORD ADVISORS

- Anne Dekas, Postdoctoral Faculty Sponsor

#### LINKS

- My personal website: <https://www.crypticbiology.com>

### Research & Scholarship

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#### CURRENT RESEARCH AND SCHOLARLY INTERESTS

Earth has transitioned from an abiotic planet to a vibrant biosphere over billions of years. During the first half of this transition, all living entities were prokaryotic microorganisms centralized in marine ecosystems. The interplay of non-living matter and microorganisms played a key role in metabolic evolution. I envision the major biogeochemical cycles (C, N, S) as “mosaics” of enzymatic and non-enzymatic reactions that co-evolved on a transitioning planet. To understand the modern biosphere, we must learn more about its origin and how it came to be.

My research interests revolve around the co-evolution of microbial life and Earth processes, the relation of these to the planetary climate, as well as astrobiology. I combine fieldwork and in-situ experiments with laboratory analyses and apply cutting-edge geochemical and molecular biological techniques, including isotopic tracers, DNA and RNA analysis, gene tree/species tree reconciliation and ancestral character state reconstruction, fluorescence in-situ hybridization (FISH), and microbiological culturing. I am also familiar with lipid analysis and nanoscale secondary ion mass spectrometry (nanoSIMS).

In the spirit of the Stanford Doerr School of Sustainability, I am also passionate about seeking solutions for global climate change by focusing on greenhouse gas removal from the atmosphere. I see high potential in the carbon dioxide, methane, and nitrous oxide consumption by enhanced mineral-microbial catalysis – processes that have been controlling gas fluxes since billions of years.

## LAB AFFILIATIONS

- Anne Dekas, Dekas Lab (4/1/2020)

## Publications

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### PUBLICATIONS

- **Mcr-dependent methanogenesis in Archaeoglobaceae enriched from a terrestrial hot spring.** *The ISME journal*  
Buessecker, S., Chadwick, G. L., Quan, M. E., Hedlund, B. P., Dodsworth, J. A., Dekas, A. E.  
2023
- **Mineral-catalysed formation of marine NO and N<sub>2</sub>O on the anoxic early Earth** *NATURE GEOSCIENCE*  
Buessecker, S., Imanaka, H., Ely, T., Hu, R., Romaniello, S. J., Cadillo-Quiroz, H.  
2022; 15 (12): 1056–+
- **Coupled abiotic-biotic cycling of nitrous oxide in tropical peatlands.** *Nature ecology & evolution*  
Buessecker, S., Sarno, A. F., Reynolds, M. C., Chavan, R., Park, J., Fontanez Ortiz, M., Perez-Castillo, A. G., Panduro Pisco, G., Urquiza-Munoz, J. D., Reis, L. P., Ferreira-Ferreira, J., Furtunato Maia, J. M., Holbert, et al  
2022
- **An essential role for tungsten in the ecology and evolution of a previously uncultivated lineage of anaerobic, thermophilic Archaea.** *Nature communications*  
Buessecker, S., Palmer, M., Lai, D., Dimapilis, J., Mayali, X., Mosier, D., Jiao, J., Colman, D. R., Keller, L. M., St John, E., Miranda, M., Gonzalez, C., Gonzalez, et al  
2022; 13 (1): 3773