**Session Proposal**

# Session Title

Soil microbial life and death: impacts on soil organic carbon dynamics under global change

# Session Organizers

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# Session Description

Soil microorganisms are central to biogeochemical processes, shaping ecosystem dynamics and stability in response to global change. Despite the remarkable diversity of microbial life in soil, only a fraction is actively growing at any given time. Emerging paradigms suggest that the continuous cycling of microbial life and death greatly contribute to the long-term storage of persistent soil organic carbon (SOC), primarily through the transformation of plant carbon into microbial necromass bound to soil minerals. However, direct evidence linking microbial physiology and functioning to the formation, recycling, and persistence of microbial necromass is still lacking, particularly concerning individual microbes or specific groups that possess different microbial traits.

This session will highlight research exploring how emergent microbial properties - such as activity, physiology, functional potential, and biomass dynamics - contribute to carbon cycling under global change. We welcome studies on microbial responses to environmental drivers such as drought, warming, land-use intensification, and biodiversity loss, as well as how these microbial responses may feedback to influence global change processes. We invite contributions from manipulative field and lab experiments, observational studies across climate and soil gradients, synthesize outputs, and modelling studies that address global change impacts on microbial and soil ecology. Studies that adopt advanced methodologies —including isotopic labeling, omics, microscopy, spectroscopy, and integrative modelling—are especially encouraged.  In particular, we welcome stable isotope-informed approaches that scale from community to group, taxon, or genomic levels, and integrate microbial traits into soil carbon cycling processes.  By bringing together these perspectives, this session aims to advance our understanding of how microbial traits govern soil functions and contribute to SOC decomposition and persistence in a changing world. Moreover, we also aim to foster interdisciplinary connections, review the current state of the art, identify knowledge gaps, discuss emerging challenges, and promote international collaboration in the field.

# Format

Oral presentations, poster

# Proposed Speakers

***Andreas Richter is now confirmed to give an invited talk in this session***

Speaker 1: Andreas Richter, Professor of Ecosystem Ecology and Head of the Centre for Microbiology and Environmental Systems Science, University of Vienna, Austria. [andreas.richter@univie.ac.at](mailto:andreas.richter@univie.ac.at)

Richter is an internationally recognized leader in terrestrial ecosystem ecology and biogeochemistry with a strong focus on microbial responses to climate change, and has been a highly cited researcher since 2018. His recent groundbreaking work using advanced, in-house developed techniques has revealed the dynamic nature of microbial growth and storage in soils. His research provides new insights into taxon-specific microbial growth in response to future climate. By focusing on microbial dynamics at the taxon and group level, Richter’s work contributes to a more nuanced understanding of how microbial traits shape soil carbon cycling processes under global change.

**If several can be invited, we would like to invite these potential speakers:**

Speaker 2: [Matthias Rillig](https://rilliglab.org/people/matthias-rillig/), professor of ecology at the Freie Universität Berlin and director of the Berlin-Brandenburg Institute of Advanced Biodiversity Research, Germany. [rillig@zedat.fu-berlin.de](mailto:rillig@zedat.fu-berlin.de)

Rillig is an internationally recognized leader in soil ecology and global change biology, with an organismal focus on fungi, and has been a highly cited researcher since 2017. He has been focusing on the effects of different factors of global change on soil processes and soil biota, and in particular how joint impacts of many factors influence soil processes and biodiversity. By addressing the challenge of high-dimensionality in global change factors, Rillig has expanded the predominantly ecotoxicological research approach by incorporating a broader view addressing global change.

Speaker 3: [Marion Schrumpf](https://www.bgc-jena.mpg.de/en/bgisoilbiogeochem), Group leader of Soil Biogeochemistry Group, Max-Planck-Institute for Biogeochemistry, Jena, Germany. [mschrumpf@bgc-jena.mpg.de](mailto:mschrumpf@bgc-jena.mpg.de)

Schrumpf’s research focuses on the persistence of organic carbon in soils and its sensitivity to land use and environmental changes. Her work integrates this knowledge into next-generation soil models that account for interactions between plants, soil organisms, and the abiotic environment. She has been a long-term advisory member in Priority Programme “Biodiversity Exploratories”, and leading the core soil and several contributing projects on linking biodiversity and land use to soil functions. In the last years her group aims at elucidating the role of microbial community and of minerals for C persistence in necromass and organic matter.

Speaker 4: [Francesca cotrufo](https://newsmediarelations.colostate.edu/contacts/francesca-cotrufo/), Professor of Department of Soil and Crop Sciences, Colorado State University, Fort Collins, CO, US. [francesca.cotrufo@colostate.edu](mailto:francesca.cotrufo@colostate.edu)

Cotrufo is a soil ecologist and biogeochemist internationally recognized for her work in litter decomposition and soil organic matter dynamics. Her research focuses on understanding the mechanisms and drivers of soil organic matter’s formation and persistence and their response to global environmental changes and disturbances. Her work helps inform climate and land use policy and management, and Cotrufo pursues applied research aimed at proposing soil management practices that regenerate healthy soils and mitigate climate change.