Curriculum Vitae

Assoc.-Prof.in Dr.in Christina Kaiser

Position in CoE: Member of the Board of Directors

Personal Details

Place of birth	Vienna, Austria
Nationality	Austrian
Children	1 (1997)
Affiliation:	University of Vienna
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List of publications	ORCID: 0000-0002-2005-1820
Academic age	12 years since PhD

Research Institution

I am working at the *Centre for Microbiology and Environmental Systems Science (CeMESS)* of the University of Vienna. The mission of our Centre is to investigate the **role of microbes and microbial communities for the functioning of medical and ecological systems**. It hosts **15 research groups** addressing scientific questions from the scale of individual microbes to ecosystems, with a great and **realized potential for synergies** among them. I am affiliated with the *Division of Terrestrial Ecosystem Research (TER)*, which specifically addresses the interplay between soil microbial communities and ecosystem processes.

Academic Career and Positions Held

I started my professional career after a formal IT education as a **software developer** for the machine building industry in 1995. In parallel, I started to study Ecology at the University of Vienna. I obtained a **Master in Ecology** in 2003, followed by a PhD in 2010 on the topic "Resource limitation of microbial decomposition of soil organic matter". After that I worked as a postdoctoral researcher for one year (2011) at the **University of Western Australia** (UWA) focusing on applying **nano-scale secondary ion mass spectrometry (NanoSIMS) and stable isotope tracing to investigate C transfer** between plants, mycorrhizal fungi and soil microbes. I was awarded an independent PostDoc fellowship at the International Institute for Applied Systems Analysis (IIASA), located in Laxenburg, Austria, where I worked for two years (2012–2013) on **individual-based modelling of microbial decomposer communities**. After that I obtained a **group leader position at the Department for Microbiology and Ecosystems Sciences** of the University of Vienna, and started to establish my own research group. In the following years I acquired research funding as a PI from the Austrian Science Fund (single project on 'the spatial aspect of rhizosphere priming') and from the **ERC** (**consolidator grant** on 'Self-organisation of microbial soil organic matter turnover') with a total volume of 2.296.151 €, and as a Co-PI in three more EU-funded projects (ESF-PolarCLIMATE, European Research Area, Joint Program initiative Climate, Marie Sklodowska-Curie Innovative Training Network) with a total funding volume of 549.907 €. I started a f**ast-track tenure track professorship** in Terrestrial ecosystem research at the University of Vienna in July 2019, and was promoted to **Associate Professor** in 2022. I have been Subject Editor 2013–2020 and Associate Chief Editor from 2020–2022 in the leading journal in the field of soil research (Soil Biology and Biochemistry). Since 2014, I contribute to teaching in the Bachelor's program 'Biology' and the Master's program 'Ecology and Ecosystems' at the University of Vienna, and have supervised 4 Master's students, who have already finished. I am currently supervising 6 PhD and 3 Master's students in my group.

Main Research Areas and Most Important Research Achievement

Main Research Areas. Together with my group, I investigate soil microbial ecosystems from the perspective of complex systems science. For this we combine methods from **soil biogeochemistry** (e.g., stable isotope tracing, soil process measurements and lipid biomarkers) and methods from **microbial ecology** (e.g., molecular analysis of soil bacterial and fungal communities, co-occurrence network analysis) with **mathematical methods** from **complex systems science**. This allows us to gain insights in self-organisation of the soil microbial ecosystem, and its consequences for soil organic matter turnover. I am further interested in interactions between plants, mycorrhizal fungi and soil microbial communities. We investigate the **interplay and resource exchange between plant roots, mycorrhizal fungi and soil microbes**, and their effect on soil C sequestration by using stable isotope tracing, combined with microscale visualization of stable isotope distribution in mycorrhizal tissue and soil microbes (i.e., by nanoscale secondary ion mass spectrometry, NanoSIMS), molecular methods and mathematical modelling. Moreover, I am interested in rhizosphere interactions and priming effects. Here, my group explores microbial dynamics at root exudation hot-spots in soil using reverse microdialyis to better understand the mechanisms behind the priming effect and its role for soil C cycling and stabilization.

Most important research achievements. Between 2012 and 2014 I developed a novel, **individual-based and spatially-explicit computer model** to simulate microbial communities involved in organic matter decomposition. Follow-up and ongoing work based on this model suggests that microbial self-organisation at the microscale has the potential to significantly influence large-scale C and N cycling (e.g., Kaiser et al, 2014, Ecology Letters, Kaiser et al 2015, Nat. Comm.). Building on this work I developed a proposal for an ERC Consolidator Grant, which I won in 2018 ("Self-organisation of microbial soil organic matter turnover"). In a parallel line of research, I employed **stable isotope tracing and visualization of in situ flows of carbon and nitrogen** across the plant-fungal, and the fungal-bacterial interface in mycorrhizal symbioses by NanoSIMS which yielded novel insights in the "mycorrhizal pathway" as a major route of C transfer from plants to soil microbies (Kaiser et al, 2014, New Phytologist; Gorka et al, 2019, Frontiers in Microbiology, Mayerhofer et al, 2021, New Phytologist). More recently, we were one of the first groups in our field to employ a novel technique ('reverse microdialysis'), which allows to investigate how soil processes respond in situ to simulated root exudation hotspots at the microscale (König et al, 2022, Soil Biology and Biochemistry). I authored 37 peer-reviewed publications, which have (counted by WOS) together 2929 citations, and an h-index of 25 (4,097 citations, h-index=27 in google scholar). I have been invited to give > 20 talks in international conferences and at research institutes.

Scientific contribution to the CoE. I will contribute my expertise in **ecosystem ecology, soil microbial ecology and ecological modelling** to the CoE. Specifically, I will contribute to Research Theme 1 by leading a work package on **cross-domain interactions** between plants, ectomycorrhizal fungi, protists and the soil microbiome. In addition, I will contribute to the Synthesis Module module by providing my expertise in working at the interface between microbial ecology and complex systems science. Here I will be strongly involved in Part 1 (Fundamental Principles of Microbiome Dynamics) and will also strengthen Part 2 (Ecological Theory) and 3 (Microbiome Complexity) together with David Berry, Thomas Rattei, and Andreas Richter in collaboration with the new tenure track professor that will join in this area.

10 Most Important Publications (*relevant for the CoE)

1. *König, A.; Wiesenbauer, J.; Gorka, S.; Marchand, L.; Kitzler, B.; Inselsbacher, E.; **Kaiser, C.** Reverse Microdialysis: A Window into Root Exudation Hotspots. *Soil Biology and Biochemistry* **2022**, 108829. *https://doi.org/10.1016/j.soilbio.2022.108829*.
2. *Guseva, K.; Darcy, S.; Simon, E.; Alteio, L. V.; Montesinos-Navarro, A.; **Kaiser, C.** From Diversity to Complexity: Microbial Networks in Soils. *Soil Biology and Biochemistry* **2022**, *169*, 108604. *https://doi.org/10.1016/j.soilbio.2022.108604*.
3. *Mayerhofer, W.; Schintlmeister, A.; Dietrich, M.; Gorka, S.; Wiesenbauer, J.; Martin, V.; Gabriel, R.; Reipert, S.; Weidinger, M.; Clode, P.; Wagner, M.; Woebken, D.; Richter, A.; **Kaiser, C.** Recently Photoassimilated Carbon and Fungus-delivered Nitrogen Are Spatially Correlated in the Ectomycorrhizal Tissue of Fagus Sylvatica. *New Phytologist* **2021**, *232* (6), 2457–2474. *https://doi.org/10.1111/nph.17591*.
4. *Lehmann, J.; Hansel, C. M.; **Kaiser, C.**; Kleber, M.; Maher, K.; Manzoni, S.; Nunan, N.; Reichstein, M.; Schimel, J. P.; Torn, M. S.; Wieder, W. R.; Kögel-Knabner, I. Persistence of Soil Organic Carbon Caused by Functional Complexity. *Nat. Geosci.* **2020**, *13* (8), 529–534. *https://doi.org/10.1038/s41561-020-0612-3*.
5. Terrer, C.; Jackson, R. B.; Prentice, I. C.; Keenan, T. F.; **Kaiser, C.**; (27 authors). Nitrogen and Phosphorus Constrain the CO2 Fertilization of Global Plant Biomass. *Nat. Clim. Chang.* **2019**, *9* (9), 684–689. *https://doi.org/10.1038/s41558-019-0545-2*.
6. *Gorka, S.; Dietrich, M.; Mayerhofer, W.; Gabriel, R.; Wiesenbauer, J.; Martin, V.; Zheng, Q.; Imai, B.; Prommer, J.; Weidinger, M.; Schweiger, P.; Eichorst, S. A.; Wagner, M.; Richter, A.; Schintlmeister, A.; Woebken, D.; **Kaiser, C.** Rapid Transfer of Plant Photosynthates to Soil Bacteria via Ectomycorrhizal Hyphae and Its Interaction With Nitrogen Availability. *Front. Microbiol.* **2019**, *10*, 168. *https://doi.org/10.3389/fmicb.2019.00168*.
7. *Walker, T. W. N.; **Kaiser, C.**; Strasser, F.; Herbold, C. W.; Leblans, N. I. W.; Woebken, D.; Janssens, I. A.; Sigurdsson, B. D.; Richter, A. Microbial Temperature Sensitivity and Biomass Change Explain Soil Carbon Loss with Warming. *Nature Clim Change* **2018**, *8* (10), 885–889. *https://doi.org/10.1038/s41558-018-0259-x*.
8. ***Kaiser, C.**; Franklin, O.; Richter, A.; Dieckmann, U. Social Dynamics within Decomposer Communities Lead to Nitrogen Retention and Organic Matter Build-up in Soils. *Nat Commun* **2015**, *6* (1), 8960. *https://doi.org/10.1038/ncomms9960*.
9. ***Kaiser, C.**; Kilburn, M. R.; Clode, P. L.; Fuchslueger, L.; Koranda, M.; Cliff, J. B.; Solaiman, Z. M.; Murphy, D. V. Exploring the Transfer of Recent Plant Photosynthates to Soil Microbes: Mycorrhizal Pathway vs Direct Root Exudation. *New Phytol* **2015**, *205* (4), 1537–1551. *https://doi.org/10.1111/nph.13138*.
10. ***Kaiser, C.**; Franklin, O.; Dieckmann, U.; Richter, A. Microbial Community Dynamics Alleviate Stoichiometric Constraints during Litter Decay. *Ecol Lett* **2014**, *17* (6), 680–690. *https://doi.org/10.1111/ele.12269*.