Kathiravan Meeran

Researcher

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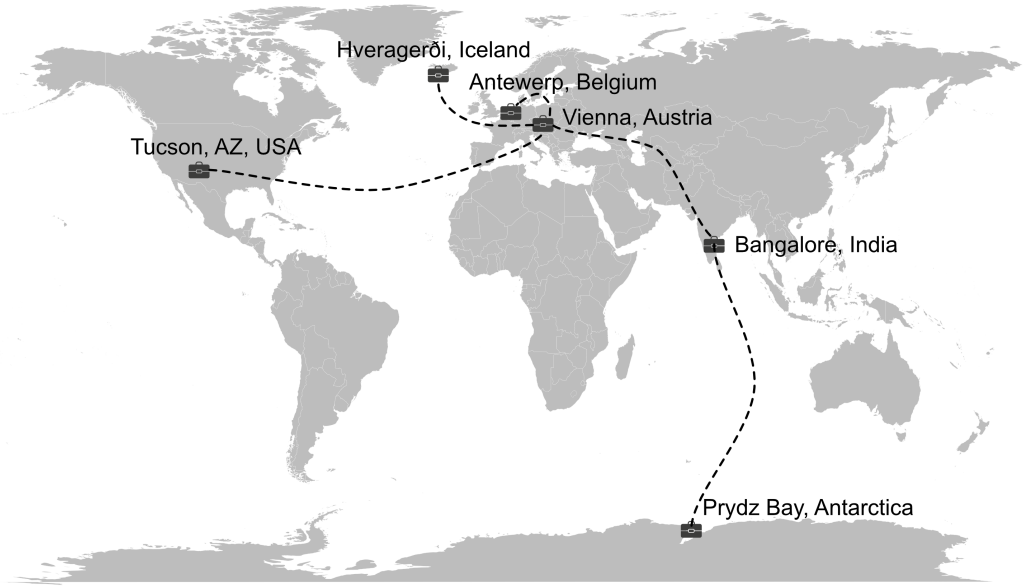
Introduction

With over seven years of experience in environment monitoring and research, I specialize in applying automation to measure and quantify pollution and greenhouse gas emissions. My work spans various international research projects, focusing on developing new tools and methods in climate change research.

Career Journey



My career journey has taken me from developing a proxy for greenhouse gas flux monitoring in the Antarctic Ocean to automating greenhouse gas flux monitoring in grassland in Austria and geothermal vents in Iceland, and with significant contributions to implementing volatile organic compounds (VOC) measurements and monitoring in Arizona, USA. Currently, I have developed and tested an automated measurement system for identifying and quantifying sources of CO_2 and CH_4 emissions by measuring CO_2, CH_4 concentration at the Arsenal Tower in Vienna. These experiences have enriched my interest in developing and experimenting with state-of-the-art technologies that are important in environment protection and conservation.

Education

Universität Innsbruck — *Innsbruck, Austria*

PhD — *Jul. 2017 - Jun. 2023*

- Advisor: Prof. Michael Bahn
- Dissertation: "Climate change and Greeh house gas emissions"

Indian Institute of Science — *Bangalore, India*

Master Degree: Earth Sciences — *May 2014 - May 2016*

- Subjects: Climate change, geophysics and geochemistry, Mass spectrometry
- Dissertation: "CO_2 dynamics in Antarctic Ocean"

Bharathidasan University *Trichy, India*

Bachelor Degree: Geotechnology and Geoinformatics *May 2010 - May 2014*

- Subjects: Environment Science, Geographic Information System, Remote-sensing
- Dissertation: "Environmental change assessment on Trichy city using remote sensing and GIS"

Experience

Atmospheric Monitoring *Vienna, Austria*

BOKU University *Sep. 2021 - Present*

- Developed automated measurement setup for CH_4, CO_2 concentrations emissions
- Built airflow nexus unit using valco multiports and solenoid valves to switch the measurement between different inlets
- Applied stable isotope techniques and bayesian inverse modelling framework identify and partitions different sources of greenhouse gases
- Applied weather models and lagrangian particle dispersion models to identify the measurement footprint and probable spatial location of the emission source
- Remote troubleshooting, data backup
- Data processing using Vienna Scientific Cluster HPC

GHG emission from natural ecosystems *Innsbruck, Austria*

Universität Innsbruck *Jan. 2019 - Aug. 2021*

- Applied geochemical tools to quantify the proportion of CO_2 CH4 emissions occurred after the earthquake in 2008 in Iceland
- Parition geogenic sources from biogenic sources using isotopes
- Built automated chamber measurement setup for measuring CO_2 emission from multiple location is grassland
- Machine learning regression modelling of the role of climate change on greenhouse gas fluxes in a managed grassland in Austria

VOC and GHG Flux from Forests *Tucson, USA*

University of Arizona *Oct. 2019 - Jan. 2020*

- Developed and implemented an automated setup for measuring volatile organic compounds and CO_2 from trees of artificial rain forest in Biosphere-2, Tuscon, Arizona, US
- Data analysis and modelling

Antarctic ocean respiration monitoring *Bangalore, India*

Indian Institute of Science *May 2015 - May 2017*

- Research on the feasibility to use oxygen isotope of CO_2 as a proxy to measure CO_2 dynamics in Antarctica
- Field experiment in Antarctic ocean
- Ocean expedition to Prydz Bay, Antarctica
- Air and seawater sampling
- Isotope mixing modelling

Mineral exploration using Hyperspectral remote sensing data *Trichy, India*

Bharathidasan University - Centre for Remote sensing *May 2013 - May 2014*

- Collecting hyperspectral remote sensing data-Hyperion data
- Potential mineralization zone identification using GIS
- Geospatial analysis and spatial probability distribution map generation

Skills

Instrumentation Skills

- Picarro G2131-i laser Isotopic Analyzer
- Licor gas analyser 8100
- IRMS MAT 253 mass spectrometer
- elemental analyzers: Flash, TC/EA
- ICP MS Basics
- PTR TOF Basics
- EGM PP systems
- Multiplexing systems: valco, solenoid valve

Software Skills

- Visual Studio Code
- ArcGIS
- Microsoft Excel, Powerpoint, Word
- Adobe Illustrator

Programming and data analysis Skills

- R advanced: dplyr, ggplot2,tidyr, broom, zoo, nlme, mgcv, randomforest
- Python intermediate: numpy, scipy, arcpy, pandas
- LabView basic
- Matlab intermediate
- Latex basic
- Git
- Bash basic, through WSL in Windows
- Data analysis through supercomputer clusters

Others

- Deutsch: B1
- Driving: B licence, Austria

Publications

Meeran, K, Ingrisch, J., Reinthaler, D., Canarini, A., Müller, L., Pötsch, E.M., Richter, A., Wanek, W. and Bahn, M., 2021. Warming and elevated CO_2 intensify drought and recovery responses of grassland carbon allocation to soil respiration. Global Change Biology. https://doi.org/10.1111/gcb.15628

Werner, C., Meredith, L.K., Ladd, S.N., Ingrisch, J., Kübert, A., van Haren, J., Bahn, M., Bamberger, I., Beyer, M., Blomdahl, D. and Byron, J., Daber, E., DeleeuW, J., Dippold, M., Fudyma, J., Gil-Loaiza, J., Honeker, L., Hu, J., Huang, J ., Klüpfel, T., Krechmer, J., Kreuzwieser, J., Kühnhammer, K., Lehmann, M., **Meeran, K**, Misztal, P., NG, W., Pfannerstill, E., Pugliese, G., Purser, G., Roscioli, J., Shi, L., Tfaily, M., Williams, J., 2021. Ecosystem fluxes during drought and recovery in an experimental forest. Science, https://doi.org/10.1126/science.abj6789

Verbrigghe, N., **Meeran, K**, Bahn, M., Fuchslueger, L., Janssens, I.A., Richter, A., Sigurdsson, B.D., Soong, J.L. and Vicca, S., 2022. Negative priming of soil organic matter following long-term in situ warming of sub-arctic soils. Geoderma. https://doi.org/10.1016/j.geoderma.2021.115652

Verbrigghe, N., **Meeran, K**, Bahn, M., Canarini, A., Fransen, E., Fuchslueger, Ingrisch, J., L.,Janssens, I.A., Richter, A., Sigurdsson, B.D., Soong, J.L. and Vicca, S., 2022. Long-term warming reduced microbial biomass but increased recent plant-derived C in microbes of a subarctic grassland. Soil Biol. and Biochem. https://doi.org/10.1016/j.soilbio.2022.108590

Verbrigghe, N, Leblans, N.I.W., Sigurdsson, B.D., Vicca,S., Fang C., Fuchslueger, L., Soong, J.L., Weedon, J T., Poeplau, C., Ariza-Carricondo, C., Bahn, M., Guenet, B., Gundersen, P., Gunnarsdóttir, G.E., Kätterer, T., Liu, F.Z., Maljanen, M., Marañón-Jiménez, S., **Meeran, K**, Oddsdóttir, E. S., Ostonen, I., Peñuelas, J., Richter, A., Sardans, J., Sigurðsson, P., Torn, M.S., Van Bodegom, P.M., Verbruggen, E., Walker, T.W.N., Wallander, H., Janssens, I.A.. Soil carbon loss in warmed subarctic grasslands is rapid and restricted to topsoil. Biogeosciences Discuss. https://doi.org/10.5194/bg-19-3381-2022

Pathak, P., Ghosh, P., Banerjee, S., Muzakkira, N., Sikdar, P., Ghosal, U., Liang, M.Chang., **Meeran, K**. Relic pond water (clay pore water) input to the shallow groundwater triggers arsenic release in Bengal aquifer. Journal of J Earth Syst Sci 131, 80. https://doi.org/10.1007/s12040-022-01819-y

Meeran, K, Verbrigghe, N., Fuchslueger, L., Ingrisch, J., Müller, L., Sigurðsson, P., Sigurdsson, B.D., Watzka, M., Soong, J.L., and Vicca, S., Janssens, I.A., Bahn, M., (2023). Individual and interactive effects of warming and nitrogen supply on CO2 fluxes and carbon allocation in subarctic grassland. Global Change Biology, 29, 5276–5291. https://doi.org/10.1111/gcb.16851

Pugliese, G., Ingrisch, J., Meredith, L.K., Pfannerstill, E.Y., Klüpfel, T., **Meeran, K**, Byron, J., Purser, G., Gil-Loaiza, J., van Haren,

J. and Kreuzwieser, J.,.. (2023). The effect of prolonged drought and recovery on soil VOC fluxes in an experimental rainforest. Nature Communications, 14(1), p.5064. https://doi.org/10.1038/s41467-023-40661-8

Honeker, L., Pugliese, G., Ingrisch, J., Fudyma, J., Gil-Loaiza, J., Carpenter, E., Singer, E., Hildebrand, G., Shi, L., Hoyt, D. and Krechmer, J., Claflin, M., Ayala-Ortiz, C., Freire-Zapata, V., Pfannerstill, E., Daber, L., Dippold, M., **Meeran, K**, Kreuzwieser, J., Williams, J., Ladd, S., Werner, C., Tfaily, M., Meredith, L. (2023). Drought induces soil microbial stress responses and emissions of volatile organic compounds in an artificial tropical rainforest. Nature Microbiology, 8, 1480–1494. https://doi.org/10.1038/s41564-023-01432-9

Fang, C., Verbrigghe, N., Sigurdsson, B., Ostonen, I., Leblans, N., Marañón, S., Fuchslueger, L., Sigurdsson, P., **Meeran, K**, Portillo-Estrada, M., Verbruggen, E., Richter, A., Sardans, J., Peñuelas, J., Bahn, M., Vicca, S., Janssens, I. (2023). Decadal soil warming decreased vascular plant above- and below-ground production in a subarctic grassland by inducing nitrogen limitation. New Phytologist. 240: 565-576. https://doi.org/10.1111/nph.19177

Leitner, S., **Meeran, K**, Watzinger, A. (2023). Stable isotope analysis of atmospheric CO2 using a Gasbench II-Cold Trap-IRMS setting.Rapid Commun Mass Spectrom. 37(24):e9647. http://doi.org/10.1002/rcm.9647

Huang, J., Ladd, S. N., Ingrisch, J., Kübert, A., Meredith, L. K., van Haren, J., Bamberger, I., Daber, L. E., Kühnhammer, K., Bailey, K., Hu, J., Fudyma, J., Shi, L., Dippold, M. A., **Meeran, K**, Miller, L., O'Brien, M. J., Yang, H., Herrera-Ramírez, D., Hartmann, H., Trumbore, S., Bahn, M., Werner, C., Lehmann, M. M., (2024). The mobilization and transport of newly-fixed carbon are driven by plant water-use in an experimental rainforest under drought. *Journal of Experimental Botany*, erae030. https://doi.org/10.1093/jxb/erae030

Meeran, K, Grabner, M., Schott, K., Wächter, E., van Loo, M., Watzinger, A. (2025). Tree size and site environment affects sessile oak growth and intrinsic water-use efficiency response to wet-dry years. *Forest Ecology and Management*, 577, 122413. https://doi.org/10.1016/j.foreco.2024.122413

Awards, Fellowships, & Grants

2021	**Exzellenzstipendien für Doktoratskollegs**, Universität Innsbruck	*€ 910/month*
2018	**ClimMani: Cost Action Research Grant**, European cooperation in science and Technology	*€ 1,350*
2014	**GATE: Graduate Fellowship**, University Grants Comission	*Rupees 12,000/month*

Invited Talks

Fall 2020. *Climate change: Past, Present and Future*. Guest Lecture, Environmental Science, Vellore Institute of Technology, India

Fall 2019. *Effect of summer drought on the coupling of photosynthesis and soil respiration under current and future climate*. Invited talk: Ecosystem Genomics Seminar Series, University of Arizona, United States.

Professional Memberships

European Geosciences Union

American Geophysical Union

Past/current supervisors for references

Mag. Dr., Univ.-Prof. Michael Bahn . *Department of Ecology, University of Innsbruck*, Michael.Bahn@uibk.ac.at

Prof. Ivan Janssens. *Department of Biology, University of Antwerp*, ivan.janssens@uantwerpen.be

Dr. Andrea Watzinger. *Insitute of Soil Research, Universität für Bodenkultur Wien* , andrea.watzinger@boku.ac.at

Dr. Bradley Matthews. *Environment Agency Austria, Vienna*, bradley.matthews@umweltbundesamt.at