Dr. Micheline Campbell

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Professional summary

My research interests are in Quaternary science, with a focus on using stalagmite proxy data to investigate past environments. My curent focus is on researching past fire events, but I also have experience and interest in the climate-water security nexus. I am currently employed as a research fellow at Max Planck Institute for Chemistry. I am hoping to secure a position which will allow me to continue to develop my analytical skillset, in both the laboratory and in data science, as well as continue to support the next generation of earth and environmental scientists.

Education

Aug 2014 - Jul 2019 **PhD (Geography)**, *School of Agriculture and Environment, The University of Western Australia*, Perth, Western Australia, Australia.

Jul 2013 - Jun 2014 **BA (Hons, 1st Class) (Geography)**, *School of Geography, Planning, and Environmental Management, The University of Queensland*, Brisbane, QLD, Australia.

Feb 2010 - Dec 2012 **BA (Geography and Spanish)**, *The University of Queensland*, Brisbane, QLD, Australia.

Experience

Research

Aug 2024 - present **Research Fellow**, *Department of Climate Geochemistry, Max Planck Institute for Chemistry*, Mainz, Rhineland-Palatinate, Germany.

- Reconstructing past fire frequencies from stalagmites.

Aug 2024 - present **Adjunct Fellow**, *School of Biological, Earth and Environmental Sciences, University of New South Wales*, Sydney, NSW, Australia.

Jun 2021 - Jun 2024 **Research Associate**, *School of Biological, Earth and Environmental Sciences, University of New South Wales*, Sydney, NSW, Australia.

- Contributing to the ARC Discovery Project "Reconstructing Australia's fire history from cave stalagmites"

Jul 2020 - Jun 2021 **Postdoctoral Researcher**, *School of Geography, University College Dublin*, Dublin/Brisbane, QLD, Ireland/Australia.
- Contributed to the project 'Using Palaeo-climate Proxies for Water Security Planning'
- Undertook the majority of data science tasks for the development of a new database of Australian climate proxy data

Feb 2020 - Jul 2020 **Scientist**, *Land and Water Science Unit, QLD Dept. of Natural Resources, Mining and Energy*, Rockhampton, QLD, Australia.

Teaching

2024 **Guest presenter: Earth and Environmental Science**, *School of Biological, Earth and Environmental Sciences, UNSW Sydney*, Sydney, NSW, Australia.

2018 **Tutor: Geographies of a Global City**, *School of Agriculture and Enviroment, The University of Western Australia*, Perth, WA, Australia.

2018 **Course Co-Coordinator and Lecturer: Catchment and River Processes**, *School of Agriculture and Enviroment, The University of Western Australia*, Perth, WA, Australia.

2014–2018 **Tutor: Catchment and River Processes**, *School of Agriculture and Enviroment, The University of Western Australia*, Perth, WA, Australia.

Teaching contributions include the delivery and creation of content for undergraduate and masters level units, both in the classroom/laboratory and in the field. Catchment and River Processes is a field-based course which I taught into for my entire time at UWA, and which I co-coordinated in 2018.

Grants and Awards

2024 **ANSTO 96 hours of beamtime on the XFM line at the Australian Synchrotron (experiment 21875)**, Investigator, in-kind support.
- $131 136

2024 **ANSTO 72 hours of beamtime on the XFM line at the Australian Synchrotron (experiment 23245)**, Investigator, in-kind support.
- $98 352

2023 **ANSTO 24 hours of beamtime on the XFM line at the Australian Synchrotron (experiment 19157)**, Lead investigator, in-kind support.
- $32 784

2022 **ANSTO 48 hours of beamtime on the XFM line at the Australian Synchrotron (experiment 17897)**, Investigator, in-kind support.
- $65 568

2022 **ANSTO 144 hours of beamtime on the IRM line at the Australian Synchrotron (experiment 17905)**, Investigator, in-kind support.
- $196 704

2022 **ANSTO 48 hours of beamtime on the IRM line at the Australian Synchrotron (experiment 18777)**, Investigator, in-kind support.
- $65 568

2021 **Australian Institute of Nuclear Science and Engineering Early Career Researcher Grant**, Lead investigator.
- $10 000

2021 **University of New South Wales UNSW Science Covid-19 Strategic Support Grant**, Lead investigator.
- $4 000

2021 **UNSW Research Stopgap Scheme**, Lead investigator, salary costs. Competitive funding internal to UNSW.
- $39 766

2018 **Australian Institute of Nuclear Science and Engineering Travel grant**, Lead investigator.
- $1 000

2017 **Australian and New Zealand Geomorphological Group Travel grant**, Lead investigator.
- $300

2016 **University of Western Australia Travel grant**, Lead investigator.
- $1 850

2015–2018 **Australian Institute of Nuclear Science and Engineering Postgraduate Ressarch Award Stipend**, Lead investigator.
- $7 500pa

2015–2018 **Australian Institute of Nuclear Science and Engineering Postgraduate Research Award Analytical Budget**, Lead investigator, in-kind support.
- $10 000pa

2014–2018 **Australian Government Research Training Program Stipend**, Lead investigator.
- $26 000pa

2014–2015 **Snowy Hydro Ltd. Stipend**.
- $5 000pa

2014 **University of Western Australia Stipend**.
- $3 000

Publications

1. McDonough, L. K., Campbell, M., Treble, P. C., Marjo, C., Frisia, S., Vongsvivut, J., Klein, A. R., Kovacs-Kis, V., & Baker, A. (2024). Fire-induced shifts in stalagmite organic matter mapped using Synchrotron infrared microspectroscopy. *Organic Geochemistry*, *195*, 104842. https://doi.org/10.1016/j.orggeochem.2024.104842
2. Campbell, M., Treble, P. C., McDonough, L. K., Naeher, S., Baker, A., Grierson, P. F., Wong, H., & Andersen, M. S. (2024). Combustion completeness and sample location determine wildfire ash leachate chemistry. *Geochemistry, Geophysics, Geosystems*, *25*, e2024GC011470. https://doi.org/10.1029/2024GC011470

3. Campbell, M., McDonough, L., Treble, P. C., Baker, A., Kosarac, N., Coleborn, K., Wynn, P. M., & Schmitt, A. K. (2023). A Review of Speleothems as Archives for Paleofire Proxies, With Australian Case Studies. *Reviews of Geophysics*, *61*(2), e2022RG000790. https://doi.org/10.1029/2022RG000790
4. Cahill, N., Croke, J., Campbell, M., Hughes, K., Vitkovsky, J., Kilgallen, J. E., & Parnell, A. (2023). A Bayesian time series model for reconstructing hydroclimate from multiple proxies. *Environmetrics*, *n/a*(n/a), e2786. https://doi.org/10.1002/env.2786
5. Croke, J., Vítkovský, J., Hughes, K., Campbell, M., Amirnezhad-Mozhdehi, S., Parnell, A., Cahill, N., & Dalla Pozza, R. (2021). A palaeoclimate proxy database for water security planning in Queensland Australia. *Scientific Data*, *8*(1), 292. https://doi.org/10.1038/s41597-021-01074-8
6. McGowan, H., Campbell, M., Callow, J. N., Lowry, A., & Wong, H. (2020). Evidence of wet-dry cycles and mega-droughts in the Eemian climate of southeast Australia. *Scientific Reports*, *10*(1), 1–10. https://doi.org/10.1038/s41598-020-75071-z
7. McGowan, H., Callow, J. N., Soderholm, J., McGrath, G., Campbell, M., & Zhao, J. (2018). Global warming in the context of 2000 years of Australian alpine temperature and snow cover. *Scientific Reports*, *8*(1), 4394. https://doi.org/10.1038/s41598-018-22766-z
8. Campbell, M., Callow, J., McGrath, G., & McGowan, H. (2018). Co-authorship analysis of the speleothem proxy-climate community: working together to tackle the big problems. *International Journal of Speleology*, *47*(2), 165–172. https://doi.org/10.5038/1827-806X.47.2.2159
9. Campbell, M., Callow, J. N., McGrath, G., & McGowan, H. (2017). A multimethod approach to inform epikarst drip discharge modelling: Implications for palaeo-climate reconstruction. *Hydrological Processes*, *31*(26), 4734–4747. https://doi.org/10.1002/hyp.11392

Publications in review

1. Song, C., Campbell, M., & Baker, A. (2025). Rainfall recharge thresholds decrease after an intense fire over a near-surface cave at Wombeyan, Australia. *Hydrology and Earth System Science (in Review)*, 1–19. https://doi.org/10.5194/egusphere-2025-84

Media and reports

1. Barrington-Smith, G., & Duncan, R. (2025). Historical holes: Beneath the surface, caves hold the key to australia's wildfire history. In *AINSE 2025 Research Spotlight*. https://www.ainse.edu.au/historical-holes-beneath-the-surface-caves-hold-the-key-to-australias-wildfire-history
2. Campbell, M., Treble, P., McDonough, L., Baker, A., Wong, H., & Hankin, S. (2024). Cave speleothems record past wildfires. In *AINSE Annual Report 2023*.
3. Campbell, M., McDonough, L., Treble, P. C., & Baker, A. (2023). Using Cave Formations to Investigate Ancient Wildfires. *Eos*, *104*. http://eos.org/editors-vox/using-cave-formations-to-investigate-ancient-wildfires
4. Campbell, M., & Barrows, T. (2023). Continuing the conversation on equity, diversity, and inclusion in AQUA. In *Quaternary Australasia* (Vol. 40).

Presentations (presenting only)

Talks

Mar 2025 **Speleothem inorganic elements as high-resolution proxies of past fire**, *Climate Change, The Karst Record X, Cape Town, South Africa*, Campbell, M., Treble, P.C., McDonough, L., Markowska, M., Vonhof, H., Baker, A.

Dec 2022 **Towards the development of fire proxies in speleothems using geochemical signatures in ashes from bushfires**, *2022 AQUA Biennial, Adelaide, Australia*, Campbell, M., McDonough, L., Naeher, S., Treble, P., Grierson, P., Sinclair, D., Howard, D., Baker, A.

Feb 2022 **Reconstructing Australia's fire history from cave stalagmites**, *13th International Conference on Southern Hemisphere Meteorology and Oceanography, New Zealand (online)*, Campbell, M., McDonough, L., Kosarac, N., Treble, P., Baker, A.

Feb 2017 **A geophysical approach to inform epikarst drip discharge modelling: Implications for palaeo-climate reconstruction**, *Australian and New Zealand Geomorphological Group 17th Biennial Conference, Greytown, New Zealand*, Campbell, M., Callow, J.N., McGrath, G.S., McGowan, H.A.

Posters

Jun 2024 **Exploring a speleothem fire severity signal using coeval stalagmites from southwest Australia**, *2024 AQUA Biemmial, Minjerribah, Australia*, Campbell, M., Treble, P.C., Baker, A., McDonough, L., Howard, D., Sinclair, D.

Apr 2023 **Speleothems as archives for palaeofire proxies**, *EGU General Assembly, Vienna, Austria*, Campbell, M., McDonough, L., Treble, P.C., Baker, A., Kosarac, N., Coleborn, K., Wynn, P., Schmitt, A.K.

Dec 2022 **Stalagmites as high-resolution archives of past fire severity**, *Synchrotron User Meeting, Melbourne, Australia*, Campbell, M., McDonough, L., Treble, P., Baker, A., Howard, D.,Hankin, S.

Jul 2022 **Stalagmites as high-resolution archives of past fire severity**, *Climate Change, The Karst Record IX, Innsbruck, Austria*, Campbell, M., McDonough, L., Treble, P., Baker, A., Howard, D.,Hankin, S.

Dec 2021 **Speleothems as palaeofire archives - a synthesis and meta-analysis of data and methods**, *American Geophysical Union, Fall Meeting, New Orleans, USA (online)*, Campbell, M., Treble, P., McDonough, L., Baker, A., Kosarac, N.

Nov 2021 **Speleothem 14C is unlikely to be impacted by wildfire - case studies from Western Australia and Tasmania**, *Accelerator Mass Spectroscopy 15th International Conference, Sydney, Australia*, Campbell, M., McDonough, L., Kosarac, N., Treble, P., Markowska, M., Baker, A., Hua, Q.

Apr 2018 **Climate patterns in South-east Australia: the Last Interglacial vs. the last 2K**, *EGU General Assembly, Vienna, Austria*, Campbell, M., Callow, J.N., McGowan, H.A., McGrath, G.S., Wong, H.

Feb 2017 **First Insights of the Eemian Hydroclimate of the Snowy Mountains, Australia**, *Australian and New Zealand Geomorphological Group 17th Biennial Conference, Greytown, New Zealand*, Campbell, M., Wong, H., McGrath, G.S., McGowan, H.A., Callow, J.N.

Dec 2016 **First Insights of the Eemian Hydroclimate of the Snowy Mountains, Australia**, *American Geophysical Union, Fall Meeting, San Francisco, USA*, Campbell, M. Wong, H., McGrath, G.S., McGowan, H.A., Callow, J.N.

Seminars

Nov 2024 **Reconstructing past fires from stalagmites - the inorganic proxy record**, *Heidelberg University Institute of Geosciences Seminar Series, Heidelberg, Germany*, Campbell, M.

Nov 2023 **Australasian palaeoclimate - developing databases and novel proxy applications**, *UOW Environmental Futures Seminar Series, Wollongong, Australia*, Campbell, M.

Jun 2023 **Towards the development of fire proxies in speleothems using geochemical signatures in ashes from bushfires**, *UTAS IMAS Seminar Series, Hobart, Australia*, Campbell, M.

Nov 2022 **Palaeoclimate, Palaeofire, and Palaeodatabases**, *UNSW BEES Seminar Series, Sydney, Australia*, Campbell, M.

Apr 2022 **Stalagmites as high-resolution archives of past fire severity**, *ANSTO Science Talks, Sydney, Australia*, Campbell, M.

Nov 2021 **Applying an open access palaeoclimate database for Australia, climate reconstructions, and water security planning in Queensland**, *NA, Australia*, Croke, J., Vitkovsky, J., Hughes, K., Campbell, M., Dalla Pozza, R.

Skills

Statistical

Statistical Methods.

- Time series analysis
- Hypothesis testing
- Social network analysis
- Linear models
- Generalised linear models
- Numerical modelling
- Principal Component Analysis and similar methods
- Data wrangling

Field

Surveying.

- Total station
- Real time kinematic

Environmental Monitoring.

- Deployment and maintenance of environmental logger networks (e.g. discharge and temperature, pressure, and RH loggers)

Environmental Sampling.

- Stable isotopes in water
- Nutrients in water

Laboratory

Sample preparation.

- Milling carbonates for IRMS
- Thick section mounting for LA-ICP-MS and Synchrotron XFM
- Cutting samples for U-Th dating

Analysis.

- LA-ICP-MS and data reduction to quantify trace elements in speleothems
- Synchrotron XFM elemental mapping and data processing to quantify trace elements in speleothems

Other

Software.

- R (advanced)
- Python (fundamental awareness)
- ArcGIS (novice)
- QGIS (novice)
- Microsoft Suite (advanced)
- LaTEX (novice)
- Rmarkdown (intermediate)

Service

May 2025 - May 2025

Session Convenor, EGU General Assembly 2025.

- Co-Convenor for the session “Understanding the carbon cycle - climate interactions during the Quaternary through the study of oceanic circulation, vegetation, and wildfire”

Jul 2023 - Jul 2023 **Session Convenor, INQUA Roma 2023**.
- Co-Convenor for the session "Session 118: Cave deposits for in deep understanding Quaternary climate and environment"

Apr 2023 - Apr 2023 **Session Convenor, EGU General Assembly 2023**.
- Co-Convenor and co-chair for session "Fire in the Earth system: understanding effects across spatiotemporal scales"

Nov 2022 - Nov 2022 **UOW Honours thesis examiner**.

Jul 2022 - Jul 2022 **Session Co-Chair, Climate Change the Karst Record IX**.
- Co-Chair for session 'Cave Monitoring'

Aug 2021 - Present **Executive Committee Member, Australasian Quaternary Association**.
- IT and communications officer 2022-2024
- Organising committee for AQUA's mentorship program in 2022 and 2024
- Student prize and travel award sub-committee
- IT support for 2022 and 2024 AQUA Biennial Meetings

Aug 2017 - Aug 2017 **Participant, Science in Schools Program**.
- Travelled to a regional town to share some love for science with primary school kids

Jan 2016 - Mar 2016 **Co-Convenor, SEE LearnR Workshop**.
- Organised a short series of 'Introduction to R' courses for the students and staff of the School of Earth and Environment
- Presented 'Introduction to ggplot2'
- Presented 'Introduction to R'

Feb 2015 - Jul 2017 **Postgraduate representative to the School of Earth and Environment**.
- Led the organisation of 2 annual symposia for postgraduate students within the school.
- Reported student concerns to the School administration
- Support and troubleshooting for new students

Oct 2014 - Oct 2014 **Guest presenter, ENVT2221: Global Climate Change and Biodiversity**.
- Presented 'Palaeo-climate and Stalagmites' for 2nd-year Biology students at UWA

Completed peer reviews

2024 Biogeochemistry.

2023 Climate of the Past.

2023 Nature Communications.

2023 Geochimica et cosmochimica acta.

2022 Paleoceanography and Paleoclimatology.

2021 Geology.

Professional development

2025 Speleothem Petrography: a tool to recognize local hydrology. University of Cape Town, South Africa

2022 Science Meets Parliament. Online

2020 Advanced R Workshop. The University of Queensland, Australia

2020 Intermediate R Workshop. The University of Queensland, Australia

2018 Weathering Climate Change: How have humans coped with climate change-and how will we continue to do so. The University of Western Australia, Australia

2018 Masterclass in Creating Opportunities and Developing your Research Skills. The University of Western Australia, Australia

2016 Synthesis II - From dynamics of structure to function of complex networks. TU Dresden, Germany

2016 Water on Earth: origin, reservoirs, and its global cycle. The University of Western Australia, Australia

2016 Fundamentals of the analysis of networks. The University of Western Australia, Australia

2014 Writing and publishing in scientific journals. The University of Western Australia, Australia

Professional memberships

Aug 2021 - Present European Geosciences Union.

Jul 2021 - Present Australasian Quaternary Association.

Jul 2021 - Present American Geophysical Union.