Lukas Brunner

curriculum vitae

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Current Position

05/2024 - presentt **Research scientist**
Climate Extremes group, Sustainability and Climate Risks, University of Hamburg

Previous Positions

01/2022 - 04/2024 **Senior scientist**
Group for Climate Dynamics and Modeling, Department of Meteorology and Geophysics, University of Vienna

05/2023 - 06/2023 **Visiting scientist**
Institute of Meteorology, Freie Universiät Berlin

10/2020 - 12/2021 **Senior scientist**
Climate Physics group, Institute for Atmospheric and Climate Science, ETH Zurich

05/2018 - 09/2020 **Postdoctoral scientist**
Climate Physics group, Institute for Atmospheric and Climate Science, ETH Zurich

04/2017 - 09/2017 **Visiting scientist**
Center for International Climate Research Oslo (CICERO), Norway

10/2015 - 03/2016 **Visiting scientist**
Chair of Climate System Science, School of Geosciences, University of Edinburgh

10/2014 - 03/2018 **Predoctoral scientist**
Research group ARSCliSys, Wegener Center, University of Graz

Education

03/2018 **Dr. rer. nat. in Climate physics**, University of Graz, Austria
Thesis A new perspective on atmospheric blocking – detection, analysis, and impacts

07/2014 **MSc. in Geophysics**, University of Graz, Austria
Thesis Stratospheric ozone and temperature evolution over the past decades

10/2012 **BSc. in Physics**, University of Graz, Austria
06/2008 School leaving examination

Funded Projects

2024 **High-resolution machine learning for the climate community in Austria**
Austrian Climate Research Programme; 300.000 Euro, June 2024 to May 2027
`https://klimaszenarien.at/projekte/datennutzbarkeit/`

Committee Work, Convening, and Volunteering

2024 - present **ÖKS Scientific Advisory Board**
Austrian Climate Scenarios (`https://klimaszenarien.at/mitwirkende/`)

2024 **Session chair EGU24**
Regional Climate Modeling, Including CORDEX and Constraining Global Multi-Model Ensembles

2024 **Mentor in the EGU mentoring programme**

2023 - 2024 **Member of the University of Vienna sustainability advisory board**
University of Vienna

2022 - 2024 **Member of the steering committee of the Austrian Climate Scenarios**
Klimaszenarien.AT

2021 - 2022 **Climate expert and participant at the Future of the Earth performance**
The Future of the Earth interactive theatre performance

2022 **Session chair CliMatters workshop**
Uncertainty in climate modeling and projections

2019 - 2021 **Board member (president in 2021)**
Club Alpbach Vorarlberg, European Forum Alpbach

2018 - present **Reviewer for scientific journals**
50+ verified reviews on WoS, including for J. Climate, Nature, and Science Advances

Awards and Scholarships

2023 **Wissenschaftspreis des Landes Vorarlberg for young researchers**
Vorarlberger Landesregierung

2022 **Scholarhip as youth representative of the European Forum Alpbach at COP27**
European Forum Alpbach Foundation and Forum Alpbach Network

2018 **Performance scholarship for my PhD project**
University of Graz

2017 - 2018 **Member PRO SCIENTIA**
Österreichisches Studienförderungswerk

2016 - 2018 **Scholarships for the European Forum Alpbach**
Club Alpbach Vorarlberg: 2016 & 2017; European Forum Alpbach Foundation: 2018

2016 **Marietta Blau scholarship**
Austrian Exchange Service

Key Presentations

10/2024 NCKF Climate Research Symposium, Copenhagen (keynote)

07/2024 Universität Freiburg, Freiburg (invited)

04/2024 EGU General Assembly, Vienna (oral presentation)

03/2024 Deutsche Klimatagung, Potsdam (keynote)

02/2024 Climate Analytics, Berlin (invited)

07/2023 IUGG General Assembly, Berlin (oral presentation)

05/2023 Colloquium Leipzig Institute for Meteorology, Leipzig University (invited)

05/2023 Institute for Meteorology colloquium, FU Berlin (invited)

05/2023 Climate statistics and extremes group, University of Hamburg (invited)
03/2023 Global Carbon Budget workshop (keynote)
05/2022 EGU General Assembly (oral presentation)
01/2022 Colloquium Department of Meteorology and Geophysics, University of Vienna (invited)
11/2021 EC-Earth Consortium General Assembly 2021 (keynote)
10/2021 Wegener Center Common Space, University of Graz, Austria (invited)
04/2017 EGU General Assembly (oral presentation)
12/2015 AGU Fall Meeting (oral presentation)

Supervision and Courses

Supervision

ongoing **Land-atmosphere drivers of European heatwaves (working title)**
Supervision of Master's thesis with Jana Sillmann

ongoing **Partitioning uncertainty in climate extreme indices (working title)**
Supervision of Master's thesis with Jana Sillmann

2024 **Effect of climate variability and extremes on heating and cooling energy demand in Canada**
Co-supervision of Master's thesis with Jana Sillmann

2024 **Exploring Classifier Skill in Distinguishing Climate Model and Observational Data**
Supervision of Master's thesis

2024 **Changes in heatwave properties under climate change**
Supervision of Master's thesis with Aiko Voigt

2024 **Extracting forced signals of climate change from daily temperature patterns across scales with CESM2**
Supervision of Bachelor's thesis

2024 **Analyse eines Fehlers in der Definition der Hitzemetrik Cumulative Heat**
Supervision of Bachelor's thesis

2021 **Interannual to decadal precipitation variability in a warming climate: spatial structure and underlying mechanisms**
Co-supervision of Master's thesis with Falvio Lehner

2020 **Assessing climate model uncertainties – an encounter with CMIP6**
Supervision of Bachelor's thesis

2019 **Changes in northern hemisphere blocking occurrence under 2×CO2 based on CESM**
Supervision of Bachelor's thesis

Teaching

2024 - present **Climate Modelling**
Master course, Universität Hamburg (part of the course)

2024 - present **Weather and Climate Extremes**
Master course, Universität Hamburg (part of the course)

2023 - 2024 **Paper club**
Master course, University of Vienna (part of the course)

2022 - 2024 **Numerische Methoden**
Bachelor course, University of Vienna (full course)

2022 - 2024 **Modelling and Data Analysis**
Master course, University of Vienna (part of the course)

2022 - 2024 **Exercises in Introduction to Computational Meteorology**
Master course, University of Vienna (full course)

Selected Outreach Activities and Media Mentions

2024 Guest lecture, Klimarecht im intra- und interdisziplinären Dialog, Faculty of Law, University of Vienna

2024 Guest lecture, Green Finance Seminar, Faculty of Law, University of Vienna

2024 Mentioned in Media: Die Presse
"Irrtum der Experten: Es gibt mehr Hitzetage", `https://www.diepresse.com/18290185/irrtum-der-experten-es-gibt-mehr-hitzetage`

2023 Discussion round: Food for thought, European Forum Alpbach
"Data sparks action: the role of information in tackling the climate crisis"; together with David Jablonski

2023 Guest lecture: Green Finance Seminar, Faculty of Law, University of Vienna
"Naturwissenschaftliche Grundlagen der Klimakrise"

2022 Climate expert and participant at the Future of the Earth interactive theatre performance, Basel

2022 Public lecture: Inspirationstag der Katholischen Kirche Wien
"Naturwissenschafltiche Grundlage der Klimakrise"

2022 Interview in Ö1 public radio
"Wie entstehen Wolken?", `https://oe1.orf.at/programm/20221027/695314/Wie-entstehen-Wolken`

2022 Participation at the Vienna Kinderuni

2022 Article: Rudolphina
`https://rudolphina.univie.ac.at/klimakonferenz-cop27-hitze-duerre-flut-extremwetter-katastrophen`

2021 Climate expert at the Future of the Earth interactive theatre performance, Basel

11.2020 Mentioned in media: Ars Technica
`https://arstechnica.com/science/2020/11/newest-climate-models-shouldnt-raise-future-warming-projections`

02/2017 Mentioned in media: Der Standard (in German)
`https://www.derstandard.at/story/2000051806269/atmosphaerische-blockaden-fuehren-zu-kaelteeinbruechen-im-fruehjahr`

Publications

So far, I have published 20 peer-reviewed articles, which have been cited more than 1500 times according to Google Scholar. My current h-index is 16.

in review **Brunner L.**, Ghosh R., Haimberger L., Hohenegger C., Putrasahan D., Rackow T., Knutti R., and Voigt A.: First climate models simulate global surface temperature patterns indistinguishable from observations, *Science Advances*

in review Nicola M., Phillips A. S., Deser C., Jnglin Wills R. C., Lehner F., Fasullo J., Caron J. M., **Brunner L.**, and Beyerle U.: The updated Multi-Model Large Ensemble Archive and the Climate Variability Diagnostics Package: New tools for the study of climate variability and change, *Geosci. Model Dev. Discuss.*

in review Sobolowski S. et al. (with **Brunner L.**): EURO-CORDEX CMIP6 GCM Selection & Ensemble Design: Best Practices and Recommendations, *BAMS*

11/2024 Nguyen V. D., Vorogushyn S., Nissen K., **Brunner L.**, and Merz B.: A non-stationary climate-informed weather generator for assessing of future flood risks, *Advances in Statistical Climatology, Meteorology and Oceanography*, DOI: `https://doi.org/10.5194/ascmo-10-195-2024`

04/2024 O'Reilly C., **Brunner L.**, Qasmi S., Nogherotto R., Ballinger A., Booth B., Befort D., Knutti R., Schurer A., Ribes A., Weisheimer A., Coppola E., and McSweeney C.: Assessing observational constraints on future European climate in an out-of-sample framework, *npj Climate and Atmospheric Science*, DOI: `https://doi.org/10.1038/s41612-024-00648-8`

03/2024 **Brunner L.** and Voigt A.: Pitfalls in diagnosing temperature extremes, *Nature Communications*,DOI: `https://doi.org/10.1038/s41467-024-46349-x`

08/2023 Merrifield A. L., **Brunner L.**, Lorenz R., Humphrey V., and Knutti R.: Climate model Selection by Independence, Performance, and Spread (ClimSIPS v1.0.1) for regional applications, *Geosci. Model Dev.*, DOI: `https://doi.org/10.5194/gmd-16-4715-2023`

07/2023 **Brunner L.** and S. Sippel: Identifying climate models based on their daily output using machine learning, *Env. Data Sci.*, DOI: `https://doi.org/10.1017/eds.2023.23`

04/2023 Palmer T. E., C. F. McSweeney, B. B. B. Booth, M. D. K. Priestley, P. Davini, **L. Brunner**, L. Borchert, and M. B. Menary (2023): Performance based sub-selection of CMIP6 models for impact assessments in Europe, *Earth Syst. Dynam.*, DOI: `https://doi.org/10.5194/esd-14-457-2023`

10/2022 Gründemann G. J, N. van de Giesen, **L. Brunner**, and R. van der Ent (2022): Rarest rainfall events will see the greatest relative increase in magnitude under future climate change, *communications earth & environment*, DOI: `https://doi.org/10.1038/s43247-022-00558-8`

06/2022 Befort D. J., **Brunner L.**, Borchert L. F., O'Reilly C. H., Mignot J., Ballinger A. P., Hegerl G. C., Murphy J. M.: Combination of decadal predictions and climate projections in time: Challenges and potential solutions, *Geophys. Res. Lett.*, DOI: `https://doi.org/10.1029/2022GL098568`

06/2021 Hegerl, G., A. P. Ballinger, B. Booth, L. F. Borchert, **L. Brunner**, M. Donat, F. Doblas-Reyes, G. Harris, J. Lowe, R. Mahmood, J. Mignot, J. Murphy, D. Swingedouw, and A. Weisheimer (2021): Toward Consistent Observational Constraints in Climate Predictions and Projections, *Front. Clim.*, DOI: `https://doi.org/10.3389/fclim.2021.678109`

11/2021 Sperna Weiland, F. C., R. D. Visser, P. Greve, B. Bisselink, **L. Brunner**, and A. H. Weerts (2021): Estimating Regionalized Hydrological Impacts of Climate Change Over Europe by Performance-Based Weighting of CORDEX Projections. *Front. Water*, DOI: https://doi.org/10.3389/frwa.2021.713537

11/2020 **Brunner, L.**, A. G. Pendergrass, F. Lehner, A. L. Merrifield, R. Lorenz, and R. Knutti: Reduced global warming from CMIP6 projections when weighting models by performance and independence. *Earth Syst. Dynam.*, DOI: https://doi.org/10.5194/esd-11-995-2020

09/2020 **Brunner, L.**, C. McSweeney, A. P. Ballinger, D. J. Befort, M. Benassi, B. B. B. Booth, E. Coppola, H. de Vries, G. Harris, G. C. Hegerl, R. Knutti, G. Lenderink, J. Lowe, R. Nogherotto, C. O'Reilly, S. Qasmi, A. Ribes, P. Stocchi, and S. Undorf: Comparing Methods to Constrain Future European Climate Projections Using a Consistent Framework. *J. Climate*, DOI: https://doi.org/10.1175/jcli-d-19-0953.1

09/2020 Merrifield, A. L., **L. Brunner**, R. Lorenz, and R. Knutti: An investigation of weighting schemes suitable for incorporating large ensembles into multi-model ensembles. *Earth Syst. Dynam.*, DOI: https://doi.org/10.5194/esd-11-807-2020

05/2020 Lehner, F., C. Deser, N. Maher, J. Marotzke, E. Fischer, **L. Brunner**, R. Knutti, and E. Hawkins: Partitioning climate projection uncertainty with multiple Large Ensembles and CMIP5/6. *Earth Syst. Dynam.*, DOI: https://doi.org/10.5194/esd-11-491-2020

09/2019 **Brunner, L.**, R. Lorenz, M. Zumwald, and R. Knutti: Quantifying uncertainty in European climate projections using combined performance-independence weighting. *Env. Res. Let.* DOI: https://doi.org/10.1088/1748-9326/ab492f

06/2018 Unterberger, C., **L. Brunner**, S. Nabernegg, K. Steininger, A. K. Steiner, E. Stabentheiner, S. Monschein and H. Truhetz: Spring frost risk for regional apple production under a warmer climate. *PLoS ONE*, DOI: https://doi.org/10.1371/journal.pone.0200201

01/2018 **Brunner, L.**, N. Schaller, J. Anstey, J. Sillmann and A. K. Steiner: Dependence of present and future European temperature extremes on the location of atmospheric blocking. *Geophys. Res. Lett.*, DOI: https://doi.org/10.1029/2018GL077837

01/2017 **Brunner, L.** and A. K. Steiner: A global perspective on atmospheric blocking using GPS radio occultation – one decade of observations. *Atmos. Meas. Tech.*, DOI: https://doi.org/10.5194/amt-10-4727-2017

11/2016 **Brunner, L.**, G. C. Hegerl and A. K. Steiner: Connecting atmospheric blocking to European temperature extremes in spring. *J. Climate*, DOI: https://doi.org/10.1175/JCLI-D-16-0518.1

04/2016 **Brunner, L.**, A. K. Steiner, B. Scherllin-Pirscher and M. W. Jury: Exploring atmospheric blocking with GPS radio occultation observations. *Atmos. Chem. Phys.*, DOI: https://doi.org/10.5194/acp-16-4593-2016

Other publications

03/2020 **Brunner, L.**, M. Hauser, R. Lorenz, and U. Beyerle: The ETH Zurich CMIP6 next generation archive: technical documentation. DOI: http://doi.org/10.5281/zenodo.3734128

06/2018 Mohankumar, S. E. P., K. Mintz-Woo, M. Damert, **L. Brunner** and J. Eise: Blogging Climate Change: A Case Study, In: Addressing the Challenges in Communication Climate Change Across Various Audiences. DOI: https://doi.org/10.1007/978-3-319-98294-6

04/2018 **Brunner, L.**: A new perspective on atmopsheric blocking from observations – detection, analysis, and impacts (Dissertation). Wegener Center Verlag Graz, Scientific Report Nr. 76-2018, URL: https://wegcwww.uni-graz.at/publ/wegcreports/2018/WCV-SciRep-No76-LBrunner-Jun2018.pdf

06/2014 **Brunner, L.**: Stratospheric ozone and temperature evolution over the past decades (Master's thesis). Wegener Center Verlag Graz, Scientific Report Nr. 59-2014, DOI: http://wegcwww.uni-graz.at/publ/wegcreports/2014/WCV-SciRep-No59-LBrunner-Aug2014_1.pdf

Published Code and Data

Code **Brunner L.** (2024): Code for: "Pitfalls in diagnosing temperature extremes", https://github.com/lukasbrunner/running_window_bias

Dataset & Code **Brunner L.** and S. Sippel (2023): Data and code for "Identifying climate models based on their daily output using machine learning". https://doi.org/10.5281/zenodo.7998436

Dataset Liu, Y, P. Kalverla, F. Alidoost, S. Verhoeven, B. Vreede, B. Booth, E. Coppola, R. Nogherotto, **L. Brunner**, G. Harris, S. Qasmi, A. Ballinger, G. Hegerl, C. McSweeney, C. O'Reilly, T. Palmer, A. Ribes, and H. de Vries (2021): Pre-processed data of atlas in EUCP-WP2 (1.0.1). https://doi.org/10.5281/zenodo.5679560

Code **Climate Model Weighting by Independence and Performance (ClimWIP)**
https://github.com/lukasbrunner/ClimWIP (collaborative project)
https://docs.esmvaltool.org/en/latest/recipes/recipe_climwip.html

Code **A global blocking detection algorithm**
https://github.com/lukasbrunner/blocking

Dataset **Brunner L.**, M. Hauser, R. Lorenz, and U. Beyerle (2020): The ETH Zurich CMIP6 next generation archive: technical documentation. DOI: http://doi.org/10.5281/zenodo.3734128

Dataset **Gridded radio occultation satellite data**
Geopotential Height: https://hdl.handle.net/20.500.11756/e4f48220, Temperature: https://hdl.handle.net/20.500.11756/8245c63e, Specific Humidity: https://hdl.handle.net/20.500.11756/8245c63e