Lukas Brunner

curriculum vitae

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Research

I am passionate about understanding changes in global and regional climate as well as their drivers. My research includes work on the evolution of atmospheric blocking and its impacts, on the analysis of multi-model ensemble projections, and on aspects of model heritage and inter-dependence. I have published several Python packages and I am enthusiastic about all aspects of open science. My work also includes teaching, supervision, project coordination, and public outreach.

Professional Experience

01/2022 - present
Senior scientist, Department of Meteorology and Geophysics, University of Vienna
- Research on atmospheric blocking and temperature extremes
- Research on climate model weighting and evolution of climate models
- Work with climate data in Python and Bash using statistical learning methods
- Development and maintenance of various code repositories using Git
- Presentation of results at international conferences and in scientific journals
- Teaching, supervision of students, and public outreach

05/2018 - 12/2021
Senior scientist, Institute for Atmospheric and Climate Science, ETH Zurich
- Research on the future evolution of global and European climate
- Project coordination and cooperation with partner universities in Europe
- Statistical analysis and visualisation of climate data with Python and Bash
- Development and maintenance of various code repositories using Git
- Presentation of results at international conferences and in scientific journals
- Teaching, supervision of students, and public outreach

10/2014 - 03/2018
Predoctoral scientist, Wegener Center, University of Graz, Austria
- Research with focus on satellite remote sensing using radio occultation
- Research on atmospheric blocking and temperature extremes
- Post-processing and statistical analysis of satellite data with Python
- Presentation of results at international conferences and in scientific journals
- Teaching, interdisciplinary cooperation, and public outreach

Research stays

04/2017 - 09/2017 **Center for International Climate Research (CICERO)**, Norway
- Collaboration with Dr. J. Sillmann and publication of a scientific paper

10/2015 - 03/2016 **School of Geosciences, University of Edinburgh**, United Kingdom
- Collaboration with Prof. G. C. Hegerl and publication of a scientific paper

Internships

06/2014 **Intern**, Abteilung für Luftreinhaltung, Umweltinstitut Bregenz, Austria
- Statistical analysis and visualization of air pollution data with R.

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

Volunteering and Committee Work

2018 - 2021 **Board member (president in 2021)**, Club Alpbach Vorarlberg, Austria
- Fundraising and organisation of scholarships for the European Forum Alpbach
- Organisation of events, management of the Club Alpbach Vorarlberg, and collaboration with the Alpbach Foundation and other clubs

2018 - 2021 **Mittelbau representative**, Insitute for Atmosphere and Climate, ETH Zurich
- Organisation of events and contact person for internal issues

2018 - present **Reviewer for scientific journals**
`https://publons.com/researcher/3679169/lukas-brunner/peer-review/`

2016 - 2018 **Volunteer**, Caritas Graz, Austria
- Support of clients in an Open Learning Center

2016-2017 **Volunteer**, University of Graz historical meteorological station, Austria
- Station upkeep and measurement of meteorological parameters

2012 - 2018 **Student representative**, University of Graz, Austria
- Representation in several committees; Speaker of my doctoral programme

Awards and scholarships

2018 Performance scholarship for my PhD project, University of Graz, Austria
2018 Scholarship as seminar assistant for the European Forum Alpbach 2018, European Forum Alpbach Foundation, Austria

2017 - 2018 Member PRO SCIENTIA, Österreichisches Studienförderungswerk, Austria

2016 - 2017 Scholarship for the European Forum Alpbach 2016 & 2017, Club Alpbach Vorarlberg

2016 Marietta Blau Scholarship, Austrian Exchange Service

2009 - 2013 Performance scholarships (3 times), University of Graz, Austria

Invited talks

11/2021 **Keynote**, EC-Earth Consortium General Assembly 2021 (virtual)
Uncertainties in multi-model assessments of future climate

10/2021 **Invited talk**, Wegener Center Common Space (virtual), University of Graz, Austria
Weighting models by performance and independence: effects on projections of future climate

Interestes and Skills

Languages German (native), English (fluent in speaking, reading, writing)

Systems Advanced: Linux, Microsoft Windows

Coding Advanced: Python, Bash; Proficient: `C++`, R, SQL

Software LaTeX, Git, SVN, CDO, Office applications

Hobbies Holder of the 2. Dan in Shotokan Karate; Hiking and Skiing enthusiast

Supervision and Courses

2019 - present **Supervision of Bachelor and Master students**

- Master's Thesis: Interannual to decadal precipitation variability in a warming climate: spatial structure and underlying mechanisms (co-supervision)
- Bachelor Thesis: Assessing climate model uncertainties – an encounter with CMIP6
- Bachelor Thesis: Changes in northern hemisphere blocking occurrence under 2×CO2 based on CESM

2020 - 2021 **Exercises in Systemanalyse**, Bachelor course, ETH Zurich

- Organisation of courses for over 200 students
- Generation of exercises and preparation of the course instructors

2016 - 2018 **Exercises in Methods of Modeling and Simulation with Python**
Master course, University of Graz, Austria (part of the course)

2016 - 2018 **Exercises Introduction to Meteorology and Climate Physics**
Bachelor course, University of Graz, Austria (full course)

2016 **Seminar Selected Topics in Atmosphere and Climate Physics**
Master course, University of Graz, Austria (part of the course)

Published Code and Data

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`

Media Coverage and Public Outreach

11.2020 **Ars Technica**: Newest climate models shouldn't raise future warming projections (`https://arstechnica.com/science/2020/11/newest-climate-models-shouldnt-raise-future-warming-projections`)

02/2017 **Der Standard** (German): Atmosphärische Blockaden führen zu Kälteeinbrüchen im Frühjahr (`https://www.derstandard.at/story/2000051806269/atmosphaerische-blockaden-fuehren-zu-kaelteeinbruechen-im-fruehjahr`)

Publications

Peer-Reviewed

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.*, 3, 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*, 3, 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.*, 11(4), 995–1012, 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*, 33(20), 8671–8692, 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.*, 11, 807-834, 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.*, 11, 491-508, 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*, 13, 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.*, 45, 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.*, 10, 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*, 30.2, 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.* 16, 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