

THOMAS BIRNER

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EMPLOYMENT

- | | |
|-------------------|---|
| 01/2009 – present | Assistant Professor, Department of Atmospheric Science, Colorado State University, Fort Collins, CO, USA. |
| 10/2008 – 12/2008 | Senior Research Scientist, Department of Atmospheric Science, Colorado State University, Fort Collins, CO, USA. |
| 09/2004 – 09/2008 | Postdoctoral Fellow, Department of Physics, University of Toronto, Toronto, ON, Canada (Supervisors: Dr. Theodore G. Shepherd, Dr. Norman A. McFarlane) |
| 11/2003 – 08/2004 | Postdoctoral Fellow, Department of Meteorology, University of Reading, Reading, UK (Supervisors: Dr. John Thuburn, Dr. George C. Craig) |
| 12/1999 – 10/2003 | Doctorand, Institut für Physik der Atmosphäre, DLR Oberpfaffenhofen, Weßling, Germany (Supervisors: Dr. Andreas Dörnbrack, Dr. Ulrich Schumann) |

EDUCATION

- | | |
|---------|---|
| 12/2003 | Ph.D. (Dr. rer. nat.), Meteorology, Ludwig-Maximilians-Universität München, Germany |
| 11/1999 | M.S. (Diplom), Physics, Universität Leipzig, Germany |

HONORS

- NSF Faculty Early Career Development (CAREER) Award, 2012-2017
- Outstanding Professor of the Year Award by the Graduate Students (2011), Department of Atmospheric Science, Colorado State University
- Roger Daley Postdoctoral Publication Award 2006 (awarded by the Canadian Meteorological and Oceanographic Society)
- Hugo-Denkmeier Award 2004 (for PhD thesis, awarded by Deutsches Zentrum für Luft und Raumfahrt)

PUBLICATIONS

(supervised students or postdocs marked by asterisks)

Submitted

- *Kim, J., W. J. Randel, **T. Birner**, M. Abalos, Spectrum of wave forcing associated with the annual cycle of upwelling at the tropical tropopause, submitted to *J. Atmos. Sci.*, March 2015.
- Jones, D. C., T. Ito, **T. Birner**, A. Klockner, D. Munday, Planetary-geometric constraints on isopycnal slope in the Southern ocean, submitted to *J. Phys. Oceanogr.*, February 2015.

Peer-reviewed

- [35] Butler, A. H., D. J. Seidel, S. C. Hardiman, N. Butchart, **T. Birner**, A. Match*, Defining sudden stratospheric warmings, *Bull. Amer. Meteor. Soc.*, in press, 2015.
- [34] Ploeger, F., M. Abalos, **T. Birner**, P. Konopka, B. Legras, R. Müller, M. Riese, Quantifying the effects of mixing and residual circulation on trends of stratospheric mean age of air, *Geophys. Res. Lett.*, 42, doi:10.1002/2014GL062927, 2015.
- [33] Konopka, P., F. Ploeger, M. Tao, **T. Birner**, M. Riese, Hemispheric asymmetries and seasonality of mean age of air in the lower stratosphere: Deep versus shallow branch of the Brewer-Dobson circulation, *J. Geophys. Res.*, 119, doi:10.1002/2014JD022429, 2015.
- [32] **Birner, T.**, S. M. Davis, D. J. Seidel, The changing width of Earth's tropical belt, *Physics Today*, 67, 12, 38-44, 2014.
- [31] *Sjoberg, J. P., **T. Birner**, Stratospheric wave-mean flow feedbacks and sudden stratospheric warmings in a simple model forced by upward wave-activity flux, *J. Atmos. Sci.*, 71, 4055-4071, 2014.
- [30] *Albers, J. R., **T. Birner**, Relative roles of planetary and gravity waves in vortex preconditioning prior to sudden stratospheric warmings, *J. Atmos. Sci.*, 71, 4028-4054, 2014.
- [29] Garny, H., **T. Birner**, H. Bönisch, F. Bunzel, The effects of mixing on age of air, *J. Geophys. Res.*, 119, doi:10.1002/jgrd.021417, 2014.
- [28] **Birner, T.**, D. W. J. Thompson, T. G. Shepherd, Up-gradient eddy fluxes of potential vorticity near the subtropical jet, *Geophys. Res. Lett.*, 40, doi:10.1002/2013GL057728, 2013.
- [27] *Davis, N. A., **T. Birner**, Seasonal to multi-decadal variability of the width of the tropical belt, *J. Geophys. Res.*, 118, doi:10.1002/jgrd.50610, 2013.
- [26] Charlton-Perez, A. J., et al. (27 co-authors including **T. Birner**), On the lack of stratospheric dynamical variability in low-top versions of the CMIP5 models, *J. Geophys. Res.*, 118, doi:10.1002/jgrd.50125, 2013. [note the supplementary material]

- [25] *Paulik, L. C., **T. Birner**, Quantifying the deep convective temperature signal within the tropical tropopause layer (TTL), *Atmos. Chem. Phys.*, 12, 12183-12195, doi:10.5194/acp-12-12183-2012, 2012.
- [24] *Sjoberg, J. P., **T. Birner**, Transient tropospheric forcing of sudden stratospheric warmings, *J. Atmos. Sci.*, 69, 3420-3432, 2012.
- [23] Thompson, D. W. J., **T. Birner**, On the linkages between the tropospheric isentropic slope and eddy fluxes of heat during Northern Hemisphere winter, *J. Atmos. Sci.*, 69, 1811-1823, 2012.
- [22] Butler, A. H., D. W. J. Thompson, **T. Birner**, Isentropic slopes, downgradient eddy fluxes, and the extratropical atmospheric response to tropical tropospheric heating, *J. Atmos. Sci.*, 68, 2292-2305, 2011.
- [21] Gettelman, A., P. Hoor, L. L. Pan, W. J. Randel, M. I. Hegglin, **T. Birner**, The extratropical upper troposphere and lower stratosphere, *Rev. Geophys.*, 49, RG3003, doi:10.1029/2011RG000355, 2011.
- [20] Bönisch, H., A. Engel, **T. Birner**, P. Hoor, D. W. Tarasick, E. A. Ray, On the structural changes in the Brewer-Dobson circulation after 2000, *Atmos. Chem. Phys.*, 11, 3937-3948, 2011. [selected for research highlight in *Nature Geosci.*]
- [19] **Birner, T.**, H. Bönisch, Residual circulation trajectories and transit times into the extratropical lowermost stratosphere, *Atmos. Chem. Phys.*, 11, 817-827, doi:10.5194/acp-11-817-2011, 2011.
- [18] **Birner, T.**, Recent widening of the tropical belt from global tropopause statistics: Statistics, *J. Geophys. Res.*, 115, D23109, doi:10.1029/2010JD014664, 2010.
- [17] Gettelman, A., et al. (37 co-authors including **T. Birner**), Multi-model assessment of the upper troposphere and lower stratosphere: tropics and trends, *J. Geophys. Res.*, 115, D00M08, doi:10.1029/2009JD013638, 2010.
- [16] **Birner, T.**, Residual Circulation and Tropopause Structure, *J. Atmos. Sci.*, 67, 2582-2600, 2010.
- [15] Grise, K. M., D. W. J. Thompson, **T. Birner**, A global survey of static stability in the upper troposphere and lower stratosphere, *J. Climate*, 23, 2275-2292, 2010.
- [14] Davoudi, J., N. A. McFarlane, **T. Birner**, Fluctuation of mass flux in a cloud resolving simulation with interactive radiation, *J. Atmos. Sci.*, 67, 400-418, 2010.
- [13] Bönisch, H., A. Engel, J. Curtius, **T. Birner**, P. Hoor, Quantifying transport into the lowermost stratosphere using simultaneous in-situ measurements of SF6 and CO2, *Atmos. Chem. Phys.*, 9, 5905-5919, 2009.
- [12] Gettelman, A., **T. Birner**, V. Eyring, et al., The tropical tropopause layer 1960–2100, *Atmos. Chem. Phys.*, 9, 1621-1637, 2009.

- [11] Son, S.–W., L. M. Polvani, D. W. Waugh, **T. Birner**, H. Akiyoshi, R. R. Garcia, A. Gettelman, D. A. Plummer, E. Rozanov, The impact of stratospheric ozone recovery on tropopause height trends, *J. Climate*, 22, 429–445, 2009.
- [10] **Birner, T.**, P. D. Williams, Sudden stratospheric warmings as noise-induced transitions, *J. Atmos. Sci.*, 65, 3337–3343, 2008.
- [9] Gettelman, A., **T. Birner**, Insights into tropical tropopause layer processes using global models, *J. Geophys. Res.*, 112, D23104, doi:10.1029/2007JD008945, 2007.
- [8] **Birner, T.**, D. Sankey, T. G. Shepherd, The tropopause inversion layer in models and analyses, *Geophys. Res. Lett.*, 33, L14804, doi:10.1029/2006GL026549, 2006.
- [7] **Birner, T.**, Fine-scale structure of the extratropical tropopause region, *J. Geophys. Res.*, 111, D04104, doi:10.1029/2005JD006301, 2006.
- [6] Küpper, C., J. Thuburn, G. C. Craig, **T. Birner**, Mass and water transport into the tropical stratosphere: a cloud-resolving simulation, *J. Geophys. Res.* 109, D10111, doi:10.1029/2004JD004541, 2004.
- [5] Larsen, N., et al., Microphysical mesoscale simulations of polar stratospheric cloud formation constrained by in situ measurements of chemical and optical cloud properties, *J. Geophys. Res.* 107(D20), 8301, doi:10.1029/2001JD000999, 2002.
- [4] Dörnbrack, A., **T. Birner**, A. Fix, H. Flentje, A. Meister, H. Schmid, E. V. Browell, M. J. Mahoney, Evidence for inertia gravity waves forming polar stratospheric clouds over Scandinavia, *J. Geophys. Res.* 107(D20), 8287, doi:10.1029/2001JD000452, 2002.
- [3] **Birner, T.**, A. Dörnbrack, U. Schumann, How sharp is the tropopause at midlatitudes? *Geophys. Res. Lett.* 29(14), 1700, doi:10.1029/2002GL015142, 2002.
- [2] **Birner, T.**, K. Lippert, R. Müller, A. Kühnel, U. Behn, Critical behavior of nonequilibrium phase transitions to magnetically ordered states, *Phys. Rev. E* 65, 046110, 2002.
- [1] Kivi, R., E. Kyrö A. Dörnbrack, **T. Birner**, Observations of vertically thick polar stratospheric clouds and record low temperature in the Arctic vortex, *Geophys. Res. Lett.* 28(19), 3661–3664, 2001.

Conference proceedings

- Flentje, H., **T. Birner**, G. Poberaj, 2002: On the formation of NAT particles in the Arctic stratosphere. In *Lidar Remote Sensing in Atmospheric and Earth Science*, pp. 419–422, ILRC 21, Quebec, Canada.
- **Birner, T.**, A. Dörnbrack, 2001: A ten year climatology of stratospheric gravity wave activity above Southern Germany, In *Proc. SPARC 2000 General Assembly*.
- Lippert, K., R. Müller, **T. Birner**, A. Kühnel, U. Behn, 2000: Noise induced phase transitions in spatially extended systems, In *Proc. Bogolyubov Conference 'Problems of theoretical and mathematical physics'*, 27 September – 6 October 1999, Eds. V. G.

Kadyshevsky, A. N. Sissakian, in: Physics of elementary particles and atomic nuclei, Vol. 31, part 7B, pp 150–155 (2000).

Miscellaneous

- Bönisch, H., P. Hoor, **T. Birner**, P. Konopka, HALO - UTLS workshop 21-23 September 2011, Glashütten, Germany, in SPARC Newsletter No. 39, pp. 27–35, July 2012.
- Barth, M., **T. Birner**, N. McFarlane, D. Pendlebury, J. Petch, Modelling of Deep Convection and Chemistry and their Roles in the Tropical Tropopause Layer: SPARC-GEWEX/GCSS-IGAC Workshop, in SPARC Newsletter No. 28, pp. 7–12, January 2007.
- **Birner, T.**, The extratropical tropopause region, PhD thesis, University of Munich, 2003. (in German)
- **Birner, T.**, A. Dörnbrack, and T. Schoenemeyer, Mountain-wave induced polar stratospheric clouds, TerraFLOPS, Issue Number 3 – October 2002.
- **Birner, T.**, Noise induced phase transitions in systems of harmonically coupled Stratonovich-Models, Diploma thesis, University of Leipzig, 1999. (in German)

SERVICE

- Co-Convener, AGU Chapman Conference: The Width of the Tropics: Climate Variations and Their Impacts, to be held July 2015
- Working group member of SPARC Reanalysis Intercomparison Project (S-RIP), Chapter Co-Lead for Chapter 5: Brewer-Dobson Circulation, ongoing
- Co-Convener, UTLS sessions at EGU General Assembly, Vienna, Austria, 2008–2014
- Co-Convener, UTLS session at AGU Fall Meeting, San Francisco, CA, USA, 2010, 2012
- Co-organization of joint SPARC-GEWEX/GCSS-IGAC workshop “Modelling of Deep Convection and of Chemistry and their Roles in the Tropical Tropopause Layer”, Victoria, BC, Canada, June 2006
- Contributing author on SPARC CCMVal report (2010), Chapter 7 (“Upper Troposphere and Lower Stratosphere”)
- Co-instructor for CMMAP teacher course on weather and climate, 2011–2013
- regular Journal reviews for: *Atmospheric Chemistry and Physics (and Discussions)*, *Geophysical Research Letters*, *Journal of Climate*, *Journal of Geophysical Research*, *Journal of the Atmospheric Sciences*
- Book review (for Bulletin of the American Meteorological Society, June 2009): The global circulation of the atmosphere, T. Schneider and A. H. Sobel, Eds., 2007, 385 pp., Princeton University Press.
- Proposal reviews for: *Department of Energy, National Science Foundation, Natural Sciences and Engineering Research Council of Canada, German Research Foundation, National Research Foundation France, NASA Postdoctoral Program*

- External Ph. D. Thesis Reviewer for Marta Abalos, University of Madrid, Spain (2013)
- External Collaborator for Helmholtz Association (Germany) Young Investigators Group “Middle Atmosphere Effects on Climate Change” (MACClim) – lead by Dr. Hella Garny

TEACHING / MENTORING

Classes taught at CSU

- ATS350, Introduction to Weather and Climate (2009, 2011, 2012, 2013)
- ATS601, Atmospheric Dynamics I (2009, 2010, 2011, 2012, 2013, 2014)
- ATS708, Middle Atmosphere Dynamics (2010, 2014)

Teaching Assistant

- Classical mechanics, Electrodynamics, 1998/1999 (University of Leipzig, Germany)

Current Graduate Students

- Edward Charlsworth (M. S.)
- Anne Glanville (M. S.)
- Kathryn Boyd (Ph. D., jointly with Prof. Meena Balgopal, School of Education)
- Nicholas Davis (Ph.D.)

Current PostDocs

- John Albers (NSF fellowship, jointly supervised with Judith Perlwitz, NOAA Boulder)
- Joowan Kim (jointly supervised with William Randel, NCAR Boulder)

Completed Degrees (Primary Thesis Advisor)

- Erin Dagg (M. S. 2015, jointly with Prof. Richard Johnson)
- Nicholas Davis (M.S. 2013)
- Laura Paulik (M. S. 2011)
- Jeremiah Sjoberg (M. S. 2010, Ph. D. 2014)

Graduate Student Committees, Member

- Oladapo Aseperi (Ph. D. in progress, Civil and Environ. Eng.)
- Marie McGraw (M. S. in progress)
- Chengji Liu (Ph. D. in progress)
- Amrapalli Garanaik (Ph. D. in progress)
- Christopher Eldred (Ph. D. in progress)
- Jonathan Woodworth (M. S. 2013)
- Farid Karimpour (Ph. D. 2014, Civil and Environ. Eng.)
- Jordan Wilson (Ph. D. 2014, Civil and Environ. Eng.)
- Alex Gonzales (Ph. D. in progress)
- Michal Clavner (Ph. D. in progress)

- Gabriela Mora Rojas (Ph. D. 2013)
- Daniel Jones (Ph. D. 2013)
- Brant Dodson (Ph. D. 2013)
- Adam Rydbeck (M. S. 2012, Ph. D. in progress)
- Kevin Grise (Ph. D. 2011)

Other Mentoring Activities

- Visiting M.S. Student Louis Rivoire, Université Pierre-et-Marie-Curie (UPMC), Paris, France (2015)
- Visiting Ph. D. Student Guadalupe Saenz Garcia, Universidad de Extremadura, Spain (2010)
- Undergraduate CMMAP Summer Interns (Bryce Currey 2014, Aaron Match 2013, Steven Brey 2012, Jason Keefer 2011)
- Several Interns at University of Toronto (2006–2007) and DLR, Germany (2000–2003)

GRANTS / FUNDING

- Stochastic Dynamics of Sudden Stratospheric Warmings, National Science Foundation, \$388,183 + \$48,501 supplemental funding, 12/2010-11/2014
- CAREER: Multiscale Dynamics of the Tropical Upper Troposphere and Lower Stratosphere, National Science Foundation, \$702,252, 02/2012-01/2017
- Multiscale Variability of the Tropical Tropopause Layer during AMIE, Department of Energy, Co-PI with PI Richard Johnson (CSU), \$174,042 (Co-PI portion), 09/2012-08/2015
- Quantifying Thermal Variability of the UTLS Using GPS Radio Occultation Data, NASA, Co-I with PI William Randel (NCAR), \$20,319 (Co-I portion), 11/2012-08/2015
- GPS Radio Occultation Data for Climate Model Comparison, NASA, Co-I with PI Chi Ao (JPL), \$100,403 (Co-I portion), 01/2014-12/2015

CONTRIBUTIONS TO CONFERENCES & WORKSHOPS

- (**Invited**) Tropopausen-Inversionsschicht: Ursachen und Wirkungen (Tropopause Inversion Layer: Causes and Effects), Festkolloquium, 70th Birthday of Prof. Dr. Ulrich Schumann, German Aerospace Center (DLR), Oberpfaffenhofen, Germany, March 2015. (**talk**)
- (**Invited**) Multiscale dynamics in the TTL, Strateole-2 workshop, Paris, France, March 2015. (**talk**)
- Sudden stratospheric warmings and anomalous upward wave activity flux, AMS 18th Conference on the Middle Atmosphere, Phoenix, AZ, January 2015. (**talk**)

- Richard Assmann and the Discovery of the Stratosphere, AMS 18th Conference on the Middle Atmosphere, Phoenix, AZ, January 2015. (**talk**)
- Dynamics of up-gradient eddy fluxes of potential vorticity near the tropopause and synoptic-planetary scale interactions, EGU General Assembly, Vienna, Austria, May 2014. (**talk**)
- Temperature structure of the tropical tropopause layer in radiative-convective equilibrium, EGU General Assembly, Vienna, Austria, May 2014. (**poster**)
- (**Invited**) Stratosphere-troposphere coupling, downward control, eddy feedbacks, and all that, AGU Fall Meeting, San Francisco, CA, December 2013. (**talk**)
- (**Invited**) Processes governing the temperature structure of the tropical tropopause layer, AGU Fall Meeting, San Francisco, CA, December 2013. (**talk**)
- How does polar winter stratospheric variability affect the troposphere?, CEDAR SSW workshop, Boulder, CO, USA, June 2013. (**talk**)
- A mechanism for up-gradient eddy fluxes of potential vorticity near the subtropical jet, AMS AOFD Meeting, Newport, RI, USA, June 2013. (**talk**)
- Temperature structure of the tropical tropopause layer in radiative-convective equilibrium, AMS Middle Atmosphere Meeting, Newport, RI, USA, June 2013. (**talk**)
- (**Invited**) Structure of the tropopause region from high-vertical resolution radiosonde (HVRR) observations, Workshop on research applications of HVRR data, SUNY Stony Brook, New York, USA, May 2013. (**talk**)
- (**Invited**) Stratospheric impact on tropical tropopause temperatures, SPARC dynvar workshop, Reading, UK, April 2013. (**talk**)
- (**Invited**) Quantifying the deep convective temperature signal within the tropical tropopause layer (TTL), Convection Workshop, CSU, Fort Collins, CO, USA, November 2012. (**talk**)
- Quantifying the deep convective temperature signal within the tropical tropopause layer (TTL) using co-located measurements from CloudSat and COSMIC, COSMIC Workshop, Boulder, CO, USA, October 2012. (**talk**)
- Quantifying the deep convective temperature signal within the tropical tropopause layer (TTL), TTL Workshop, Honolulu, HI, USA, October 2012. (**talk**)
- (**Invited**) Structural characteristics of the Brewer-Dobson circulation and implications for lower stratospheric transport, SHARP-II Kickoff Meeting, DLR Wessling, Germany, July 2012. (**talk**)
- (**Invited**) Brewer-Dobson circulation and tropopause structure, SPARC Workshop on the Brewer-Dobson Circulation, Grindelwald, Switzerland, June 2012. (**talk**)
- Structural characteristics of the Brewer-Dobson circulation, SPARC Workshop on the Brewer-Dobson Circulation, Grindelwald, Switzerland, June 2012. (**poster**)

- Tropospheric wave activity preceding and following sudden stratospheric warmings, Workshop on Sudden Stratospheric Warming and its Role in Weather and Climate Variations, Kyoto, Japan, February 2012. (**talk**)
- (**Invited**) Dynamics and transport in the UTLS: Open questions, HALO SPP topical workshop – UTLS, Glashütten, Germany, September 2011. (**talk**)
- (**Invited**) Large-scale heat budget of the tropical tropopause layer, IUGG General Assembly, Melbourne, Australia, July 2011. (**talk**)
- Toward understanding the dynamics of stratosphere-troposphere coupling, IUGG General Assembly, Melbourne, Australia, July 2011. (**talk**)
- Counter-gradient eddy fluxes of potential vorticity near the subtropical jet, AMS AOFD meeting, Spokane, WA, USA, June 2011. (**talk**)
- (**Invited**) Direct and indirect convective signatures in the tropical upper troposphere / lower stratosphere, Convection Workshop, CSU, Fort Collins, CO, USA, May 2011. (**talk**)
- Recent widening of the tropical belt from global tropopause statistics: robustness and sensitivities, AGU fall meeting, San Francisco, CA, USA, December 2010. (**poster**)
- Impact of stratospheric dynamics on global tropopause structure, Dynvar workshop, NOAA, Boulder, CO, USA, November 2010. (**talk**)
- Residual circulation trajectories and transit times into the extratropical lowermost stratosphere, 44th Annual CMOS Congress, Ottawa, ON, Canada, June 2010. (**talk**)
- (**Invited**) Recent widening of the tropical belt from global tropopause statistics, 44th Annual CMOS Congress, Ottawa, ON, Canada, June 2010. (**talk**)
- Residual circulation trajectories and transit times into the extratropical lowermost stratosphere, EGU General Assembly, Vienna, Austria, May 2010. (**poster**)
- Stratospheric dynamics and tropopause structure, EGU General Assembly, Vienna, Austria, May 2010. (**poster**)
- Residual circulation trajectories and transit times into the extratropical lowermost stratosphere, AGU fall meeting, San Francisco, CA, USA, December 2009. (**talk**)
- Residual circulation and tropopause structure, UTLS workshop, NCAR, Boulder, CO, USA, October 2009. (**talk**)
- (**Invited**) The tropopause inversion layer, SPARC 2008 General Assembly, Bologna, Italy, September 2008. (**talk**)
- Sudden stratospheric warmings as noise-induced transitions, SPARC 2008 General Assembly, Bologna, Italy, September 2008. (**poster**)
- Trends in global tropopause parameters, 2nd annual C-SPARC workshop, Toronto, ON, Canada, December 2007. (**talk**)

- **(Invited)** Stratospheric residual circulation and tropopause structure, Chapman Conference on The Role of the Stratosphere in Climate and Climate Change in Santorini, Greece, September 2007. (**talk**)
- Sudden stratospheric warmings as noise-induced transitions, Chapman Conference on The Role of the Stratosphere in Climate and Climate Change in Santorini, Greece, September 2007. (**poster**)
- **(Invited)** Heat budget of the extratropical tropopause region, DACH Meteorologentagung in Hamburg, Germany, September 2007. (**talk**)
- Sudden stratospheric warmings as noise-induced transitions, DACH Meteorologentagung in Hamburg, Germany, September 2007. (**talk**)
- Coupling of the residual circulation and static stability in the lowermost extratropical stratosphere, AMS 14th conference on the middle atmosphere in Portland, OR, USA, August 2007. (**talk**)
- Heat budget of the tropical tropopause layer, PIMS workshop in Victoria, BC, Canada, July 2007. (**talk**)
- Variability and trends in global tropopause parameters, CCMVal workshop in Leeds, U.K., June 2007. (**talk**)
- Thermal characteristics of the tropical tropopause layer in observations and GCMs, AGU Fall Meeting, San Francisco, CA, USA, December 2006. (**talk**)
- Data assimilation smoothes the strong observed curvature of temperature around the tropopause, AGU Fall Meeting, San Francisco, CA, USA, December 2006. (**poster**)
- Thermal characteristics of the tropical tropopause layer in observations and models, 1st annual C-SPARC workshop, Toronto, ON, Canada, December 2006. (**talk**)
- **(Invited)** Issues in modelling the vertical temperature structure around the (tropical) tropopause, SPARC Data Assimilation Workshop, Noordwijk, The Netherlands, October 2006. (**talk**)
- The thermal structure of the tropical tropopause layer in observations and models, SPARC-GEWEX/GCSS-IGAC TTL workshop, Victoria, BC, Canada, June 2006. (**poster**)
- Dehydration in the tropical tropopause layer of a cloud-resolving model, SPARC-GEWEX/GCSS-IGAC TTL workshop, Victoria, BC, Canada, June 2006. (**poster**)
- The tropopause inversion layer in models and analyses, 40th CMOS Congress, Toronto, ON, Canada, May 2006. (**talk**)
- The thermal structure of CMAM’s tropopause region (UTLS), 13th annual MAM/GCC workshop in Toronto, ON, Canada, December 2005. (**talk**)
- The thermal structure of the UTLS in observations and models, CCMVal workshop in Boulder, CO, USA, October 2005. (**poster**)

- Dehydration in the tropical tropopause layer of a cloud-resolving model, AMS Conference in Cambridge, MA, USA, June 2005. (**poster**)
- Potential vorticity homogenization and the extratropical tropopause, AMS Conference in Cambridge, MA, USA, June 2005. (**talk**)
- A high-resolution climatology of the extratropical tropopause region, 12th annual MAM/GCC workshop in Toronto, ON, Canada, December 2004. (**talk**)
- The extratropical tropopause inversion, Global Circulation of the Atmosphere Conference, Pasadena, CA, USA, November 2004. (**poster**)
- Potential vorticity homogenization and the extratropical tropopause, Global Circulation of the Atmosphere Conference, Pasadena, CA, USA, November 2004. (**poster**)
- The extratropical tropopause inversion, SPARC 2004 General Assembly, Victoria, BC, Canada, August 2004. (**poster**)
- Dehydration in the tropical tropopause layer of a cloud-resolving model, SPARC 2004 General Assembly, Victoria, BC, Canada, August 2004. (**talk**)
- Potential vorticity homogenization and the extratropical tropopause, EGU 1st General Assembly, Nice, France, April 2004. (**talk**)
- A cloud-resolving model study of the mass and water transport into the tropical stratosphere, EGU 1st General Assembly, Nice, France, April 2004. (**poster**)
- The sharpness of the extratropical tropopause, EGS/AGU/EUG Meeting, Nice, France, April 2003. (**talk**)
- Large-amplitude stratospheric gravity waves, AMS Mountain Meteorology Conference, Park City, Utah, June 2002. (**poster**)
- How sharp is the tropopause at midlatitudes?, EGS Meeting, Nice, France, April 2002. (**talk**)
- Sources of stratospheric gravity wave activity above Southern Germany: radiosonde data and model results, 8th scientific Assembly of the IAMAS, Innsbruck, Austria, July 2001. (**talk**)
- A ten year climatology of stratospheric gravity wave activity above Southern Germany, MAP Meeting 2001, Schliersee, Germany, May 2001. (**poster**)
- A ten year climatology of stratospheric gravity wave activity above Southern Germany, SPARC 2000 General Assembly, Mar del Plata, Argentina, November 2000. (**poster**)
- N.B. this only lists first authored contributions

SEMINARS

- University of Southern Florida, College of Marine Science, St. Petersburg, FL, USA, February 2015.
- Princeton University, Princeton, NJ, USA, February 2015.
- NCAR, Atmospheric Chemistry Division, Boulder, CO, USA, July 2014.
- CSU/CMMAP summer intern program, Fort Collins, CO, USA, June 2014.
- Columbia University, Department of Applied Physics and Applied Mathematics, New York, NY, USA, October 2013.
- MIT, EAPS, PAOC, Cambridge, MA, USA, September 2013.
- NCAR, Atmospheric Chemistry Division, Boulder, CO, USA, June 2013.
- NCAR, Atmospheric Chemistry Division, Boulder, CO, USA, February 2013.
- University of Tokyo, Department of Earth and Planetary Science, Tokyo, Japan, February 2012.
- Texas A&M, Department of Atmospheric Science, College Station, TX, USA, April 2011.
- CU Boulder, ATOC, Boulder, CO, April 2011.
- IAP Kühlungsborn, Germany, March 2011.
- IFM-GEOMAR, Kiel, Germany, March 2011.
- Institut für Physik der Atmosphäre, Johannes Gutenberg–Universität Mainz, Germany, March 2011.
- New York University, Courant Institute, CAOS, New York, NY, USA, November 2010.
- MIT, EAPS, PAOC, Cambridge, MA, USA, November 2010.
- NOAA Earth System Research Laboratory, Chemical Sciences Division, Boulder, CO, USA, August 2010.
- NCAR, Atmospheric Chemistry Division, Boulder, CO, USA, August 2010.
- Institut für Meteorologie, Freie Universität Berlin, Germany, May 2010.
- Department of Atmospheric Science, Colorado State University, Fort Collins, CO, USA, December 2009.
- Atmospheric Chemistry Division (ACD), National Center for Atmospheric Research (NCAR), Boulder, CO, USA, March 2009.
- Institut für Chemie und Dynamik der Geosphäre, Forschungszentrum Jülich, Germany, November 2008.

- Institut für Meteorologie, Universität Leipzig, Germany, October 2008.
- Department of Atmospheric Science, Colorado State University, CO, USA, April 2007.
- Institut für Physik der Atmosphäre, DLR Oberpfaffenhofen, Germany, January 2007.
- Meteorologisches Institut, Ludwig Maximilians–Universität München, Germany, January 2007.
- Institut für Physik der Atmosphäre, Johannes Gutenberg–Universität Mainz, Germany, January 2007.
- Alfred Wegner Institut, Potsdam, Germany, January 2007.
- Climate Modelling Group, School of Earth and Ocean Sciences, University of Victoria, BC, Canada, June 2006.
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