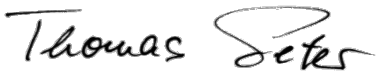
Thomas PETER – Curriculum Vitae

Personal Information		Born 21 January 1958 Married to Dr. Anke Hannemann, Meteorologist (1992) Three children: Maike (1992), Robin (1996), Ronya (1999) ResearcherID: https://www.webofscience.com/wos/author/record/B-2529-2018 ORCID: https://orcid.org/0000-0002-7218-7156
Tertiary Education	1980	BSc in Physics and Mathematics (Vordiplom), University of Marburg, Germany
	1981/82	MSc studies in Physics, University of Maryland, USA
	1985	MSc in Physics (Diplom, summa cum laude), Technical Univ. Munich, Germany
	1988	PhD in Physics (magna cum laude), Technical University Munich, Germany Thesis title "Plasma physics of ion stopping in matter" Max Planck Institute (MPI) for Quantum Optics, Garching, Germany
Distinctions and Honours	1981/82	Fulbright Fellow, University of Maryland, Maryland, U.S.A.
	Oct. 1987	Post-Graduate Fellow, Acad. Sci. USSR, Lebedev Physics Institute, Moscow, USSR
	1995	Leader of the "Junior Group for Aerosol Chemistry and Microphysics" at MPI for Chemistry, Mainz, Germany
	1999	Member of Academia Europaea
	2002	Charney Lecturer, AGU Spring Meeting, Baltimore, MD, U.S.A.
	2010	Distinguished Lecturer, "The Golden Owl", ETH Zurich, Switzerland
	2013	Elected Head of Department of Environmental System Science, ETH Zurich
Employment Record	1988-1990	Scientific staff at MPI for Quantum Optics, Munich, Germany
	1990-1994	Scientific staff at MPI for Chemistry, Mainz, under Prof. Paul Crutzen
	Since1999	Professor for atmospheric chemistry, ETH Zurich, Switzerland, retired in 2023
	2012/2013	Sabbatical (1 yr) at NOAA, Boulder, Colorado
Affiliation	Since 1999	Institute for Atmospheric and Climate Science, ETH Zurich See the group's website for ongoing projects
Teaching Record	1997-1999	"Atmosphärische Fernerkundung" (University of Mainz, 2 h/wk, ½ semester)
	2001-2005	"Aerosols I" + "Aerosols II" (ETH, 2 h/wk + tutorial, ⅔ semester)
	2001-2024	"Atmosphäre" (ETH, 2 h/wk, ½ semester)
	2001-2012	"Stratospheric Chemistry" (ETH, 2 h/wk + tutorial, full semester)
	2004-2023	"Praktikum Atmosphäre und Klima" (ETH, field course, 12 h/wk, ⅙ semester)
	2004-2024	"Atmosphärenchemie" (ETH, 2 h/wk + turorial, ½ semester)
	2005-2023	"Mathematik IV" (ETH, 2 h/wk + tutorial, ⅙ semester)
	2013-2024	"Stratospheric Chemistry" (ETH, 2 h/wk + tutorial, ½ semester)
	Summer 2019	"Atmos. Science and Climate Change" (Univ. of the Chinese Acad. Sci., 3 wk block)
Supervision of junior researchers	1995-2023	Supervision of junior researchers at graduate and postgraduate level: 67 PhD students: 58 defended successfully, 4 terminated early, 5 are still ongoing. 13 scientists were as postdoctoral researchers in my group. Of these 80 PhD students and postdocs, 15 have been appointed as Professors:
	1995-1999	Stefanie Meilinger, Professor for Sustainable Engineering, St. Augustin, Germany
	1995-1999	Ken Carslaw, Professor of Atmospheric Science, University of Leeds, UK
	1999-2004	Thomas Koop, Professor of Physical Chemistry, Bielefeld University, Germany
	2000-2004	Christina Colberg, Prof. for Environ. & Society, Ped. Univ. Thurgau, Keuzlingen, Switzerland
	2001-2004	Stephan Fueglistaler, Assoc. Prof. of Geosciences, Princeton University, NJ, USA
	2002-2005	Michaela Hegglin, Prof. of Atmospheric Chemistry, Cologne Univiversity, Germany
	2002-2003	Christiane Voigt, Prof. of Experimental Meteorology, University of Mainz, Germany
	2002-2005	Daniel Knopf, Professor for Terrestr. Planet. Atmospheres, Stony Brook, NY, USA
	2005-2008	Barbara Scarnato, Asst. Prof. Remote Sensing, Michigan Technol. Univ., MI, USA
	2005-2009	Andreas Zünd, Assoc. Prof. for Aerosols, Clouds and Climate, McGill, Montreal, Canada
	2006-2008	Aldona Wiacek, Assoc. Prof. Atmos. & Environ. Physics, St. Mary's Univ., Halifax, Canada
	2008-2011	Harald Rieder, Professor, Head Inst. Meteorology, Univ. Nat'l Res. (BOKU), Vienna, Austria
	2009-2013	Mijung Song, Asst. Prof. Atmos. Chemistry, Chonbuk National University, Korea
	2011-2013	Andrew Huisman, Asst. Prof. of Chemistry, Union College, Schenectady, NY, USA
	2015-2019	William Ball, Asst. Prof. Air Quality & Climate Change, TU Delft, NL, deceased

Community Services and Memberships	1992-1999	Member of "Energy Advisory Board", Ministry for Economics, Mainz
	1995-2000	Coordinator within the German Ozone Research Program, Ministry for Education and Sciences, Bonn, Germany
	1995/98, 2004	Guest Researcher and Lecturer, University of Washington, Seattle, USA
	1995/1996	Member of the advisory board for the "Atmospheric Aerosol Program", Ministry for Research, Bonn, Germany
	1996-2005	Member of the "APE Scientific Steering Committee" of the Russian high altitude research aircraft Geophysica
	1996-1997	Coordinator POLECAT winter campaign of Russian high altitude research aircraft Geophysica and the German Falcon
	1997-2007	Member of the "Scientific Steering Group" of SPARC, core project of the World Climate Research Programme (WCRP)
	1998-2022	Co-Author and reviewer of various chapters of the "Scientific Assessment of the Ozone Layer", WMO/UNEP
	1999	Mission scientist of the APE-THESEO tropical campaign with the Russian high altitude aircraft Geophysica
	1999	Invited Lecturer, Summer Seminar Series, University of Colorado, Boulder, USA
	2000-2001	Lead author, 2nd European Assessment of Stratospheric Ozone Research
	2001-2002	Co-Chair of a comprehensive case study on the Montreal Protocol for students of Environmental Sciences, ETH Zurich
	2001-2009	Co-Editor of the international science journal "Atmospheric Chemistry and Physics"
	2003-2012	Studies Advisor for the curriculum in Atmospheric and Climate Science (A&C) at ETH Zurich
	2004	Co-designer of the A&C curriculum after the Bologna Reform at ETH Zurich
	2004-2008	Mission Scientist and activity leader, Tropical SCOUT-O3 Campaign, funded by the European Commission
	2004-2012	Vice Chair of the Department of Environmental Sciences (D-UWIS), ETH Zurich
	2004-2012	Chair of the Strategic Planning Commission of D-UWIS, ETH Zurich
	2004-2013	Chair of Science Advisory Committee, Institute for Tropospheric Research, Leipzig, Germany
	2005-2008	Coordinator of the multi-partner Polyproject "Solar Variability and Global Climate"
	2005-2017	Chair of the Science Advisory Committee, Department for General Energy, Paul Scherrer Institute, Villigen, Switzerland
	2007-2012	Co-Chair of SPARC (Stratospheric Processes and their Role in Climate), core project of the World Climate Research Programme (WCRP)
	2008-2013	Member of the executive committee, RECONCILE Geophysica Polar Campaign, funded by the European Commission
	2011-2017	Host of the International Project Office of SPARC at ETH Zurich, co-sponsored by MeteoSwiss, the Federal Office for the Environment, and WCRP
	2008-2022	Delegate for Faculty Recruitment of the President of ETH Zurich
	2013-2017	Head of Department of Environmental System Science (D-USYS), ETH Zurich
	2014-2018	Member of the executive committee, StratoClim Geophysica and Balloon Campaign in the Asian Summer Monsoon, funded by the European Commission
	2015-2023	Member of the Joint Steering Committee, World Climate Research Programme
	2018-2022	Member of ETH's Research Commission
Publications	11 Feb 2021	ISI publications: N = 341, citations = 15'159, avg. cit. per item = 45.0, h-index = 67 See https://www.webofscience.com/wos/author/record/B-2529-2018



Thomas Peter, Zürich, 11 February 2023

Thomas PETER – Major achievements

Whether working on the level of my research group, my department or in my international collaboration: scientific research and science organization are matters of *team work*. Therefore, the achievements below are mostly team achievements.

1996-present **Measurements in the Upper Troposphere / Lower Stratosphere (Field Campaigns)**

We helped sparking the idea to establish a highflying aircraft in Europe: the Russian "Geophysica", which enables to fly to 20 km altitude. Since 1993, the Geophysica flew 130 scientific flights (each 4-5 hrs) within 11 scientific projects, yielding more than 140 publications (search WoS for "Geophysica"). I was member of the executive group of most of these projects and mission scientist on many flights. Through these activities we discovered ultrathin ice clouds below the tropical tropopause, investigated the role of deep convection for stratospheric dehydration, and clarified the role of heterogeneous nucleation of polar stratospheric clouds most likely on meteoritic particles. For example, see here.

2008-present **Discovering and exploring the glassy state of organic aerosols (Lab expts + Modeling)**

We were among the first to recognize the importance of aerosols with a wide range of compositions becoming glassy under dry atmospheric conditions. The glassy state may affect chemistry within the aerosol particles, potentially turning them from efficient chemical reactors (when at low viscosity) to containments, which may help pollutants travel over wide distances protecting them against atmospheric decomposition. We have > 10 publications on experimental and modeling work with 900 citations on this topic.

2009-present **Exploring liquid-liquid phase separation in aerosols (Lab expts + Modeling)**

We play an internationally recognized role in measuring and characterizing liquid-liquid phase separation in mixed organic-inorganic solutions with sophisticated lab studies and semi-empirical models of concentrated solutions, see here (14 publications, 900 citations).

2009-present **Quantifying the atmospheric S-cycle, also wrt counteracting climate change (Global Model)**

We developed a global chemistry-climate model coupled with a size resolving (40-size bin) stratospheric aerosol model to quantitatively describe the natural sulfur cycle, apply it to volcanic eruptions and also to the question of climate engineering (see here). This work is the basis for datasets of stratospheric aerosols used for the recent CMIP6 activities.

2007-2017 **Leading SPARC and hosting the SPARC International Office (Int'l Coordination)**

I was co-chair of SPARC, a core project of the World Climate Research Programme, from 2007-2012, and host of the SPARC International Project Office from 2011-2017. Besides lots of other activities, SPARC blossomed through the chemistry-climate model initiatives. Many groups, last but not least our own, benefitted tremendously from this international framework.

2013-2017 **Leading ETH's Department of Environmental System Science (Dept Chair)**

The Environmental System Science is a great department at ETH Zurich, covering a wide range of disciplines, represented by 40 professorships with about 800 employees. I had the honor of being elected Head of Department, leading and advancing the department, while it prospered to one of the very best of its kind worldwide (see here).

My 10 possibly most important publications are the following, in chronological order

Energy loss of heavy ions in dense plasma – Linear and non-linear Vlasov Theory for the stopping power, Peter T. and J. Meyer-ter-Vehn, *Physical Review A*, https://doi.org/10.1103/PhysRevA.43.1998 (1991)
Understanding the stopping power of heavy ions in dense plasmas is of utmost importance for making progress in fusion energy research. I had 15 publications in this field with, before I joined atmospheric and climate science.

An analytic expression of aqueous HNO_3-H_2SO_4 stratospheric aerosols including gas-phase removal of HNO_3, Carslaw K.S., B.P. Luo, T. Peter, *Geophysical Research Letters*, https://doi.org/10.1029/95GL01668 (1995)
This paper highlights the detailed knowledge obtained on the thermodynamics of ternary solution systems interacting with the gas phase, a major cornerstone of understanding polar stratospheric clouds.

Microphysics and heterogeneous chemistry of polar stratospheric clouds, *Annual Review of Physical Chemistry*, Peter T., https://doi.org/10.1146/annurev.physchem.48.1.785 (1997)
In this review, I summarized our understanding of polar stratospheric clouds at that time, most of which remains valid also today.

Water activity as the determinant for homogeneous ice nucleation in aqueous solutions, Koop T., B.P. Luo, A. Tsias, T. Peter, *Nature*, https://doi.org/10.1038/35020537 (2000)
This is the most important and influential paper from my group. It revolutionized our understanding of homogeneous ice nucleation in aqueous solutions with impacts not only on atmospheric sciences, but within material and food science, the biology of freezing resistant organisms, etc.

Mixing of the organic aerosol fractions: Liquids as the thermodynamically stable phases, Marcolli C., B.P. Luo, T. Peter, *Journal of Physical Chemistry*, https://doi.org/10.1021/jp036080l (2004)
Complexity may hinder progress, until one recognizes that maximum entropy can also help understanding fundamental properties of a complex system. This is what this highly cited paper is about.

When dry air is too humid, Peter, T., C. Marcolli, P. Spichtinger, T. Corti, M.B. Baker, T. Koop, *Science*, https://doi.org/10.1126/science.1135199 (2006)
Field observations called into question our understanding of the basic principles underpinning ice cloud formation and the distribution of uppr tropospheric humidity, as discussed in this Science Perspective.

Ultra-slow water diffusion in aqueous sucrose glasses, Zobrist, B., V. Soonsin, B.P. Luo, U.K. Krieger, C. Marcolli, T. Peter, T. Koop, *Atmosospheric Chemistry and Physics*, https://doi.org/10.1039/C0CP01273D (2011)
By unprecedented measurements of glassy aqueous sucrose droplets in a particle trap and solving the non-linear diffusion equation, we demonstrate how the concentration of water molecules in aerosols determines their own interal diffusivity, a process controlling water uptake under typical tropospheric conditions.

Evidence for a continuous decline in lower stratospheric ozone offsetting ozone layer recovery, Ball, W.T., J. Alsing, D.J. Mortlock, J. Staehelin, J.D. Haigh, T. Peter, F. Tummon, R. Stubi, A. Stenke, J. Anderson, A. Bourassa, S.M. Davis, D. Degenstein, S. Frith, L. Froidevaux, C. Roth, V. Sofieva, R. Wang, J. Wild, P.F. Yu, J.R. Ziemke, E.V. Rozanov, Atmos. Chem. Phys., https://doi.org/10.5194/acp-18-1379-2018 (2018)
In this paper we call into question that lower stratospheric ozone actually stopped decreasing, and this impacts our understanding of chemical and dynamical processes of the ozone layer.

Balloon-borne measurements of temperature, water vapor, ozone and aerosol backscatter on the southern slopes of the Himalayas during StratoClim 2016-2017, Brunamonti, S., T. Jorge, P. Oelsner, S. Hanumanthu, B.B. Singh, K.R. Kumar, S. Sonbawne, S. Meier, D. Singh, F.G. Wienhold, B.P. Luo, M. Boettcher, Y. Poltera, H. Jauhiainen, R. Kayastha, J. Karmacharya, R. Dirksen, M. Naja, M. Rex, S. Fadnavis, T. Peter, *Atmospheric Chemistry and Physics*, https://doi.org/10.5194/acp-18-15937-2018 (2018)
This paper provides an overview over our Indian and Nepalese balloon campaigns (2016/17), establishing the structure of the Asian monsoon Anticyclone in an unprecedented manner.

Expiratory Aerosol pH: The Overlooked Driver of Airborne Virus Inactivation, Luo, B.P., A. Schaub, I. Glas, L.K. Klein, S.C. David, N. Bluvshtein, K. Violaki, G. Motos, M.O. Pohl, W. Hugentobler, A. Nenes, U.K. Krieger, S. Stertz, T. Peter, T. Kohn, Environ. Sci Technol., https://doi.org/10.1021/acs.est.2c05777 (2022)
This unparalleled examination of acidity in expiratory aerosol particles demonstrates its impact on airborne virus persistence. We combine pH dependent inactivation rates of influenza A virus (IAV) and SARS-CoV-2 with microphysical properties of respiratory fluids using a biophysical aerosol model. We find that particles exhaled into indoor air acidify rapidly, inactivating IAV within minutes, whereas SARS-CoV-2 requires days. We show that aerosol acidity has profound implications for virus transmission and mitigation strategies.