Academic CV of Prof. Dr. Gottfried Kirchengast

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Academic education

University of Graz, Austria (main studies 1984-1991, post-doctoral qualification 1992-1996)

1996	Habilitation certificate ("venia docendi") for the field of Geophysics
1992-1996	Post-doctoral research & teaching qualification phase towards habilitation
1994-1995	Completion Physics Diploma studies, MSc Physics 1995 (with highest honors)
1992	PhD degree Natural Sciences/Geophysics (with highest honors)
1989-1991	PhD studies in Natural Sciences (Dr.rer.nat.) and continuation of Physics Diploma studies (towards MSc level); completion of PhD studies Dec.1991
1988	MSc degree Geophysics (graduation with highest honors)
1984-1988	Diploma studies in Physics, Meteorology, and Geophysics; 1st diploma (BSc level) in these fields 1986; 2nd diploma (MSc level) in Geophysics Dec.1988

Academic career and positions held

2019-present	Speaker, Field of Excellence Climate Change Graz and Earth Observation & Climate Strategies, Univ of Graz; Founding Director/Director R&D Strategy, Wegener Center
2016-present	Honorary Professor, National Space Science Center, Chinese Academy of Sciences
2008-present	Member of the Austrian Academy of Sciences (as of 2011 lifetime member), Vienna
2003-present	Professor of Geophysics (Alfred Wegener's Chair), University of Graz, Austria
1998-present	Visiting Scientist/Professor at MPI for Meteorology Hamburg, Germany; UCAR Boulder, University of Arizona Tucson, USA; GFZ Potsdam, Germany; University of Hawai'i Manoa/Honolulu, USA; RMIT Univ. Melbourne, Australia; NSSC/CAS Beijing, China etc. (typically 2-3 months summer stays)
2012-2018	Adjunct Professor, Geospatial Sciences School, RMIT University Melbourne, Australia
2005-2019	Director, Wegener Center for Climate and Global Change, University of Graz, Austria
1992-2002	Assistant Professor – Associate Professor (as of 1997), University of Graz, Austria
1992-1994	Max-Planck Postdoc Fellow at MPI for Aeronomy Lindau/Göttingen, Germany

Main areas of research

Core research areas are atmospheric remote sensing and climate change research. Atmospheric remote sensing research includes satellite-based occultation sounding such as GNSS radio occultation and other microwave and infrared methods, with the main aim to conceive and develop methods and algorithms providing climate benchmark data. Furthermore, work on advancing ground-based observing systems with high resolution, especially the unique WegenerNet climate station network and climate change research facilities in southeast Austria. Climate change research topics include analysis of atmospheric change, Earth energy imbalance and implications, climate change detection

and attribution, climate model evaluation, and foci on precipitation and hydro-meteorological extremes in a warming climate as well as on carbon budgeting and carbon management towards reaching Paris-compliant climate goals. Methodologically, the research includes innovative use of a broad array of dynamical and statistical modeling and data analysis methods for the study of complex systems, such as parts of the climate & society system, with a core interest to help explore climate change and sustainable transition pathways towards a low-carbon and climate-resilient society.

Most important research results achieved

Important research results achieved through personal conceptions, analysis, intellectual guidance, scholarship, and research leadership include, among others: early-career fundamental contributions to understand upper atmosphere-ionosphere interactions driven by gravity waves (e.g., incoherent scatter radar insights, elucidation of related traveling ionospheric disturbance dynamics); pioneering contributions to the field of GPS/GNSS radio occultation for climate science (e.g., benchmark-quality retrieval algorithms, new climate change indicators, first anthropogenic change detections) as well as to microwave and optical occultation (e.g., conception of and initial R&D on infrared-laser occultation for atmospheric profiling of greenhouse gases and wind); and foundational contributions to hydro-meteorological high-resolution observations and research (e.g., founding the WegenerNet facilities, novel 1-km-resolved multi-scale analyses of short-duration convective rainfall extremes) as well as to greenhouse gas budgeting and low carbon transition (e.g., conception of and initial R&D on carbon management, a new approach to help relevant actors achieve Paris-compliant climate goals).

Beyond these, a myriad of important research results was fostered to be achieved in a wide range of climate change science fields through inspiring, founding, and leading research-based institutions and interdisciplinary consortia, providing broad research leadership, and supervising and mentoring young scientists. These achievements include, among others, to act as founder and leader (since 1996) of the Atmospheric Remote Sensing and Climate System Research Group (ARSCliSys), founder and director (2005-2019) of the Wegener Center for Climate and Global Change, co-founder and speaker (since 2019) of the Field of Excellence Climate Change Graz, leader (2017-2022) of the GEOCLIM Data Infrastructure Austria cooperation (eight universities/research institutions), and leader in various international Earth observation and climate activities (e.g., Uni Graz EUMETSAT ROM SAF partnership). Furthermore, more than 40 PhD students have been supervised to PhD completion, many of whom are successful also in international careers (e.g., professors, lead scientists, executives), and more than 20 mid-career researchers have been mentored along their way towards lead-level academic positions.

Ten of the most important publications *(selection)*

Fuchsberger, J., **Kirchengast, G.**, Kabas, T. (2021): WegenerNet high-resolution weather and climate data from 2007 to 2020. Earth Syst. Sci. Data, 13: 1307-1334, doi:10.5194/essd-13-1307-2021.

Schroeer, K., **Kirchengast, G.** (2018): Sensitivity of extreme precipitation to temperature: the variability of scaling factors from a regional to local perspective. Clim. Dyn., 50: 3981-3994, doi:10.1007/s00382-017-3857-9.

Kirchengast, G., Kabas, T., Leuprecht, A., Bichler, C., Truhetz, H. (2014): WegenerNet: A pioneering high-resolution network for monitoring weather and climate. Bull. Amer. Meteorol. Soc., 95: 227-242, doi:10.1175/BAMS-D-11-00161.1.

Kirchengast, G., Schweitzer, S. (2011): Climate benchmark profiling of greenhouse gases and thermodynamic structure and wind from space. Geophys. Res. Lett., 38: L13701, doi:10.1029/2011GL047617.

Lackner, B. C., Steiner, A. K., Hegerl, G. C. and **Kirchengast, G.** (2011): Atmospheric climate change detection by radio occultation data using a fingerprinting method. J. Climate, 24: 5275-5291, doi:10.1175/2011JCLI3966.1.

Steiner, A. K., **Kirchengast, G.**, Lackner, B. C., Pirscher, B., Borsche, M., et al. (2009) Atmospheric temperature change detection with GPS radio occultation 1995 to 2008. Geophys. Res. Lett., 36: L18702, doi:10.1029/2009GL039777.

Gobiet, A., **Kirchengast, G.**, Manney, G. L., Borsche, M., Retscher, C., et al. (2007): Retrieval of temperature profiles from CHAMP for climate monitoring: intercomparison with Envisat MIPAS and GOMOS and different atm. analyses. Atmos. Chem. Phys., 7: 3519-3536, doi:10.5194/acp-7-3519-2007.

Kirchengast, G., Foelsche, U., Steiner, A. K. (Eds.) (2004): Occultations for Probing Atmosphere and Climate. Berlin-Heidelberg: Springer, www.springer.com/978-3-540-22350-4. *Including (together with 6 further papers as co-author):* Kirchengast, G., Occultations for probing atmosphere and climate: setting the scene, p. 1-8; Kirchengast, G., and P. Hoeg, The ACE+ mission: An atmosphere and climate explorer based on GPS, GALILEO, and LEO-LEO radio occultation, p. 201-220.

Steiner, A. K., **Kirchengast, G.**, Ladreiter, H.-P. (1999): Inversion, error analysis, and validation of GPS/MET occultation data. Ann. Geophys., 17: 122-138, doi:10.1007/s00585-999-0122-5.

Kirchengast, G. (1996): Elucidation of the physics of the gravity wave – TID relationship with the aid of theoretical simulations. J. Geophys. Res., 101: 13,353-13,368, doi:10.1029/96JA00750.

Additional research achievements and services *(ten selected ones)*

***Awards**—two main ones selected:*

- 2012 State of Styria Research Prize–Main Prize (State of Styria & Research Prizes Jury)
- 1998 START Prize (Austria Science Fund FWF & International START-Wittgenstein Jury)

***Keynote speeches**—two leadership-talk examples at conferences selected:*

- Kirchengast, G. (2017): GNSS radio occultation for climate science: where do we stand and what are key next steps?, delivered at IAG Workshop Satellite Geodesy & Climate Studies, Sep.2017, Bonn, DE, and COSMIC-IROWG 2017 Workshop, Sep.2017, Estes Park, CO, USA.
- Kirchengast, G. (2012): A next-generation space geodetic technique: profiling greenhouse gases and climate by microwave and infrared-laser occultation, European Geophysical Union (EGU) General Assembly, Apr.2012, Vienna, AT.

***Important research projects**—two major FWF programmes selected:*

- Climate change—uncertainties, thresholds, and coping strategies (DK Climate Change), FWF-DK Doktoratskolleg–Doctoral Programme, 2014-2022, ~5.2 Mio € FWF part (Initiator & Co-Speaker)
- Advanced spaceborne sounding and climate modeling for atmospheric change analysis (START-ATCHANGE), FWF START Prize Programme, 1999-2005, ~1.1 Mio € funding (PI)

***Research data & software**—two major system developments selected:*

- Founder and Lead Scientist of the "End-to-end Generic Occultation Simulation and Processing System (EGOPS)" and "Wegener Center Occultation and Climate Analysis System (WOCAS)", and
- Founder and Lead Scientist "WegenerNet Processing System (WPS)"; total R&D invest ~3.6 Mio €.

***Knowledge transfer & science communication**—two major transfer initiatives selected:*

- Initiator and Leading Author of the award-winning „Referenzplan der Wissenschaft zum Nationalen Energie- und Klimaplan für Österreich (Ref-NEKP)", ccca.ac.at/refnekp, ÖAW Verlag, 2019.

Founder and Scientific Head of the transfer projects Carbon Management—carbsmart2Paris (CM), carbmanage.earth, and Graz Climate Change Indicators (GCCI), gcci.earth, Univ. of Graz, 2021.