

### **Gottfried Kirchengast — Scientific Publications**

1. Ten selected ones from the most significant publications (page 1)
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#### **1. Ten selected ones from the most significant publications**

Liu, C.-L., G. Kirchengast, S. Syndergaard, E. R. Kursinski, Y.-Q. Sun, W.-H. Bai, and Q.-F. Du, A review of low Earth orbit occultation using microwave and infrared-laser signals for monitoring the atmosphere and climate, *Adv. Space Res.*, 60, 2776-2811, doi:10.1016/j.asr.2017.05.011, 2017

Kirchengast, G., T. Kabas, A. Leuprecht, C. Bichler, and H. Truhetz, 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, 2014

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

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

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

Ho, S.-P., G. Kirchengast, S. Leroy, J. Wickert, T. Mannucci, A.K. Steiner, D. Hunt, W. Schreiner, S.V. Sokolovskiy, C.O. Ao, M. Borsche, A. von Engeln, U. Foelsche, S. Heise, B. Iijima, Y.-H. Kuo, E.R. Kursinski, B. Pirscher, M. Ringer, C. Rocken, and T. Schmidt, Estimating the uncertainty of using GPS radio occultation data for climate monitoring: Inter-comparison of CHAMP refractivity climate records 2002-2006 from different data centers, *J. Geophys. Res.*, 114, D23107, doi: 10.1029/2009JD011969, 2009

Gobiet, A., G. Kirchengast, G. L. Manney, M. Borsche, C. Retscher, and G. Stiller, 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, 2007

Kirchengast, G., U. Foelsche, A. K. Steiner (Eds.), *Occultations for Probing Atmosphere and Climate*, 408 p., Springer Berlin-Heidelberg, www.springer.com/978-3-540-22350-4, 2004 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., G. Kirchengast, and H.-P. Ladreiter, Inversion, error analysis, and validation of GPS/MET occultation data, *Ann. Geophys.*, 17, 122-138, 1999

Kirchengast, G., Elucidation of the physics of the gravity wave – TID relationship with the aid of theoretical simulations, *J. Geophys. Res.*, 101, 13,353-13,368, 1996

### 2. Complete list of peer-reviewed publications

(126 ISI publications, and three edited books; ISI-indexed Springer book articles which passed two-reviewer peer review process included)

Bai, W.-H., C.-L. Liu, X.-G. Meng, Y.-Q. Sun, G. Kirchengast, Q.-F. Du, X.-Y. Wang, G.-L. Yang, M. Liao, Z.-D. Yang, D.-Y. Zhao, J.-M. Xia, Y.-R. Cai, L.-J. Liu, L., and D.-W. Wang, Evaluation of atmospheric profiles derived from single- and zero-difference excess phase processing of BeiDou radio occultation data from the FY-3C GNOS mission, *Atmos. Meas. Tech.*, 11, 819-833, doi:10.5194/amt-11-819-2018, 2018

Gorbunov, M. E., and G. Kirchengast, Wave-optics uncertainty propagation and regression-based bias model in GNSS radio occultation bending angle retrievals, *Atmos. Meas. Tech.*, 11, 111-125, doi:10.5194/amt-11-111-2018, 2018

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Liu, C.-L., G. Kirchengast, Y.-Q. Sun, K. Zhang, R. Norman, M. Schwaerz, W.-H. Bai, Q.-F. Du, and Y. Li, Analysis of ionospheric structure influences on residual ionospheric errors in GNSS radio occultation bending angles based on ray tracing simulations, *Atmos. Meas. Tech.*, 11, 2427-2440, doi:10.5194/amt-11-2427-2018, 2018

O, S., U. Foelsche, G. Kirchengast, and J. Fuchsberger, Validation and correction of rainfall data from the WegenerNet high density network in southeast Austria, *J. Hydrol.*, 556, 1110-1122, doi:10.1016/j.jhydrol.2016.11.049, 2018

Schroerer, K., and G. Kirchengast, 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, 2018

Schwarz, J., G. Kirchengast, and M. Schwaerz, Integrating uncertainty propagation in GNSS radio occultation retrieval: from excess phase to atmospheric bending angle profiles, *Atmos. Meas. Tech.*, 11, 2601-2631, doi:10.5194/amt-11-2601-2018, 2018

Tan, J., W. A. Petersen, G. Kirchengast, D. C. Goodrich, and D. B. Wolff, Evaluation of Global Precipitation Measurement rainfall estimates against three dense gauge networks, *J. Hydrometeorol.*, 19, 517-532, doi:10.1175/JHM-D-17-0174.1, 2018

Angerer, B., F. Ladstädter, B. Scherllin-Pirscher, M. Schwärz, A. K. Steiner, U. Foelsche, and G. Kirchengast, Quality aspects of the Wegener Center multi-satellite GPS radio occultation record OPSv5.6, *Atmos. Meas. Tech.*, 10, 4845-4863, doi:10.5194/amt-10-4845-2017, 2017

Biondi, R., A. K. Steiner, G. Kirchengast, H. Brenot, and T. Rieckh, Supporting the detection and monitoring of volcanic clouds: A promising new application of Global Navigation Satellite System radio occultation, *Adv. Space Res.*, 60, 2707-2722, doi:10.1016/j.asr.2017.06.039, 2017

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June 2018 (for publication information complementary to the CV, focus peer-reviewed/written publications)

Liu, C.-L., G. Kirchengast, S. Syndergaard, E. R. Kursinski, Y.-Q. Sun, W.-H. Bai, and Q.-F. Du, A review of low Earth orbit occultation using microwave and infrared-laser signals for monitoring the atmosphere and climate, *Adv. Space Res.*, 60, 2776-2811, doi:10.1016/j.asr.2017.05.011, 2017

Nehrir, A. R., C. Kiemle, M. D. Lebsock, G. Kirchengast, S. A. Buehler, U. Loehnert, C.-L. Liu, P. C. Hargrave, M. Barrera-Verdejo, and D. M. Winker, Emerging technologies and synergies for airborne and space-based measurements of water vapor profiles, *Surv. Geophys.*, 38, 1445-1482, doi:10.1007/s10712-017-9448-9, 2017

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Pincus, R., A. Beljaars, S. A. Buehler, G. Kirchengast, F. Ladstaedter, and J. S. Whitaker, The representation of tropospheric water vapor over low-latitude oceans in (re-)analysis: errors, impacts, and the ability to exploit current and prospective observations, *Surv. Geophys.*, 38, 1399-1423, doi:10.1007/s10712-017-9437-z, 2017

Scherllin-Pirscher, B., A. K. Steiner, G. Kirchengast, M. Schwärz, and S. S. Leroy, The power of vertical geolocation of atmospheric profiles from GNSS radio occultation, *J. Geophys. Res. Atmos.*, 122, 1595-1616, doi:10.1002/2016JD025902, 2017

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Schwarz, J., G. Kirchengast, and M. Schwaerz, Integrating uncertainty propagation in GNSS radio occultation retrieval: From bending angle to dry-air atmospheric profiles, *Earth Space Sci.*, 4, 200-228, doi:10.1002/2016EA000234, 2017

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Biondi, R., A. K. Steiner, G. Kirchengast, and T. Rieckh, Characterization of thermal structure and conditions for overshooting of tropical and extratropical cyclones with GPS radio occultation, *Atmos. Chem. Phys.*, 15, 5181-5193, doi:10.5194/acp-15-5181-2015, 2015

Gorbunov, M. E., and G. Kirchengast, Uncertainty propagation through wave optics retrieval of bending angles from GPS radio occultation: Theory and simulation results, *Radio Sci.*, 50, 1086-1096, doi:10.1002/2015RS005730, 2015

Kann, A., I. Meirold-Mautner, F. Schmid, G. Kirchengast, J. Fuchsberger, V. Meyer, L. Tüchler, and B. Bica, Evaluation of high-resolution precipitation analyses using a dense station network, *Hydrol. Earth Syst. Sci.*, 19, 1547-1559, doi:10.5194/hess-19-1547-2015, 2015

Ladstädter, F., A. K. Steiner, M. Schwärz, and G. Kirchengast, Climate intercomparison of GPS radio occultation, RS90/92 radiosondes and GRUAN from 2002 to 2013, *Atmos. Meas. Tech.*, 8, 1819-1834, doi:10.5194/amt-8-1819-2015, 2015

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Li, Y., G. Kirchengast, B. Scherllin-Pirscher, R. Norman, Y. Yuan, J. Fritzer, M. Schwaerz, and K. Zhang, Dynamic statistical optimization of GNSS radio occultation bending angles: advanced algorithm and performance analysis, *Atmos. Meas. Tech.*, 8, 3447-3465, doi:10.5194/amt-8-3447-2015, 2015

Liu, C. L., G. Kirchengast, K. Zhang, R. Norman, Y. Li, S. C. Zhang, J. Fritzer, M. Schwaerz, S. Q. Wu, and Z. X. Tan, Quantifying residual ionospheric errors in GNSS radio occultation bending angles based on ensembles of profiles from end-to-end simulations, *Atmos. Meas. Tech.*, 8, 2999-3019, doi:10.5194/amt-8-2999-2015, 2015

Norman, R., J. Le Marshall, W. Rohm, B. A. Carter, G. Kirchengast, S. Alexander, C. Liu, and K. Zhang, Simulating the impact of refractive transverse gradients resulting from a severe troposphere weather event on GPS signal propagation, *IEEE J. Sel. Topics Appl. Earth Obs. Remote Sens.*, 8, 418-424, doi:10.1109/JSTARS.2014.2344091, 2015

Plach, A., V. Proschek, and G. Kirchengast, Profiling wind and greenhouse gases by infrared-laser occultation: results from end-to-end simulations in windy air, *Atmos. Meas. Tech.*, 8, 2813-2825, doi:10.5194/amt-8-2813-2015, 2015

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Lammer, H., S.-C. Schiefer, I. Juvan, P. Odert, N. V. Erkaev, C. Weber, K. G. Kislyakova, M. Güdel, G. Kirchengast, and A. Hanslmeier, Origin and stability of exomoon atmospheres: implications for habitability, *Orig. Life Evol. Biosph.*, 44, 239-260, doi:10.1007/s11084-014-9377-2, 2014

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Scherllin-Pirscher, B., A. K. Steiner, and G. Kirchengast, Deriving dynamics from GPS radio occultation: Three-dimensional wind fields for monitoring the climate, *Geophys. Res. Lett.*, 41, 7367-7374, doi:10.1002/2014GL061524, 2014

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Li Y., G. Kirchengast, B. Scherllin-Pirscher, S. Wu, M. Schwärz, J. Fritzer, S. Zhang, B. A. Carter, and K. Zhang, A new dynamic approach for statistical optimization of GNSS radio occultation bending angles for optimal climate monitoring utility, *J. Geophys. Res. Atmos.*, 118, 13022-13040, doi:10.1002/2013JD020763, 2013

Liu, C. L., G. Kirchengast, K. F. Zhang, R. Norman, Y. Li, S. C. Zhang, B. Carter, J. Fritzer, M. Schwaerz, S. L. Choy, S. Q. Wu, and Z. X. Tan, Characterisation of residual ionospheric errors in bending angles using GNSS RO end-to-end simulations, *Adv. Space Res.*, 52, 821-836, doi:10.1016/j.asr.2013.05.021, 2013

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Gurvich, A. S., M. E. Gorbunov, O. V. Fedorova, G. Kirchengast, V. Proschek, G. Gonzalez Abad, and K. A. Tereszchuk, Spatio-temporal structure of a laser beam over 144 km in a Canary Islands experiment, *Appl. Optics*, 51, 7374-7383, doi:10.1364/AO.51.007374, 2012

Ho, S.-P., D. Hunt, A. K. Steiner, A. Mannucci, G. Kirchengast, H. Gleisner, S. Heise, A. von Engeln, C. Marquardt, S. Sokolovskiy, W. Schreiner, B. Scherllin-Pirscher, C. Ao, J. Wickert, S. Syndergaard, K. Lauritsen, S. Leroy, E. R. Kursinski, Y.-H. Kuo, U. Foelsche, T. Schmidt, and M. Gorbunov, Reproducibility of GPS radio occultation data for climate monitoring: profile-to-profile inter-comparison of CHAMP climate records 2002 to 2008 from six data centers, *J. Geophys. Res.*, 117, D18111, doi:10.1029/2012JD017665, 2012

Foelsche, U., S. Syndergaard, J. Fritzer, and G. Kirchengast, Errors in GNSS radio occultation data: relevance of the measurement geometry and obliquity of profiles, *Atmos. Meas. Tech.*, 4, 189-199, doi:10.5194/amt-4-189-2011, 2011

Foelsche, U., B. Scherllin-Pirscher, F. Ladstädter, A. K. Steiner, and G. Kirchengast, Refractivity and temperature climate records from multiple radio occultation satellites consistent within 0.05 %, *Atmos. Meas. Tech.*, 4, 2007-2018, doi:10.5194/amt-4-2007-2011, 2011

Harrison, J. J., P. F. Bernath, and G. Kirchengast, Spectroscopic requirements for ACCURATE, a microwave and infrared-laser occultation satellite mission, *J. Quant. Spectrosc. Radiat. Trans.*, 112, 2347-2354, doi:10.1016/j.jqsrt.2011.06.003, 2011

Kabas, T., U. Foelsche, and G. Kirchengast, Seasonal and annual trends of temperature and precipitation within 1951/1971-2007 in South-Eastern Styria/Austria, *Meteorol. Z.*, 20, 277-289, doi:10.1127/0941-2948/2011/0233, 2011

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Kabas, T., A. Leuprecht, C. Bichler, and G. Kirchengast, WegenerNet climate station network region Feldbach, Austria: network structure, processing system, and example results, *Adv. Sci. Res.*, 6, 49-54, doi:10.5194/asr-6-49-2011, 2011

Kann, A., T. Haiden, K. von der Emde, C. Gruber, T. Kabas, A. Leuprecht, and G. Kirchengast, Verification of operational analyses using an extremely high density surface station network, *Wea. Forecasting*, 26, 572-578, doi:10.1175/WAF-D-11-00031.1, 2011

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

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Lackner, B. C., A. K. Steiner, and G. Kirchengast, Where to see climate change best in radio occultation variables – study using GCMs and ECMWF reanalyses, *Ann. Geophys.*, 29, 2147-2167, doi:10.5194/anngео-29-2147-2011, 2011

Ladstädter, F., A. K. Steiner, U. Foelsche, L. Haimberger, C. Tavorato, and G. Kirchengast, An assessment of differences in lower stratospheric temperature records from (A)MSU, radiosondes, and GPS radio occultation, *Atmos. Meas. Tech.*, 4, 1965-1977, doi:10.5194/amt-4-1965-2011, 2011

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Scherllin-Pirscher, B., A. K. Steiner, G. Kirchengast, Y.-H. Kuo, and U. Foelsche, Empirical analysis and modeling of errors of atmospheric profiles from GPS radio occultation, *Atmos. Meas. Tech.*, 4, 1875-1890, doi:10.5194/amt-4-1875-2011, 2011

Scherllin-Pirscher, B., G. Kirchengast, A. K. Steiner, Y.-H. Kuo, and U. Foelsche, Quantifying uncertainty in climatological fields from GPS radio occultation: an empirical-analytical error model, *Atmos. Meas. Tech.*, 4, 2019-2034, doi:10.5194/amt-4-2019-2011, 2011

Schweitzer, S., G. Kirchengast, and V. Proschek, Atmospheric influences on infrared-laser signals used for occultation measurements between Low Earth Orbit satellites, *Atmos. Meas. Tech.*, 4, 2273-2292, doi:10.5194/amt-4-2273-2011, 2011

Schweitzer, S., G. Kirchengast, M. Schwaerz, J. M. Fritzer, and M. E. Gorbunov, Thermodynamic state retrieval from microwave occultation data and performance analysis based on end-to-end simulations, *J. Geophys. Res.*, 116, D10301, doi:10.1029/2010JD014850, 2011

Steiner, A. K., B. C. Lackner, F. Ladstädter, B. Scherllin-Pirscher, U. Foelsche, and G. Kirchengast, GPS radio occultation for climate monitoring and change detection, *Radio Sci.*, 46, RS0D24, doi:10.1029/2010RS004614, 2011

Ladstädter, F., A. K. Steiner, B. C. Lackner, B. Pirscher, G. Kirchengast, J. Kehrner, H. Hauser, P. Muigg, and H. Doleisch, Exploration of climate data using interactive visualization, *J. Atmos. Oceanic Tech.*, 27, 667-679, doi: 10.1175/2009JTECHA1374.1, 2010

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Pirscher, B., U. Foelsche, M. Borsche, G. Kirchengast, and Y.-H. Kuo, Analysis of migrating diurnal tides detected in FORMOSAT-3/COSMIC temperature data, *J. Geophys. Res.*, 115, D14108, doi:10.1029/2009JD013008, 2010

Foelsche, U., B. Pirscher, M. Borsche, G. Kirchengast, and J. Wickert, Assessing the climate monitoring utility of radio occultation data: From CHAMP to FORMOSAT-3/COSMIC, *Terr. Atmos. Oceanic Sci.*, 20, 155-170, doi:10.3319/TAO.2008.01.14.01(F3C), 2009

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Ladstädter F., A. K. Steiner, B. C. Lackner, G. Kirchengast, P. Muigg, J. Kehrler, and H. Doleisch, SimVis: An interactive visual field exploration tool applied to climate research, in *New Horizons in Occultation Research*, A. K. Steiner, B. Pirscher, U. Foelsche, G. Kirchengast (Eds.), Springer Berlin-Heidelberg, 235-245, doi:10.1007/978-3-642-00321-9\_19, 2009

Pirscher B., U. Foelsche, M. Borsche, and G. Kirchengast, Sampling of the Diurnal Cycle of Temperature Using Formosat-3/COSMIC Data, in *New Horizons in Occultation Research*, A. K. Steiner, B. Pirscher, U. Foelsche, G. Kirchengast (Eds.), Springer Berlin-Heidelberg, 131-140, doi:10.1007/978-3-642-00321-9\_11, 2009

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

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Steiner, A. K., B. Pirscher, U. Foelsche, G. Kirchengast (Eds.), *New Horizons in Occultation Research – Studies in Atmosphere and Climate*, 316 p., Springer Berlin-Heidelberg, www.springer.com/978-3-642-00320-2, 2009

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### 3. Notes on and link to further scientific publications

In addition to the peer-reviewed publications G. Kirchengast has authored or co-authored more than 160 further scientific articles and reports. Four selected ones are cited here, each having received more than 25-55 citations (Google Scholar) despite being “grey” literature:

Kirchengast, G., J. Fritzer, and J. Ramsauer, End-to-end GNSS Occultation Performance Simulator Version 4 (EGOPS4) Software User Manual (Overview and Reference Manual), *Tech. Rep. ESA/ESTEC 3/2002*, 472 p., Inst. for Geophys., Astrophys., and Meteorol., Univ. of Graz, Austria, 2002

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Another four selected ones are finally noticed here as examples of substantially influential reports in the field (as per feedback from the relevant scientific communities):

Kirchengast, G., et al., ACCURATE—climate benchmark profiling of greenhouse gases and thermodynamic variables and wind from space (ESA Earth Explorer Opportunity Mission EE-8 Proposal), *Sci. Rep. 36-2010*, 93 p., Wegener Center Verlag, Graz, Austria, 2010

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A detailed list of scientific publications (written and oral) is found via the website <http://homepage.uni-graz.at/gottfried.kirchengast/> (follow the link *Publications*).

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