Curriculum vitae

Name

- Dr. Paul Martin Winkler

Webpage

- http://nanodynamite.at

Higher education

- 1995 – 2001 Study of meteorology at the University of Vienna, title of MS thesis: *The influence of ammonia on the heterogeneous nucleation of nanoparticles.*
- 2001 – 2004 Dissertation at the Institute for Experimental Physics, University of Vienna, title of PhD thesis: *Experimental study of condensation processes in systems of water and organic vapors employing an expansion chamber*. Adviser: Prof. P. E. Wagner

Professional appointments and scientific career

- 2001 – 2004 PhD student-researcher at Univ. Vienna, employed by University of Helsinki.
- 2004 – 2009 Postdoc co-worker at Univ. Vienna, funded by the Austrian Science Fund (FWF).
- 2009 – 2012 Postdoctoral fellow at the National Center for Atmospheric Research (NCAR), Boulder, CO, USA.
- 2012 – 2014 Postdoctoral fellow and University Assistant at University of Vienna.
- 2013 – current: Team leader of University of Vienna at the CLOUD experiment
- 2014 – current: tenure track position and promotion to Assistant Professor at Univ. of Vienna
- 2015 Habilitation in Experimental Physics at University of Vienna.
- 2015 – 2016: Spokesperson of the Aerosol Physics and Environmental Physics Group

Current main areas of interest

- Heterogeneous nucleation processes
- Condensation and growth processes
- Chemical characterization of nanoparticles
- In-situ characterization of aerosol nanoparticles by small angle x-ray scattering
- Instrumentation development

Top 5 international cooperations

- University of Helsinki: Cooperation withProf. Markku Kulmala
- CERN/Geneva: Cosmics Leaving OUtdoor Droplets (CLOUD) collaboration
- NCAR/University of California, Irvine: Prof. James N. Smith
- University of Minnesota: Cooperation with Prof. Peter H. McMurry.
- Brookhaven National Laboratory: Cooperation with Dr. Robert L. McGraw

Top 5 invited talks

- *Heterogeneous nucleation by nanoparticles: recent experiments and some applications.* Plenary talk at the International Conference on Nucleation and Atmospheric Aerosols (ICNAA), August 11th 2009, Prague, Czech Republic.
- *Hunting for molecular species in newly formed biogenic nanoparticles,* Meteorologisch-Geophysikalisches Kolloquium, University of Vienna, May 19th 2011, Vienna, Austria.
- *Understanding the biogenic species responsible for atmospheric new particle growth,* ASR meeting of the Department of Energy, March 14th 2012, Arlington, VA, USA.
- *Size and temperature effects in heterogeneous nucleation,* BNL seminar, October 9th 2015, Brookhaven National Laboratory, USA
- *Experimental retrieval of nanoparticle dynamics from high time resolution measurements at low signal,* ERC seminar, April 19th 2017, University of Helsinki, Helsinki, Finland.

Top 5 Reviewing activities

- National Science Foundation
- Journal of Chemical Physics
- Geophysical Research Letters
- Proceedings of the National Academy of Sciences
- Science Advances

Self-acquired Funding

- Postdoctoral Fellowship of the Advanced Study Program at the National Center for Atmospheric Research: Sum $ 135.000,00, duration 24 months (September 2009 – August 2011)
- Erwin-Schrödinger-Fellowship of the Austrian Science Fund (FWF): Sum € 79.760,00, duration 18 months (September 2011 – March 2013)
- European Research Council (ERC) Consolidator Grant: Sum € 1.810.696,00, duration 5 years (March 2014 – February 2019)
- European Commission, H2020, Marie Sklodowska Curie Actions Innovative Training Network (MSCA-ITN) CLOUD MOTION: Sum € 255.934,08 (amount for University of Vienna only), duration 36 months (2018-2021)

Teaching and student support

- Lecture: Aerosol Physics
- Lecture: Physics for Biologists
- Lab class on Aerosol Physics
- Practical course: Environmental Physics
- Practical exercises: Methods of Experimental Physics I and II
- Seminar: Current Problems in Aerosol Optics and Aerosol Dynamics
- Supervision and mentoring of students on MS and PhD level
- Mentoring of Postdocs

Memberships and services in professional societies

- Gesellschaft für Aerosolforschung (GAeF)
- American Association for Aerosol Research (AAAR)
- Chemisch-Physikalische Gesellschaft (CPG): board member (2015 – 2017)
- Österreichische Meteorologische Gesellschaft (ÖMG)
- Committee on Nucleation and Atmospheric Aerosols (CNAA): board member (2009 – 2017)
- Forschungsverbund Umwelt der Universität Wien: advisory board member (2015 – 2016)

Media appearance (5 selected)

- Der Standard, 6.4.2011, "Woher die Wolken kommen" https://derstandard.at/1301873936521/Geistesblitz-Woher-die-Wolken-kommen
- Press release by the University of Vienna, 12.12.2013, http://medienportal.univie.ac.at/presse/aktuelle-pressemeldungen/detailansicht/artikel/erc-consolidator-grant-fuer-aerosolphysiker-paul-winkler/ http://derstandard.at/1385170806860/Hoch-dotierter-EU-Foerderpreis-fuer-Wiener-Aerosolphysiker
- Format/trend Extra, March 2014, "Top Austrian Research" http://nanodynamite.at/docs/junge_forscher_prazak_format_trend_innovation_maerz_2014.pdf
- Austrian Broadcasting (ORF), 30.5.2016, „heute mittag: Wie Wolken entstehen" http://nanodynamite.at/outreach.html
- Austrian Broadcasting (ORF), 27.5.2017, „Newton: Die Wolken – unsere Wettermacher" https://www.youtube.com/watch?v=3IMyheaqrYw

Awards

- Diploma thesis award sponsored by the NAWI-CLUB (Natural Sciences Club) of the University of Vienna (2002).
- Recognition award for Science sponsored by the State Government of Lower Austria (2010).
- Consolidator Grant awarded by the European Research Council (ERC) (2013).

Vienna, March 23rd, 2018

List of Publications

A) Peer-reviewed Journals

A1. L. Wind, L. Hofer, A. Nagy, P. Winkler, A. Vrtala, W.W. Szymanski, "Light scattering from droplets with inclusions and the impact on optical measurement of aerosols", *J. Aerosol Sci*., **35**, 1173, (2004).

A2. P. M. Winkler, A. Vrtala, P. E. Wagner, M. Kulmala, K. E. J. Lehtinen, T. Vesala, "Mass and Thermal Accommodation during Gas-Liquid Condensation of Water", *Phys. Rev. Lett.* **93**, 075701-1 (2004).

A3. P. Davidovits, D. R. Worsnop, J. T. Jayne, C. E. Kolb, P. Winkler, A. Vrtala, P. E. Wagner, M. Kulmala, K. E. J. Lehtinen, T. Vesala, M. Mozurkewich, "Mass Accommodation Coefficient of Water Vapor on Liquid Water", *Geophys. Res. Lett.* **31**, L22111 (2004).

A4. A. Laaksonen, T. Vesala, M. Kulmala, P. M. Winkler, P. E. Wagner, "Commentary on Cloud Modelling and the Mass Accommodation Coefficient of Water", *Atmos. Chem. Phys.* **5**, 461 (2005).

A5. A. I. Gaman, I. Napari, P. M. Winkler, H. Vehkamäki, P. E. Wagner, R. Strey, Y. Viisanen, M. Kulmala, „Homogeneous Nucleation of n-Nonane and n-Propanol Mixtures. A Comparison of Classical Nucleation Theory and Experiments", *J. Chem. Phys.*, **123**, 244502 (2005).

A6. P. M. Winkler, A. Vrtala, R. Rudolf, P. E. Wagner, I. Riipinen, T. Vesala, K. E. J. Lehtinen, Y. Viisanen, M. Kulmala, "Condensation of Water Vapor: Experimental Determination of Mass and Thermal Accommodation Coefficients", *J. Geophys. Res.* **111**, D19202, (2006).

A7. A. I. Hienola, P. M. Winkler, P. E. Wagner, H. Vehkamäki, A. Lauri, I. Napari, M. Kulmala, „Estimation of Line Tension and Contact Angle from Heterogeneous Nucleation Experimental Data", *J. Chem. Phys.* **126,** 094705 (2007).

A8. M. Kulmala, G. Mordas, T. Petäjä, T. Grönholm, P. P. Aalto, H. Vehkamäki, A. I. Hienola, E. Herrmann, M. Sipilä, I. Riipinen, H. E. Manninen, K. Hämeri, F. Stratmann, M. Bilde, P. M. Winkler, W. Birmili, P. E. Wagner, "The Condensation Particle Counter Battery (CPCB): A New Tool to Investigate the Activation Properties of Nanoparticles", *J. Aerosol Sci.*, **38**, 289-304 (2007).

A9. H. Vehkamäki, A. Määttänen, A. Lauri, M. Kulmala, P. M. Winkler, A. Vrtala, P. E. Wagner, "Heterogeneous Multicomponent Nucleation Theorems for the Analysis of Nanoclusters", *J. Chem. Phys.*, **126**, 174707 (2007).

A10. P. M. Winkler, G. Steiner, A. Vrtala, H. Vehkamäki, M. Noppel, K. E. J. Lehtinen, G. P. Reischl, P. E. Wagner, M. Kulmala, „Heterogeneous Nucleation Experiments Bridging the Scale from Molecular Ion Clusters to Nanoparticles", *Science*, **319**, 1374-1377 (2008).

A11. P. M. Winkler, A. Vrtala, P. E. Wagner, "Condensation Particle Counting Below 2 nm Seed Particle Diameter and the Transition from Heterogeneous to Homogeneous Nucleation", *Atmos. Res.,* **90**, 125-131 (2008).

A12. P. M. Winkler, A. Hienola, G. Steiner, G. Hill, A. Vrtala, G. P. Reischl, M. Kulmala, P. E. Wagner, „Effects of Seed Particle Size and Composition on Heterogeneous Nucleation of n-Nonane", *Atmos. Res.*, **90**, 187-194 (2008).

A13. M. Kulmala, V.-M. Kerminen, A. Laaksonen, I. Riipinen, M. Sipilä, T. M. Ruuskanen, T. Kurtén, A. Lauri, L. Sogacheva, P. Hari, J. Bäck, H. Lihavainen, K. E. J. Lehtinen, H. Hakola, Y. Viisanen, M. Bilde, B. Svenningsson, M. Lazaridis, K. Torseth, K. E. Yttri, P. Tunved, E. D. Nilsson, S. Pryor, L.-L. Sørensen, S. Larsen, U. Hõrrak, P. M. Winkler, P. E. Wagner, E. Swietlicki, M.-L. Riekkola, K. Hartonen, A. Ekman, R. Krejci, A. Grini, C. Hoyle, Ø. Hov, H.-C. Hansson, "Overview of the Biosphere-Aerosol-Cloud-Climate Interactions (BACCI) Studies", *Tellus B*, **60**, 300-317 (2008).

A14. J. Duplissy, M. B. Enghoff, K. L. Aplin, F. Arnold, H. Aufmhoff, M. Avngaard, U. Baltensperger, T. Bondo, R. Bingham, K. Carslaw, J. Curtius, A. David, B. Fastrup, S. Gagné, F. Hahn, R. G. Harrison, B. Kellett, J. Kirkby, M. Kulmala, L. Laakso, A. Laaksonen, E. Lillestol, M. Lockwood, J. Mäkelä, V. Makhmutov, N. D. Marsh, T. Nieminen, A. Onnela, E. Pedersen, J. O. P. Pedersen, J. Polny, U. Reichl, J. H. Seinfeld, M. Sipilä, Y. Stozhkov, F. Stratmann, H. Svensmark, J. Svensmark, R. Veenhof, B. Verheggen, Y. Viisanen, P. E. Wagner, G. Wehrle, E. Weingartner, H. Wex, M. Wilhelmsson, and P. M. Winkler, „Results from the CERN pilot CLOUD experiment", *Atmos. Chem. Phys.*, **10**, 1635-1647 (2010).

A15. C. E. Kolb, R. A. Cox, J. P. D. Abbatt, M. Ammann, E. J. Davis, D. J. Donaldson, B. C. Garrett, C. George, P. T. Griffiths, D. R. Hanson, M. Kulmala, G. McFiggans, U. Poschl, I. Riipinen, M. J. Rossi, Y. Rudich, P. E. Wagner, P. M. Winkler, D. R. Worsnop, and C. D. O'Dowd, „An overview of current issues in the uptake of atmospheric trace gases by aerosols and clouds", *Atmos. Chem. Phys.*, **10**, 10561-10605 (2010).

A16. V.-M. Kerminen, T. Petäjä, H. E. Manninen, P. Paasonen, T. Nieminen, M. Sipilä, H. Junninen, M. Ehn, S. Gagné, L. Laakso, I. Riipinen, H. Vehkamäki, T. Kurten, I. K. Ortega, M. Dal Maso, D. Brus, A. Hyvärinen, H. Lihavainen, J. Leppä, K. E. J. Lehtinen, A. Mirme, S. Mirme, U. Hõrrak, T. Berndt, F. Stratmann, W. Birmili, A. Wiedensohler, A. Metzger, J. Dommen, U. Baltensperger, A. Kiendler-Scharr, T. F. Mentel, J. Wildt, P. M. Winkler, P. E. Wagner, A. Petzold, A. Minikin, C. Plass-Dülmer, U. Pöschl, A. Laaksonen, and M. Kulmala. „Atmospheric nucleation: highlights of the EUCAARI project and future directions", *Atmos. Chem. Phys.*, **10**, 10829-10848 (2010).

A17. S. Schobesberger, P. M. Winkler, T. Pinterich, A. Vrtala, M. Kulmala, and P. E. Wagner, „Experiments on the temperature dependence of heterogeneous nucleation upon nm-sized NaCl and Ag particles." *Chem. Phys. Chem.,* 11, 3874-3882 (2010).

A18. P. M. Winkler, G. Steiner, A. Vrtala, G. P. Reischl, M. Kulmala, and P. E. Wagner, Unary and binary heterogeneous nucleation of organic vapours on monodisperse WO_x seed particles with diameters down to 1.4 nm. *Aerosol Sci. Technol*., **45**, 493-498 (2011).

A19. T. Pinterich, P. M. Winkler, A. Vrtala, P. E. Wagner, „Experiments on the Contact Angle of n-Propanol on Differently Prepared Silver Substrates at Various Temperatures and Implications for the Properties of Silver Nanoparticles.", *Atmos. Res.,* **101**, 510-518 (2011).

A20. J. Kirkby, J. Curtius, J. Almeida, E. Dunne, J. Duplissy, S. Ehrhardt, A. Franchin, S. Gagné, L. Ickes, A. Kürten, A. Kupc, A. Metzger, F. Riccobono, L. Rondo, S. Schobesberger, G. Tsagkogeorgas, D. Wimmer, A. Amorim, F. Bianchi, M. Breitenlechner, A. David, J. Dommen, A. Downard, M. Ehn, R. C. Flagan, S. Haider, A. Hansel, D. Hauser, W. Jud, H. Junninen, F. Kreissl, A Kvashin, A. Laaksonen, K. Lehtipalo, J. Lima, E. R. Lovejoy, V. Makhmutov, S. Mathot, J. Mikkilä, P. Minginette, S. Mogo, T. Nieminen, A. Onnela, P. Pereira, T. Petäjä, R. Schnitzhofer, J. H. Seinfeld, M. Sipilä, Y. Stozhkov, F. Stratmann, A. Tome, J. Vanhanen, Y. Viisanen, A. Vrtala, P. E. Wagner, H. Walther, E. Weingartner, H. Wex, P. M. Winkler, K. S. Carslaw, D. R. Worsnop, U. Baltensperger, M. Kulmala, „Role of sulfuric acid, ammonia and galactic cosmic rays in atmospheric aerosol nucleation.", *Nature*, **476**, 429-433 (2011).

A21. P. M. Winkler, A. Vrtala, G. Steiner, D. Wimmer, H. Vehkamäki, K. E. J. Lehtinen, G. P. Reischl, M. Kulmala, P. E. Wagner, „Quantitative characterization of critical nanoclusters nucleated on large single molecules", *Phys. Rev. Lett*. **108**, 085701 (2012).

A22. L. Cappellin, T. Karl, M. Probst, O. Ismailova, P. M. Winkler, C. Soukoulis, E. Aprea, T. D. Märk, F. Gasperi, F. Biasioli, "On Quantitative Determination of Volatile Organic Compound Concentrations Using Proton-transfer-reaction-time-of-flight-mass-spectrometry", *Environ. Sci. Technol*. **46**, 2283-2290 (2012).

A23. P. M. Winkler, J. Ortega, T. Karl, L. Cappellin, H. R. Friedli, K. Barsanti, P. H. McMurry, J. N. Smith, "Identification of the biogenic compounds responsible for size-dependent nanoparticle growth", *Geophys. Res. Lett*. **39**, L20815 (2012).

A24. A. Kupc, P. M. Winkler, A. Vrtala, P. E. Wagner, "Unusual temperature dependence of heterogeneous nucleation of water vapor on Ag particles", *Aerosol Sci. Technol*. **47**, i-iv (2013).

A25. M. Noppel, H. Vehkamäki, P. M. Winkler, M. Kulmala, P. E. Wagner, "Heterogeneous nucleation in multi-component vapor on a partially wettable charged conducting seed particle. I. Formulation of general equations: Electrical surface and line excess quantities", *J. Chem. Phys*. **139**, 134107 (2013).

A26. M. Noppel, H. Vehkamäki, P. M. Winkler, M. Kulmala, P. E. Wagner, "Heterogeneous nucleation in multi-component vapor on a partially wettable charged conducting seed particle. II. The generalized Laplace, Gibbs-Kelvin, and Young equations and application to nucleation", *J. Chem. Phys*. **139**, 134108 (2013).

A27. E. J. T. Levin, A. J. Prenni, B. B. Palm, D. A. Day, P. Campuzano-Jost, P. M. Winkler, S. M. Kreidenweis, P. J. DeMott, J. L. Jimenez, J. N. Smith, "Size-resolved aerosol composition and its link to hygroscopicity at a forested site in Colorado", *Atmos. Chem. Phys*. **14**, 2657-2667 (2014).

A28. Y. Y. Cui, A. Hodzic, J. N. Smith, J. Ortega, J. Brioude, H. Matsui, E. J. T. Levin, A. Turnipseed, P. Winkler, B. de Foy, "Modeling ultrafine particle growth at a pine forest site influenced by anthropogenic pollution during BEACHON-RoMBAS-2011", *Atmos. Chem. Phys.* **14**, 11011-11029 (2014).

A29. A. Kürten, T. Jokinen, M. Simon, M. Sipilä, N. Sarnela, H. Junninen, A. Adamov, J. Almeida, A. Amorim, F. Bianchi, M. Breitenlechner, J. Dommen, N. M. Donahue, J. Duplissy, S. Ehrhart, R. C. Flagan, A. Franchin, J. Hakala, A. Hansel, M. Heinritzi, M. Hutterli, J. Kangasluoma, J. Kirkby, A. Laaksonen, K. Lehtipalo, M. Leiminger, V. Makhmutov, S. Mathot, A. Onnela, T. Petäjä, A. P. Praplan, F. Riccobono, M. P. Rissanen, L. Rondo, S. Schobesberger, J. H. Seinfeld, G. Steiner, A. Tomée, J. Tröstl, P. M. Winkler, C. Williamson, D. Wimmer, P. Yei, U. Baltensperger, K. S. Carslaw, M. Kulmala, D. R. Worsnop, J. Curtius, "Neutral molecular cluster formation of sulfuric acid-dimethylamine observed in real time under atmospheric conditions", *Proc. Natl. Acad. Sci.* **111**, 15019-15024 (2014).

A30. J. L. Fry, D. C. Draper, K. C. Barsanti, J. N. Smith, J. Ortega, P. M. Winkler, M. J. Lawler, S. S. Brown, P. M. Edwards, R. C. Cohen, L. Lee, "Secondary organic aerosol formation and organic nitrate yield from NO3 oxidation of biogenic hydrocarbons", *Environ. Sci. Technol*. **48**, 11944-11953 (2014).

A31. J. Julin, P. M. Winkler, N. M. Donahue, P. E. Wagner, I. Riipinen, "Near-unity mass accommodation coefficient of organic molecules of varying structure", *Environ. Sci. Technol*. **48**, 12083-12089 (2014).

A32. F. Bianchi, A. P. Praplan, N. Sarnela, J. Dommen, A. Kürten, I. K. Ortega, S. Schobesberger, H. Junninen, M. Simon, J. Tröstl, T. Jokinen, M. Sipilä, A. Adamov, A. Amorim, J. Almeida, M. Breitenlechner, J. Duplissy, S. Ehrhart, R. C. Flagan, A. Franchin, J. Hakala, A. Hansel, M. Heinritzi, J. Kangasluoma, H. Keskinen, J. Kim, J. Kirkby, A. Laaksonen, M. J. Lawler, K. Lehtipalo, M. Leiminger, V. Makhmutov, S. Mathot, A. Onnela, T. Petäjä, F. Riccobono, M. P. Rissanen, L. Rondo, A. Tomé, A. Virtanen, Y. Viisanen, C. Williamson, D. Wimmer, P. M. Winkler, P. Ye, J. Curtius, M. Kulmala, D. R. Worsnop, N. M. Donahue, U. Baltensperger, "Insight into acid-base nucleation experiments by comparison of the chemical composition of positive, negative and neutral clusters", *Environ. Sci. Technol*. **48**, 13675-13684 (2014).

A33. A. P. Praplan, S. Schobesberger, F. Bianchi, M. P. Rissanen, M. Ehn, T. Jokinen, H. Junninen, A. Adamov, A. Amorim, J. Dommen, J. Duplissy, J. Hakala, A. Hansel, M. Heinritzi, J. Kangasluoma, J. Kirkby, M. Krapf, A. Kürten, K. Lehtipalo, F. Riccobono, L. Rondo, N. Sarnela, M. Simon, A. Tomé, J. Tröstl, P. M. Winkler, C. Williamson, P. Ye, J. Curtius, U. Baltensperger, N. M. Donahue, M. Kulmala, D. R. Worsnop, "Elemental composition and clustering behaviour of α–pinene oxidation products for different oxidation conditions", *Atmos. Chem. Phys*. **15**, 4145-4159 (2015).

A34. J. Kim, L. Ahlm, T. Yli-Juuti, M. Lawler, H. Keskinen, J. Tröstl, S. Schobesberger, J. Duplissy, K.E.J. Lehtinen, J. Smith, I. Riipinen, A. Kürten, F. Bianchi, N. M Donahue, P. Miettinen, A. Amorim, A. Laaksonen, A. Tomé, C. Williamson, D. Wimmer, J. Hakala, J. Kirkby, K. Lehtipalo, K. Sengupta, L. Rondo, M. Heinritzi, P. M. Winkler, M. P, Rissanen, M. Simon, P. Ye, R. C. Flagan, T. Jokinen, T. Petäjä, M. Kulmala, and A. Virtanen, "Hygroscopicity of nanoparticles produced from homogeneous nucleation in the CLOUD experiments", *Atmos. Chem. Phys*. **16**, 293-304 (2016).

A35. T. Petäjä, E. O'Connor, D. Moisseev, V. Sinclair, A. Manninen, R. Väänänen, A. von Lerber, J. Thornton, K. Nicoll, W. Petersen, V. Chandrasekar, J. Smith, P. Winkler, O. Krüger, H. Hakola, H. Timonen, D. Brus, T. Laurila, E. Asmi, M. Riekkola, J. Mona, P. Massoli, R. Engelmann, M. Komppula, J. Wang, C. Kuang, J. Bäck, A. Virtanen, J. Levula, M. Ritsche, N. Hickmon, "BAECC: A field campaign to elucidate the impact of biogenic aerosols on clouds and climate." *Bull. Amer. Meteor. Soc.*, **97**, 1909-1928, (2016).

A36. C. R. Hoyle, C. Fuchs, E. Järvinen, H. Saathoff, A. Dias, I. El Haddad, M. Gysel, S. C. Coburn, J. Tröstl, A.-K. Bernhammer, F. Bianchi, M. Breitenlechner, J. C. Corbin, J. Craven, N. M. Donahue, J. Duplissy, S. Ehrhart, C. Frege, H. Gordon, N. Höppel, M. Heinritzi, T. B. Kristensen, U. Molteni, L. Nichman, T. Pinterich, A. S. H. Prevot, M. Simon, J. G. Slowik, G. Steiner, A. Tomé, A. L. Vogel, R. Volkamer, A. C. Wagner, R. Wagner, A. S. Wexler, C. Williamson, P. M. Winkler, C. Yan, A. Amorim, J. Dommen, J. Curtius, M. W. Gallagher, R. C. Flagan, A. Hansel, J. Kirkby, M. Kulmala, O. Möhler, F. Stratmann, D. R. Worsnop, U. Baltensperger, "Aqueous phase oxidation of sulphur dioxide by ozone in cloud droplets", *Atmos. Chem. Phys*. **16**, 1693-1712 (2016).

A37. E. Järvinen, K. Ignatius, L. Nichman, T. B. Kristensen, C. Fuchs, C. R. Hoyle, N. Höppel, J. C. Corbin, J. Craven, J. Duplissy, S. Ehrhart, I. El Haddad, C. Frege, H. Gordon, T. Jokinen, P. Kallinger, J. Kirkby, A. Kiselev, K.-H. Naumann, T. Petäjä, T. Pinterich, A. S. H. Prevot, H. Saathoff, T. Schiebel, K. Sengupta, M. Simon, J. G. Slowik, J. Tröstl, A. Virtanen, P. Vochezer, S. Vogt, A. C. Wagner, R. Wagner, C. Williamson, P. M. Winkler, C. Yan, U. Baltensperger, N. M. Donahue, R. C. Flagan, M. W. Gallagher, A. Hansel, M. Kulmala, F. Stratmann, D. R. Worsnop, O. Möhler, T. Leisner, M. Schnaiter, „Observation of viscosity transition in α–pinene secondary organic aerosol", *Atmos. Chem. Phys*. **16**, 4423-4438 (2016).

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