

## CURRICULUM VITAE

### CYNTHIA H. TWOHY

#### EDUCATION:

Ph.D., Atmospheric Sciences, University of Washington, 1992.

M.S., Atmospheric Sciences, University of Washington, 1988.

B.S., Summa Cum Laude, University of California at Davis, 1981.

#### EXPERIENCE:

##### *Sr. Research Scientist—Northwest Research Associates (2014-present)*

Twohy conducts independent and collaborative research on atmospheric aerosol particles, clouds, and climate, using both field research and modeling. Most of her work involves making measurements from research aircraft in different regions globally. She studies how particles in clean and polluted environments form cloud droplets and ice and then influence climate through changes in cloud microphysics, radiative properties and precipitation.

##### *Visiting Researcher—Scripps Institution of Oceanography (2013-present)*

##### *Professor (Sr. Res.)—Oregon State University (2009-2014)*

##### *Associate Professor (Sr. Res.)—Oregon State University (2003-2009)*

##### *Assistant Professor (Sr. Res.)—Oregon State University (1998-2003)*

##### *Scientist I, II, III--National Center for Atmospheric Research (1994-1998)*

At NCAR, Twohy developed and supported the research applications of aircraft and instrumentation, in particular airborne aerosol and cloud microphysical measurement capabilities at the Research Aviation Facility. She performed wind tunnel studies, airflow modeling, and developed the Counterflow Virtual Impactor airborne cloud sampler for field work. She also conducted independent and collaborative research on aerosols, cloud physics, cloud chemistry and climate.

##### *Postdoctoral Fellow--National Center for Atmospheric Research (1992-1994)*

##### *Graduate Research Fellow--National Center for Atmospheric Research (1990-1992)*

##### *Scientific Visitor--National Center for Atmospheric Research (1988-1990)*

##### *Research/Teaching Assistant--University of Washington (1985-1988)*

##### *Senior Food Technologist--Case-Swayne Co, Inc. (1981-1985)*

*Airborne Atmospheric Research* (Participated in 37 aircraft field programs as instrument principal investigator, project manager or flight scientist between 1987 and present):

- Western wildfire Experiment for Cloud chemistry, Aerosol absorption and Nitrogen (NCAR C-130), 2018.
- Southern Ocean Clouds Radiation Aerosol Transport Experimental Study (NCAR G-V), 2018.
- Airborne Research Instrumentation and Testing Opportunity (NCAR G-V), 2017.
- Instrument Development and Education in Atmospheric Science-IV (NCAR G-V), 2013.
- Ice in Clouds--Tropical Experiment (NCAR C-130), 2011.
- Pre-Depression Investigation of Cloud-systems in the Tropics (NCAR Gulfstream-V), 2010.
- VAMOS Ocean-Cloud-Atmosphere-Land Study (NCAR C-130), 2008.
- Ice in Clouds--Layer Experiment (NCAR C-130), 2007.
- Tropical Composition, Cloud and Climate Coupling (NASA DC-8), 2007.
- Pacific Dust Experiment (NCAR Gulfstream-V), 2007
- NASA African Monsoon Multidisciplinary Analysis (NASA DC-8), 2006.
- Costa-Rica AURA Validation Experiment (NASA WB-57F), 2006.
- Rain in Cumulus over the Ocean (NCAR C-130), 2004-2005.
- Mid-latitude Cirrus Experiment (NASA WB-57F), 2004.
- Alliance Icing Research Study-II (NCAR C-130), 2003.
- Instrument Development and Education in Atmospheric Science-III (NCAR C-130), 2003.
- Cirrus Regional Study of Tropical Anvils and Cirrus Layers (UND Citation), 2002.
- Instrument Development and Education in Atmospheric Science-II (NCAR C-130), 2002.
- Convection and Moisture Experiment-IV (NASA DC-8), 2001.
- Dynamics and Chemistry of Marine Stratocumulus (NCAR C-130), 2001.
- Atmospheric Radiation Measurement (ARM) Cloud IOP (UND Citation), 2000.
- Indian Ocean Experiment (NCAR C-130), 1999.
- Stratosphere-Troposphere Experiment: Radiation, Aerosols, and Ozone (WB-57F), 1998.
- Lake-Ice (NCAR Electra), 1997/1998.
- C-130 Aerosol Inlet Evaluation-II (NCAR C-130), 1997.
- Subsonic Aircraft: Contrail and Cloud Effects Special Study (NASA DC-8), 1996.
- C-130 Aerosol Inlet Evaluation (NCAR C-130), 1995.
- Southern Ocean Cloud Experiment II (CSIRO F-27), 1995.
- Winter Storms Project (NCAR Electra), 1994.
- Stratospheric Photochemistry, Aerosols, and Dynamics Exp. (NASA ER-2), 1993.
- Southern Ocean Cloud Experiment (CSIRO F-27), 1993.
- Kuwait Oil-Fire Smoke Experiment (NCAR Electra), 1991.
- Hawaiian Rainband Project (NCAR Electra), 1990.
- Cloud Droplet Chemistry (NCAR King Air), 1989.
- ERICA (NCAR Electra and Sabreliner), 1989.
- First ISCCP Regional Experiment (U. Washington Convair), 1987.
- NSF Cloud Chemistry Program (U. Washington Convair), 1987.

## **HONORARY AND PROFESSIONAL ACTIVITIES:**

Proposal and paper reviewer for NSF, NASA, European and Middle Eastern science foundations, U.S. and international journals, including panel reviews for NASA and NSF (1992-present)  
Editor (Aerosols and Clouds), Bulletin of the American Meteorological Society (2010-2019)  
Editorial Board, Atmospheric Chemistry and Physics Special Issue on VOCALS (2009-2018)  
Commissioner, International Commission on Clouds and Precipitation, IUGG (2008-2016)  
Frontiers in Global Change Invited Speaker, Pacific Northwest National Laboratory (2013)  
Invited Speaker, European HALO-HIAPER Aircraft Workshop (2013)  
Committee of Visitors Review Panel, NSF Atmospheric and Geospace Sciences Division (2013)  
Conference Chair, American Association for Aerosol Research (2009-2010)  
Invited Author, European Facility for Airborne Research (EUFAR) book on Airborne Measurements (2009-2013)  
Steering Committee, NSF/NASA/DOE Measurement of Ice in Clouds Workshop (2010)  
Editorial Board, Aerosol Science and Technology (2003-2011)  
Invited Speaker, IGBP/IGAC/GEWEX International Workshop (2007)  
Attributed Reviewer, WMO/UIGG Report on Aerosol Pollution Impact on Precipitation (2007)  
NASA Group Achievement Award, NAMMA Experiment (2007)  
NASA Group Achievement Award, TC-4 Experiment (2007)  
Invited Speaker, U.C. Berkeley 5th Annual Atmospheric Science Symposium (2005)  
Board of Directors, American Association for Aerosol Research (2003-2006)  
Editor, American Association for Aerosol Research Newsletter (2005-2006)  
Assistant Editor, American Association for Aerosol Research Newsletter (2003-2005)  
NASA Group Achievement Award, CRYSTAL-FACE Experiment (2003)  
NSF Geosciences Education Review Panel (2003)  
NSF Observing Facilities Advisory Panel, (2002-2005, 3 year term)  
Chair, Atmos. Aerosols Working Group, American Assn for Aerosol Research (2001-2002)  
Vice-Chair, Atmos. Aerosols Working Group, Am. Assn for Aerosol Research (2000-2001)  
Co-Chair, NSF HIAPER Working Group on Inlets and Airflow (2002-2005)  
Mentor at Association for Women in Science Workshop (2002)  
Marquis Who's Who (various)  
NCAR WB-57F Aircraft Mission Scientist (1997-1998)  
NCAR Aerosol Program Steering Committee (1996-1998)  
Science Fair Judge, Kohl Elementary School, Broomfield, CO (1996-1998)  
Chair, NCAR C-130 Working Group on Aerosols and Inlets (1995-1996)  
NASA Astronaut Candidate Finalist (1994)  
Chair, NCAR Atmospheric Technology Divisional Equity Committee (1994)  
United Way Math Tutor, Lafayette, CO (1992-1993)  
NCAR Postdoctoral Fellowship (1992-1994)  
NCAR Graduate Research Fellowship (1990-1992)  
Panhellenic Scholarship Award, University of California at Davis (1980)  
Phi Kappa Phi (US National Honor Society)  
Prytanean Women's Honor Society  
Sigma Xi Honor Society  
American Meteorological Society

American Geophysical Union  
American Association for Aerosol Research  
Multiple committees at Oregon State University

**FUNDED PROPOSALS** (Total Funding Secured: \$4.64 million):

“Collaborative Research: Field Measurements of Clouds and Aerosol Particles over the Southern Ocean in SOCRATES”, funded by NSF AGS. Funding (2017-22): *\$341K*

“Collaborative Research: Western wildfire Experiment for Cloud chemistry, Aerosol absorption and Nitrogen (WE-CAN)”, subcontract through University of Colorado funded by NSF AGS. Funding (2017-22): *\$95K*

“Collaborative Research: The Influence of Tropical Convection on the Evolution and Transport of the Saharan Air Layer”, funded by NSF AGS. Funding (2014-17): *\$305K*

“Impact of Mineral Dust on Lifecycle of Tropical Convection”, funded by NSF ATM. Funding (10-14): *\$325K + \$13K Supplement*.

“Collaborative Research: Interaction of Aerosols with Marine Boundary Layer Clouds in the VOCALS Regional Experiment”, funded by NSF ATM. Funding (08-12): *\$187K*.

Research Experience for Undergraduates—Supplement funded by NSF-ATM. Funding (09): *\$7K*.

“Ubiquitous Small Ice Crystals in Cirrus Clouds: Fact or Fiction?”, funded by NASA. Funding (08-13): *\$225K*.

“An Aircraft Study of the Characterization and Evolution of Supercooled and Mixed-Phase Clouds—PACDEX SUPPLEMENT ”, funded by NSF ATM. Funding (07-09): *\$80K*.

"Microphysical Measurements and Analysis in Support of the Tropical Composition, Cloud, and Climate Coupling Experiment", subcontract to NCAR, funded by NASA. Funding (07-10): *\$73K*

"Effects of Aerosols on Microphysical Properties of Springtime Clouds Containing Ice", funded by NSF ATM. Funding (06-09): *\$311K*.

"Microphysical Measurements and Analysis in Support of the NASA African Monsoon Multidisciplinary Activities (NAMMA)", funded by NASA. Funding (06-09): *\$193K*.

"Investigations of Aerosol Radiative Forcing in Cloudy Regions”, funded by NOAA AGP. Funding (06-09): *\$305K. (Co-investigator with Jim Coakley)*

“Research Experience for Undergraduates—Supplement funded by NSF-ATM. Funding (05-06): *\$7K*.

“Droplet Nuclei and Condensed Water Content in Mixed-Phase Clouds”, funded by NSF-ATM. Funding (03-06): *\$280K*.

“Droplet Nuclei and Condensed Water Content in Mixed-Phase Clouds”, funded by NSF-ATM. Supplemental Funding for RICO Experiment (03-06): *\$56K*.

“Ice Water Content in Mid-Latitude Cirrus”, funded by NASA Code YS. Funding (04-05): *\$40K*.

“Interactions of Aerosol Particles and Marine Stratocumulus Clouds”, funded by NSF ATM. Funding (01-04): *\$202K*.

“Parameterizations of the Vertical Variability of Tropical Cirrus Microphysical and Radiative Properties”, funded by NASA. Funding (01-03): *\$172K*.

“Development of a Compact Cloud Spectrometer and Impactor (Phase II)”, funded by NSF STTR program. Funding (01-03): *\$138K*.

“Microphysical Observations in Support of Convection and Moisture Experiment (CAMEX-4)”, funded by NASA. Funding (01-03): \$94K.

"Characteristics of Cloud Nucleating Aerosols in INDOEX", funded by NSF ATM. Funding (00-02): \$198K.

“Development of a Compact Cloud Spectrometer and Impactor (Phase I)”, funded by NSF STTR program. Funding (00): \$35K.

“Deployment of a Counterflow Virtual Impactor in Support of the March, 2000 Cloud IOP”, funded by DOE/Battelle. Funding (99-00): \$63K.

"Optical Spectrometer", with D. Baumgardner of NCAR and Spec., Inc., funded by NASA SBIR program. Funding (98-00): \$150K.

"Analysis of SUCCESS Contrail and Cirrus Microphysical and State Parameter Data and Conceptual/Numerical Model Development", with A. Heymsfield of NCAR, funded by NASA’s Atmospheric Effects of Aviation/Subsonic Assessment. Funding (97-99): \$301K.

"Lake-Ice CVI", with Ken Beard and Harry Ochs of University of Illinois, funded by National Science Foundation/ U. Illinois. Funding (97-99): \$7K.

“In-Situ Measurement of Cirrus Cloud Properties” with B. Gandrud of NCAR, funded by NASA’s Atmospheric Effects of Aviation/Subsonic Assessment. Funding (95-97): \$320K.

“Southern Hemisphere Cloud Condensation Nuclei” with J. Hudson of Desert Research Institute, funded by NASA’s Mission to Planet Earth. Total funding (93-96): \$115K.

“C-130 Aerosol Inlet Evaluation” with D. Rogers and L. Radke. *Thirty flight hours* on NCAR C-130 awarded by OFAP (4/95).

"Cloud Droplet Chemistry Experiment" with B. Huebert and R. J. Charlson. *Fifty flight hours* on NCAR King Air awarded by OFAP (9/89).

## **PUBLIC & COMMUNITY SERVICE:**

Volunteer at Carlsbad Library, Homebound Program (2018-2)

Volunteer at Homeward Bound Pets (no-kill animal shelter), McMinnville, OR (2005-2013)

Association for Women in Science workshop mentor, Corvallis, OR (2001)

Science Fair Judge, Kohl Elementary School, Broomfield, CO (1996-1998)

Master Gardener, Colorado State University Cooperative Extension (1996-1997)

Convalescent Home Pet Visitation, Thornton, CO (1995-1997)

United Way Math Tutor, Lafayette, CO (1992-1993)

## **PUBLICATIONS: Cynthia H. Twohy**

### **Thesis:**

Twohy, C.H., 1988: Sampling and analysis of cloud droplets by aircraft using a counterflow virtual impactor. M.S. Thesis, University of Washington, Department of Atmospheric Sciences, 133 pp.

Twohy, C.H., 1992: On the size dependence of the chemical properties of cloud droplets: exploratory studies by aircraft. *NCAR Cooperative Thesis CT-137*, University of Washington and National Center for Atmospheric Research, 239 pp.

**Refereed** (93 peer-reviewed journal or book publications):

- Charlson, R.J., C.H. Twohy and P.K. Quinn, 1988: Physical influences of altitude on the chemical properties of clouds and of water deposited from the troposphere. In *Acid Deposition at High Altitude Sites*. M. H. Unsworth and D. Fowler (eds.), Kluwer Academic Publishers.
- Twohy, C. H., P. Austin and R. J. Charlson, 1989: Chemical consequences of the initial diffusional growth of cloud droplets: a clean marine case. *Tellus*, **41B**, 51-60.
- Twohy, C. H., A. D. Clarke, S. G. Warren, L.F. Radke and R. J. Charlson, 1989: Light-absorbing material extracted from cloud droplets and its effect on cloud albedo. *J. Geophys. Res.*, **94**, 8623-8631.
- Twohy, C.H. and D. Rogers, 1993: Airflow and water drop trajectories at instrument sampling points around the Beechcraft King Air and Lockheed Electra. *J. Atmos. Oceanic Technol.*, **10**, 566-578.
- Drdla, K., A. Tabazadeh, R. P. Turco, M. Z. Jacobson, J.E. Dye, C. Twohy and D. Baumgardner, 1994: Analysis of the physical state of one Arctic polar stratospheric cloud based on observations. *Geophys. Res. Lett.*, **21**, 2475-2478.
- Twohy, C. H., P. A. Durkee, B. J. Huebert and R. J. Charlson, 1995: Effects of aerosol particles on the microphysics of coastal stratiform clouds. *J. Climate*, **8**, 773-783.
- Twohy, C. H., and J. G. Hudson, 1995: Measurements of cloud condensation nucleus spectra within maritime cumulus cloud droplets: Implications for mixing processes. *J. Appl. Meteor.*, **34**, 815-833.
- Twohy, C. H., A.J. Schanot and W. A. Cooper, 1997: Measurement of condensed water content in liquid and ice clouds using an airborne counterflow virtual impactor. *J. Atmos. Oceanic Tech.*, **14**, 197-202.
- DeMott, P. J., D. C. Rogers, S. M. Kreidenweis, Y. Chen, C. H. Twohy, D. Baumgardner, A. J. Heymsfield, and K. R. Chan, 1998: The role of heterogeneous freezing nucleation in upper tropospheric clouds: Inferences from SUCCESS. *Geophys. Res. Lett.*, **25**, 1387-1390.
- Gerber, H., C. H. Twohy, B. Gandrud, A. J. Heymsfield, G. M. McFarquhar, P. J. DeMott, and D. C. Rogers, 1998: Measurements of wave-cloud microphysical properties with two new aircraft probes. *Geophys. Res. Lett.*, **25**, 1117-1120.
- Heymsfield, A. J, L. M. Miloshevich, C. Twohy, G. Sachse, and S. Oltmans, 1998: Upper tropospheric relative humidity observations and implications for cirrus ice nucleation. *Geophys. Res. Lett.*, **25**, 1343-1346.
- Jensen, E. J., O. B. Toon, S. Kinne, G. W. Sachse, B. E. Anderson, K. R. Chan, C. H. Twohy, B. Gandrud, A. Heymsfield, and R. C. Mialke-Lye, 1998: Environmental conditions required for contrail formation and persistence. *J. Geophys. Res.*, **103**, 3929-3936.
- Jensen, E.J., O.B. Toon, A. Tabazadeh, G.W. Sachse, B. E. Anderson, K. R. Chan, C. Twohy, B. Gandrud, S. M. Aulench, A. Heymsfield, J. Hallett, and B. Gary, 1998: Ice nucleation processes in upper tropospheric wave-clouds observed during SUCCESS. *Geophys. Res. Lett.*, **25**, 1363-1366.
- Laucks, M.L., and C. H. Twohy, 1998: Size-dependent sampling efficiency of an airborne counterflow virtual impactor. *Aer. Sci. and Tech.*, **28**, 40-61.
- Twohy, C.H., 1998: Model calculations and wind tunnel testing of an isokinetic shroud for high-speed sampling. *Aer. Sci. and Tech.*, **29**, 261-280.

- Twohy, C. H., and B. W. Gandrud, 1998: Electron microscope analysis of residual particles from aircraft contrails. *Geophys. Res. Lett.*, **25**, 1359-1362.
- Vay, S. A., B. E. Anderson, G.W. Sachse, J. E. Collins, J. R. Podolske, C. H. Twohy, B. Gandrud, K. R. Chan, S. L. Baughcum, and H. A. Wallio, 1998: DC-8-based observations of aircraft CO, CH<sub>4</sub>, N<sub>2</sub>O, and H<sub>2</sub>O emission indices during SUCCESS. *Geophys. Res. Lett.*, **25**, 1717-1720.
- Weinheimer, A. J., T. L. Campos, J. G. Walega, F. E. Grahek, B. A. Ridley, D. Baumgardner, C. H. Twohy, B. Gandrud, and E. J. Jensen, 1998: Uptake of NO<sub>y</sub> on wave-cloud ice particles. *Geophys. Res. Lett.*, **25**, 1725-1728.
- Clement, C. F., I. J. Ford, and C. H. Twohy, 2000: Aerosol nucleation and mixing in the upper troposphere, *J. Aerosol Science*, S570-S571, doi: 10.1016/S0021-8502(00)90581-0.
- Clement, C. F., I. J. Ford, and C. H. Twohy, 2000: Mixing of atmospheric gas concentrations. *Phys. Res. Lett.*, **84**, 4010-4013.
- Blomquist, B. W., B. J. Huebert, S. G. Howell, M. Litchy, C. H. Twohy, A. Schanot, D. Baumgardner, B. Lafleur, R. Seebaugh and M. L. Laucks, 2001: An evaluation of the community aerosol inlet for the NCAR C-130. *J. Atmos. Ocean. Tech.*, **18**, 1387-1397.
- Clement, C. F., I. J. Ford and C.H. Twohy, 2001: Fluctuations in aerosols and trace gas concentrations following mixing in the upper troposphere, *J. Aerosol Sci.*, **32**, 1045-1046.
- Jensen, E. J., O. B. Toon, S. A. Vay, J. Ovarlez, R. May, P. Bui, C. H. Twohy, B. W. Gandrud, Pueschel, R.F. and U. Schumann, 2001: Prevalence of ice supersaturated regions in the upper troposphere: implications for optically thin ice cloud formation. *J. Geophys. Res.*, **106**, 17,253-17,266.
- Twohy, C. H., J. G. Hudson, S. S. Yum, J. R. Anderson, S. K. Durlak, and D. Baumgardner, 2001: Characteristics of cloud nucleating aerosols in the Indian Ocean region. *J. Geophys. Res.*, **106**, 28699-28710.
- Baumgardner, D., J-F. Gayet, H. Gerber, A. Korolev and C. Twohy, 2002: Clouds: Measurement Techniques In Situ. In *Encyclopedia of Atmospheric Sciences*. J. R. Holton, J. A. Curry and Pyle J (eds.), Academic Press, London, pp 489-498.
- Clement, C. F., I. J. Ford, C. H. Twohy, A. Weinheimer and T. Campos, 2002: Particle production in the outflow of a mid-latitude storm. *J. Geophys. Res.*, **107**, 4559, doi: 10.1029/2001JD001352.
- Heymsfield, A. J., A. Bansemer, S. Lewis, J. Iaquinta, M. Kajikawa and C. Twohy, 2002: A general approach for deriving the properties of cirrus and stratiform ice cloud particles. *J. Atmos. Sci.*, **59**, 3-29.
- Twohy, C. H., C. F. Clement, B. W. Gandrud, A. J. Weinheimer, T. Campos, D. Baumgardner, W. H. Brune, I. Faloona, D. Tan, G. W. Sachse and S. A. Vay, 2002: Deep convection as a source of new particles in the midlatitude upper troposphere. *J. Geophys. Res.*, **107**, 4560, doi: 10.1029/2001JD000323.
- Garrett, T. J., H. Gerber, D. G. Baumgardner, C. H. Twohy, and E. M. Weinstock, 2003: Small, highly reflective ice crystals in low-latitude cirrus. *Geophys. Res. Lett.*, **30** (21), 2132, doi:10.1029/2003GL018153.
- Stevens, B., D. H. Lenschow, G. Vali, H. Gerber, ...C. Twohy et al., 2003: Dynamics and chemistry of marine stratocumulus—DYCOMS-II. *Bull. of Amer. Meteor. Soc.*, **84**, 579-593.
- Twohy, C. H., J. W. Strapp, and M. Wendisch, 2003: Performance of a counterflow virtual impactor in the NASA Icing Research Tunnel. *J. Atmos. Ocean. Tech.*, **20**, 781-790.

- Beard, K. V., H. T. Ochs, and C. H. Twohy, 2004: Aircraft measurements of high average charges on cloud drops in stratiform clouds. *Geophys. Res. Lett.*, **31**, L14111, doi:10.1029/2004GL020465.
- Heymsfield, A. J., A. Bansemer, C. Schmitt, C. Twohy, and M. R. Poellot, 2004: Effective ice particle densities derived from aircraft data. *J. Atmos. Sci.*, **61**, 982-1003.
- Garrett, T. J., B. C. Navarro, C. H. Twohy, E. J. Jensen, D. G. Baumgardner, T. P. Bui, H. Gerber, R. L. Herman, A. J. Heymsfield, P. Lawson, P. Minnis, L. Nguyen, M. Poellot, S. K. Pope, F. P. J. Valero, and E. Weinstock, 2005: Evolution of a Florida cirrus anvil. *J. Atmos. Sci.*, **62**, 2352-2372.
- Heymsfield, A. J., L. M. Miloshevich, C. Schmitt, A. Bansemer, C. Twohy, M. R. Poellot, A. Fridland, and H. Gerber, 2005: Homogeneous ice nucleation in tropical convection and its influence on cirrus anvil microphysics. *J. Atmos. Sci.*, **62**, 41-64.
- Twohy, C. H. and M. R. Poellot, 2005: Chemical characteristics of ice residual nuclei in anvil cirrus clouds: implications for ice formation processes. *Atmos. Chem. Phys.*, 2289-2297, doi:10.5194/acp-5-2289-2005.
- Twohy, C. H., J. R. Anderson, and P. A. Crozier, 2005: Nitrogenated organic aerosols as cloud condensation nuclei. *Geophys. Res. Lett.*, **32**, L19805, doi:10.1029/2005GL023605.
- Twohy, C. H., M. D. Petters, J. R. Snider, B. Stevens, W. Tahnk, M. Wetzel, L. Russell and F. Burnet, 2005: Evaluation of the aerosol indirect effect in marine stratocumulus clouds: droplet number, size, liquid water path and radiative impact. *J. Geophys. Res.*, **110**, D08203, doi:10.1029/2004JD005116.
- Clement, C. F., L. Pirjola, C. H. Twohy, I. J. Ford, and M. Kulmala, 2006: Analytic and numerical calculations of formation of a sulphuric acid aerosol in the upper troposphere. *J. Aer. Sci.*, **37**, 1717-1729.
- Heymsfield, A. J., C. Schmitt, A. Bansemer, G-J. van Zadelhoff, M. McGill, D. Baumgardner, and C. Twohy, 2006: Effective Radius of Ice Cloud Particle Populations Derived from Aircraft Probes. *J. Atmos. Ocean. Tech.*, **23**, 361-380.
- Mace, G. G., S. Benson, K. L. Sonntag, S. Kato, Q. Min, P. Minnis, C. Twohy, M. Poellot, C. Long, Q. Zhang, and D. R. Doelling, 2006: Cloud radiative forcing at the ARM Climate Research Facility: Part 1. Technique, validation, and comparison to satellite-derived diagnostic quantities. *J. Geophys. Res.*, **111**, D11S90, doi:10.1029/2005JD005921.
- Davis, S., L. M. Avallone, E. M. Weinstock, C. H. Twohy, J. B. Smith, and G. L. Kok, 2007: Comparisons of in-situ measurements of cirrus cloud ice water content. *J. Geophys. Res.*, **112**, D10212, doi:10.1029/2006JD008214.
- Heymsfield, A. J., A. Bansemer and C. H. Twohy, 2007: Refinements to ice particle mass dimensional and terminal velocity relationships for ice clouds: Part I: temperature dependence. *J. Atmos. Sci.*, **64**, 1047-1067, doi: 10.1175/JAS3890.1.
- Prenni, A. J., P. J. DeMott, C. H. Twohy, M. R. Poellot, S. M. Kreidenweis, D. C. Rogers, S. D. Brooks, M. S. Richardson, and A. J. Heymsfield, 2007: Examinations of ice formation processes in Florida cumuli using ice nuclei measurements of anvil ice crystal particle residues. *J. Geophys. Res.*, **112**, D10221, doi:10.1029/2006JD007549.
- Park, S., R. Jiménez, B. C. Daube, L. Pfister, T. J. Conway, E. W. Gottlieb, V. Y. Chow, D. J. Curran, D. M. Matross, A. Bright, E. L. Atlas, T. P. Bui, R-S. Gao, C. H. Twohy, and S. C. Wofsy, 2007: The CO<sub>2</sub> tracer clock for the tropical tropopause layer. *Atmos. Chem. Phys.* acp-2007-0151, 7, 3989-4000, www.atmos-chem-phys.net/7/3989/2007/.



- Heymsfield, A. J., C. Schmitt, A. Bansemer, G-J. van Zadelhoff, M. McGill, C. Twohy, and D. Baumgardner, 2007: Reply. *J. Atmos. Ocean. Tech.*, **24**, 1511–1518, doi: 10.1175/JTECH2077.1.
- Rauber, R. M., B. Stevens, H. T. Ochs III, C. Knight, ...C. H. Twohy, 2007: Rain in (Shallow) Cumulus over the Ocean — The RICO Campaign. *Bull. Amer. Meteor. Soc.*, **88**, 1912-1928.
- Field, P. R., A. J. Heymsfield, A. Bansemer and C. H. Twohy, 2008: Determination of the combined ventilation factor and capacitance for ice crystal aggregates from airborne observations in a tropical anvil cloud. *J. Atmos. Sci.*, **65**, 376.
- Lasher-Trapp, S., S. Anderson-Bereznicki, A. Shackelford, C. Twohy and J. G. Hudson, 2008: An Investigation of the Influence of Droplet Number Concentration and Giant Aerosol Particles Upon Supercooled Large Drop Formation in Wintertime Stratiform Clouds. *J. Appl. Meteor. Clim.*, **47**, 2569-2678, doi: 10.1175/2008JAMC1807.1.
- Hawkins, L, L. M. Russell, C. H. Twohy and J. R. Anderson, 2008: Uniform particle-droplet partitioning of 18 organic and elemental components measured in and below DYCOMS-II stratocumulus clouds. *J. Geophys. Res.*, **113**, D14201, doi:10.1029/2007JD009150.
- Twohy, C. H., and J. R. Anderson, 2008: Droplet nuclei in non-precipitating clouds: Composition and size matter, *Environ. Res. Lett.*, **3**, doi: 10.1088/1748-9326/3/4/045002 (invited paper).
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