

NEWMAN, PAUL A.

Dr. Paul A. Newman

**Chief Scientist for Earth Sciences
Earth Sciences Division
NASA Goddard Space Flight Center**

RESEARCH AREAS:

Atmospheric Dynamics, Stratospheric Climatology, Stratospheric Ozone

EDUCATION:

1984 - Ph.D. - Physics, Iowa State University, Ames, IA

1978 - B.S. - Physics, minor in Mathematics, Seattle University, Seattle, WA Magna Cum Laude

PREVIOUS POSITIONS:

1989 - 1990 Universities Space Research Associates, GSFC

1986 - 1989 Applied Research Corp., Landover, MD

1984 - 1986 NASA Goddard Space Flight Center, Greenbelt, MD, National Research Council
Postdoctoral Fellow

1982 - 1984 Iowa State University, Ames, IA, L. H. Brown Pre-Doctoral Fellow

1978 - 1981 Iowa State University, Ames, IA, Research and Teaching Assistant in Physics

PROFESSIONAL MEMBERSHIPS AND POSITIONS:

American Meteorological Society (1979-present)

AMS Polar Meteorology and Oceanography Committee (1994)

AMS Middle Atmosphere Committee (1994)

American Geophysical Union (1979-present)

AASE theory team member (1988-1989)

AASE II theory team member (1991-1992)

SPADE theory team member (1992-1993)

ASHOE/MAESA theory team member (1994)

ERAST leadership team member (1994-1997)

Associate Editor, Journal of Geophysical Research (1997-2004)

Stratospheric Tracers of Atmospheric Transport (STRAT) Co-Project Scientist (1994-1997)

POLARIS Co-Project Scientist (1997)

SOLVE Co-Project Scientist (1999-2000)

International Council of Scientific Unions (ICSU), Solar-Terrestrial Energy Program (STEP),

STEP Results, Applications, and Modeling Phase (SRAMP) Steering Committee Member

SOLVE-II Co-Project Scientist (2001-2002)

CRYSTAL-FACE ER-2 Platform Scientist (2002)

WMO/UNEP Scientific Assessment of Ozone Depletion: 2002, Polar Ozone Chapter lead author

Pre-AVE Co-Project Scientist (2004)

AVE Project Scientist (2004-2009)

Network for Detection of Stratospheric Change steering group member, 1994-2004

WMO/UNEP Scientific Assessment of Ozone Depletion: 2006, Polar Ozone Chapter lead author

Tropical Composition, Cloud and Climate Coupling (TC4) ER-2 platform scientist (2007)

Member of U.S. Climate Change Science Program's Synthesis and Assessment Product 2.4:

Trends in Emissions of Ozone Depleting Substances, Ozone Layer Recovery, and
Implications for Ultraviolet Radiation Exposure (2007)

Global Hawk Pacific Mission (GloPac) project scientist (2008-2011)

International Ozone Commission (2009-present)

Montreal Protocol Scientific Assessment Panel, Co-Chairman (2007-present)

Hurricane and Severe Storm Sentinel (HS3) - Deputy Project Scientist

Airborne Tropical Tropopause Experiment (ATTREX) - Global Hawk platform scientist

Lead for the Stratospheric Processes And their Role in Climate, Reevaluation of the Lifetimes of

Dominant Stratospheric Ozone Depleting Substances (ODSs) activity (2011-2014)

USGCRP Strategic Plan Author (2011)

Southeast Asia Composition, Cloud, Climate Coupling Regional Study (SEAC4 RS) Science
Team (2011-2012)

Lead for the Stratospheric Processes And their Role in Climate, Solving the Mystery of carbon
tetrachloride activity (2015-present)

NASA GSFC Earth Sciences Division, Scientific Advisory Group (SAG), 2014-

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Atmospheric Tomography Mission (ATom) an Earth Venture Suborbital-2 program (2015-2019).
Science Team Lead
Advisory committee for the General Trust Fund for Financing Activities on Research and
Systematic Observations Relevant to the Vienna Convention

AWARDS:

Magna Cum Laude, Seattle University
L. H. Brown Pre-Doctoral Fellow
Premium for Academic Excellence, 1984
National Research Council Postdoctoral Fellow, 1984-1986
NASA Group Achievement Award (AASE I)
NASA Group Achievement Award (Ozone Trends Panel)
NASA Group Achievement Award (Temperature Analysis Group)
AGU, Excellence in Reviewing award, 1993 JGR
GSFC Laboratory for Atmospheres Peer Award, 199
NASA Group Achievement Award (AASE II), 1992
AGU, Excellence in Reviewing Award, 1994 JGR
NASA Group Achievement Award (Stratospheric Forecasting), 1994
NASA Group Achievement Award (SPADE), 1994
Naval Research Laboratory's Alan Berman Research Publication Award, 1995
NASA Group Achievement Award (ASHOE/MAESA), 1995
NASA Group Achievement Award (POLARIS), 1998
NASA GSFC Special Act Award (SOLVE), 2000
GSFC Laboratory for Atmospheres Peer Award, 2001
Arthur S. Flemming Award, 2002
NASA Group Achievement Award (SOLVE II), 2004
NASA Group Achievement Award (SOLVE II DC-8 Science Team), 2005
GSFC Laboratory for Atmospheres Peer Award, 2006 GSFC
Webby Award, NASA's Ozone Watch, 2006 Official Nominee
William T. Pecora Award, Total Ozone Mapping Spectrometer Team, 2006
NASA Group Achievement Award (TOMS), 2006
NASA Group Achievement Award (TC-4 Science Team), 2008
Environmental Protection Agency Ozone Protection Award, 2009
Fellow of the American Geophysical Union, 2010
William Nordberg Memorial Award for Earth Sciences, 2011
NASA Group Achievement Award (GloPac Science Team), 2011
American Geophysical Union Bjerknes Lecturer, 2011
Fellow of the American Meteorological Society, 2012
Seattle University Alumni Professional Achievement Award, 2012
Senior Fellow, Goddard Space Flight Center, 2014
Robert H. Goddard Exceptional Achievement for Science Team, Chelyabinsk Bolide, 2014.
NASA Group Achievement Award (SEAC4RS), 2014.
NASA Group Achievement Award (HS3), 2015.

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PUBLICATIONS (h-index of 44 from Web of Science):

1. "Observational Characteristics of Atmospheric Anomalies with Short Meridional and Long Zonal Scales," P. A. Newman and J. L. Stanford, *J. Atmos. Sci.*, **40**, 2547-2554, 1983.
2. "Short Meridional Scale Anomalies in the Lower Stratosphere and Upper Troposphere," P. A. Newman and J. L. Stanford, *J. Atmos. Sci.*, **42**, 2081-2092, 1985.
3. "Horizontal Mixing Coefficients Calculated from NMC Data," P. A. Newman, M. R. Schoeberl, and R. A. Plumb, *J. Geophys. Res.*, **91**, 7919-7924, 1986.
4. "Nimbus 7 Satellite Measurements of the Springtime Antarctic Ozone Decrease," R. S. Stolarski, A. J. Krueger, M. R. Schoeberl, R. D. McPeters, P. A. Newman, and J. C. Alpert, *Nature*, **322**, 808-811, 1986.
5. "October Antarctic Temperature and Total Ozone Trends from 1979-1985," P. A. Newman and M. R. Schoeberl, *Geophys. Res. Lett.*, **13**, 1206-1209, 1986.
6. "The Morphology of Antarctic Total Ozone as Seen by TOMS," M. R. Schoeberl, A. J. Krueger, and P. A. Newman, *Geophys. Res. Lett.*, **13**, 1217-1220, 1986.
7. "The Final Warming and Polar Vortex Disappearance During the Southern Hemisphere Spring," P. A. Newman, *Geophys. Res. Lett.*, **13**, 1228-1231, 1986.
8. "Mixing Rates Calculated from Potential Vorticity," P. A. Newman, M. R. Schoeberl, R. A. Plumb, and J. E. Rosenfield, *J. Geophys. Res.*, **93**, 5221-5240, 1988.
9. "Effect of Computed Horizontal Diffusion Coefficients on Two-Dimensional N₂O Model Distributions," C. H. Jackman, P. A. Newman, P. D. Guthrie, and M. R. Schoeberl, *J. Geophys. Res.*, **93**, 5213-5219, 1988.
10. "Coherent Ozone-Dynamical Changes during the Southern Hemisphere Spring, 1979-1986," P. A. Newman, and W. J. Randel, *J. Geophys. Res.*, **93**, 12,585-12,606, 1988.
11. "Antarctic Springtime Ozone Depletion Computed from Temperature Observations," J. E. Rosenfield, M. R. Schoeberl, and P. A. Newman, *J. Geophys. Res.*, **93**, 3833-3849, 1988.
12. "The Morphology and Meteorology of Southern Hemisphere Spring Total Ozone Mini-Holes," P. A. Newman, L. R. Lait, and M. R. Schoeberl, *Geophys. Res. Lett.*, **15**, 923-926, 1988.
13. "Quasi-biennial Modulation of the Antarctic Ozone Depletion," L. R. Lait, M. R. Schoeberl, and P. A. Newman, *J. Geophys. Res.*, **94**, 11,559-11,571, 1989.
14. "Reconstruction of the Constituent Distribution and Trends in the Antarctic Polar Vortex from ER-2 Flight Observation," M. R. Schoeberl, L. R. Lait, M. Proffitt, P. A. Newman, R. L. Martin, D. L. Hartmann, M. Loewenstein, J. Podolske, S. E. Strahan, J. Anderson, K. R. Chan, and B. Gary, *J. Geophys. Res.*, **94**, 16815-16846, 1989.
15. "Potential Vorticity Estimates in the South Polar Vortex from ER-2 Flight Data," D.L. Hartmann, K. R. Chan, B. L. Gary, M. R. Schoeberl, P. A. Newman, R. L. Martin, M. Loewenstein, J. R. Podolske, and S. E. Strahan, *J. Geophys. Res.*, **94**, 11625-11640, 1989.
16. "Evidence of the Mid-Latitude Impact of Antarctic Ozone Depletion," R. J. Atkinson, W. A. Mathews, P. A. Newman, and R. A. Plumb, *Nature*, **340**, 290-293, 1989.
17. "Total Ozone during the 1988-1989 Northern Hemisphere Winter," P. A. Newman, R. S. Stolarski, M. R. Schoeberl, L. R. Lait, and A. J. Krueger, *Geophys. Res. Lett.*, **17**, 317-320, 1990.
18. "Stratospheric Temperatures During the 88-89 Northern Hemisphere Winter," P. A. Newman, L. R. Lait, M. R. Schoeberl, and R. M. Nagatani, *Geophys. Res. Lett.*, **17**, 329-332, 1990.
19. "A Comparison of Arctic Lower Stratospheric Winter Temperatures for 1988-89 with Temperatures Since 1964," R. M. Nagatani, A. J. Miller, M. E. Gelman, and P. A. Newman, *Geophys. Res. Lett.*, **17**, 333-336, 1990.
20. "Stratospheric Temperatures During AASE: Results From STRATAN," R. B. Rood, P. A. Newman, D. J. Lamich, L. R. Lait, and R. Chan, *Geophys. Res. Lett.*, **17**, 337-340, 1990.
21. "Radiative Heating Rates during the Airborne Arctic Stratospheric Expedition," J. E. Rosenfield, M. R. Schoeberl, L. R. Lait, P. A. Newman, M. H. Proffitt, and K. K. Kelly, *Geophys. Res. Lett.*, **17**, 345-348, 1990.
22. "Small-Scale Waves Encountered during AASE," J. T. Bacmeister, M. R. Schoeberl, L. R. Lait, P. A. Newman, B. Gary, *Geophys. Res. Lett.*, **17**, 349-352, 1990.
23. "Stratospheric Constituent Trends from ER-2 Profile Data," M. Schoeberl, M. Proffitt, K. Kelly, L. Lait, P. Newman, J. Rosenfield, M. Loewenstein, J. Podolske, S. Strahan, and J. Vedder, *Geophys. Res. Lett.*, **17**, 469-472, 1990.
24. "Airborne Measurements of Stratospheric Constituents Over the Arctic in the Winter of 1989," W. Mankin, M. Coffey, A. Goldman, M. Schoeberl, L. Lait, and P. Newman, *Geophys. Res. Lett.*, **17**, 473-476, 1990.
25. "Reconstruction of O₃ and N₂O Fields from ER-2, DC-8, and Balloon Observations," L. R. Lait, M. R. Schoeberl, P. A. Newman, M. H. Proffitt, K. K. Kelly, M. Loewenstein, J. R. Podolske, S. E.

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- Strahan, K. R. Chan, B. Gary, J. Margitan, E. Browell, M. P. McCormick, and A. Torres, *Geophys. Res. Lett.*, **17**, 521-524, 1990.
26. "Three Dimensional Simulation of Hydrogen Chloride and Hydrogen Fluoride during the Airborne Arctic Stratospheric Expedition," J. A. Kaye, A. R. Douglass, R. B. Rood, R. S. Stolarski, P. A. Newman, D. J. Allen, E. M. Larson, M. T. Coffey, W. G. Mankin, and G. C. Toon, *Geophys. Res. Lett.*, **17**, 529-532, 1990.
 27. "Effects of Atmospheric Transport on Column Abundances of Nitrogen and Chlorine Compounds in the Arctic Stratosphere," J. Yatteau, S. Wofsy, R. Salawitch, M. McElroy, M. Schoeberl, L. Lait, P. Newman, A. Torres, T. Jorgensen, W. Mankin, M. Coffey, G. Toon, M. Loewenstein, J. Podolske, S. Strahan, K. Chan, and M. Proffitt, *Geophys. Res. Lett.*, **17**, 533-536, 1990.
 28. "Loss of Ozone in the Arctic Vortex for the Winter of 1989," R. Salawitch, M. McElroy, J. Yatteau, S. Wofsy, M. Schoeberl, L. Lait, P. Newman, K. Chan, M. Loewenstein, J. Podolske, S. Strahan, and M. Proffitt, *Geophys. Res. Lett.*, **17**, 561-564, 1990.
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 30. "Lidar Observations of Ozone Changes Induced by Air Mass Motions," T. J. Mcgee, R. Ferrare, J. Butler, P. Newman, D. Whiteman, J. Burris, S. Godin, and I. S. McDermid, *J. Geophys. Res.*, **95**, 20,527-20,530, 1990.
 31. "The 1990 Antarctic Ozone Hole as Observed by TOMS," P. Newman, R. Stolarski, M. Schoeberl, R. McPeters, and A. Krueger, *Geophys. Res. Lett.*, **18**, 661-664, 1991.
 32. "Spatial and Temporal Variability of the Extent of Chemically Processed Stratospheric Air," J. A. Kaye, A. R. Douglass, R. B. Rood, R. S. Stolarski, P. A. Newman, D. J. Allen, and E. M. Larson, *Geophys. Res. Lett.*, **18**, 29-32, 1991.
 33. "Depletion of Arctic Ozone in the Winter 1990," M. Koike, Y. Kondo, M. Hayashi, Y. Iwasaka, P. A. Newman, M. Helten, P. Amedieu, *Geophys. Res. Lett.*, **18**, 791-794, 1991.
 34. "Comparison of Ozone Profiles from Ground-Based Lidar, ECC Balloon Sonde, ROCOZ-A Rocketsonde, and SAGE II Satellite Measurements," I. S. McDermid, R. A. Barnes, C. L. Parsons, A. Torres, M. P. McCormick, W. P. Chu, P. Wang, J. Butler, P. Newman, J. Burris, R. Ferrare, D. Whiteman, and T. J. McGee, *J. Geophys. Res.*, **95**, 10,037-10,042, 1991.
 35. "The 1989 Antarctic Ozone Hole as Observed by TOMS," R. S. Stolarski, M. R. Schoeberl, P. A. Newman, R. D. McPeters, and A. J. Krueger, *Geophys. Res. Lett.*, **18**, 661-664, 1991.
 36. "Reactive Nitrogen, Ozone, and Nitrate Aerosols Observed in the Arctic Stratosphere in January 1990," Y. Kondo, P. Amedieu, M. Koike, Y. Iwasaka, P. A. Newman, U. Schmidt, and W. A. Matthews, *J. Geophys. Res.*, **97**, 13,025-13,038, 1991.
 37. "An Investigation into the Reduction of Stratospheric Ozone in the Southern Australian Region," P. Lehmann, D. J. Karoly, P. A. Newman, T. S. Clarkson, and W. A. Matthews, *Geophys. Res. Lett.*, **14**, 1463-1466, 1992.
 38. "The 1991 Antarctic Ozone Hole: TOMS Observations," A. Krueger, M. Schoeberl, P. Newman, and R. Stolarski, *Geophys. Res. Lett.*, **12**, 1215-1218, 1992.
 39. "Long-term Winter Total Ozone Changes at Macquarie Island," P. Lehmann, D. J. Karoly, P. A. Newman, T. S. Clarkson, and W. A. Matthews, *Geophys. Res. Lett.*, **19**, 1459-1462, 1992.
 40. "Evidence for Subsidence in the 1989 Arctic Winter Stratosphere from Airborne Infrared Composition Measurements," G. C. Toon, C. B. Farmer, P. W. Schaper, L. L. Lowe, R. H. Horton, M. R. Schoeberl, L. R. Lait, and P. A. Newman, *J. Geophys. Res.*, **97**, 7963-7970, 1992.
 41. "The Structure of the Polar Vortex," M. R. Schoeberl, L. R. Lait, P. A. Newman, J. E. Rosenfield, *J. Geophys. Res.*, **97**, 7859-7882, 1992.
 42. "A Simulation of the Cerro Hudson SO₂ Cloud," M. R. Schoeberl, S. Doiron, L. R. Lait, P. A. Newman, and A. J. Krueger, *J. Geophys. Res.*, **98**, 2949-2955, 1992.
 43. "Chemical Loss of Ozone in the Arctic Polar Vortex in the Winter of 1991-1992," R. J. Salawitch, C. F. Wofsy, E. W. Gottlieb, D. W. Toohey, L. M. Avallone, L. R. Lait, P. A. Newman, M. R. Schoeberl, M. Loewenstein, J. R. Podolske, S. E. Strahan, A. Weaver, M. H. Proffitt, C. R. Webster, R. D. May, D. W. Fahey, D. Baumgardner, J. E. Dye, J. C. Wilson, K. K. Kelly, J. W. Elkins, K. R. Chan, and J. G. Anderson, *Science*, **261**, 1146-1149, 1993.
 44. "Heterogeneous Reaction Probabilities, Solubilities, and Physical State of Cold Volcanic Aerosols," O. Toon, B. Gary, L. Lait, P. Newman, R. Pueschel, P. Russell, M. Schoeberl, G. Toon, W. Traub, F. Valero, H. Selkirk, and J. Jordan, *Science*, **261**, 1136-1140, 1993.
 45. "The Seasonal Evolution of Reactive Chlorine in the Northern Hemisphere Stratosphere," D. W. Toohey, L. M. Avallone, L. R. Lait, P. A. Newman, M. R. Schoeberl, D. W. Fahey, C. R. Webster, R. D. May, and J. G. Anderson, *Science*, **261**, 1134-1136, 1993.
 46. "Chlorine Chemistry on Polar Stratospheric Cloud Particles in the Arctic Winter," C. R. Webster, R. D. May, D. W. Toohey, L. M. Avallone, J. G. Anderson, P. Newman, L. Lait, M. R. Schoeberl, J. W. Elkins, and K. R. Chan, *Science*, **261**, 1130-1134, 1993.

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47. "The Evolution of CIO and NO along Air Parcel Trajectories," M. R. Schoeberl, A. R. Douglass, R. S. Stolarski, P. A. Newman, L. R. Lait, D. Toohey, L. Avallone, J. G. Anderson, W. Brune, D. W. Fahey, and K. Kelly, *Geophys. Res. Lett.*, **20**, 2511-2514, 1993.
48. "Volcanic and Wave-Cloud Optical Depth Spectra from DC-8 Tracking Sunphotometer Measurements: 1. Results vs. Latitude, Time, and Vortex Structure," P. B. Russell, J. M. Livingston, R. F. Pueschel, J. A. Reagan, E. V. Browell, G. C. Toon, P. Newman, L. R. Lait, M. R. Schoeberl, and B. M. Herman, *Geophys. Res. Lett.*, **22**, 2571-2574, 1993.
49. "AASE II Stratospheric Meteorological Conditions," P. Newman, L. Lait, M. Schoeberl, E. Nash, K. Kelly, D. W. Fahey, R. Nagatani, D. Toohey, J. Anderson, and L. Avallone, *Science*, **261**, 1143-1146, 1993.
50. "Record Low Global Ozone in 1992," J. Gleason, P. K. Bhartia, J. R. Herman, R. McPeters, P. Newman, R. S. Stolarski, L. Flynn, G. Labow, D. Larko, C. Seftor, C. Wellemeyer, W. D. Komhyr, A. J. Miller, and W. Planet, *Science*, **260**, 523-526, 1993.
51. "Interpretation of NO_x/NO_y Observations from AASE-II Using a Model of Chemistry Along Trajectories," S. R. Kawa, D. W. Fahey, J. C. Wilson, M. R. Schoeberl, A. R. Douglass, R. S. Stolarski, E. L. Woodbridge, H. Jonsson, L. R. Lait, P. A. Newman, M. H. Proffitt, D. W. Toohey, D. E. Anderson, M. Loewenstein, K. R. Chan, C. R. Webster, R. May, and K. K. Kelly, *Geophys. Res. Lett.*, **20**, 2507-2510, 1993.
52. "MLS CIO Observations and Arctic Polar Vortex Temperatures," M. R. Schoeberl, R. S. Stolarski, A. R. Douglass, P. A. Newman, L. R. Lait, J. W. Waters, L. Froidevaux, W. G. Ready, *Geophys. Res. Lett.*, **20**, 2861-2864, 1993.
53. "New Observations of the Noy/N₂O Correlation in the Lower Stratosphere," M. Loewenstein, J. R. Podolske, D. W. Fahey, E. L. Woodbridge, P. Tin, A. Weaver, P. A. Newman, S. E. Strahan, S. R. Kawa, M. R. Schoeberl, and L. R. Lait, *Geophys. Res. Lett.*, **20**, 2531-2534, 1993.
54. "Correlation of Ozone Loss with the Presence of Volcanic Aerosols," T. McGee, M. Gross, U. Singh, P. Newman, G. Megie, S. Godin, and A. Locoste, *Geophys. Res. Lett.*, **21**, 2801-2804, 1994.
55. "UARS MLS O₃ Soundings Compared with Lidar Measurements Using the Conservative Coordinates Reconstruction Technique," G. Redaelli, L. R. Lait, M. Schoeberl, P. A. Newman, G. Visconti, A. D'Altorio, F. Masci, V. Rizzi, L. Froidevaux, J. W. Waters, and A. J. Miller, *Geophys. Res. Lett.*, **21**, 1535-1538, 1994.
56. "Fine-Scale, Poleward Transport of Tropical Air During AASE 2," D. W. Waugh, R. A. Plumb, P. A. Newman, M. R. Schoeberl, L. R. Lait, M. Loewenstein, J. R. Podolske, J. W. Elkins, and K. R. Chan, *Geophys. Res. Lett.*, **21**, 2603-2606, 1994.
57. "Antarctic Total Ozone in 1958," P. A. Newman, *Science*, **264**, 543-546, 1994.
58. "Intrusions Into the Lower Stratospheric Arctic Vortex During the Winter of 1991-1992," R. A. Plumb, D. W. Waugh, R. J. Atkinson, P. A. Newman, L. R. Lait, M. R. Schoeberl, E. V. Browell, A. J. Simmons, and M. Loewenstein, *J. Geophys. Res.*, **99**, 1089-1105, 1994.
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60. "Computations of Diabatic Descent in the Stratospheric Polar Vortex," J. E. Rosenfield, P. A. Newman, and M. R. Schoeberl, *J. Geophys. Res.*, **99**, 16677-16689, 1994.
61. "An Algorithm for Forecasting Mountain Wave-Related Turbulence in the Stratosphere," J. T. Bacmeister, P. A. Newman, B. L. Gary, and K. R. Chan, *Weather and Forecasting*, **9**, 241-253, 1994.
62. "A Comparison of Winds From the STRATAN Data Assimilation System to Balanced Wind Estimates", L. Coy, R. Rood, P. Newman, *J. Atmos. Sci.*, **51**, 2309-2315, 1994.
63. "Meteor-3 Total Ozone Mapping Spectrometer Observations of the 1993 Ozone Hole", J. Herman, P. Newman, R. McPeters, A. Krueger, P. Bhartia, C. Seftor, O. Torres, G. Jaross, R. Cebula, D. Larko, C. Wellemeyer, *J. Geophys. Res.*, **100**, 2973-2983, 1995.
64. "Trajectory Mapping of Upper Atmosphere Research Satellite (UARS) Data," G. A. Morris, M. R. Schoeberl, L. SpA.g, P. A. Newman, L. R. Lait, L. Elson, J. Waters, R. A. Suttie, A. Roche, J. Kumer, and J. M. Russell, III, *J. Geophys. Res.*, **100**, 16,491-16,505, 1995.
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66. "A Multiple Level Trajectory Analysis of Vortex Filaments," M. R. Schoeberl and P. A. Newman, *J. Geophys. Res.*, **100**, 25,801-25,815, 1995.
67. "Trajectory Modelling of Emissions from Lower Stratospheric Aircraft," L. Sparling, M. Schoeberl, A. Douglass, C. Weaver, P. Newman, and L. Lait, *J. Geophys. Res.*, **100**, 1427-1438, 1995.
68. "A Reinterpretation of the Data From the NASA Stratosphere-Troposphere Exchange Project," P. A. Newman and M. R. Schoeberl, *Geophys. Res. Lett.*, **22**, 2501-2504, 1995.

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69. "Measurements of Polar Vortex Air in Midlatitudes," P. A. Newman, L. R. Lait, M. Schoeberl, M. Seabloom, M. Proffitt, M. Loewenstein, J. R. Podolske, J. W. Elkins, C. R. Webster, R. D. May, D. W. Fahey, G. S. Dutton, and K. R. Chan, *J. Geophys. Res.*, **101**, 12,879-12,891, 1996.
70. "An Objective Determination of the Polar Vortex Using Ertel's Potential Vorticity," E. Nash, P. Newman, J. Rosenfield, and M. Schoeberl, *J. Geophys. Res.*, **101**, 9471-9478, 1996.
71. "Stratospheric Horizontal Wave-Number Spectra of Winds, Potential Temperature, and Atmospheric Tracers Observed by High-Altitude Aircraft," J. Bacmeister, S. Eckermann, P. Newman, L. Lait, K. Chan, M. Loewenstein, M. Proffitt, and B. Gary, *J. Geophys. Res.*, **101**, 9441-9470, 1996.
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73. "Ozone Change from 1992 to 1993 as Observed from SSBUV on the ATLAS-1 and ATLAS-2 Missions, E. Hilsenrath, P. Newman, R. Cebula, P. DeCamp, T. Kelly, L. Coy, *Geophys. Res. Lett.*, **23**, 2305-2308, 1996.
74. "Activation of Chlorine in Sulfate Aerosol as Inferred from Aircraft Observations," S. R. Kawa, P. A. Newman, L. R. Lait, M. R. Schoeberl, R. M. Stimpfle, J. G. Anderson, D. W. Kohn, C. R. Webster, R. D. May, D. Baumgardner, J. E. Dye, J. C. Wilson, K. R. Chan, and M. Loewenstein, *J. Geophys. Res.*, **102**, 3921-3933, 1997.
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