

NOAA/OAR Aeronomy Laboratory 2003 Peer-Reviewed Scientific Papers

18 February 2004

This summary describes the 2003 peer-reviewed scientific publications of the NOAA Research's Aeronomy Laboratory from several perspectives. In addition to identifying and listing the 2003 publications, we indicate here several of their characteristics.

I. The Major Current Research Foci of the Aeronomy Laboratory

In the main table given below in Sec. IV, the 2003 scientific papers are grouped by the Laboratory's current three major research foci (which are described in detail in Part 4, "Research at the Aeronomy Laboratory," of the 6 February 2004 "data call" on the Research Review Team web site). Also listed in Sec. IV below are the chapters of the 2003 cross-cutting decision-support assessments to which Aeronomy Laboratory researchers served as authors.

The number of 2003 peer-reviewed papers and book chapters in those categories are as follows:

<u>Research Focus and Decision-Support Product</u>	<u>Number of Papers</u>
The chemistry, radiation, and dynamics of climate	36 (36%)
The stratospheric ozone layer	17 (17%)
Regional air chemistry	40 (40%)
State-of-understanding scientific assessments	<u>6</u> (6%)
Total:	99

For a given year of publication, these percentages reflect, of course, particular major research thrusts of the two-to-three preceding years, such as the occurrence of a major field campaign. But, these percentages also show the results of purposeful, longer-term redirection of its research by the Aeronomy Laboratory toward environmental issues for which there are more pressing decision-support information needs. For example, in the years 1993 through 1996, Aeronomy Laboratory publications addressing the stratospheric ozone layer issue were 46% of its scientific output. In 2003, however, this focus comprised 17%. Indeed, such self-directed change in the research foci of the Aeronomy Laboratory has characterized its nearly 40-year time span (see Part 2, "History of the Aeronomy Laboratory," of the 6 February 2004 "data call" on the Research Review Team web site).

II. The Journals and Books in Which the Aeronomy Lab Researchers Published: 2003

Listed below are the journals and other peer-reviewed publications in which the Aeronomy Laboratory researchers and collaborators published their findings in 2003. In many respects, the titles also tell “the Aeronomy Laboratory story”: global and regional geophysics, a major focus on atmospheric chemistry, instrument science (“It is an under-observed world”), reviews of knowledge in a field, and embodiment of the state of understanding into decision-support information.

<u>Journal or Peer-Reviewed Publication</u>	<u>Number of Papers</u>
Journal of Geophysical Research	39
Atmospheric Chemistry and Physics	11
Journal of Physical Chemistry	8
Geophysical Research Letters	5
“Scientific Assessment of Ozone Depletion: 2002”	5
Journal of Environmental Monitoring	4
Aerosol Science and Technology	3
Chemical Reviews	3
Environmental Science and Technology	3
Journal of Atmospheric Sciences	3
Proceedings of the National Academy of Sciences of the United States of America	2
Atmospheric Environment	1
Encyclopedia of Atmospheric Sciences	1
EOS Transactions, American Geophysical Union	1
Quarterly Journal of the Royal Meteorological Society	1
International Journal of Mass Spectrometry and Ion Processes	1
Journal of Applied Meteorology	1
Journal of Atmospheric and Oceanic Technology	1
Journal of Atmospheric and Solar-Terrestrial Physics	1
Journal of Climate	1
Journal of Photochemistry and Photobiology A: Chemistry	1
Meteorological Monographs	1
Monthly Weather Review	1
“Particulate Matter Science for Policy Makers: A NARSTO Assessment”	1
Total	99

As of mid-February 2004, Aeronomy Laboratory researchers have 70 papers and manuscripts that are either published already with a 2004 date (11), in press (26), or submitted (33).

III. Other Characteristics of Aeronomy Laboratory Publications

A Basic Indicator: Collaborative Publications

A hallmark of the Laboratory's research through the years has been strong and extensive collaborative activities with other national and international institutions, e.g., universities, other Federal agencies, other NOAA Research Laboratories, and the private sector. One of the most telling indicators of those close scientific interactions are journal publications. Typically, well over half of the Laboratory's research papers are with non-Laboratory coauthors. In the list of the Aeronomy Laboratory's 2003 peer-reviewed publications, about 80% are published with external collaborators as coauthors.

Recognition by Peers

Each year, NOAA Research recognizes its "Outstanding Papers", generally from papers that have been published in a pair of earlier years. Typically, from two to four papers with Aeronomy Laboratory coauthors have been on the list of about a dozen outstanding research and review papers. The process involving 2001 and 2002 papers is in progress now.

ISI Thompson Scientific tracks the citations of scientific papers by the worldwide scientific community. Their "ISI Highly Cited" index features "The World's Most Influential Researchers" by determining the most-cited authors in each of a dozen research fields over the nearly 20-year period 1981-1999. In the geosciences, ten NOAA Research scientists are prominent in the listing of "highly cited" researchers (see "ISI Highly Cited" on the Research Review Team web site). Seven on that list are Aeronomy Laboratory federal and joint institute researchers.

IV. 2003 Peer-Reviewed Papers of the Aeronomy Laboratory

Overview of the Aeronomy Laboratory Peer-Reviewed Papers Listing: Three Major Scientific Issues, and an Overarching Role in Science Communication. The Aeronomy Lab's research is aimed at understanding the atmospheric processes important to model predictions of environmental changes in three research areas: climate, the stratospheric ozone layer, and regional air chemistry. In addition, scientists at the Aeronomy Lab play leading roles in producing "state-of-the-science" assessment reports for use by national and international decision makers. The 2003 peer-reviewed publications of the Aeronomy Lab total 99 in number. They are shown here in those four major areas of contribution.

A. The Chemistry, Radiation, and Dynamics of Climate

The Aeronomy Laboratory's research on the chemistry, radiation, and dynamics of climate led to 36 publications in 2003. As reflected in the list below, those publications focus on: (i) field and laboratory studies, theoretical analyses, and diagnostic modeling to characterize the globally-occurring chemical and dynamical processes that affect the radiative balance of the coupled ozone-layer and climate system, especially with respect to non-CO₂ climate-related trace constituents such as tropospheric ozone, aerosols, water vapor, and clouds, and (ii) understanding the relationships between tropical dynamics and climate variability.

2003 Peer-Reviewed Papers

Atlas, D., and C.R. Williams, The anatomy of a continental tropical convective storm, *Journal of the Atmospheric Sciences*, 60 (1), 3-15, 2003.

Atlas, D., and C.R. Williams, Radar echoes from lightning and their microphysical environment, *Geophysical Research Letters*, 30 (5), 1262, doi:10.1029/2002GL016521, 2003.

Bais, A.F., S. Madronich, J.H. Crawford, S.R. Hall, B. Mayer, M. VanWeele, J. Lenoble, J.G. Calvert, C.A. Cantrell, R.E. Shetter, A. Hofzumahaus, P. Koepke, P.S. Monks, G.J. Frost, R. McKenzie, N. Krotkov, A. Kylling, S.A. Lloyd, W.H. Swartz, G. Pfister, T.J. Martin, E.-P. Roeth, E. Griffioen, A. Ruggaber, M. Krol, A. Kraus, G.D. Edwards, M. Mueller, B. Lefer, P.E. Johnston, H. Schwander, D. Flittner, B.G. Gardiner, J.D. Barrick and R. Schmitt, International photolysis frequency measurement and model intercomparison: Spectral actinic solar flux measurements and modeling, *Journal of Geophysical Research*, 108 (D16), 8543, doi:10.1029/2002JD002891, 2003.

Battaglia, A., C. Kummerow, D.-B. Shin and C.R. Williams, Constraining microwave brightness temperatures by radar brightband observations, *Journal of Atmospheric and Oceanic Technology*, 20, 856-871, 2003.

Ciesielski, P.E., R.H. Johnson and P.T. Haertel, Corrected TOGA COARE sounding humidity data: Impact on diagnosed properties of convection and climate over the warm pool, *Journal of Climate*, 16 (14), 2370-2384, 2003.

Cziczo, D.J., P.J. DeMott, C. Brock, P.K. Hudson, B. Jesse, S.M. Kreidenweis, A.J. Prenni, J. Schreiner, D.S. Thomson and D.M. Murphy, A method for single particle mass spectrometry of ice nuclei, *Aerosol Science and Technology*, 37, 460-470, DOI: 10.1080/02786820390112687, 2003.

Daniel, J.S., S. Solomon, H.L. Miller, A.O. Langford, R.W. Portmann and C.S. Eubank, Retrieving cloud information from passive measurements of solar radiation absorbed by molecular oxygen and O₂-O₂, *Journal of Geophysical Research*, 108 (D16), 4515, doi:10.1029/2002JD002994, 2003.

Eliason, T.L., S. Aloisio, D.J. Donaldson, D.J. Cziczo and V. Vaida, Processing of unsaturated organic acid films and aerosols by ozone, *Atmospheric Environment*, 37, 2207-2219, doi:10.1016/S1352-2310(03)00149-3, 2003.

de F. Forster, P.M., and S. Solomon, Observations of a "weekend effect" in diurnal temperature range, *Proceedings of the National Academy of Sciences of the United States of America*, 100 (20), 11225-11230, doi:10.1073/pnas.2034034100, 2003.

DeMott, P.J., D.J. Cziczo, A.J. Prenni, D.M. Murphy, S.M. Kreidenweis, D.S. Thomson, R. Borys and D.C. Rogers, Measurements of the concentration and composition of nuclei for cirrus formation, *Proceedings of the National Academy of Sciences of the United States of America*, 100 (25), 14655-14660, doi:10.1073/pnas.2532677100, 2003.

Donaldson, D.J., A.F. Tuck and V. Vaida, Atmospheric photochemistry via vibrational overtone absorption, *Chemical Reviews*, 103, 4717-4729, doi:10.1012/cr0206519, 2003.

Eckhardt, S., A. Stohl, S. Beirle, N. Spichtinger, P. James, C. Forster, C. Junker, T. Wagner, U. Platt and S.G. Jennings, The North Atlantic Oscillation controls air pollution transport to the Arctic, *Atmospheric Chemistry and Physics*, 3, 1769-1778, 2003.

Fischer, H., M. de Reus, M. Traub, J. Williams, J. Lelieveld, J.A. de Gouw, C. Warneke, H. Schlager, A. Minikin, R. Scheele and P. Siegmund, Deep convective injection of boundary layer air into the lowermost stratosphere at midlatitudes, *Atmospheric Chemistry and Physics*, 3, 739-745, 2003.

Flatau, M.K., P.J. Flatau, J. Schmidt and G.N. Kiladis, Delayed onset of the 2002 Indian monsoon, *Geophysical Research Letters*, 30 (14), 1768, doi:10.1029/2003GL017434, 2003.

Gage, K.S., and E.E. Gossard, Recent developments in observations, modeling and understanding atmospheric turbulence and waves in radar and atmospheric science: A collection of essays in honor of David Atlas, R.M. Wakimoto and R. Srivastava, *Meteorological Monographs*, 30, 139-174, 2003.

Granier, C., and G.P. Brasseur, The impact of road traffic on global tropospheric ozone, *Geophysical Research Letters*, 30 (2), 1086, doi:10.1029/2002GL015972, 2003.

Haag, W., B. Kärcher, J. Ström, A. Minikin, U. Lohmann, J. Ovarlez and A. Stohl, Freezing thresholds and cirrus cloud formation mechanisms inferred from in situ measurements of relative humidity, *Atmospheric Chemistry and Physics*, 3, 1791-1806, 2003.

Kjaergaard, H.G., T.W. Robinson, D.L. Howard, J.S. Daniel, J.E. Headrick and V. Vaida, Complexes of importance to the absorption of solar radiation, *The Journal of Physical Chemistry A*, 107 (49), 10680-10686, 2003.

McCabe, D.C., S.S. Brown, M.K. Gilles, R.K. Talukdar, I.W.M. Smith and A.R. Ravishankara, Kinetics of the removal of OH(n=1) and OD(n=1) by HNO₃ and DNO₃ from 253-383K, *Journal of Physical Chemistry A*, 107 (39), 7762-7769, doi:10.1021/jp0346413, 2003.

Murphy, D.M., A.M. Middlebrook and M. Warshawsky, Cluster analysis of data from the Particle Analysis by Laser Mass Spectrometry (PALMS) instrument, *Aerosol Science and Technology*, 37 382-391, doi:10.1080/02786820390125241, 2003.

Murphy, D.M., Dehydration in cold clouds is enhanced by a transition from cubic to hexagonal

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- Ravishankara, A.R., Introduction: Atmospheric Chemistry-Long-Term Issues, *Chemical Reviews*, 103, 4505-4507, 2003.
- Schafer, R., S.K. Avery and K.S. Gage, A comparison of VHF wind profiler observations and the NCEP/NCAR reanalysis over the tropical Pacific, *Journal of Applied Meteorology*, 42, 873-889, 2003.
- Scheeren, H.A., J. Lelieveld, G.J. Roelofs, J. Williams, H. Fischer, M. de Reus, J.A. de Gouw, C. Warneke, R. Holzinger, H. Schlager, T. Klüpfel, M. Bolder, C. van der Veen and M.G. Lawrence, The impact of monsoon outflow from India and southeast Asia in the upper troposphere over the eastern Mediterranean, *Atmospheric Chemistry and Physics*, 3, 1589-1608, 2003.
- Shetter, R.E., W. Junkermann, W.H. Swartz, G.J. Frost, J.H. Crawford, B.L. Lefer, J.D. Barrick, S.R. Hall, A. Hofzumahaus, A. Bais, J.G. Calvert, C.A. Cantrell, S. Madronich, M. Müller, A. Kraus, P.S. Monks, G.D. Edwards, R. McKenzie, P. Johnston, R. Schmitt, E. Griffioen, M. Krol, A. Kylling, R.R. Dickerson, S.A. Lloyd, T. Martin, B. Gardiner, B. Mayer, G. Pfister, E.P. Röth, P. Koepke, A. Ruggaber, H. Schwander and M. van Weele, Photolysis frequency of NO₂: Measurement and modeling during the International Photolysis Frequency Measurement and Modeling Intercomparison (IPMMI), *Journal of Geophysical Research*, 108 (D16), 8544, doi:10.1029/2002JD002932, 2003.
- Shine, K.P., M.S. Bourqui, P.M. de F. Forster, S.H.E. Hare, U. Langematz, P. Braesicke, V. Grewe, M. Ponater, C. Schnadt, C.A. Smith, J.D. Haigh, J. Austin, N. Butchart, D.T. Shindell, W.J. Randel, T. Nagashima, R.W. Portmann, S. Solomon, D.J. Seidel, J. Lanzante, S. Klein, V. Ramaswamy and M.D. Schwarzkopf, A comparison of model-simulated trends in stratospheric temperatures, *Quarterly Journal of the Royal Meteorological Society*, 129, 1565-1588, doi: 10.1256/qj.02.186, 2003.
- Sierk, B., S. Solomon, J.S. Daniel, R.W. Portmann, S.I. Gutman, A.O. Langford, C.S. Eubank, K.H. Holub and S.V. Florek, Field test of spectral line intensity parameters for tropospheric water vapor, *Journal of Geophysical Research*, 108 (D12), 4351, doi:10.1029/2002JD002985, 2003.
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- Stohl, A., H. Huntrieser, A. Richter, S. Beirle, O. Cooper, S. Eckhardt, C. Forster, P. James, N. Spichtinger, M. Wenig, T. Wagner, J.P. Burrows and U. Platt, Rapid intercontinental air pollution transport associated with a meteorological bomb, *Atmospheric Chemistry and Physics*, 3, 969-985, 2003.

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- Straub, K.H., and G.N. Kiladis, Interactions between the boreal summer intraseasonal oscillation and higher-frequency tropical wave activity, *Monthly Weather Review*, 131, 945-960, 2003.
- Straub, K.H., and G.N. Kiladis, The observed structure of convectively coupled Kelvin waves: Comparison with simple models of coupled wave instability, *Journal of the Atmospheric Sciences*, 60, 1655-1668, 2003.
- Trickl, T., O.R. Cooper, H. Eisele, P. James, R. Mücke and A. Stohl, Intercontinental transport and its influence on the ozone concentrations over central Europe: Three case studies, *Journal of Geophysical Research*, 108 (D12), 8530, doi:10.1029/2002JD002735, 2003.
- Wise, M.E., S.D. Brooks, R.M. Garland, D.J. Cziczo, S.T. Martin and M.A. Tolbert, Solubility and freezing effect of Fe^{2+} and Mg^{2+} in H_2SO_4 solutions representative of upper tropospheric and lower stratospheric sulfate particles, *Journal of Geophysical Research*, 108 (D14), 4434, doi:10.1029/2003JD003420, 2003.
- Zanis, P., T. Trickl, A. Stohl, H. Wernli, O. Cooper, C. Zerefos, H. Gaeggeler, C. Schnabel, L. Tobler, P.W. Kubik, A. Priller, H.E. Scheel, H.J. Kanter, P. Cristofanelli, C. Forster, P. James, E. Gerasopoulos, A. Delcloo, A. Papayannis and H. Claude, Forecast, observation and modelling of a deep stratospheric intrusion event over Europe, *Atmospheric Chemistry and Physics*, 3, 763-777, 2003.
- ## B. The Stratospheric Ozone Layer
- The Aeronomy Laboratory's research on the stratospheric ozone layer led to 17 publications in 2003. The major theme of these publications is: laboratory, field, and diagnostic investigations of the chemical processes related to ozone depletion.
- ### 2003 Peer-Reviewed Publications
- Alexander, M.J., and K.H. Rosenlof, Gravity-wave forcing in the stratosphere: Observational constraints from the Upper Atmosphere Research Satellite and implications for parameterization in global models, *Journal of Geophysical Research*, 108 (D19), 4597, doi:10.1029/2003JD003373, 2003.
- Brooks, S.D., D. Baumgardner, B. Gandrud, J.E. Dye, M.J. Northway, D.W. Fahey, T.P. Bui, O.B. Toon and M.A. Tolbert, Measurements of large stratospheric particles in the Arctic polar vortex, *Journal of Geophysical Research*, 108 (D20), 4652, doi:10.1029/2002JD003278, 2003.
- Danilin, M.Y., P.J. Popp, R. L. Herman, M.K.W. Ko, M.N. Ross, C.E. Kolb, D.W. Fahey, L.M. Avallone, D.W. Toohey, B.A. Ridley, O. Schmid, J.C. Wilson, D.G. Baumgardner, R.R. Friedl, T.L. Thompson and J.M. Reeves, Quantifying uptake of HNO_3 and H_2O by alumina particles in Athena-2 rocket plume, *Journal of Geophysical Research*, 108 (D4), 4141, doi:10.1029/2002JD002601, 2003.

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Herman, R.L., K. Drdla, J.R. Spackman, D.F. Hurst, P.J. Popp, C.R. Webster, P.A. Romashkin, J.W. Elkins, E.M. Weinstock, B.W. Gandrud, G.C. Toon, M.R. Schoeberl, H. Jost, E.L. Atlas and T.P. Bui, Hydration, dehydration, and the total hydrogen budget of the 1999/2000 winter Arctic stratosphere, *Journal of Geophysical Research*, 108 (D5), 8320, doi:10.1029/2001JD001257, 2003.

Konopka, P., J.-U. Grooß, G. Günther, D.S. McKenna, R. Müller, J.W. Elkins, D.W. Fahey and P.J. Popp, Weak impact of mixing on chlorine deactivation during SOLVE/THESEO 2000: Lagrangian modeling (CLaMS) versus ER-2 in situ observations, *Journal of Geophysical Research*, 108 (D5), 8324, doi:10.1029/2001JD000876, 2003.

Minschwaner, K., T. Carty and C.R. Burnett, Hydroxyl column abundance measurements: PEPSIOS instrumentation at the Fritz Peak Observatory and data analysis techniques, *Journal of Atmospheric and Solar-Terrestrial Physics*, 65, doi:10.1016/S1364-6826(02)00297-3, 335-344, 2003.

Moore, F.L., J.W. Elkins, E.A. Ray, G.S. Dutton, R.E. Dunn, D.W. Fahey, R.J. McLaughlin, T.L. Thompson, P.A. Romashkin, D.F. Hurst and P.R. Wamsley, Balloonborne in situ gas chromatograph for measurements in the troposphere and stratosphere, *Journal of Geophysical Research*, 108 (D5), 8330, doi:10.1029/2001JD000891, 2003.

Pierce, R.B., J.A. Al-Saadi, T.D. Fairlie, M. Natarajan, V.L. Harvey, W.L. Grose, J.M. Russell III, R.M. Bevilacqua, S.D. Eckerman, D.W. Fahey, P.J. Popp, E.C. Richard, R.M. Stimpfle, G.C. Toon, C.R. Webster and J.W. Elkins, Large-scale chemical evolution of the Arctic vortex during the 1999/2000 winter: HALOE/POAM III Lagrangian photochemical modeling for the SAGE III—Ozone Loss and Validation Experiment (SOLVE) campaign, *Journal of Geophysical Research*, 108 (D5), 8317, doi:10.1029/2001JD001063, 2003.

Proffitt, M.H., K. Aikin, A.F. Tuck, J.J. Margitan, C.R. Webster, G.C. Toon and J.W. Elkins, Seasonally averaged ozone and nitrous oxide in the Northern Hemisphere lower stratosphere, *Journal of Geophysical Research*, 108 (D3), 4110, doi: 10.1029/2002JD002657, 2003.

Richard, E.C., K.C. Aikin, E.A. Ray, K.H. Rosenlof, T.L. Thompson, A. Weinheimer, D.D. Montzka, D.J. Knapp, B.A. Ridley and A. Gettelman, Large-scale equatorward transport of ozone in the subtropical lower stratosphere, *Journal of Geophysical Research*, 108 (D23), 4714, doi:10.1029/2003JD003884, 2003.

Rosenlof, K.H., How water enters the stratosphere, *Science*, 302, 1691-1692, 2003.

Tuck, A.F., S.J. Hovde, K.K. Kelly, M.J. Mahoney, M.H. Proffitt, E.C. Richard and T.L.

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Tuck, A.F., S.J. Hovde, E.C. Richard, D.W. Fahey and R.S. Gao, A scaling analysis of ER-2 data in the inner vortex during January-March 2000, *Journal of Geophysical Research*, 108 (D5), 8306, doi: 10.1029/2001JD000879, 2003.

C. Regional Air Chemistry

The Aeronomy Laboratory's research on regional air chemistry led to 40 publications in 2003. As reflected in the list below, the three major themes of those publications are: (i) regionally focused air quality field studies and diagnostic analyses and (ii) laboratory investigations of air-quality chemical reactions.

2003 Peer-Reviewed Papers

Angevine, W.A., C.J. Senff and E.R. Westwater, Boundary Layers/Observational Techniques – Remote, *Encyclopedia of Atmospheric Sciences*, 1, 271-279, 2003.

Angevine, W.M., A.B. White, C.J. Senff, M. Trainer, R.M. Banta and M.A. Ayoub, Urban-rural contrasts in mixing height and cloudiness over Nashville in 1999, *Journal of Geophysical Research*, 108 (D3), 4092, doi:10.1029/2001JD001061, 2003.

Brock, C.A., M. Trainer, T.B. Ryerson, J.A. Neuman, D.D. Parrish, J.S. Holloway, D.K. Nicks, Jr., G.J. Frost, G. Hübner, F.C. Fehsenfeld, J.C. Wilson, J.M. Reeves, B.G. Lafleur, H. Hilbert, E.L. Atlas, S.G. Donnelly, S.M. Schauffler, V.R. Stroud and C. Wiedinmyer, Particle growth in urban and industrial plumes in Texas, *Journal of Geophysical Research*, 108 (D3), 4111, doi:10.1029/2002JD002746, 2003.

Brown, S.S., Absorption spectroscopy in high finesse cavities for atmospheric studies, *Chemical Reviews*, 2003.

Brown, S.S., H. Stark and A.R. Ravishankara, Applicability of the steady state approximation to the interpretation of atmospheric observations of NO₃ and N₂O₅, *Journal of Geophysical Research*, 108 (D17), 4539, doi:10.1029/2003JD003407, 2003.

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Geyer, A., B. Aliche, R. Ackermann, M. Martinez, H. Harder, W. Brune, P. di Carlo, E. Williams, T. Jobson, S. Hall, R. Shetter and J. Stutz, Direct observations of daytime NO_3 : Implications for urban boundary layer chemistry, *Journal of Geophysical Research*, 108 (D12), 4368, doi:10.1029/2002JD002967, 2003.

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D. State-of-Understanding Scientific Assessments

In addition to helping strengthen the science related to climate, the ozone layer, and air quality, a hallmark of the Aeronomy Lab has focused on also assisting with periodic assessments of the state of the science on these three topics, which lies at the heart of NOAA's role as an environmental information service. These assessments serve as scientific, decision-support input to those required to make policy decisions with regard to environmental issues and the public welfare. For example, Aeronomy Lab staff have helped and are continuing to help by serving in a variety of roles with the Intergovernmental Panel on Climate Change (IPCC) Science Working Group and the ozone-layer assessment for the U.N. Montreal Protocol.

Scientific Assessment of Ozone Depletion: 2002. World Meteorological Organization, Global Ozone Research and Monitoring Project—Report No. 47, Geneva, 498 pp., 2003. Chairs of the Montreal Protocol Scientific Assessment Panel are Ayité-Lô Ajavon (Togo), Daniel L. Albritton (U.S.), Gérard Mégie (France), and Robert T. Watson (U.S.).

This report was the fifth in the series of international assessments of the state of the science of stratospheric ozone depletion for governments, industry, and the public. These assessments are prepared by international experts and are peer reviewed twice (mail and panel). Aeronomy Laboratory scientists led the preparation and review of its separately published “Executive Summary” booklet, served as authors on three of the report’s five scientific chapters, and served as Lead Author of its special separately published booklet on “Twenty Questions and Answers About the Ozone Layer,” as shown below:

- “Executive Summary,” *Scientific Assessment of Ozone Depletion: 2002*. A.-L. Ajavon, D.L. Albritton, G. Mégie, and R.T. Watson (Lead Authors).
- Chapter 1: “Controlled Substances and Other Source Gases.” S.A. Montzka and P.J. Fraser (Lead Authors), J.H. Butler, P.S. Connell, D.M. Cunnold, J.S. Daniel, R.G. Derwent, S. Lal, A. McCulloch, D.E. Oram, C.E. Reeves, E. Sanhueza, L.P. Steele, G.J.M. Velders, R.F. Weiss, and R.J. Zander.
- Chapter 2: “Very Short-Lived Halogen and Sulfur Substances.” M.K.W. Ko and G. Poulet (Lead Authors), D.R. Blake, O. Boucher, J.H. Burkholder, M. Chin, R.A. Cox, C. George, H.-F. Graf, J.R. Holton, D.J. Jacob, K.S. Law, M.G. Lawrence, P.M. Midgley, P.W. Seakins, D.E. Shallcross, S.E. Strahan, D.J. Wuebbles, and Y. Yokouchi.
- Chapter 4: “Global Ozone: Past and Future.” M.P. Chipperfield and W.J. Randel (Lead Authors), G.E. Bodeker, M. Dameris, V.E. Fioletov, R.R. Friedl, N.R.P. Harris, J.A. Logan, R.D. McPeters, N.J. Muthama, T. Peter, T.G. Shepherd, K.P. Shine, S. Solomon, L.W. Thomason, and J.M. Zawodny.
- “Twenty Questions and Answers About the Ozone Layer.” Lead Author: D.W. Fahey.

Aeronomy Laboratory staff also served as contributors of scientific information for chapters and as mail reviewers, panel reviewers, and coordinating technical editor of the report.

Particulate Matter Science for Policy Makers: A NARSTO Assessment. Electric Power Research Institute, EPRI Report No. 1007735, 2003.

This report is the second scientific assessment of NARSTO, a multi-stakeholder organization involving the U.S., Canada, and Mexico that fosters policy-relevant research on surface-level ozone and fine particles. This assessment report was reviewed by international peers and the National Academies of the countries. An Aeronomy Laboratory scientist led one of the assessment’s 11 chapters, as shown below:

- Chapter 5: “Particle and Gas Measurement.” F. Fehsenfeld, D. Hastie, J. Chow, P. Solomon.