GTE BIBLIOGRAPHY

Introductory Remarks

In 1984, the National Academy of Sciences recommended initiation of a Global Tropospheric Chemistry Program (GTCP) in recognition of the central role of tropospheric chemistry in global change. Envisioned as the U.S. national component of an ultimately international research effort, GTCP calls for the systematic study, supported by numerical modeling, of (1) biological sources of atmospheric chemicals; (2) global distributions and long-range transport of chemical species; and (3) reactions in the troposphere that lead to the conversion, redistribution, and removal of atmospheric chemicals.

NASA's contribution to GTCP is the Global Tropospheric Experiment (GTE), which utilizes large, extensively instrumented aircraft-ideal platforms for many atmospheric chemistry experiments as primary research tools. While GTE began primarily as an aircraft-based program supplemented by ground-based measurements, satellite data and model analyses now play an important role. Space Shuttle observations of tropospheric carbon monoxide distributions have helped to plan and direct the course of expeditions over tropical rain forests. Landsat land-surface images have facilitated the extrapolation of regional arctic-tundra measurements into global-scale conclusions. Weather data returned by environmental satellites and model analyses have guided flight planning for research aircraft. Modeling studies also play a critical role in interpreting the mission measurements.

Our knowledge of tropospheric chemistry is limited primarily by measurement capabilities. A first task of GTE was therefore to foster development of the new technologies and experimental techniques required for major research advances. These were evaluated through a series of rigorous intercomparisons called the Chemical Instrumentation Test and Evaluation (CITE) project. The CITE projects were designed to validate the instruments developed for GTE measurements through rigorous intercomparisons under actual field conditions. The three CITE projects completed to date have established the credibility (or, in some cases, the limitations) of powerful new techniques for atmospheric-chemistry measurements; calibrated these new techniques through comparisons with older, proven approaches and provided important new data on trace-gas concentrations in the clean-air regions that served as test sites.

The initial GTE field expeditions-the Atmospheric Boundary Layer Experiment (ABLE) projects-were designed to probe the interactions between the biosphere and the atmosphere. Nowhere is the atmosphere-biosphere interaction more pronounced than within the atmospheric boundary layer-the lowest few hundred meters of the atmosphere. Upward through this layer rise trace gases emitted by the biosphere or produced by industrial activity and combustion. And downward through this layer settle gases and aerosols formed by atmospheric chemistry processes, destined for final deposition on land and sea. Expeditions have now been completed in three ecosystems that are known to exert a major influence over global tropospheric chemistry and that are being profoundly affected by natural processes, human activities, or both. These are the tropical Atlantic Ocean (ABLE-1), the Brazilian rain forest (ABLE-2), and the northern wetlands (ABLE-3).

Because of the great importance of trace-gas fluxes and their coupling to the global atmosphere, the first extensive GTE field studies were focused on these processes. The southern tropical Atlantic Ocean was the site of one of these large-scale experiments-Transport and Chemistry near the Equator in the Atlantic (TRACE-A). It built upon ABLE-2 results in the Amazon and the research of French, German, and African scientists in Africa to investigate the distribution of atmospheric trace gases over the tropical South Atlantic.

By the early 1990s, progress in instrumentation and the accumulation of additional expedition experience permitted studies of atmospheric chemistry over the Pacific Basin. Over this vast area is found some of the cleanest air on Earth. But around its rim are the most rapidly growing economies in the world. The retention of air quality in this area therefore poses perhaps the ultimate challenge to both science and governments. The projects designed to meet this challenge were collectively called the Pacific Exploratory Missions, or PEM. At present, four missions have been completed: (1) PEM-West A and B, which carried out measurements of the chemical composition of the air leaving the Asian continent, studied its transport to the central Pacific, and evaluated its impact there; (2) PEM-Tropics A, which studied the latitude and altitude dependence of trace-gas and aerosol concentrations over the central Pacific from Peru to New Zealand; and (3) PEM-Tropics B, which focused on the tropical Pacific rain forests and air-sea interactions. These projects have involved most of the Pacific Rim nations. The results have provided profound new insights into chemical changes within clean-air regions around the world.

In early spring 2001, GTE revisited the western Pacific for the Transport and Chemical Evolution over the Pacific (TRACE-P) mission. The two major objectives, (1) chemistry of air emerging from Asia and (2) the chemical evolution of that air as it moves away from Asia, and recent improvements in instrumentation allow deeper understanding of these phenomena than was possible during the PEM West missions.

GTE projects scheduled over the next several years will investigate the global distributions of atmospheric chemical species and the photochemical and transport processes that control large-scale atmospheric chemistry. Table 1 summarizes the GTE missions to date.

The purpose of this bibliography is to provide a single reference for the many publications and presentations (Table 2 indicates the major meetings at which GTE papers were presented) made possible by the GTE Project to date. It is hoped that by expanding visibility for GTE and related missions, increased scientific collaboration will occur. The citations are organized by mission. Inevitably, some citations have been unintentionally overlooked, and the reader is requested to bring these to the attention of the Project Office for inclusion in future bibliography updates.

Known publications and presentations for the Northern Wetlands Study (NOWES) and Southern African Fire-Atmosphere Research Initiative (SAFARI-92) have been included because of the close coordination (objectives, time and space) between these and GTE missions. Related publication and presentation citations are generally from work not sponsored by GTE, but utilize the same instruments as in GTE for another mission or make the same measurements at the same location as GTE or are studies of the same atmospheric phenomena which are a GTE focus. These sections also include citations for GTE work not specific to any one mission.

Table 1. GTE Field Expeditions

Expedition	Date	Location
CITE-1	11/83	Hawaii
CITE-1	4/84	Pacific-CA coast
ABLE-1	6/84	Barbados
ABLE-2A	8/85	Amazon
CITE-2	8/86	Western US
ABLE-2B	5/87	Amazon
ABLE-3A	7/88	Alaska
CITE-3	8/89	Atlantic-VA & Brazil
ABLE-3B	7/90	Canada
PEM-West A	10/91	Western Pacific
TRACE-A	9/92	Brazil, S. Atlantic, SW Africa
PEM-West B	2/94	Western Pacific
PEM-Tropics A	8/96	Tropical Pacific
PEM-Tropics B	3/99	Tropical Pacific
TRACE-P	2/01	Western Pacific

Table 2. GTE Results Presentations at Major AGU and IGAC Meetings

Date	Name	Location	No. Sess.	No. Pres.	Mission
5/30-6/3	1983 AGU Spring Meeting	Baltimore	-	-	
12/5-10	1983 AGU Fall Meeting	San Francisco	-	-	
5/14-17	1984 AGU Spring Meeting	Cincinnati	-	-	
12/3-7	1984 AGU Fall Meeting	San Francisco	1	12	CITE-1
5/27-31	1985 AGU Spring Meeting	Baltimore	-	13	ABLE-1
12/9-13	1985 AGU Fall Meeting	San Francisco	-	2	
5/19-23	1986 AGU Spring Meeting	Baltimore	2	27	ABLE-2A
12/8-12	1986 AGU Fall Meeting	San Francisco	-	-	
5/18-21	1987 AGU Spring Meeting	Baltimore	-	-	
12/7-11	1987 AGU Fall Meeting	San Francisco	1	17	CITE-2
5/16-20	1988 AGU Spring Meeting	Baltimore	3	40	ABLE-2B
12/5-9	1988 AGU Fall Meeting	San Francisco	-	1	
5/7-12	1989 AGU Spring Meeting	Baltimore	2	49	ABLE-3A
12/4-8	1989 AGU Fall Meeting	San Francisco	-	-	
5/7-11	1990 AGU Spring Meeting	Baltimore	-	-	
12/3-7	1990 AGU Fall Meeting	San Francisco	2	23	CITE-3
5/28-31	1991 AGU Spring Meeting	Baltimore	4	29	ABLE-3B
12/9-13	1991 AGU Fall Meeting	San Francisco	-	1	
5/12-16	1992 AGU Spring Meeting	Montreal	-	-	
8/17-21	1992 AGU W. Pacific Geophys.	Hong Kong	2	23	PEM-West A
12/7-11	1992 AGU Fall Meeting	San Francisco	-	-	
5/24-28	1993 AGU Spring Meeting	Baltimore	-	-	
4/18-22/93	1st IGAC Scientific Conference	Eilat, Israel	1	16	PEM-West A, SAFARI-92, TRACE-A
12/6-10	1993 AGU Fall Meeting	San Francisco	-	30	SAFARI-92
5/23-27	1994 AGU Spring Meeting	Baltimore	-	2	
8/17-21	1994 AGU W. Pacific Geophys.	Hong Kong	-	4	PEM-West A & B
9/5-9/94	2nd IGAC Scientific Conference	Fuji-Yoshida, Japan	-	18	PEM-West A & B, TRACE-A, SAFARI-92
12/5-9	1994 AGU Fall Meeting	San Francisco	-	4	
5/30-6/2	1995 AGU Spring Meeting	Baltimore	-	2	
10/9-14	1995 WMO-IGAC Meeting	Beijing, China	-	7	
12/11-15	1995 AGU Fall Meeting	San Francisco	-	6	

Date	Name	Location	No. Sess.	No. Pres.	Mission
5/20-24	1996 AGU Spring Meeting	Baltimore	-	2	
12/15-19	1996 AGU Fall Meeting	San Francisco	-	6	
5/27-30	1997 AGU Spring Meeting	Baltimore	-	-	
12/8-12	1997 AGU Fall Meeting	San Francisco	-	14	
5/26-29	1998 AGU Spring Meeting	Boston	-	4	
7/21-24	1998 AGU W. Pacific Geophys.	Taipei, Taiwan	-	1	
12/6-10	1998 AGU Fall Meeting	San Francisco	-	7	
5/31-6/4	1999 AGU Spring Meeting	Boston	-	6	
12/13-17	1999 AGU Fall Meeting	San Francisco	-	5	
5/30-6/3	2000 AGU Spring Meeting	Washington D.C.	3	36	PEM-Tropics B
6/27-30	2000 AGU W. Pacific Geophys.	Tokyo, Japan	-	3	
12/15-19	2000 AGU Fall Meeting	San Francisco	-	1	
5/29-6/2	2001 AGU Spring Meeting	Boston	-	2	

Table 3. Summary of GTE Publications and Presentations

(in chronological order by mission)

Mission	No. Publications	No. Presentations	No. Media Articles
CITE-1	36	17	-
ABLE-1	4	10	-
ABLE 2A	48	29	1
CITE-2	19	17	-
ABLE-2B	64	58	11
ABLE-3A	35	48	-
CITE-3	24	24	2
ABLE-3B	29	32	1
PEM-West A	49	53	-
TRACE-A	60	20	14
PEM-West B	44	21	-
PEM-Tropics A	53	30	10
PEM-Tropics B	41	45	2
TRACE-P	-	-	2
Other Related Publications	22	-	-
Other Related Presentations	-	18	-
GTE Workshop	12	-	-
Totals	540	422	43

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Summary of CITE-1 Special Publications and Presentations

CITE-1 SPECIAL PUBLICATIONS:

J. Geophys. Res., 90, 20 December 1985
J. Geophys. Res., 92, 20 February 1987

CITE-1 SPECIAL PRESENTATIONS:

1984 AGU Fall Meeting, San Francisco, CA, 3-7 December 1984

CITE-1 Publications

1. Beck, S. M., R. J. Bendura, D. S. McDougal, J. M. Hoell, Jr., G. L. Gregory, H. J. Curfman, Jr., D. D. Davis, J. Bradshaw, M. O. Rodgers, C. C. Wang, L. I. Davis, M. J. Campbell, A. L. Torres, M. A. Carroll, B. A. Ridley, G. W. Sachse, G. F. Hill, E. P. Condon, and R. A. Rasmussen, Operational overview of NASA GTE/CITE-1 airborne instrument intercomparisons: Carbon monoxide, nitric oxide, and hydroxyl instrumentation, *J. Geophys. Res., 92*, 1977-1985, 20 February 1987.

2. Bradshaw, J. D., M. O. Rodgers, S. T. Sandholm, S. KeSheng, and D. D. Davis, A two-photon laser-induced fluorescence field instrument for ground-based and airborne measurements of atmospheric NO, *J. Geophys. Res., 90*, 12861-12873, 20 December 1985.

3. Browell, E. V., E. F. Danielsen, S. Ismail, G. L. Gregory, and S. M. Beck, Tropopause fold structure determined from airborne lidar and in situ measurements, *J. Geophys. Res., 92*, 2112-2120, 20 February 1987.

4. Carroll, M. A., M. McFarland, B. A. Ridley, and D. L. Albritton, Ground-based nitric oxide measurements at Wallops Island, Virginia, *J. Geophys. Res., 90*, 12853-12860, 20 December 1985.

5. Chameides, W. L., Ozone precursors and ozone photochemistry over eastern north Pacific during the spring of 1984 based on the NASA GTE/CITE-1 airborne observations, *J. Geophys. Res., 94*, 9799-9808, 20 July 1989.

6. Chameides, W. L., D. D. Davis, J. Bradshaw, M. Rodgers, S. Sandholm, and D. B. Bai, An estimate of the NO_x production rate in electrified clouds based on NO observations from the GTE/CITE-1 fall 1983 field operation, *J. Geophys. Res., 92*, 2153-2156, 20 February 1987.

7. Chameides, W. L., D. D. Davis, M. O. Rodgers, J. Bradshaw, S. Sandholm, G. W. Sachse, G. Hill, G. Gregory, and R. Rasmussen, Net ozone photochemical production over the eastern and central North Pacific as inferred from GTE/CITE-1 observations during fall 1983, *J. Geophys. Res., 92*, 2131-2152, 20 February 1987.

8. Condon, E. P., E. F. Danielsen, G. W. Sachse, and G. F. Hill, Carbon monoxide measurements over the eastern Pacific during GTE/CITE-1, *J. Geophys. Res., 92*, 2095-2102, 20 February 1987.

9. Crosley, D. R., The measurement of OH and HO_2 in the atmosphere, *J. Atmos. Sci., 52*, 3299-3314, 1 October 1995.

10. Crosley, D. R., Laser fluorescence detection of atmospheric hydroxyl radicals. Chap. 8 in *Progress and Problems in Atmospheric Chemistry*, ed. J. R. Baker, World Scientific Publishing, Singapore, 1995.

11. Danielsen, E. F., S. E. Gaines, R. S. Hipskind, G. L. Gregory, G. W. Sachse, and G. F. Hill, Meteorological context for fall experiments including distributions of water vapor, ozone, and carbon monoxide, *J. Geophys. Res., 92*, 1986-1994, 20 February 1987.

12. Danielsen, E. F., R. S. Hipskind, S. E. Gaines, G. W. Sachse, G. L. Gregory, and G. F. Hill, Three-dimensional analysis of potential vorticity associated with tropopause folds and observed variations of ozone and carbon monoxide, *J. Geophys. Res., 92*, 2103-2111, 20 February 1987.

13. Davis, D. D., J. D. Bradshaw, M. O. Rodgers, S. T. Sandholm, and S. KeSheng, Free tropospheric and boundary layer measurements of NO over the central and eastern North Pacific Ocean, *J. Geophys. Res., 92*, 2049-2070, 20 February 1987.

14. Davis, L. I., Jr., C. Guo, J. V. James, P. T. Morris, R. Postiff, and C. C. Wang, An airborne lidar instrument for detection of OH using the technique of laser-induced fluorescence, *J. Geophys. Res., 90*, 12835-12842, 20 December 1985.

15. Davis, L. I., Jr., J. V. James, C. C. Wang, C. Guo, P. T. Morris, and J. Fishman, OH measurements near the intertropical convergence zone in the Pacific, *J. Geophys. Res., 92*, 2020-2024, 20 February 1987.

16. Fishman, J., G. L. Gregory, G. W. Sachse, S. M. Beck, and G. F. Hill, Vertical profiles of ozone, carbon monoxide, and dew-point temperature obtained during GTE/CITE-1, October-November 1983, *J. Geophys. Res., 92*, 2083-2094, 20 February 1987.

17. Gregory, G. L., S. M. Beck, and R. J. Bendura, Field test to intercompare carbon monoxide, nitric oxide and hydroxol instrumentation at Wallops Island, Virginia. NASA Technical Memorandum, TM-87718, January 1987.

18. Gregory, G. L., J. M. Hoell, Jr., S. M. Beck, D. S. McDougal, J. A. Meyers, and D. B. Bruton, Jr., Operational overview of Wallops Island instrument intercomparison: Carbon monoxide, nitric oxide, and hydroxyl instrumentation, *J. Geophys. Res., 90*, 12808-12818, 20 December 1985.

19. Hipskind, R. S., G. L. Gregory, G. W. Sachse, G. F. Hill, and E. F. Danielsen, Correlations between ozone and carbon monoxide in the lower stratosphere, folded tropopause, and maritime troposphere, *J. Geophys. Res., 92*, 2121-2130, 20 February 1987.

20. Hoell, J. M., Jr., Preface, *J. Geophys. Res., 90*, 12807, 20 December 1985.

21. Hoell, J. M., Jr., G. L. Gregory, M. A. Carroll, M. McFarland, B. A. Ridley, D. D. Davis, J. Bradshaw, M. O. Rodgers, A. L. Torres, G. W. Sachse, G. F. Hill, E. P. Condon, R. A. Rasmussen, M. C. Campbell, J. C. Farmer, J. C. Sheppard, C. C. Wang, and L. I. Davis, An intercomparison of carbon monoxide, nitric oxide, and hydroxyl measurement techniques: Overview of results, *J. Geophys. Res., 89*, 11819-11825, 20 December 1984.

22. Hoell, J. M., Jr., G. L. Gregory, D. S. McDougal, M. A. Carroll, M. McFarland, B. A. Ridley, D. D. Davis, J. Bradshaw, M. O. Rodgers, and A. L. Torres, An intercomparison of nitric oxide measurement techniques, *J. Geophys. Res., 90*, 12843-12851, 20 December 1985.

23. Hoell, J. M., Jr., G. L. Gregory, D. S. McDougal, G. W. Sachse, G. F. Hill, E. P. Condon, and R. A. Rasmussen, An intercomparison of carbon monoxide measurement techniques, *J. Geophys. Res., 90*, 12881-12889, 20 December 1985.

24. Hoell, J. M., Jr., G. L. Gregory, D. S. McDougal, G. W. Sachse, G. F. Hill, E. P. Condon, and R. A. Rasmussen, Airborne intercomparison of carbon monoxide measurement techniques, *J. Geophys. Res., 92*, 2009-2019, 20 February 1987.

25. Hoell, J. M., Jr., G. L. Gregory, D. S. McDougal, A. L. Torres, D. D. Davis, J. Bradshaw, M. O. Rodgers, B. A. Ridley, and M. A. Carroll, Airborne measurements of nitric oxide measurement techniques, *J. Geophys. Res., 92*, 1995-2008, 20 February 1987.

26. Hübler, G., D. D. Montzka, R. B. Norton, P. C. Murphy, F. C. Fehsenfeld, S.-C. Liu, B. A. Ridley, J. G. Walega, E. Atlas, and F. E. Grahek, Total reactive oxidized nitrogen(NO_y) in the remote Pacific troposphere and its correlation with O_3 and CO-Mauna Loa Observatory Photochemistry Experiment 1988, *J. Geophys. Res., 97*, 10427-10477, 30 June 1992.

27. McNeal, R. J., Preface, *J. Geophys. Res., 92*, 1976, 20 February 1987.

28. Ridley, B. A., M. A. Carroll, D. D. Dunlap, M. Trainer, E. P. Condon, G. L. Gregory, and G. W. Sachse, Measurements of NO_x over the eastern Pacific ocean and southwestern continental US during the spring of 1984 NASA GTE aircraft program, *J. Geophys. Res., 94*, 5043-5067, 20 April 1989.

29. Ridley, B. A., M. A. Carroll, and G. L. Gregory, Measurements of nitric oxide in the boundary layer and free troposphere over the Pacific Ocean, *J. Geophys. Res., 92*, 2025-2047, 20 February 1987.

30. Ridley, B. A., M. A. Carroll, G. L. Gregory, and G. W. Sachse, NO and NO_2 in the troposphere: Technique and measurements in regions of a folded troposphere, *J. Geophys. Res., 93*, 15813-15830, 20 December 1988.

31. Ridley, B. A., M. A. Carroll, A. L. Torres, E. P. Condon, G. W. Sachse, G. F. Hill, and G. L. Gregory, An intercomparison of results from ferrous sulphate and photolytic converter techniques for measurements of NO_x made during the NASA GTE/CITE-1 aircraft program, *J. Geophys. Res., 93*, 15803-15811, 20 December 1988.

32. Rodgers, M. O., J. D. Bradshaw, S. T. Sandholm, S. KeSheng, and D. D. Davis, A 2-λ laser-induced fluorescence field instrument for ground-based and airborne measurements of atmospheric OH, *J. Geophys. Res., 90*, 12819-12834, 20 December 1985.

33. Russell, P. B., E. F. Danielson, R. A. Craig, and H. B. Selkirk, The NASA spring 1984 stratospheric-tropospheric exchange experiment: Science objectives and operations, *J. Geophys. Res., 96*, 17401-17404, 20 September 1991.

34. Sachse, G. W., G. F. Hill, L. O. Wade, and M. G. Perry, Fast-response, high-precision carbon monoxide sensor using a tunable diode laser absorption technique, *J. Geophys. Res., 92*, 2071-2081, 20 February 1987.

35. Smith, G. P. and D. R. Crosley, A photochemical model of ozone interference effects in laser detection of tropospheric OH, *J. Geophys. Res., 95*, 16427-16442, 20 September 1990.

36. Torres, A. L., Nitric oxide measurements at a nonurban eastern United States site: Wallops instrument results from July 1983 GTE/CITE mission, *J. Geophys. Res., 90*, 12875-12880, 20 December 1985.

CITE-1 Presentations

1. Bradshaw, J. D., S. KeSheng, M. O. Rodgers, S. T. Sandholm, and D. D. Davis, Measurements of tropospheric NO concentrations as part of the NASA GTE/CITE program. Paper No. A21-07, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

2. Browell, E. V., G. L. Gregory, S. M. Beck, and E. F. Danielsen, Airborne lidar and in situ measurements of tropopause fold event. Paper No. A21-11, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

3. Browell, E. V., S. Ismail, E. F. Danielsen, G. L. Gregory, and S. M. Beck, Airborne lidar investigations of troposphere fold events. Paper No. A21-08, 1984 AGU Spring Meeting, Baltimore, MD, May 1985.

4. Campbell, M. J., J. C. Sheppard, J. C. Farmer, and M. N. Henry, Radiochemical hydroxyl measurements. Paper No. A21-10, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

5. Carroll, M. A. and B. A. Ridley, Tropospheric NO_x measurements. Paper No. A21-05, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

6. Condon, E., E. F. Danielsen, G. Sachse, and G. Hill, Carbon monoxide measurements over the eastern Pacific during GTE/CITE-1. Paper No. A22A-13, 1985 AGU Fall Meeting, San Francisco, CA, December 1985.

7. Danielsen, E. F., Meteorological context for global tropospheric experiments instrument tests. Paper No. A21-02, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

8. Hinton, R. R., E. V. Browell, G. L. Gregory, and R. C. Harriss, CO, O_3, and aerosol measurements from NASA Global Tropospheric Experiment-Test flights 1981. AMS 2nd Symposium on the Composition of the Nonurban Troposphere, Williamsburg, VA, 25-28 May 1982.

9. Hipskind, R. S., G. L. Gregory, G. W. Sachse, G. F. Hill, and E. F. Danielsen, Correlation between ozone and carbon monoxide in the lower stratosphere, folded tropopause, and maritime troposphere. Paper No. A21-07, 1985 AGU Spring Meeting, Baltimore, MD, May 1985.

10. Hoell, J. M., Jr., The NASA Global Tropospheric Experiment/Chemical Instrumentation Test and Test and Evaluation (GTE/CITE): Overview of results. Paper No. A21-03, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

11. McNeal, R. J., The NASA Global Tropospheric Experiment/Chemical Instrumentation Test and Evaluation (GTE/CITE) Project: A programmatic overview. Paper No. A21-01, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

12. Rodgers, M. O., J. D. Bradshaw, A. J. Hynes, S. KeSheng, S. T. Sandholm, and D. D. Davis, Measurements of tropospheric hydroxyl radical concentrations as part of the NASA GTE/CITE Program. Paper No. A21-09, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

13. Russell, P. B., E. F. Danielsen, and R. A. Craig, The NASA spring 1984 Stratosphere-Troposphere Exchange Experiment: Science objectives and operations. Invited Paper No. A21-01, 1985 AGU Spring Meeting, Baltimore, MD, May 1985.

14. Sachse, G. W., G. F. Hill, G. L. Gregory, S. M. Beck, and J. Fishman, Differential absorption diode laser measurements of CO: GTE/CITE results. Paper No. A21-04, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

15. Sheridan, P. and W. Zoller, The source of atmospheric particles on the GTE Hawaii mission. Paper No. A21-12, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

16. Torres, A. L., Tropospheric nitric oxide measurements during GTE/CITE. Paper No. A21-06, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

17. Wang, C. W., L. I. Davis, Jr., J. V. James, G. W. Sachse, and J. Fishman, OH measurements in the Pacific and in California using the technique of laser-induced fluorescence. Paper No. A21-08, 1984 AGU Fall Meeting, San Francisco, CA, December 1984.

Other Related Publications

1. Bandy, A. R., D. C. Thornton, R. G. Ridgeway, Jr., and B. B. Blomquist, Key sulfur-containing compounds in the atmosphere and ocean: Determination by gas chromatography-mass spectrometry and isotopically labeled internal standards, Chapter 25 in *Isotope Effects in Gas-Phase Chemistry*, ed. J. A. Kaye, ACS Press, 1992.

2. Bandy, A. R., B. J. Tucker, and P. J. Maroulis, Determination of parts-per-trillion by volume levels of atmospheric carbon disulfide by gas chromatography/mass spectrometry, *Analytical Chemistry, 57*, 1310-1314, June 1985.

3. Bradshaw, J., D. Davis, G. Grodzinsky, S. Smyth, R. E. Newell, S. Sandholm, and S. Liu, Observed distributions of nitrogen oxides in the remote free troposphere from the NASA Global Tropospheric Experiment programs, *Reviews of Geophysics, 38*, 61-116, February 2000.

4. Bradshaw, J. D. and S. T. Sandholm, Description of the multi-photon laser-induced fluorescence spectrometer for airborne measurement of important ultra-trace gases, in *Proceedings of 2nd International Airborne Remote Sensing Conference and Exhibition: Technology, Measurement, and Analysis*, vol. 2, pp 242-250, San Francisco, CA, 24-27 June 1996.

5. Bradshaw, J., S. Sandholm, and R. Talbot, An update on reactive odd-nitrogen measurements made during NASA's GTE programs, *J. Geophys. Res., 103*, 19129-19148, 20 August 1998.

6. Brune, W. H., P. S. Stevens, and J. H. Mather, Measuring OH and HO_2 in the troposphere by laser induced fluorescence at low pressure, *J. Atmos. Sci., 52*, 3328-3336, 1995.

7. Chamidies, W. L., Diagnostic studies of the H_xO_y-N_xO_y-O_3 photochemical system using data from NASA GTE field expeditions: Final Report, July 1, 1987-July 30, 1990. NASA Contractor Report, CR-193672, Georgia Inst. of Tech., September 1990.

8. Clarke, A. D. and V. N. Kapustin, Aerosol climatology of the Pacific: Production, transport, evolution, and mixing evident in two decades of aerosol measurements, in *Proceedings of the American Meteorology Society*, January 2001.

9. Courchaine, B., Venable, J., et al., Validation of global climatologies of trace gases using NASA Global Tropospheric Experiment (GTE) data, in Washington University Technical Reports: Langley Aerospace Research Summer Scholars, p. 107-132, January 1995.

10. Crosley, D. R., The 1993 OH tropospheric photochemistry experiment: A summary and perspective. *J. Geophys. Res., 102*, 6495-6510, 20 March 1997.

11. Crosley, D. R., Measurements and intercomparisons: The examples of DMS and SO_2, in *IGAC Integration and Synthesis*, ed. G. Brasseur and A. Pzsenny, in press 2001.

12. Crosley, D. R., P. D. Goldan, K. D. Nicks, R. L. Benner, S. O. Farwell, D. L. MacTaggart, and W. L. Bamsberger, Gas-phase sulfur intercomparison experiment #2: Analysis and conclusions, *J. Geophys. Res., 105*, 19787-19793, 16 August 2000.

13. Driedger, A. R., D. C. Thornton, M. Lalevic, and A. R. Bandy, Determination of parts-per-trillion levels of atmospheric sulfur dioxide by isotope dilution gas chromatography/mass spectrometry, *Analytical Chemistry, 59*, 1196-1200, 15 April 1987.

14. Hoell, J. M., Jr., R. McNeal, and R. C. Harriss, An overview of the NASA Global Tropospheric Experiment, in *Proceedings from the 28th AIAA Aerospace Sciences Meeting*, Reno, NV, January 1990.

15. Lewin, E. E., B. L. Taggart, M. Lalevic, and A. R. Bandy, Determination of atmospheric carbonyl sulfide by isotope dilution gas chromatography/mass spectrometry, *Analytical Chemistry, 59*, 1296-1220, 1 May 1987.

16. McNeal, R. J., Global Troposphere Experiment: Probing the chemistry/climate connection, NASA Headquarters publication, 20 p.

17. McNeal, R. J., NASA Global Tropospheric Experiment, *EOS: Transactions*, vol. 64, no. 38, pp. 561-562, 20 September 1983.

18. McNeal, R. J., D. J. Jacob, D. D. Davis, and S. C. Liu, The NASA Global Tropospheric Experiment: Recent accomplishments and future plans, *IGACtivities Newsletter*, Issue No. 13, 2-18, June 1998.

19. Newell, R. E., V. Thouret, J. Y. N. Cho, P. Stoller, A. Marenco, and H. G. Smits, Ubiquity of quasi-horizontal layers in the troposphere, *Nature, 398*, 316-319, 25 March 1999.

20. Sachse, G. W., J. E. Collins, Jr., G. F. Hill, L. O. Wade, L. G. Burney, and J. A. Ritter, Airborne tunable diode laser sensor for high-precision concentration and flux measurements of carbon monoxide and methane, in *SPIE Proceedings*, vol. 1433, pp. 157-166, 1991.

21. Thornton, D. C., A. R. Driedger, III, and A. R. Bandy, Determination of parts-per-trillion levels of sulfur dioxide in humid air, *Analytical Chemistry, 58*, 2688-2691, November 1986.

22. Ward, E., et al., Homepage for the Global Tropospheric Experiment, in Norfolk State University, Langley Aerospace Research Summer Scholars Program, p. 791-798, January 1995.

Other Related Presentations

1. Andreae, M. O., Atmospheric impacts from biomass burning. 1st IGAC Scientific Conference, Invited Paper, Eilat, Israel, 18-22 April 1993.

2. Andronova, N. G., E. V. Rozanov, V. A. Zubov, and M. E. Schlesinger, The three-dimensional study of the influence of long-range gas transport on ozone and ozone-precursor gases over the North-Atlantic region. Paper No. A12D-03, 1998 AGU Fall Meeting, San Francisco, CA, December 1998.

3. Bandy, A. R., D. C. Thornton, and B. W. Blomquist, Sulfur dioxide, dimethyl sulfoxide and dimethyl sulfone formation from dimethyl sulfide oxidation. Paper No. 3.10, 2nd Scientific Conference of the IGAC Project, Fuji-Yoshida, Japan, 5-9 September 1994.

4. Bradshaw, J. D. and S. T. Sandholm, Description of the multi-photon laser-induced fluorescence spectrometer for airborne measurement of important ultra-trace gases, 2nd International Airborne Remote Sensing Conference and Exhibition: Technology, Measurement, and Analysis, San Francisco, CA, 24-27 June 1996.

5. Browell, E. V., Airborne lidar measurements of gases and aerosols for global process studies and satellite validation, IGAC SPARC GAW Conference on Global Measurement Systems for Atmospheric Composition, Toronto, Canada, 20-22 May 1997.

6. Clarke, A. D., S. Howell, K. Moore, and V. N. Kapustin, A decade of aircraft data over remote oceans: Aerosol properties in clean and continental air masses, IAMAS Conference, Innsbruk, Austria, 10-18 July 2001.

7. Chatfield, R. B., and L. Li, Global transport of aerosol and CO: Initial 3-D simulations of MAPS, TOMS, and AVHRR patterns as informed by GTE. Poster No. A32A-11, 1997 AGU Fall Meeting, San Francisco, CA, December, 1997.

8. Chin, M., R. B. Rood, S. Lin, D. Jacob, and J. Muller, Sulfate and Pb-210 simulated in a global model using assimilated meteorological fields. Paper No. A21E-05, 1999 AGU Spring Meeting, Boston, MA, May 1999.

9. Hoell, J. M., Jr., R. McNeal, and R. C. Harriss, An overview of the NASA Global Tropospheric Experiment, 28th AIAA Aerospace Sciences Meeting, Reno, 8-11 January 1990.

10. Horowitz, L. W., S. Walters, D. L. Mauzerall, L. K. Emmons, P. J. Rasch, C. Granier, X. Tie, J. Lamarque, M. Schultz, and G. P. Brasseur, A global simulation of tropospheric ozone and related tracers: Description and Evaluation of MOZART, version 2. Poster No., A32B-03, 2001 AGU Spring Meeting, Boston, MA, May 2001.

11. Jacob, D. J., L. Jaegle, M. G. Schultz, Y. H. Wang, W. H. Brune, Y. Kondo, H. Singh, and R. W. Talbot, Effects of subsonic aircraft on ozone: Insights from aircraft missions and global models. Invited Paper No. A41D-01, 1998 AGU Spring Meeting, Boston, MA, May 1998.

12. Kanakidou, M. and H. B. Singh, An investigation of the atmospheric sources and sinks of methyl bromide. 1st IGAC Scientific Conference, Paper No. 81, Eilat, Israel, 18-22 April 1993.

13. Liu, S. C., S. A. McKeen, K. K. Kelly, X. Lin, J. D. Bradshaw, S. T. Sandholm, D. D. Davis, B. A. Ridley, J. G. Walega, J. E. Dye, Y. Kondo, M. Koike, H. B. Singh, Ratios of NO to NO_y and the implication to tropospheric ozone, WMO-IGAC Conference on the Measurement and Assessment of Atmospheric Composition Change, Beijing, China, 9-14 October 1995.

14. Sachse, G. W., J. E. Collins, Jr., G. F. Hill, L. O. Wade, L. G. Burney, and J. A. Ritter, Airborne tunable diode laser sensor for high-precision concentration and flux measurements of carbon monoxide and methane, SPIE Meeting on Measurement of Atmospheric Gases, Los Angeles, 21-23 January 1991.

15. Singh, H. B. and M. Kanakidou, Acetone in the global troposphere: Its possible role as a global source of PAN. Paper No. 2.28, 2nd Scientific Conference of the IGAC Project, Fuji-Yoshida, Japan, 5-9 September 1994.

16. Stewart, R. W. and A. M. Thompson, Applications of uncertainty analysis in atmospheric photochemical modeling. Invited Paper No. A31C-01, 1997 AGU Fall Meeting, San Francisco, CA, December 1997.

17. Thakur, A. N. and H. B. Singh, Reactive nitrogen distribution in the troposphere and lower stratosphere. Poster No. A31B-12, 1996 AGU Fall Meeting, San Francisco, CA, December 1996.

18. Thompson, A. M., R. W. Stewart, and M. A. Owens, Is the oxidizing capacity of the atmosphere changing? Paper A41-01, 1988 AGU Spring Meeting, Baltimore, MD, May 1988.

GTE NASA Workshop Reports

1. *Report of the NASA Working Group on Tropospheric Program Planning*, J. H. Seinfield, Chrm., NASA RP 1062, 1981.

2. *Applying Modeling Results in Designing a Global Tropospheric Experiment,* in Proceedings of a Working Group meeting held in Virginia Beach, VA, 15-16 July 1981, NASA CP-2235, 1982.

3. *Tropospheric Passive Remote Sensing,* in Proceedings of a workshop held in Virginia Beach VA, 20-23 July 1981, Edited by Lloyd S. Keafer, Jr., NASA CP-2237, 1982.

4. *Assessment of Techniques for Measuring Tropospheric N_xO_y*, in Proceedings of a workshop held in Palo Alto, CA, 16-20 August 1982, NASA CP-2292, 1983.

5. *Assessment of Techniques for Measuring Tropospheric H_xO_y*, in Proceedings of a workshop held in Palo Alto, CA, 16-20 August 1982, ed. James M. Hoell, Jr., NASA CP- 2332, 1984.

6. *Research Needs in Heterogeneous Tropospheric Chemistry*, in Proceedings of a workshop held in Sarasota, FL, 9-13 January 1984, NASA CP-2320, 1984.

7. *Future Directions for H_xO_y Detection*, in Proceedings of a workshop held in Menlo Park, CA, 12-15 August 1985, NASA CP-2448, December 1986, ed. David A. Crosley and James M. Hoell.

8. *Space Opportunities for Tropospheric Chemistry Research,* in Proceedings of a workshop held in New York City, 9-13 September 1985, NASA CP-2450, February 1987, ed. Joel S. Levine.

9. Crosley, D. R., *The 1993 NASA Blue Ribbon NO_y Panel*. SRI International Report MP 93-185, November 1993.

10. *Local Measurement of Tropospheric HO_x*, Summary of a workshop held at SRI International, Menlo Park, CA, 23-26 March 1992, NASA CP 3245, February 1994.

11. Crosley, D. R., *Issues in the measurement of reactive nitrogen compounds in the atmosphere*. SRI International Report MP 94-035, March 1994.

12. Crosley, D. R., *Instrumentation Development for the Global Tropospheric Experiment,* Report of a workshop held at SRI International 15-17 July 1996, SRI International Report MP 96-112, August 1996.

GTE BIBLIOGRAPHY

Revision History

Revision	Date	Comments
Original	April 1994	Initial issue
A	December 20, 1996	Preliminary update for PI review
B	February 28, 1997	Incorporates PI updates, library searches, Introductory Comments, inclusion of all authors, and general revision for citation consistency.
C	December 5, 2001	Incorporates PI updates, library searches, inclusion of all authors, and general revision for citation consistency.