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 TRACE-A Special Publications and Presentations

TRACE-A SPECIAL PUBLICATIONS:

J. Geophys. Res., 101, 30 October 1996

TRACE-A SPECIAL PRESENTATIONS:

2nd Scientific Conference of the International Global Atmospheric Chemistry (IGAC) Project, Fuji-Yoshida, Japan, 5-9 September 1994

SAFARI-92 SPECIAL PUBLICATIONS:

J. Geophys. Res., 101, 30 October 1996

SAFARI-92 SPECIAL PRESENTATIONS:

1993 AGU Fall Meeting, San Francisco, CA, 6-10 December 1993

TRACE-A Media Coverage

1. "Inpe e Nasa estudam efeitos de queimadas", *Folha De São Paulo*, 9 August 1992.

2. "Nasa estuda gás nos ares do Brasil", *O Estado De São Paulo*, 15 August 1992.

3. "Inpe e Nasa medem efeito das queimadas no céu", *Vale Paraibano* (São José Dos Campos), 28 August 1992.

4. "INPE inicia pesquisa sobre concentrações de ozônio na região central do País", *Gazeta Mercantil* (São Paulo), 2 September 1992.

5. "Nuvem tóxica gigante sobrevao Atlântico", *Folha De São Paulo*, 10 September 1992.

6. "Falha em avião da Nasa atrasa projeto do Inpe", *Folha De São Paulo*, 11 September 1992.

7. "Nuvem tóxica de ozônio sobre o mar tem tamanho do Brasil", *Jornal Do Brasil* (Rio De Janeiro), 11 September 1992.

8. "Maus ventos trazem Nasa ao País", *O Estado De São Paulo*, 3 October 1992.

9. "Nasa detecta no Tocantins o maior foco de queimadas", *O Globo* (Rio De Janerio), 3 October 1992.

10. "Nasa e Inpe vêem mancha de ozônio e queimadas", *ValeParaibano* (São José Dos Campos), 3 October 1992.

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Revision History

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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.
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