

# 1974 INTERNATIONAL LASER RADAR CONFERENCE

— SIXTH CONFERENCE ON LASER ATMOSPHERIC STUDIES —

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## CONFERENCE ABSTRACTS

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SEPTEMBER 3 - 6, 1974

SENDAI SHIMIN KAIKAN  
( SENDAI CITY PUBLIC HALL )

SENDAI, JAPAN

Under the auspices of

The Japan Society of Applied Physics  
The Society of Terrestrial Magnetism  
and Electricity of Japan

The Meteorological Society of Japan  
The Japan Society of Air Pollution

Sponsored by

The American Meteorological Society  
(Committee on Laser Atmospheric Studies)  
The Optical Society of America

Hosted by

The Research Institute of Electrical  
Communication, and  
The Upper Atmosphere and Space  
Research Laboratory,  
Tohoku University, Sendai



PROGRAM

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TUESDAY, SEPTEMBER 3, 1974

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OPENING SESSION 9:30 - 10:20 a.m.

Welcoming Address

Recent Progress in Laser Atmospheric Studies

J.A. Weinman

Chairman of Committee on Laser Atmospheric Studies,  
University of Wisconsin, Wisconsin, U. S. A.

Research and Development of Laser Radars in Japan 1

H. Inaba

Chairman of Program Committee of the 1974 ILRC,  
Research Institute of Electrical Communication,  
Tohoku University, Sendai, Japan

Coffee 10:20 - 10:35 a.m.

SESSION I — LASER RADAR SYSTEMS AND DATA PROCESSING

10:35 - 12:25 a.m.

Chairman : A.I. Carswell

Department of Physics, York Uni-  
versity, Ontario, Canada

- I-1 Invited Paper: A Digital Real-Time Lidar Data Recording, Processing, and Display System 4  
E.E. Uthe and R.J. Allen  
Stanford Research Institute, Menlo Park, California, U.S.A.
- I-2 A New Lidar Signal Processor Using Digital Techniques to Provide Real Time Display 5  
C. Frush  
National Center for Atmospheric Research, Boulder, Colorado, U.S.A.
- I-3 Airborne Laser Radar for Mapping Two-Dimensional Contours of Aerosol Concentration 6  
G.W. Grams, E.M. Patterson and C.M. Wyman  
National Center for Atmospheric Research, Boulder, Colorado, U.S.A.
- I-4 The Design and Operation of a Tropospheric Remote Sensing System 8  
V.E. Derr, R.E. Cupp, G.T. McNice, N.L. Abshire, M.J. Post and R.L. Schwiesow  
National Oceanic and Atmospheric Administration, Environmental Research Laboratories, Boulder, Colorado, U.S.A.
- I-5 Laser Radar System, On-Line Data Processing, and Its Application to Air Pollution and Meteorological Studies 10  
S. Kitamura  
Kobe University, Kobe, Japan, and

	Y. Izawa, Y. Murakami, Y. Suzuki, C. Yamanaka and M. Nishimura Osaka University, Osaka, Japan	
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Tokyo Astronomical Observatory,  
University of Tokyo, Tokyo, Japan

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Osaka University, Osaka, Japan
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Instituto de Pesquisas Espaciais (INPE), São José dos Campos, São Paulo, Brasil
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Radio Research Laboratories, Koganei, Tokyo, Japan
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H. Herrmann and Ch. Werner  
German Establishment for Aeronautical and Space Research (DFVLR), Institute of Atmospheric Physics, Oberpfaffenhofen, Germany
- II-5 Feasibility of a CW Lidar Technique for Measurement of Plume Opacity 35  
R. Ferguson  
Stanford Research Institute, Menlo Park, California, U.S.A.
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Old Dominion University, Norfolk, Virginia, U.S.A.
- II-7 An Optical Heterodyne Radar System for Position and Velocity Detection 37  
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Institute of Industrial Science, University of Tokyo, Tokyo, Japan

Reception

6:30 p.m.

Grand Hotel Sendai

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WEDNESDAY, SEPTEMBER 4, 1974

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SESSION III — SPECTROSCOPIC STUDIES AND MEASUREMENTS I

9:15 - 12:05 a.m.

Chairman : J.J. Cooney

Department of Physics and Atmospheric Science, Drexel University,  
Philadelphia, Pennsylvania, U.S.A.

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ISL, Saint Louis, Missouri, U.S.A.
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General Electric Corporate Research and Development,  
Schenectady, New York, U.S.A.
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Sektion Physik der Universität München, München, Germany
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Upper Atmosphere and Space Research Laboratory, Tohoku University, Sendai, Japan
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Avco-Everett Research Laboratory, Everett, Massachusetts, U.S.A.
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Graduate Center for Cloud Physics Research, University of Missouri-Rolla, Rolla, Missouri, U.S.A.
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T. Kobayasi, H. Shimizu and H. Inaba  
Research Institute of Electrical Communication, Tohoku University, Sendai, Japan

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	J.A. Salzman and T.A. Coney NASA Lewis Research Center, Cleveland, Ohio, U.S.A.	
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	J.J. Cooney and M. Pina Drexel University, Philadelphia, Pennsylvania, U.S.A.	
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	A. Daniels University of Hawaii, Honolulu, Hawaii, U.S.A.	

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1:30 - 2:45 p.m.

Chairman : H. Inaba

Research Institute of Electrical  
Communication, Tohoku University,  
Sendai, Japan

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	R.L. Byer Microwave Laboratory, Stanford University, Stanford, California, U.S.A.	
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	R.K. Long, F.S. Mills and E.K. Damon Ohio State University, ElectroScience Laboratory, Columbus, Ohio, U.S.A.	
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	J.A. Dowling and P.M. Livingston Naval Research Laboratory, NRL Experimental Laser Propagation Field Team, Washington, D.C., U.S.A.	
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Block Engineering, Cambridge, Massachusetts, U.S.A.

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Chairman : B.M. Herman  
Institute of Atmospheric Physics,  
University of Arizona,  
Tucson, Arizona, U.S.A.

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J.D. Lindberg  
United States Army Electronics Command, Atmospheric  
Science Laboratory, White Sands Missile Range, New Mexico,  
U.S.A.

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Atmospheric Turbulence and Diffusion Laboratory, National  
Oceanic and Atmospheric Administration, Oak Ridge,  
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A. Hågård  
Research Institute of National Defence (FOA), Stockholm,  
Sweden

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E.E. Uthe and P.B. Russell  
Stanford Research Institute, Menlo Park, California, U.S.A.

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P.B. Russell and E.E. Uthe  
Stanford Research Institute, Menlo Park, California, U.S.A.

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University of Arizona, Tucson, Arizona, U.S.A., and  
A.J. Hunt  
Optical Science Center, University of Arizona, Tucson,  
Arizona, U.S.A.

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Research Institute of Applied Electricity, Hokkaido  
University, Sapporo, Japan

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A.E.S. Green, T. Sawada and R. McPeters  
University of Florida, Gainesville, Florida, U.S.A.

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NASA Wallops Station, Wallops Island, Virginia, U.S.A., and  
W.A. Munn  
Smithsonian Astrophysical Observatory, Washington, D.C.,  
U.S.A.

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	R.W.L. Thomas Wolf Research and Development Corporation, Riverdale, Maryland, U.S.A.	
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	R.W.L. Thomas Wolf Research and Development Corporation, Riverdale, Maryland, U.S.A.	

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THURSDAY, SEPTEMBER 5, 1974

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9:15 — 12:30 a.m.

Chairman : V.E. Derr

Wave Propagation Laboratory  
Environmental Research Laboratory,  
NOAA, Boulder, Colorado,  
U.S.A.

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S.H. Melfi, D. Bundy, J. Eckert and J. Guagliardo  
U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada, U.S.A., and  
J.L. McElroy  
U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, U.S.A.
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The Institute of Atmospheric Optics of the U.S.S.R., Academy of Sciences, Siberian Branch, Tomsk, U.S.S.R.
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J. Politch  
Environmental Engineering Research Center, Laboratory for Opto-Electronics Instrumentation and Holography, Technion I.I.T., Haifa, Israel
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T. Ohkita  
Department of Community Environmental Studies, Institute of Public Health, Tokyo, Japan
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Indian Institute of Technology, Kanpur, India

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	T. Tsuji and Y. Higuchi Research and Development Center, Tokyo Shibaura Electric Co., Ltd., Kawasaki, Japan, and H. Kimura Instrument and Automatic Division, Tokyo Shibaura Electric Co., Ltd., Kawasaki, Japan	
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MEASUREMENTS

2:00 - 4:50 p.m.

Chairman : B.G. Schuster

Graduate Center for Cloud  
Physics Research, University of  
Missouri-Rolla, Rolla, Missouri,  
U.S.A.

VII-1	Invited Paper: Synoptic Scale Variability in the Distribution of Stratospheric Aerosols as Revealed by Airborne Lidar	111
	F.G. Fernald, E.F. Danielsen and D.G. Deaven National Center for Atmospheric Research, Boulder, Colorado, U.S.A., and B.G. Schuster Graduate Center for Cloud Physics Research, University of Missouri-Rolla, Rolla, Missouri, U.S.A.	
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	R. Fegley Mauna Loa Observatory, Hilo, Hawaii, U.S.A.	
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	A. Cohen and M. Graber The Hebrew University of Jerusalem, Jerusalem, Israel	
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	K.E. Kunkel, E.W. Eloranta and J.A. Weinman University of Wisconsin, Madison, Wisconsin, U.S.A.	

POST DEADLINE PAPERS AND BUSINESS SESSION

4:50 - 5:30 p.m.

Chairman : J.A. Weinman

Chairman of CLAS,  
Department of Meteorology,  
University of Wisconsin,  
Madison, Wisconsin, U.S.A.

Cocktail Party 6:00 p.m.

Sendai Shimin Kaikan

(Sendai City Public Hall)

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FRIDAY, SEPTEMBER 6, 1974

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SESSION VIII — TROPOSPHERIC SCATTERING STUDIES I

9:15 - 11:55 a.m.

Chairman : R.M. Schotland

Institute of Atmospheric Physics,  
University of Arizona,  
Tucson, Arizona, U.S.A.

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V.E. Zuev, Yu. S. Balin, G.G. Matvienko, I.V. Samokhvalov and V.S. Shamanaev  
The Institute of Atmospheric Optics of the U.S.S.R., Academy of Sciences, Siberian Branch, Tomsk, U.S.S.R.
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The Institute of Atmospheric Optics of the U.S.S.R., Academy of Sciences, Siberian Branch, Tomsk, U.S.S.R.
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The Institute of Atmospheric Optics of the U.S.S.R., Academy of Sciences, Siberian Branch, Tomsk, U.S.S.R., and L.S. Ivlev  
Leningrad State University, Leningrad, U.S.S.R.
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M.P. McCormick and W.H. Fuller, Jr.  
NASA Langley Research Center, Hampton, Virginia, U.S.A.
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Meteorological Research Institute, Koenji, Tokyo, Japan, and T. Ikeno  
Japan Meteorological Association, Tokyo, Japan
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Meteorological Research Institute, Koenji, Tokyo, Japan, and T. Ikeno  
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Nippon Electric Co. Ltd., Futyu, Tokyo, Japan

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	R.E. Turner Infrared and Optics Division, Environmental Research Institute of Michigan, Ann Arbor, Michigan, U.S.A.	
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	H.T. Yura Electronics Research Laboratory, The Aerospace Corporation, Los Angeles, California, U.S.A.	

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Department of Atmospheric  
Science, The Hebrew University  
of Jerusalem, Jerusalem, Israel

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	A. Deepak NASA Marshall Space Flight Center, Huntsville, Alabama, U.S.A.	

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W. Büchtemann and D.H. Höhn Forschungsinstitut für Optik, Gesellschaft zur Förderung der Astrophysikalischen Forschung e.V., Tübingen, Germany	
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K. Sasson University of Wyoming, Laramie, Wyoming, U.S.A.	
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Coffee 3:20 - 3:35 p.m.

#### SESSION X — UPPER ATMOSPHERE AND SPACE MEASUREMENTS

3:35 - 5:00 p.m.

Chairman : H. Kamiyama  
Upper Atmosphere and Space  
Research Laboratory, Tohoku  
University, Sendai, Japan

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<b>X-3 Characteristics of the Sodium Layer Observed at Mt. Zao</b>	<b>174</b>
H. Kamiyama, S. Okano, T. Ohnuma, T. Aruga Upper Atmosphere and Space Research Laboratory, Tohoku University, Sendai, Japan, and M. Jyumonji, A. Yamagishi, T. Kobayasi and H. Inaba Research Institute of Electrical Communication, Tohoku University, Sendai, Japan	

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