Preface

International Workshop on Spaceborne Lidar 1995 - Technology and Applications - was held at Nara Prefectural Culture Hall in Nara, Japan on October 24-26, 1995. This meeting was organized under the joint auspices of Earth Environment Observation Committee (EEOC) and National Space Development Agency of Japan (NASDA). The aim of the workshop is to encourage lively and useful discussions helping to lay the foundations for progress in this challenging area, according to one of the recommendations adopted at the NASDA session in the 17th International Laser Radar Conference (17ILRC) held at Sendai Convention Center, Sendai, Japan, July 25-29, 1994.

It is said that rapid climate change is giving rise to recent earth environment crisis. Atmospheric lidars are expected as one of fruitful remote sensors observing the earth environment from space and analyzing the climate changing phenomena. Therefore, many space agencies, i.e. NASA, ESA , CNES and RSA have been directing their efforts to develop Mie back scattering lidar for observing clouds, aerosols and PBL, DIAL for water vapor measurement, coherent Doppler lidar for measuring atmospheric wind vector. Japan also has to contribute our efforts to the promotion of preservation for the earth environment. NASDA has planned Japan's long-range scenario for the earth observation by the space lidar. According to the scenario, the first Japan's spaceborne lidar named as Lidar Engineering Test Satellite (LETS) is planned to be launched with other satellite (DRTS) by H-II in 2001. Preliminary flight experiments for DIAL and Japanese Laser Atmospheric Wind Sounder (J-LAWS) are also planed in the 2000's.

In this workshop, current status of the spaceborne lidar and its applications were presented. Most concentrated discussions were made from the view points of resolutions for the climate change problem related to interactions between cloud, aerosols and radiation budgets. All sessions were consist of only invited talks from United States, France, Germany, Russia and Japan. Most of talks strongly pointed out importances of global observation by using the spaceborne lidar and also necessities of immediate developments for it. We deeply believe that these discussions might encouraged all of participants. As a concluding remarks, it was recommended that next workshop focus on the aerosol observation and should be held in Japan again .

This proceeding is dedicated to many scientists and engineers who are interested in this area. Special thanks go to Mr.M.Noguchi, Mr.A.Hirano, Mr.Y.Tanabe of Remote Sensing Technology Center of Japan (RESTEC) for their assistance in arranging the workshop and also in compiling, formatting this proceeding.

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Program

October 24 (Tue.)

chaired by H. Koshiishi (National Aerospace Laboratory)

13:00-13:30 **Opening Session**
K. Asai (Tohoku Instute of Technology
T. Igarashi (National Space Development Agency of Japan)

13:30-13:55 Earth Observation Long Term Scenario in Japan
T. Igarashi (National Space Development Agency of Japan)

13:55-14:20 What will we see from space using a Mie lidar ?
Y.Sasano (National Institute of Environmental Studies)

14:20-14:55 Spaceborne Cloud Information for Climate Research
E. Raschke (GKSS-Forschungszentrum Geesthacht GmbH)

14:55-15:20 **Coffee Break**

chaired by P.H. Flamant
(Laboratoire de Meteorologie Dynamique du CNRS Ecole Polytechnique)

15:20-15:45 Implications of Three Dimensional Cloud/Aerosol Measurement in the Climate Change Issues
T. Nakajima (Center for Climate System Research, University of Tokyo)

15:45-16:10 Small Satellite System for Technology Demonstration
T. Hidaka, Y. Kawada, A. Noda, T. Hujita (National Space Development Agency of Japan)

16:10-16:35 Conceptual Study and Near Future Plan of Space Lidar
N. Tanioka, S. Ishii, A. Tuiki, Y. Yamamoto
(National Space Development Agency of Japan)

18:00-20:30 **Reception**

October 25 (Wed.)

chaired by T. Shibata (Nagoya University)

9:10-9:45 LITE : The First Atmospheric Lidar Measurements from Space
D.M. Winker (NASA Langley Research Center)

9:45-10:20 LITE Observations of Biomass Burning Over South America, Africa, and the South Atlantic Ocean
E.V. Browell, W.B. Grant, G.D. Nowicki, M.A. Fenn, R.M. Hoff, R.J. Bauer
(NASA Langley Research Center)

10:20-10:45 **Coffee Break**

chaired by N. Takeuchi (Chiba University)

10:45-11:10 Cloud Inhomogeneity and Shortwave Radiation Budget
T. Hayasaka (Center for Atmospheric and Oceanic Studies, Tohoku University)

11:10-11:45 Overview of the Studies Conducted in France to Assess the Potential of Space-based Lidar for a Radiation and Climate Watch Mission
P.H. Flamant (Laboratoire de Meteorologie Dynamique du CNRS Ecole Polytechnique)
J. Pelon (Service d'Aeronomie du CNRS)

11:45-15:30 **Lunch**

chaired by E.V. Browell (NASA Langley Research Center)

15:30-15:55 Need of 3-D Polar Cloud Climatology for Earth Radiation Budget Study
T. Yamanouchi (National Institute of Polar Research)

15:55-16:30 Utility of Spaceborne Lidar Data for Cloud Studies in Climate Research
G.L. Stephens (Department of Atmospheric Science, Colorado State University)

16:30-16:50 Coffee Break

chaired by J.L. Bufton (NASA Goddard Space Flight Center)
M. Nakajima (National Space Development Agency of Japan)

16:50-17:10 Future Spaceborne Lidar Systems
T. Kobayashi (Fukui University)

17:10-17:30 Development of All Solid-state Lasers and Optics for Airborne and Space Lidar Systems
K. Tatsumi, Y. Hirano (Mitsubishi Electric Corporation)
N. Tanioka, S. Ishii (National Space Development Agency of Japan)

17:30-17:50 Conductively Cooled LDP Nd:YAG Laser for Spaceborne Lidar System
T. Ishii, T. Hotta, H. Kubomura, T. Araki, K. Nakajima, H. Imoto, R. Kameyama (NEC Corporation)
N. Tanioka, S. Ishii (National Space Development Agency of Japan)

17:50-18:10 Space LIDAR Activity in Toshiba
K. Tsuno, Y. Kameda (Toshiba Komukai Works)
M. Nakayama, E. Koike (Toshiba Manufactural Engineering Laboratory)

chaired by N. Sugimoto (National Institute of Environmental Studies)
C. Nagasawa (Tokyo Metropolitan University)

18:20-20:20 Poster Party

October 26 (Thu.)

chaired by C. Nagasawa (Tokyo Metropolitan University)

9:10-9:35 Development of Water Vapor DIAL
O. Uchino (Japan Meteorological Agency)

9:35-10:10 Advanced Airborne DIAL Systems and Measurements and Plans for Future Spaceborne DIAL Missions
E.V. Browell, S. Ismail, W.B. Grant, N.S. Higdon, A. Dudelzak (NASA Langley Research Center)

10:10-10:35 Coffee Break

chaired by T. Itabe (Communication Research Laboratory)

10:35-11:10 Shuttle Laser Altimeter: A Pathfinder for Space-Based Laser Altimetry and Lidar
J.L. Bufton (NASA Goddard Space Flight Center)

11:10-11:45 Spaceborne Lidar "ALISSA" for Orbital "MIR" Station
G. Tulinov (Institute of Applied Geophysics)

11:45-12:00 Closing Remark
T. Itabe (Communication Research Laboratory)