

## ASSESSMENT OF DIAL DATA COLLECTION AND ANALYSIS TECHNIQUES

E. V. Browell<sup>a</sup> and P. T. Woods<sup>b</sup>

The First International DIAL Data Collection and Analysis Workshop was held in Virginia Beach, Virginia, on November 18-21, 1985. The objectives of the Workshop were to assemble representatives from most of the leading DIAL groups into a limited and focused working group and to address the details of current and future DIAL data collection and analysis techniques. The emphasis of the Workshop was on direct detection DIAL methods and on an assessment of current techniques used in DIAL measurements throughout the 0.2 - 11 $\mu$ m spectral range. A total of 38 researchers from 22 DIAL groups contributed to the Workshop. A list of the DIAL participants in this Workshop is given by country and organization in Table 1. A NASA report is being prepared to communicate the Workshop results to the entire DIAL community.<sup>1</sup> This paper discusses the Workshop and summarizes the Workshop's assessment of DIAL data collection and analysis techniques.

The Workshop was organized to examine the key issues in all areas of DIAL data collection and analysis techniques. This included consideration of the practical and theoretical limitations of DIAL and the range of possible DIAL measurements. Table 2 lists the main topics discussed at the Workshop and examples of issues addressed in each area. Each of the DIAL groups represented at the Workshop presented a current status of their DIAL research as it pertained to the topics of the Workshop. A written summary of each report is found in the appendix of Reference 1. During the Workshop, each of the topics identified in Table 2 was discussed initially by a panel comprised of several of the DIAL participants and later by the entire Workshop. Each panel chairman had the responsibility of leading the Workshop discussion on a particular DIAL topic and of drafting a section of the Workshop report. Each panel report defined the issues to be considered, the various approaches used to address each issue, and, where possible, quantitatively compared competing techniques. The report from this Workshop<sup>1</sup> presents a comprehensive assessment of the major DIAL techniques, and this paper summarizes the results of this Workshop in each of the major topic areas.

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1. Browell, E. V., and P. T. Woods, eds.: Assessment of DIAL Data Collection and Analysis Techniques. NASA Langley, work in preparation.

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Table 1. DIAL Participants in the First International DIAL  
Data Collection and Analysis Workshop

Sweden: Lund Inst. of Tech. - K. Fredrikson

Japan: Kyushu Univ. - O. Uchino  
NIES - N. Sugimoto

France: CNRS/Serv. Aeronomy - G. Megie/J. Pelon  
CNRS/Dynam. Meteor. - P. Flamant  
Elect. Du. France - C. Cahen/B. Grossmann

U.K.: NPL - P. T. Woods/B. W. Jolliffe/M. Milton  
Univ. of Hull - B. J. Rye  
CERL - R. H. Varey

F.R.G.: Inst. for Physik - A. Breinig/W. Staehr  
MPI fur Meteor. - J. Boesenberg  
DFVLR - W. Renger

Italy: ENEL and CISE - A. Marzorati/E. Zanzottera

Canada: AES - R. M. Hoff/F. A. Froude

U.S.: NOAA/WPL - R. M. Hardesty  
EPA Las Vegas - M. Bristow/D. Bundy  
SRI Inter. - R. E. Warren/J. G. Hawley  
NASA GSFC - C. L. Korb/G. K. Schwemmer  
RCA Astro. - A. Rosenberg/J. C. Petheram  
JPL - W. B. Grant/S. McDermid  
Univ. of MD - T. D. Wilkerson/C. Braun  
NASA LaRC - E. V. Browell/S. Ismail/A. F.  
Carter/R. J. Allen

Table 2. DIAL Workshop Topics

	<u>EXAMPLES OF ISSUES</u>
I. Data Collection Techniques	
Transmitting Systems	Laser Requirements; Simultaneous Versus Non- simultaneous Outputs; Laser Output Characterization; Spectral Data
Atmospheric Effects	Speckle; Turbulence; Wavelength-Dependent Propagation Effects
Receiving Systems	Telescope Design; Coaxial; Collinear
Detection Systems	Linearity; Gain Modulation; Noise Effects; Wavelength Separation Techniques
Post-detection Electronics	Amplifier Saturation; Dynamic Range Compression, Digitiza- tion Speed; Accuracy Limitations
New Concepts	
II. Data Analysis	
Signal Processing	Averaging Techniques; Smoothing; Differentiation
Data Handling	Parallel Processing; Computa- tional Techniques
Correction to Results	Wavelength Dependence of Scattering; Correction for Atmospheric Density; Absorption Cross Sections; Deconvolution of Laser Spectral Properties
Error Analysis	Contributions to Total Error Budget