

**FOURTH SYMPOSIUM  
ON METEOROLOGICAL  
OBSERVATIONS AND  
INSTRUMENTATION**

April 10-14, 1978

**AMERICAN METEOROLOGICAL SOCIETY**

FOURTH SYMPOSIUM  
ON METEOROLOGICAL OBSERVATIONS  
AND INSTRUMENTATION

of the  
AMERICAN METEOROLOGICAL SOCIETY

APRIL 10-14, 1978  
DENVER, COLORADO

Copyright © 1978, American Meteorological Society. This copyright notice applies to only the overall collection of papers; authors retain their individual rights and should be contacted directly for permission to use their material separately. Contact AMS for permission pertaining to the overall collection.

The manuscripts reproduced in this collection of preprints are unrefereed papers presented at the Fourth Symposium on Meteorological Observations and Instrumentation; their appearance in this collection does not constitute formal publication.

AMERICAN METEOROLOGICAL SOCIETY  
45 BEACON STREET, BOSTON, MASSACHUSETTS 02108

## FOREWORD

The Symposia on Meteorological Observations and Instrumentation have come into their own as a regular event. The first symposium was held 10-14 February 1969 in Washington, D.C. Papers were invited by the program committee and were classed as either Observation or Instrumentation. Eight panel discussions were distributed throughout the week. The proceedings were published as Meteorological Monographs, Vol. 11, No. 33, in October 1970 by the American Meteorological Society.

The second symposium was held 27-30 March 1972 in San Diego, Calif.; its theme was, "Relevancy of the Present Observational Structure to Real Data Needs." Contributed papers and a preprint volume came into use at this time.

The third symposium was held 10-13 February 1975 again in Washington, D.C.; its theme was, "Observations and Instruments for Mesoscale Phenomena."

The groundwork for this fourth symposium began in 1976 when the AMS Committee on Atmospheric Measurements (CAM) concurred that improving the communication between the remote sensing specialist and the meteorological user community was a worthwhile symposium goal. Correspondence between Floyd Elder, then Chairman of CAM, and Gordon Little focussed further on the theme. With both NCAR and NOAA in Boulder heavily involved in remote sensing research as well as in new in situ instrumentation development, it seemed appropriate to share the planning and organizing function within both groups.

When we scan the papers in this volume and compare them with those in the previous three proceedings, we see that there has truly been an evolution in meteorological instrumentation. More and more devices incorporate built-in data averaging, processing, or calibrating capabilities. Digital techniques that were experimental only 10 years ago have become so commonplace and economical that there is now no choice but to employ them. Interactive experiments, long a dream of the atmospheric scientist, are now a reality. Is it possible that we are on the verge of a breakthrough in meteorology, where the new observation techniques can result in significant forecast improvements? Can our experimental community be satisfied with anything less?

Freeman F. Hall and Julian M. Pike  
Program Cochairmen

## PROGRAM COMMITTEE

Freeman F. Hall, Cochairman	Walter E. Hoehne
Julian M. Pike, Cochairman	Donald H. Lenschow
Constantinos B. Emmanuel	Harold V. Thompson

## AMS 1977 COMMITTEE ON ATMOSPHERIC MEASUREMENTS

Walter E. Hoehne, Chairman	Thomas J. Lockhart	Julian M. Pike
William L. Clink	Daniel A. Mazzarella	John A. Reagan
Floyd C. Elder	Alvin L. Morris	Dennis W. Thomson
Lawrence R. French		

# TABLE OF CONTENTS

	Page
FOREWORD	i
AUTHOR INDEX	xiii
WELCOME TO THE FOURTH SYMPOSIUM. Walter E. Hoehne, Chairman, AMS Committee on Atmospheric Measurements, and Chief, Functional Experimentation Test Branch, Test and Evaluation Lab./NOAA, Sterling, Va.	1
SESSION 1: <u>IN SITU</u> INSTRUMENTS AND CALIBRATION	
CHAIRMAN: Donald H. Champ, Atmospheric Environment Service, Downsview, Ont., Canada.	
THE ROLE OF INSTRUMENT CALIBRATION IN DATA QUALITY ASSURANCE. D. H. Champ and R. S. Bourke, Atmospheric Environment Service, Downsview, Ont., Canada.	**
THE NATIONAL BASIS FOR ACCURACY IN HUMIDITY MEASUREMENTS. S. Hasegawa, National Bureau of Standards, Washington, D.C.	**
THE TVA METEOROLOGICAL DATA ACCEPTANCE ANALYSIS PROGRAM. George W. Reynolds and Doyle E. Pittman, Tennessee Valley Authority, Muscle Shoals, Ala.	3
SESSION 2: <u>IN SITU</u> INSTRUMENTS AND CALIBRATION	
CHAIRMAN: Walter E. Hoehne, Chief, Functional Experimentation Test Branch, Test and Evaluation Lab./NOAA, Sterling, Va.	
A SAD LOOK AT COMMERCIAL HUMIDITY SENSORS FOR METEOROLOGICAL APPLICATIONS. D. J. McKay, Atmospheric Environment Service, Downsview, Ont., Canada.	7
EFFECTS OF SAMPLING RATES AND AVERAGING PERIODS ON METEOROLOGICAL MEASUREMENTS. Duane A. Haugen, Wave Propagation Lab./NOAA, Boulder, Colo.	15
TALL TOWER AND AIRCRAFT INSTRUMENTATION: QUALITY CONTROL PROCEDURES--DEVELOPMENT AND APPLICATION. J. T. Lee and Judith Stokes, National Severe Storms Lab./NOAA, Norman, Okla.	19
AIR TEMPERATURE AND DIFFERENTIAL TEMPERATURE MEASUREMENT USING IC TEMPERATURE SENSORS. Harold L. Cole, NCAR, Boulder, Colo.	25
A BAROMETER DEVELOPMENT. William L. Clink, Atmospheric Environment Service, Downsview, Ont., Canada.	31
A REMOTE WEATHER STATION FOR USE IN FOREST FIRE MANAGEMENT. James B. Harrington, Jr., Forest Fire Research Institute/Environment Canada, Ottawa, Ont., Canada.	33

\*\*Manuscript not available; if received in time, it will appear in back of book.

**SESSION 3: IN SITU INSTRUMENTS AND CALIBRATION**

**CHAIRMAN:** J. C. Kaimal, Wave Propagation Lab./NOAA, Boulder, Colo.

**NOAA INSTRUMENTATION AT THE BOULDER ATMOSPHERIC OBSERVATORY.** 35  
J. C. Kaimal, Wave Propagation Lab./NOAA, Boulder, Colo.

**METEOROLOGICAL OBSERVATIONS ON THE 213 M MAST AT CABAUIW, IN** 41  
**THE NETHERLANDS.** A. G. M. Driedonks, H. van Dop, and W. H. Kohsiek,  
Royal Netherlands Meteorological Institute, De Bilt, Netherlands.

**AN OPTICAL HEAT FLUX EXPERIMENT.** J. C. Wyngaard, J. C. Kaimal, 47  
G. R. Ochs, R. J. Hill, and D. C. Sorensen, Wave Propagation Lab./NOAA,  
Boulder, Colo.

**THE INVERSION OF OPTICAL DATA TO OBTAIN A MICROMETEOROLOGICAL** 51  
**TEMPERATURE PROFILE.** William H. Mach and Alistair B. Fraser,  
Pennsylvania State University, University Park, Pa.

**RADIATION MATER.** John M. Cook, Atmospheric Environment Service, Downsview, 54  
Ont., Canada.

**SESSION 4: IN SITU INSTRUMENTS AND CALIBRATION**

**CHAIRMAN:** Thomas J. Lockhart, Meteorology Research, Inc., Altadena, Calif.

**A FIELD CALIBRATION STRATEGY FOR ROTATING ANEMOMETERS AND WIND** 57  
**VANES.** Thomas J. Lockhart, Meteorology Research, Inc., Altadena, Calif.

**AN OPERATIONAL DIGITAL WIND SYSTEM.** M. E. Still, Atmospheric 61  
Environment Service, Toronto, Ont., Canada.

**A BALLOON-BORNE SONIC ANEMOMETER-THERMOMETER.** J. Ovarlez, H. 65  
Cabrita, D. Cadet, and H. Ovarlez, Laboratoire de Meteorologie Dynamique,  
Palaiseau Cedex, France.

**AN INDUCTION-TYPE BIVANE TO MEASURE VERTICAL AND LATERAL WIND** 70  
**VELOCITY FLUCTUATIONS.** S. SethuRaman and W. A. Tuthill, Brookhaven  
National Lab., Upton, N.Y.

**VORTEX SENSING: AN OPERATIONAL REVIEW.** Douglas W. Beadle, J-TEC 73  
Associates, Inc., Cedar Rapids, Iowa.

**RESPONSE AND OTHER CHARACTERISTICS OF A FLAT BLADED, DUAL** 77  
**PITCH PROPELLER ANEMOMETER.** V. R. Turner, Atmospheric Environment  
Service, Toronto, Ont., Canada.

**AN OMNIDIRECTIONAL, TILT INSENSITIVE, WIND SPEED THRESHOLD DETECTOR.** 83  
A. J. Bedard, Jr., Wave Propagation Lab./NOAA, Boulder, Colo.; and T. T.  
Fujita, Univ. of Chicago, Chicago, Ill.

**SESSION 5: EXPERIMENTS, DATA, AND OPERATIONS**

**CHAIRMAN:** William R. Cotton, Dept. of Atmospheric Science, Colorado State Univ.,  
Ft. Collins, Colo.

**A SUMMER WITH PAM.** William R. Cotton and Raymond L. George, Colorado 87  
State Univ., Ft. Collins, Colo.

	Page
A LOOK BACK AT GATE RADIOSONDE SYSTEMS. Donald T. Acheson, Equipment Development Labs., NWS/NOAA, Silver Spring, Md.	93
A CENTRALLY-LOCATED DATA ACQUISITION AND PROCESSING SYSTEM FOR A NETWORK OF REMOTE-SENSING METEOROLOGICAL TOWERS AT EXISTING AND PROPOSED NUCLEAR POWER PLANT SITES. Joseph Laznow, Yankee Atomic Electric Co., Westboro, Mass.	99
THE TVA METEOROLOGICAL TOWER NETWORK. T. J. Ploski, C. D. Nicholson, and C. L. Bach, Tennessee Valley Authority, Knoxville, Tenn.	105
A COMPARISON OF SIGMA THETA AND DELTA T AS MEASURES OF ATMOSPHERIC STABILITY. Anthony P. Letizia and Joseph F. Silvey, Envirosphere Co., New York; and Sherman L. Williams, General Electric Co., Schenectady, N.Y.	109
 SESSION 6: EXPERIMENTS, DATA, AND OPERATIONS	
CHAIRMAN: Donald Acheson, Equipment Development Labs., NWS/NOAA, Silver Spring, Md.	
THE DULLES AIRPORT PRESSURE-SENSOR ARRAY FOR GUST-FRONT DETEC- TION--SYSTEM DESIGN AND PRELIMINARY RESULTS. A. J. Bedard, Jr., and W. H. Hooke, Wave Propagation Lab./NOAA, Boulder, Colo.	115
AN OPERATIONAL APPLICATION OF MESONETWORKS FOR WARNING OF TRANSLATING SURFACE WIND CHANGE BOUNDARIES. R. C. Goff and E. E. Schlatter, National Aviation Facilities Experimental Center/FAA, Atlantic City, N.J.	*
AV-AWOS AND AUTOB--AN UPDATE. James T. Bradley, Matthew Lefkowitz, and William Read, National Weather Service/NOAA, Silver Spring, Md.	125
NATIONAL WEATHER SERVICE AUTOMATED OBSERVATIONAL NETWORKS AND THE TEST & EVALUATION DIVISION FUNCTIONAL TESTING PROGRAM. Richard J. Stone, National Weather Service/NOAA, Sterling, Va.	131
THE TOUCH TONE TELEPHONE AS A DIRECT OBSERVER-TO-COMPUTER DATA LINK. Thomas M. Blackburn, National Weather Service/NOAA, Silver Spring, Md.	136
 SESSION 7: REMOTE SENSING, RADIOMETRY.	
CHAIRMAN: Freeman F. Hall, Wave Propagation Lab./NOAA, Boulder, Colo.	
REMOTE SENSING CALIBRATION AND STANDARDS. C. Gordon Little, Wave Propagation Lab./NOAA, Boulder, Colo.	143
ATMOSPHERIC INFRARED SENSING ABOARD THE NASA C-141A JET LABORATORY--OBSERVATIONS AND PRECISION. P. M. Kuhn, Environmental Research Labs./NOAA, Boulder, Colo.	146
TESTS OF MICROWAVE RADIOMETRIC SENSING OF ATMOSPHERIC TEMPER- ATURE AND WATER IN THE GULF OF ALASKA. M. T. Decker, E. R. Westwater, and F. O. Guiraud, Wave Propagation Lab./NOAA, Boulder, Colo.	148

\*Manuscript not available.

	Page
GROUND-BASED PASSIVE MICROWAVE SENSING OF WATER VAPOR AND CLOUD LIQUID. E. R. Westwater and F. O. Guiraud, Wave Propagation Lab./NOAA, Boulder, Colo.	150
IMPROVED DETERMINATION OF VERTICAL TEMPERATURE PROFILES OF THE ATMOSPHERE BY A COMBINATION OF RADIOMETRIC AND ACTIVE GROUND-BASED REMOTE SENSORS. E. R. Westwater, Wave Propagation Lab./NOAA, Boulder, Colo.	153
 SESSION 8: RADIOMETRY	
CHAIRMAN: C. Gordon Little, Wave Propagation Lab./NOAA, Boulder, Colo.	
DIRECT AND REMOTE SENSING OF OCEAN TEMPERATURE FROM AN AIRCRAFT. Peter G. Black, National Hurricane and Experimental Meteorology Lab./NOAA; and Terry Schricker, Research Facilities Center/NOAA, Miami, Fla.	158
COMPARISON OF ONSHORE AND OFFSHORE RADIOSONDINGS AND THE CORRECTION OF SEA-SURFACE TEMPERATURE FROM SATELLITE INFRARED MEASUREMENTS. S. A. Hsu, L. J. Rouse, Jr., and Oscar K. Huh, Louisiana State Univ., Baton Rouge, La.	166
AIRBORNE INFRARED MEASUREMENTS OF LOGAN CANYON, UTAH. I. Dirmhirn, Utah State Univ., Logan, Utah; and F. D. Eaton, Univ. of Wyoming, Laramie, Wyo.	*
THE EARTH RADIATION BUDGET SATELLITE SYSTEM OF THE EARLY 1980'S. John E. Cooper and Charles V. Woerner, Langley Research Center/NASA, Hampton, Va.	172
SYSTEM CONSIDERATIONS FOR AN EARTH RADIATION BUDGET SCANNING RADIOMETER. G. Louis Smith and T. Dale Bess, Langley Research Center/NASA, Hampton, Va.	179
 SESSION 9: LIDAR AND OPTICAL METHODS	
CHAIRMAN: Theodore W. Cannon, NCAR, Boulder, Colo.	
AIRBORNE LIDAR AEROSOL MEASUREMENTS OVER U.S.--RESULTS OF THE ASSESS II SPACELAB SIMULATION MISSION. Christian Werner, Institute of Atmospheric Physics (DFVLR), Oberpfaffenhofen, F.R.G.	185
OBJECTIVE IDENTIFICATION OF MIXING LAYER HEIGHT FROM LIDAR RECORDS. R. M. Endlich and F. L. Ludwig, SRI International, Menlo Park, Calif.; Jason Ching, EPA, Research Triangle Park, N.C.	189
SIMULTANEOUS OBSERVATIONS OF THE TROPOSPHERIC AEROSOL USING LIDAR AND A SOLAR RADIOMETER. C. Werner, G. S. Kent, and F. Köpp, Institute of Atmospheric Physics (DFVLR), Oberpfaffenhofen, F.R.G.	197
ON THE SIMULTANEOUS OBSERVATIONS OF O <sub>3</sub> AND H <sub>2</sub> O WITH BALLOON SONDE AND SATELLITE. H. K. Paetzold and A. Ghazi, Institut f. Geophysik u. Meteorologie, Univ. zu Koeln, Koeln, F.R.G.	*
COMPARISON OF SCATTERING COEFFICIENT TYPE VISIBILITY SENSORS FOR AUTOMATED WEATHER STATION APPLICATIONS. Brian Sheppard, Atmospheric Environment Service, Downsview, Ont., Canada.	201

\*Manuscript not available

## SESSION 10: SATELLITE IMAGERY AND DOPPLER RADAR

CHAIRMAN: Peter M. Kuhn, Environmental Research Labs./NOAA, Boulder, Colo.

DIGITAL-VIDEO MANIPULATION OF SATELLITE IMAGERY. Marvin L. Brown, 207  
Colorado State Univ., Ft. Collins, Colo.

USE OF THE ADVISAR IN THE ANALYSIS OF DIGITAL SATELLITE DATA FOR 212  
OPERATIONAL SEED NO SEED DECISION MAKING. David W. Reynolds and  
Kenneth R. Morris, Colorado State Univ., Ft. Collins, Colo.

A NEW GENERATION OF REAL-TIME SATELLITE DATA-PROCESSING AT THE \*  
AIR FORCE GLOBAL WEATHER CENTRAL. J. E. George, Air Force Global  
Weather Central, Offutt AFB, Nebr.

DUAL DOPPLER RADAR OBSERVATIONS OF WIND FIELDS IN A DRY 219  
CONVECTIVE BOUNDARY LAYER. Myron I. Berger and Richard J. Doviak,  
National Severe Storms Lab./NOAA, Norman, Okla.

COHERENT RADAR SYSTEMS FOR PROBING THE TROPOSPHERE, STRATOSPHERE, 227  
AND MESOSPHERE. Ben B. Balsley and John L. Green, Aeronomy Lab./NOAA,  
Boulder, Colo.

COMPARISON OF SENSITIVE DOPPLER RADAR OBSERVATIONS OF WIND AND 231  
TURBULENCE WITH IN SITU OBSERVATIONS. K. S. Gage, Aeronomy Lab./  
NOAA, Boulder, Colo.

THE RELATIONSHIP BETWEEN COARSE RESOLUTION SATELLITE DATA AND 239  
AREA OF RAIN. Shaun Lovejoy, McGill Univ., Montreal, Que., Canada.

OPERATIONAL NOWCASTING OF HEAVY RAIN UTILIZING DIRECT SURFACE \*\*  
RAINFALL MEASUREMENTS AND RADAR. J. F. Henz, Geophysical R&D Corp.,  
Englewood; and J. F. Wirshorn, Mountain States Weather Services, Ft. Collins,  
Colo.

MAN-INTERACTIVE SATELLITE SOUNDING TECHNIQUES. W. L. Smith, H. M. \*\*  
Woolf, and C. M. Hayden, National Environmental Satellite Service/NOAA,  
Madison, Wis. (Reserve Paper)

## SESSION 11: OBSERVATION SYSTEMS

CHAIRMAN: Julian M. Pike, NCAR, Boulder, Colo.

SYSTEMS APPROACH TO THE DESIGN OF A SHORT RANGE WEATHER FORE- 243  
CASTING SERVICE. J. Alex Thomson and Klaus G. P. Sulzmann, Physical  
Dynamics, Inc., Berkeley, Calif.

THE MONSOON EXPERIMENT'S COMPOSITE OBSERVATIONAL NETWORK. 250  
W. C. Bolhofer, NCAR, Boulder, Colo.

THE ROLE OF ACOUSTIC RADAR IN THE AIDJEX AIR STRESS PROGRAM. 258  
Frank Carsey, Univ. of Washington, Seattle, Wash.

SESSION 12: AIRCRAFT CLOUD PHYSICS INSTRUMENTATION<sup>1</sup>

CHAIRMAN: Roscoe R. Braham, Jr., Cloud Physics Lab., Univ. of Chicago,  
Chicago, Ill.

<sup>1</sup>Conference on Atmospheric Measurements from Aircraft.

\*Manuscript not available.

\*\*Manuscript not available; if received in time, it will appear in back of book.

	Page
ON THE QUESTION OF PLATFORMS FOR CLOUD STUDIES. R. R. Braham, Jr., Univ. of Chicago, Chicago, Ill. (Keynote Speaker)	*
NEW CLOUD PHYSICS INSTRUMENTATION REQUIREMENTS. Arnold A. Barnes, Jr., Air Force Geophysics Lab., Hanscom AFB, Mass.	264
AN EVALUATION OF THE MRI CONTINUOUS TOTAL WATER CONTENT INSTRUMENT (TWCI). D. M. Takeuchi, L. J. Jahnsen, and S. M. Thomas, Meteorology Research, Inc., Altadena, Calif.	269
SESSION 13: QUANTITATIVE ACOUSTIC MEASUREMENTS <sup>2</sup>	
CHAIRMAN: E. H. Brown, Wave Propagation Lab./NOAA, Boulder, Colo.	
QUANTITATIVE ACOUSTIC MEASUREMENTS OF ATMOSPHERIC TURBULENCE. Edmund H. Brown, Wave Propagation Lab./NOAA, Boulder, Colo.	275
MEASURING $C_T^2$ -PROFILES WITH ACOUSTIC SOUNDERS. Duane A. Haugen and J. Chandran Kaimal, Wave Propagation Lab./NOAA, Boulder, Colo.	278
MULTI-BEAMWIDTH STUDIES OF EXCESS ACOUSTIC ATTENUATION. W. D. Neff and D. A. Haugen, Wave Propagation Lab./NOAA, Boulder, Colo.	281
A COMMUNICATION PHILOSOPHY FOR COMPLEX BISTATIC ACOUSTIC SOUNDERS. K. K. Wu, M. G. Woodhead, and W. L. Clink, Atmospheric Environment Service, Downsview, Ont., Canada.	285
MICROCOMPUTER-CONTROLLED ACOUSTIC ECHO SOUNDER. Edward J. Owens, Wave Propagation Lab./NOAA, Boulder, Colo.	288
SESSION 14: AIRCRAFT CLOUD PHYSICS INSTRUMENTATION <sup>1</sup>	
CHAIRMAN: Roscoe R. Braham, Jr., Cloud Physics Lab., Univ. of Chicago, Chicago, Ill.	
PRECIPITATION PROBES INTERCOMPARISON. E. S. Lobl, Meteorology Research, Inc., Altadena, Calif.	292
CALIBRATION OF THE NCAR PARTICLE CAMERAS. Theodore W. Cannon, NCAR, Boulder, Colo.	296
AIRCRAFT REAL-TIME ICE PARTICLE SIZE ANALYSIS SYSTEM. W. T. S. Tan and J. D. McTaggart-Cowan, Atmospheric Environment Service, Toronto, Ont., Canada.	302
COMPARISON OF AN AIRBORNE CCN SPECTROMETER WITH A CONVENTIONAL CCN COUNTER. V. K. Saxena, Univ. of Utah, Salt Lake City, Utah; and H. E. Dytch, Univ. of Chicago, Chicago, Ill.	308
THE USAGE OF NCAR'S QUEEN AIR FOR ENVIRONMENTAL CLOUD PHYSICS STUDIES. Joe Wisniewski, Aspen Institute for Humanistic Studies, Princeton, N.J.; and Gary Langer, NCAR, Boulder, Colo.	314
SESSION 15: BOUNDARY LAYER MORPHOLOGY <sup>2</sup>	
CHAIRMAN: B. R. Kerman, Atmospheric Environment Service, Downsview, Ont., Canada.	

<sup>1</sup>Conference on Atmospheric Measurements from Aircraft.

<sup>2</sup>Fifth Workshop on Atmospheric Acoustics.

\*Manuscript not available.

	Page
MONOSTATIC ACOUSTIC RADAR OBSERVATIONS PLUS IN-SITU SURFACE MEASUREMENTS: A TOTAL SYSTEM OF INPUTS TO AIR QUALITY MODELS. Paul B. MacCready, Jr., AeroVironment, Inc., Pasadena, Calif.	321
THE USE OF ACOUSTIC METHODS FOR BOUNDARY LAYER STUDIES NEAR THE COAST OF THE NETHERLANDS. H. van Dop, Royal Netherlands Meteorological Institute, De Bilt; R. Steenkist, K.E.M.A. Labs., Arnhem; and D. Altena and R. Scholten, National Institute of Public Health, Bilthoven, Netherlands.	326
BOUNDARY LAYER CLIMATOLOGIES FROM ACOUSTIC SOUNDER INVESTIGATIONS. Freeman F. Hall, Jr., Wave Propagation Lab./NOAA, Boulder, Colo.	330
ACOUSTIC SOUNDING OF THE ATMOSPHERIC BOUNDARY LAYER OVER A TROPICAL WINDWARD COAST. S. A. Hsu, Louisiana State Univ., Baton Rouge, La.	333
STRONG MOUNTAIN DOWNSLOPE WIND FIELD EXPERIMENT USING SURFACE STATION, MONOSTATIC ACOUSTIC SOUNDER, AND RAWINSONDE OBSERVATIONS. William T. Sommers, Pacific Southwest Forest and Range Experiment Station/USDA Forest Service, Riverside, Calif.	339
 SESSION 16: CLOUD PHYSICS OBSERVATIONS FROM AIRCRAFT <sup>1</sup>	
CHAIRMAN: D. H. Lenschow, NCAR, Boulder, Colo.	
THE USAGE OF NCAR'S QUEEN AIR FOR ENVIRONMENTAL CLOUD PHYSICS STUDIES--PART 2 (RESULTS). J. Wisniewski, Aspen Institute for Humanistic Studies, Princeton, N.J.; and G. Langer, NCAR, Boulder, Colo.	314†
ANALYSIS OF PARTICLE SPECTRAL DATA FROM OPTICAL ARRAY (PMS) 1D AND 2D SENSORS. Robert M. Cunningham, Air Force Geophysics Lab., Hanscom AFB, Mass.	345
CLOUD PHYSICS OBSERVATIONS INSIDE HAILSTORMS WITH AN ARMORED AIRCRAFT DATA SYSTEM. Gary N. Johnson, Joseph H. Killinger, Dennis J. Musil, and Paul L. Smith, Jr., South Dakota School of Mines and Technology, Rapid City, S. Dak.	351
 SESSION 17: BOUNDARY LAYER MORPHOLOGY <sup>2</sup>	
CHAIRMAN: Duane A. Haugen, Wave Propagation Lab./NOAA, Boulder, Colo.	
ACOUSTIC REMOTE SENSING OF THE PLANETARY BOUNDARY LAYER AT THE SOUTH POLE. W. D. Neff and F. F. Hall, Jr., Wave Propagation Lab./NOAA, Boulder, Colo.	357
ACOUSTIC SOUNDING AT HANFORD. R. K. Hadlock, Battelle Pacific Northwest Lab., Richland, Wash.	362
CASE STUDIES OF SOME UNCOMMON PHENOMENA OBSERVED WITH AN ACOUSTIC ECHO SOUNDER. Werner Nater, Peter D. Phillips, and Hans Richner, Lab. for Atmospheric Physics ETH, Zurich, Switzerland.	366
PROPOSED METHOD FOR THE ESTIMATION OF MAXIMUM GROUND CONCENTRATION IN A FREELY CONVECTIVE BOUNDARY LAYER BY ACOUSTIC SOUNDING. Bryan R. Kerman, Atmospheric Environment Service, Downsview, Ont., Canada.	371

<sup>1</sup>Conference on Atmospheric Measurements from Aircraft.

<sup>2</sup>Fifth Workshop on Atmospheric Acoustics.

†Parts 1 and 2 are submitted as one paper.

SESSION 18: AIRCRAFT DATA HANDLING SYSTEMS<sup>1</sup>

CHAIRMAN: R. M. Cunningham, Air Force Geophysics Lab., Hanscom AFB, Mass.

DESIGN OF A FLEXIBLE AIRCRAFT DATA ACQUISITION SYSTEM. Michael J. Merritt, Meteorology Research, Inc., Altadena, Calif. 547\*\*

A MODULAR APPROACH TO AIRBORNE RESEARCH INSTRUMENTATION. Carl E. Beck, NCAR, Boulder, Colo. 377

A NEW AIRBORNE DATA SYSTEM FOR ATMOSPHERIC RESEARCH. R. B. Friesen and R. Brown, NCAR, Boulder, Colo. 382

MICROPROCESSOR CONTROL OF AIRCRAFT DME. P. K. Govind, NCAR, Boulder, Colo. 385

SESSION 19: ACOUSTICS AND STRUCTURE PARAMETERS<sup>2</sup>

CHAIRMAN: Ron K. Hadlock, Battelle Pacific Northwest Labs., Richland, Wash.

SODAR GEOMETRY. L. Kristensen and K. H. Underwood, Pennsylvania State Univ., University Park, Pa; and R. L. Coulter, Argonne National Lab., Argonne, Ill. 391

SODAR AND AIRCRAFT MEASUREMENTS OF TURBULENCE PARAMETERS WITHIN COOLING TOWER PLUMES. Richard L. Coulter, Argonne National Lab., Argonne, Ill; and Kenneth H. Underwood, Pennsylvania State Univ., University Park, Pa. 396

SIMULTANEOUS MEASUREMENTS OF TURBULENCE IN THE LOWER ATMOSPHERE USING SODAR AND AIRCRAFT. D. W. Thomson, Pennsylvania State Univ., University Park, Pa.; R. L. Coulter, Argonne National Lab., Argonne, Ill.; and Z. Warhaft, Cornell Univ., Cornell, N.Y. 402

ACOUSTIC SOUNDING IN A MOIST TROPICAL MARINE ATMOSPHERIC BOUNDARY LAYER DURING GATE. John E. Gaynor, Wave Propagation Lab./NOAA, Boulder, Colo. 410

INVESTIGATION OF THE PLANETARY BOUNDARY LAYER WITH AN ACOUSTIC DOPPLER SOUNDER. A. Weill, L. Eymard, M. E. LeQuere, C. Klapisz, and F. Baudin, CRPE (CNET/CNRS), Issy Les Moulineaux; and P. Van Grunderbeeck, EERM, Boulogne, France. 415

SESSION 20: AIRCRAFT MEASUREMENTS OF AIR MOTION AND TURBULENCE: INSTRUMENTATION AND OBSERVATIONS<sup>1</sup>

CHAIRMAN: C. B. Emmanuel, Research Facilities Center, ERL/NOAA, Miami, Fla.

RESEARCH AIRCRAFT AND THEIR CAPABILITIES. Constantinos B. Emmanuel, Research Facilities Center, ERL/NOAA, Miami, Fla. 422

A SMALL AIRCRAFT GUST-PROBE SYSTEM FOR STUDIES OF BOUNDARY LAYER CONVECTION AND TRANSPORT. R. O. Gilmer, R. E. McGavin, and R. F. Reinking, Weather Modification Program Office/NOAA, Boulder, Colo. 426

THE STATUS OF AIR MOTION MEASUREMENTS ON NCAR AIRCRAFT. D. H. Lenschow, C. A. Cullian, R. B. Friesen, and E. N. Brown, NCAR, Boulder, Colo. 433

<sup>1</sup>Conference on Atmospheric Measurements from Aircraft.<sup>2</sup>Fifth Workshop on Atmospheric Acoustics.

\*\*Manuscript not available; if received in time, it will appear in back of book.

	Page
THE CESSNA-207 AIRCRAFT TURBULENCE AND TEMPERATURE MEASURING SYSTEM. Minoru Gamo, Susumu Yamamoto, and Osayuki Yokoyama, National Research Institute for Pollution and Resources, MITI, Tokyo, Japan.	439

## SESSION 21: DOPPLER AND REFRACTION<sup>2</sup>

CHAIRMAN: R. L. Coulter, Meteorology Section, Argonne National Lab., Argonne, Ill.

AN ACOUSTIC DOPPLER RADAR SYSTEM FOR THE VERTICAL VELOCITY MEASUREMENTS IN THE LOWER ATMOSPHERE. Masayasu Hayashi and Osayuki Yokoyama, National Research Institute for Pollution and Resources, Tokyo; Yasunobu Kobori, Kaijo Denki Co. Ltd., Tokyo; and Yasushi Mitsuta, Kyoto Univ., Kyoto, Japan.	441
---	-----

OBSERVATION OF SOUND VELOCITY NEAR THE STRATOPAUSE USING NATURAL INFRASOUND. David Rind and William Donn, Lamont-Doherty Geological Observatory, Columbia Univ., Palisades, N.Y.	443
--	-----

ACOUSTIC ECHOSOUNDER, ACOUSTIC BISTATIC WIND AND FM-CW RADAR MEASUREMENTS DURING WEST COAST FOEHN WINDS. V. R. Noonkester, Naval Ocean Systems Center, San Diego, Calif.	447
--	-----

OBSERVATION AND THEORY FOR A NON-LINEAR GRAVITY WAVE RESONANT IN A CLOSED VALLEY. R. J. Greenfield, G. D. Kraft, M. R. Teufel, and D. W. Thomson, Pennsylvania State Univ., University Park, Pa.	455
--	-----

CONVECTIVE PLUMES OBSERVED IN THE BOUNDARY LAYER BY MEANS OF AN ACOUSTIC DOPPLER SYSTEM. P. Van Grunderbeeck, EERM, Boulogne, France.	556**
---	-------

MEASUREMENTS OF VERTICAL VELOCITY VARIANCE BY MEANS OF AN ACOUSTIC SOUNDER. A. Weill and M. E. LeQuere, CRPE (CNET/CNRS), Issy Les Moulineaux; and P. Van Grunderbeeck and J. P. Goutorbe, EERM, Boulogne, France.	459
--	-----

WIND PROFILE IN THE MORNING INTERPRETATION OF SODAR MEASUREMENTS. C. Klapisz and A. Weill, CRPE (CNET/CNRS), Issy Les Moulineaux, France.	560**
---	-------

## SESSION 22: AIRCRAFT MEASUREMENTS OF AIR MOTION AND TURBULENCE: INSTRUMENTATION AND OBSERVATIONS<sup>1</sup>

CHAIRMAN: C. B. Emmanuel, Research Facilities Center, ERL/NOAA, Miami, Fla.

THE DEVELOPMENT OF AN AIRBORNE HOT-WIRE ANEMOMETER SYSTEM. Donald H. Lenschow, NCAR, Boulder, Colo.; and Carl A. Friehe and John C. LaRue, Univ. of California at San Diego, La Jolla, Calif.	463
---	-----

A NEW FIXED VANE FOR AIR MOTION SENSING. H. P. Johnson, D. H. Lenschow, and K. Danninger, NCAR, Boulder, Colo.	467
--	-----

MEASUREMENT OF VERTICAL VELOCITY FLUCTUATIONS IN THE ATMOSPHERIC BOUNDARY LAYER WITH A SMALL AIRCRAFT. S. SethuRaman, R. M. Brown, G. S. Raynor, and W. A. Tuthill, Brookhaven National Lab., Upton, N.Y.	471
---	-----

<sup>1</sup>Conference on Atmospheric Measurements from Aircraft.

<sup>2</sup>Fifth Workshop on Atmospheric Acoustics.

\*\*Manuscript not available; if received in time, it will appear in back of book.

	Page
THUNDERSTORM UPDRAFT VELOCITY MEASUREMENTS FROM AIRCRAFT. T. J. Kelly and D. H. Lenschow, NCAR, Boulder, Colo.	474
AN INTERCOMPARISON OF TURBULENCE MEASUREMENTS FROM AIRCRAFT. William T. Pennell and Margaret A. LeMone, NCAR, Boulder, Colo.	479
 SESSION 23: ACOUSTIC SOUNDERS IN NETWORKS AND AIR POLLUTION <sup>2</sup>	
CHAIRMAN: V. R. Noonkester, Naval Ocean Systems Center, San Diego, Calif.	
OBSERVATIONS OF THE BOUNDARY LAYER STRUCTURE OVER THE CITY OF KÖLN WITH A SODAR AND TETHERED SONDE. G. U. Spohr, W. Bahmann, W. Behnke, E. Raschke, and G. Warmbier, Univ. zu Köln, Köln, F.R.G.	487
SODAR NETWORK MEASUREMENTS OF REGIONAL MIXING DEPTH AND STABILITY PATTERNS FOR AN AIR QUALITY MODEL/1/. Philip B. Russell and Edward E. Uthe, SRI International, Menlo Park, Calif.	490
MEASUREMENT OF MEAN WIND AND WINDSPECTRA BY SODAR. G. Peters and C. Wamser, Univ. of Hamburg, Hamburg, Germany.	498
COMPARISONS BETWEEN THREE SODAR SYSTEMS, DIRECT PROFILES, AND FLUCTUATION MEASUREMENTS AT A 300 M MAST. C. Wamser, Max-Planck- Institute for Meteorology, Hamburg, Germany.	**
APPLICATION OF COMPUTER-DRIVEN DISPLAYS TO SODAR SYSTEMS. John P. Scheib, Brookhaven National Lab., Upton, N.Y.	501
SYNCHRONOUS SOUNDING OF THE TROPOSPHERE WITH RADAR, LIDAR, AND SODAR INSTRUMENTS. V. K. Ivanov, A. I. Korotov, A. E. Myagkov, and A. B. Shupiaty, Central Aerological Observatory, Moscow, U.S.S.R.	*
 SESSION 24: <u>IN SITU</u> AIRCRAFT INSTRUMENTATION DEVELOPMENT <sup>1</sup>	
CHAIRMAN: W. T. Pennell, Battelle Pacific Northwest Labs., Richland, Wash.	
PRELIMINARY EVALUATION OF AN AIRCRAFT HYGROMETER. E. N. Brown, NCAR, Boulder, Colo.	*
ELECTRIC FIELD MEASUREMENTS FROM AIRPLANES. Heinz W. Kasemir, Atmospheric Physics and Chemistry Lab./NOAA, Boulder, Colo.	506
UV FLUX MEASUREMENTS AND O( <sup>1</sup> D) PHOTOPRODUCTION RATES FOR THE AUG.-SEPT. 1977, GAMETAG FLIGHT SERIES. Bach Sellers and Frederick A. Hanser, Panametrics, Inc., Waltham, Mass.	514
AN AIRCRAFT COMPATIBLE LASER INDUCED FLOURESCENCE SYSTEM: IN SITU AND REMOTE MEASUREMENTS OF TRACE GASES. D. D. Davis and D. Philen, Georgia Institute of Technology, Atlanta, Ga.	518
THE USE OF AIRBORNE AND GROUND-BASED MEASUREMENTS OF LAUNCH VEHICLE HCl PUFFS IN A FINITE DIFFERENCE PARAMETER ESTIMATION PROCEDURE. Thomas S. Englar, Jr., and John M. Diamante, Business and Technological Systems, Inc., Seabrook, Md.	524

<sup>1</sup>Conference on Atmospheric Measurements from Aircraft.

<sup>2</sup>Fifth Workshop on Atmospheric Acoustics.

\*Manuscript not available.

\*\*Manuscript not available; if received in time, it will appear in back of book.

A COMPARISON OF TEMPERATURES AND WINDS REPORTED BY THE  
CONCORDE SST WITH DATA OBTAINED FROM RAWINSONDE AND SATELLITE.  
Raymond M. McInturff, National Meteorological Center/NOAA, Washington, D.C.

532

TRANSMISSION OF 1 MIN AIRBORNE HURRICANE RECONNAISSANCE OBSERVA-  
TIONS VIA SATELLITE LINK FOR REAL-TIME EVALUATION OF STORM  
STRUCTURE, INTENSITY, AND MOVEMENT. J. DuGranrut, Research Facilities  
Center/NOAA; N. L. Frank and M. Kirkland, National Hurricane Center/NOAA;  
and P. G. Black, National Hurricane and Experimental Meteorology Lab./NOAA,  
Miami, Fla.

\*\*

ANALYSIS OF AIR MOTION MEASUREMENTS FROM AIRCRAFT. Arsi Vaziri  
and James W. Telford, Univ. of Nevada Desert Research Institute, Reno, Nev.

535

SPECTROSCOPIC MEASUREMENTS FROM AIRCRAFT. William G. Mankin, NCAR,  
Boulder, Colo.

542

\*\*Manuscript not available; if received in time, it will appear in back of book.

# AUTHOR INDEX

	Page		Page
ACHESON, D. T.	93	FRANK, N. L.	**
ALTENA, D.	326	FRASER, A. B.	51
BACH, C. L.	105	FRIEHE, C. A.	463
BAHMANN, W.	487	FRIESEN, R. B.	382, 433
BALSLEY, B. B.	227	FUJITA, T. T.	83
BARNES, A. A., JR.	264	GAGE, K. S.	231
BAUDIN, F.	415	GAMO, M.	439
BEADLE, D. W.	73	GAYNOR, J. E.	410
BECK, C. E.	377	GEORGE, J. E.	*
BEDARD, A. J., JR.	83, 115	GEORGE, R. L.	87
BEHNKE, W.	487	GHAZI, A.	*
BERGER, M. I.	219	GILMER, R. O.	426
BESS, T. D.	179	GOFF, R. C.	*
BLACK, P. G.	158, **	GOUTORBE, J. P.	459
BLACKBURN, T. M.	136	GOVIND, P. K.	385
BOLHOFFER, W. C.	250	GREEN, J. L.	227
BOURKE, R. S.	**	GREENFIELD, R. J.	455
BRADLEY, J. T.	125	GUIRAUD, F. O.	148, 150
BRAHAM, R. R., JR.	*	HADLOCK, R. K.	362
BROWN, E. H.	275	HALL, F. F., JR.	330, 357
BROWN, E. N.	433, *	HANSER, R. A.	514
BROWN, M. L.	207	HARRINGTON, J. B., JR.	33
BROWN, R.	382	HASEGAWA, S.	**
BROWN, R. M.	471	HAUGEN, D. A.	15, 278, 281
CABRITA, H.	65	HAYASHI, M.	441
CADET, D.	65	HAYDEN, C. M.	**
CANNON, T. W.	296	HENZ, J. F.	**
CARSEY, F.	258	HILL, R. J.	47
CHAMP, D. H.	**	HOEHNE, W. E.	1
CHING, J.	189	HOOKE, W. H.	115
CLINK, W. L.	31, 285	HSU, S. A.	166, 333
COLE, H. L.	25	HUH, O. K.	166
COOK, J. M.	54	IVANOV, V. K.	*
COOPER, J. E.	172	JAHNSEN, L. J.	269
COTTON, W. R.	87	JOHNSON, G. N.	351
COULTER, R. L.	391, 396, 402	JOHNSON, H. P.	467
CULLIAN, C. A.	433	KAIMAL, J. C.	35, 47, 278
CUNNINGHAM, R. M.	345	KASEMIR, H. W.	506
DANNINGER, K.	467	KELLY, T. J.	474
DAVIS, D. D.	518	KENT, G. S.	197
DECKER, M. T.	148	KERMAN, B. R.	371
DIAMANTE, J. M.	524	KILLINGER, J. H.	351
DIRMHIRN, I.	*	KIRKLAND, M.	**
DONN, W.	443	KLAPISZ, C.	415, 560**
DOVIAK, R. J.	219	KOBORI, Y.	441
DRIEDONKS, A. G. M.	41	KÖPP, F.	197
DUGRANRUT, J.	**	KOHSIEK, W. H.	41
DYTCH, H. E.	308	KOROTOV, A. I.	*
EATON, F. D.	*	KRAFT, G. D.	455
EMMANUEL, C. B.	422	KRISTENSEN, L.	391
ENDLICH, R. M.	189	KUHN, P. M.	146
ENGLAR, T. S.	524		
EYMARD, L.	415		

\*Manuscript not available.

\*\*Manuscript not available; if received in time, it will appear in back of book.

	Page		Page
LANGER, G.	314	SAXENA, V. K.	308
LARUE, J. C.	463	SCHEIB, J. P.	501
LAZNOW, J.	99	SCHLATTER, E. E.	*
LEE, J. T.	19	SCHOLTEN, R.	326
LEFKOWITZ, M.	125	SCHRICKER, T.	158
LEMONE, M. A.	479	SELLERS, B.	514
LENSCHOW, D. H.	433, 463, 467, 474	SETHURAMAN, S.	70, 471
LE QUERE, M. E.	415, 459	SHEPPARD, B.	201
LETIZIA, A. P.	109	SHUPIATSKY, A. B.	*
LITTLE, C. G.	143	SILVEY, J. F.	109
LOBL, E. S.	292	SMITH, G. L.	179
LOCKHART, T. J.	57	SMITH, P. L., JR.	351
LOVEJOY, S.	239	SMITH, W. L.	**
LUDWIG, F. L.	189	SOMMERS, W. T.	339
		SORENSEN, D. C.	47
MACCREADY, P. B., JR.	321	SPOHR, G. U.	487
MACH, W. H.	51	STEENKIST, R.	326
MANKIN, W. G.	542	STILL, M. E.	61
MCGAVIN, R. E.	426	STOKES, J.	19
MCINTURFF, R. M.	532	STONE, R. J.	131
MCKAY, D. J.	7	SULZMANN, K. G. P.	243
MCTAGGART-COWAN, J. D.	302		
MERRITT, M. J.	547**	TAKEUCHI, D. M.	269
MITSUTA, Y.	441	TAN, W. T. S.	302
MORRIS, K. R.	212	TELFORD, J. W.	535
MUSIL, D. J.	351	TEUFEL, M. R.	455
MYAGKOV, A. E.	*	THOMAS, S. M.	269
		THOMSON, D. W.	402, 455
NATER, W.	363	THOMSON, J. A.	243
NEFF, W. D.	281, 357	TURNER, V. R.	77
NICHOLSON, C. D.	105	TUTHILL, W. A.	70, 471
NOONKESTER, V. R.	447		
		UNDERWOOD, K. H.	391, 396
OCHS, G. R.	47	UTHE, E. E.	490
OVARLEZ, H.	65		
OVARLEZ, J.	65	VAN DOP, H.	41, 326
OWENS, E. J.	288	VAN GRUNDERBEECK, P.	415, 459, 556**
		VAZIRI, A.	535
PAETZOLD, H. K.	*		
PENNELL, W. T.	479	WAMSER, C.	498, **
PETERS, G.	498	WARHAFT, Z.	402
PHILEN, D.	518	WARMBIER, G.	487
PHILLIPS, P. D.	366	WEILL, A.	415, 459, 560**
PITTMAN, D. E.	3	WERNER, C.	185, 197
PLOSKI, T. J.	105	WESTWATER, E. R.	148, 150, 153
		WILLIAMS, S. L.	109
RASCHKE, E.	487	WIRSHBORN, J. F.	**
RAYNOR, G. S.	471	WISNIEWSKI, J.	314
READ, W.	125	WOERNER, C. V.	172
REINKING, R. F.	426	WOODHEAD, M. G.	285
REYNOLDS, D. W.	212	WOOLF, H. M.	**
REYNOLDS, G. W.	3	WU, K. K.	285
RICHNER, H.	366	WYNGAARD, J. C.	47
RIND, D.	443		
ROUSE, L. J., JR.	166	YAMAMOTO, S.	439
RUSSELL, P. B.	490	YOKOYAMA, O.	439, 441

\*Manuscript not available.

\*\*Manuscript not available; if received in time, it will appear in back of book.

## WELCOME TO THE FOURTH SYMPOSIUM

Walter E. Hoehne

Chairman, Committee on Atmospheric Measurements  
American Meteorological Society

Advances in the science of meteorology have been accompanied by the development of instruments and data processors to supplement, complement, and replace subjective human observations. Technological subspecialties grew around individual instrumental techniques. Some Committees of the American Meteorological Society sponsor specialized conferences and symposiums to discuss and compare notes on problems and accomplishments in these subspecialties. The Committee on Atmospheric Measurements (CAM) is interested in both objective and subjective observations and the instrumentation used to make such observations.

One of the objectives in the Frame of Reference for the CAM is improving the reliability and quality of data obtained. To help in achieving this objective the CAM instituted in 1969 a series of symposiums to bring together the users of meteorological data, the providers of that data, and the developers of techniques and instrumentation for obtaining and distributing the data. As Dr. Teweles, the Program Chairman for the First Symposium, pointed out, the publication of the proceedings "serve as a professional source book to encourage and facilitate the instruction of college students and to provide general guidance to other workers in the meteorological area."<sup>1</sup>

The First Symposium covered a wide range of interests, measurements, and observations. Precision, accuracy and representativeness of meteorological measurements along with the timeliness and distribution of the observations were among the many subjects addressed.

In the years following the First Symposium, social, economic, and political forces required new capabilities for gathering and distributing atmospheric data. Concern for the environment led to laws requiring information about natural and man-made influences on our atmosphere. Thus, the Second Symposium was directed toward micro-meteorological measurements, and the processing of data obtained from them.

While increasing population density had made micro-meteorological measurements of increased importance, it was realized that the influence

of weather on transportation, agriculture, lives, and property in general, required a continual interest in meso-scale meteorological phenomena. Thus, the Third Symposium was designed specifically to address meso-scale problems and the impact of increased requirements for short-term forecasts and warnings.

Since the Third Symposium, meteorologists have continued efforts to improve the precision, accuracy and distribution of meteorological observations while the technology explosion in the fields of acoustics, electromagnetics and micro-circuitry have greatly increased the amount of information that can be gathered, processed, and recorded. In spite of warnings from Jim Giraytys and others, it seems as if we may be trying to "measure everything, everywhere, all the time."<sup>2</sup>

Our Fourth Symposium is very much technology oriented, but the state-of-the art in sensing and measuring by remote and indirect means has an ever-broadening scope as that technology is applied to meteorological measurements. Satellites, certainly remote platforms, use passive and active indirect probing by electromagnetic radiation to measure a wide range of meteorological and environmental phenomena. Automatic meteorological observing systems provide not only measurements traditionally made by instrumentation such as wind velocity, temperature and humidity, but also provide measurements of visibility and cloud height for operational use by the aviation industry. The traditional subjective human observation is more and more being supplemented and replaced by measurements from instruments that automatically sense with data automatically processed and transmitted.

Because it has in its Frame of Reference specific mention of standards for instruments and data acquisition systems, the CAM is particularly concerned with the subtle and/or gross differences there may be between measurements made by direct, manual means and measurements of the same parameters by indirect, remote, and/or automatic methods. Some of these differences arise from the derived, quantitative, numerical relationships between the subjective report of the observer and the objective output of an instrument. A familiar example is the relationship between the subjective Beaufort Scale

<sup>1</sup>Teweles, Sidney, "Purpose," Meteorological Observations & Instrumentation, American Meteorological Society, Vol. 11, No. 33, Oct. 1970.

<sup>2</sup>Giraytys, James, "Forward," Proceedings of the Third Symposium on Meteorological Observations and Instrumentations, Feb. 10 - 13, 1975, Washington, D. C.