

Wiley Series in Atmospheric Physics and Remote Sensing

Edited by
M. Wendisch and J.-L. Brenguier

 WILEY-VCH

Airborne Measurements for Environmental Research

Methods and Instruments



Table of Contents

[Related Titles](#)

[Title Page](#)

[Copyright](#)

[Preface](#)

[A Tribute to Dr. Robert Knollenberg](#)

[List of Contributors](#)

[Chapter 1: Introduction to Airborne Measurements of the Earth
Atmosphere and Surface](#)

[Chapter 2: Measurement of Aircraft State and Thermodynamic and
Dynamic Variables](#)

[2.1 Introduction](#)

[2.2 Historical](#)

[2.3 Aircraft State Variables](#)

[2.4 Static Air Pressure](#)

[2.5 Static Air Temperature](#)

[2.6 Water Vapor Measurements](#)

[2.7 Three-Dimensional Wind Vector](#)

[2.8 Small-Scale Turbulence](#)

[2.9 Flux Measurements](#)

[Chapter 3: In Situ Trace Gas Measurements](#)

[3.1 Introduction](#)

[3.2 Historical and Rationale](#)

[3.3 Aircraft Inlets for Trace Gases](#)

[3.4 Examples of Recent Airborne Missions](#)

[3.5 Optical *In Situ* Techniques](#)

[3.6 Chemical Ionization Mass Spectrometry](#)

[3.7 Chemical Conversion Techniques](#)

[3.8 Whole Air Sampler and Chromatographic Techniques](#)

[Chapter 4: In Situ Measurements of Aerosol Particles](#)

[4.1 Introduction](#)

[4.2 Aerosol Particle Number Concentration](#)

[4.3 Aerosol Particle Size Distribution](#)

[4.4 Chemical Composition of Aerosol Particles](#)

[4.5 Aerosol Optical Properties](#)

[4.6 CCN and IN](#)

[4.7 Challenges and Emerging Techniques](#)

[Chapter 5: In Situ Measurements of Cloud and Precipitation Particles](#)

[5.1 Introduction](#)

[5.2 Impaction and Replication](#)

[5.3 Single-Particle Size and Morphology Measurements](#)

[5.4 Integral Properties of an Ensemble of Particles](#)

[5.5 Data Analysis](#)

[5.6 Emerging Technologies](#)

[Acknowledgments](#)

[Chapter 6: Aerosol and Cloud Particle Sampling](#)

[6.1 Introduction](#)

[6.2 Aircraft Influence](#)

[6.3 Aerosol Particle Sampling](#)

[6.4 Cloud Particle Sampling](#)

[6.5 Summary and Guidelines](#)

[Chapter 7: Atmospheric Radiation Measurements](#)

[7.1 Motivation](#)

[7.2 Fundamentals](#)

[7.3 Airborne Instruments for Solar Radiation](#)

[7.4 Terrestrial Radiation Measurements from Aircraft](#)

[Chapter 8: Hyperspectral Remote Sensing](#)

[8.1 Introduction](#)

[8.2 Definition](#)

[8.3 History](#)

[8.4 Sensor Principles](#)

[8.5 HRS Sensors](#)

[8.6 Potential and Applications](#)

- [8.7 Planning of an HRS Mission](#)
- [8.8 Spectrally Based Information](#)
- [8.9 Data Analysis](#)
- [8.10 Sensor Calibration](#)
- [8.11 Summary and Conclusion](#)

[Chapter 9: LIDAR and RADAR Observations](#)

- [9.1 Historical](#)
- [9.2 Introduction](#)
- [9.3 Principles of LIDAR and RADAR Remote Sensing](#)
- [9.4 LIDAR Atmospheric Observations and Related Systems](#)
- [9.5 Cloud and Precipitation Observations with RADAR](#)
- [9.6 Results of Airborne RADAR Observations–Some Examples](#)
- [9.7 Parameters Derived from Combined Use of LIDAR and RADAR](#)
- [9.8 Conclusion and Perspectives](#)
- [Acknowledgments](#)

[Appendix A: Supplementary Online Material](#)

- [A.1 Measuring the Three-Dimensional Wind Vector Using a Five-Hole Probe](#)
- [A.2 Small-Scale Turbulence](#)
- [A.3 Laser Doppler Velocimetry: Double Doppler Shift and Beats](#)
- [A.4 Scattering and Extinction of Electromagnetic Radiation by Particles](#)
- [A.5 LIDAR and RADAR Observations](#)
- [A.6 Processing Toolbox](#)

[List of Abbreviations](#)

[Constants](#)

- [Greek](#)
- [Latin](#)

[References](#)

[Index](#)