

PART II

OBSERVING SYSTEMS

PART II. OBSERVING SYSTEMS

CONTENTS

	<i>Page</i>
CHAPTER 1. MEASUREMENTS AT AUTOMATIC WEATHER STATIONS	II.1-1
1.1 General.....	II.1-1
1.2 Automatic weather station hardware	II.1-3
1.3 Automatic weather station software.....	II.1-10
1.4 Automatic weather station siting considerations.....	II.1-17
1.5 Central network data processing	II.1-17
1.6 Maintenance	II.1-18
1.7 Calibration	II.1-19
1.8 Training.....	II.1-20
References and further reading	II.1-22
CHAPTER 2. MEASUREMENTS AND OBSERVATIONS AT AERONAUTICAL METEOROLOGICAL STATIONS.....	II.2-1
2.1 General.....	II.2-1
2.2 Surface wind.....	II.2-3
2.3 Visibility.....	II.2-4
2.4 Runway visual range	II.2-5
2.5 Present weather.....	II.2-9
2.6 Cloud	II.2-10
2.7 Air temperature.....	II.2-11
2.8 Dewpoint	II.2-11
2.9 Atmospheric pressure.....	II.2-12
2.10 Other significant information at aerodromes.....	II.2-14
2.11 Automated meteorological observing systems	II.2-14
2.12 Radar	II.2-15
2.13 Ice sensor.....	II.2-15
2.14 Lightning detection	II.2-16
2.15 Other relevant observations	II.2-16
References and further reading	II.2-17
CHAPTER 3. AIRCRAFT OBSERVATIONS.....	II.3-1
3.1 General.....	II.3-1
3.2 Pressure and Mach number	II.3-1
3.3 Air temperature	II.3-4
3.4 Wind speed and direction.....	II.3-5
3.5 Turbulence	II.3-6
3.6 Relative humidity	II.3-8
3.7 Icing	II.3-9
3.8 Practical operational systems.....	II.3-9
3.9 Future AMDAR systems.....	II.3-9
References and further reading	II.3-11
CHAPTER 4. MARINE OBSERVATIONS.....	II.4-1
4.1 General.....	II.4-1
4.2 Observations from ships	II.4-1
4.3 Moored buoys	II.4-17

4.4	Unstaffed light vessels	II.4-18
4.5	Towers and platforms.....	II.4-18
4.6	Drifting buoys.....	II.4-19
	Annex. Descriptions of precipitation for use by ship-borne observers	II.4-20
	References and further reading.....	II.4-22
CHAPTER 5. SPECIAL PROFILING TECHNIQUES FOR THE BOUNDARY LAYER AND THE TROPOSPHERE.....		II.5-1
5.1	General.....	II.5-1
5.2	Ground-based remote-sensing techniques	II.5-1
5.3	In situ measurements.....	II.5-6
	References and further reading.....	II.5-10
CHAPTER 6. ROCKET MEASUREMENTS IN THE STRATOSPHERE AND MESOSPHERE		II.6-1
6.1	General.....	II.6-1
6.2	Wind measurement	II.6-1
6.3	Temperature measurement by immersion thermometry	II.6-3
6.4	Temperature measurement by inflatable falling sphere	II.6-5
6.5	Calculation of other aerological variables	II.6-6
6.6	Networks and comparisons.....	II.6-6
	References and further reading.....	II.6-8
CHAPTER 7. LOCATING THE SOURCES OF ATMOSPHERICS		II.7-1
7.1	General.....	II.7-1
7.2	The direction finding lightning location system.....	II.7-3
7.3	Examples of time-of-arrival location systems.....	II.7-5
7.4	Comparisons of direction-finder and time-of-arrival networks	II.7-7
7.5	A combination of the direction-finder and time-of-arrival techniques	II.7-8
7.6	Presentation and distribution of lightning data.....	II.7-8
	References and further reading.....	II.7-9
CHAPTER 8. SATELLITE OBSERVATIONS		II.8-1
8.1	General.....	II.8-1
8.2	Operational satellite systems	II.8-3
8.3	Meteorological observations.....	II.8-8
8.4	Related facilities	II.8-30
	Annex 8.A. Advanced very high resolution radiometer channels.....	II.8-34
	Annex 8.B. HIRS channels and their applications.....	II.8-35
	References and further reading.....	II.8-36
CHAPTER 9. RADAR MEASUREMENTS		II.9-1
9.1	General.....	II.9-1
9.2	Radar technology	II.9-4
9.3	Propagation and scattering of radar signals.....	II.9-11
9.4	Velocity measurements	II.9-13
9.5	Sources of error	II.9-15
9.6	Optimizing radar characteristics.....	II.9-16
9.7	Radar installation.....	II.9-18
9.8	Calibration and maintenance.....	II.9-19
9.9	Precipitation measurements	II.9-20

	<i>Page</i>
9.10 Severe weather detection and nowcasting applications	II.9-24
9.11 High frequency radars for ocean surface measurements	II.9-26
References and further reading	II.9-27
 CHAPTER 10. BALLOON TECHNIQUES	 II.10-1
10.1 Balloons.....	II.10-1
10.2 Balloon behaviour	II.10-2
10.3 Handling balloons	II.10-3
10.4 Accessories for balloon ascents	II.10-5
10.5 Gases for inflation.....	II.10-5
10.6 Use of hydrogen and safety precautions	II.10-7
References and further reading	II.10-10
 CHAPTER 11. URBAN OBSERVATIONS.....	 II.11-1
11.1 General.....	II.11-1
11.2 Choosing a location and site for an urban station.....	II.11-7
11.3 Instrument exposure	II.11-8
11.4 Metadata	II.11-20
11.5 Assessment of urban effects	II.11-22
11.6 Summary of key points for urban stations	II.11-22
References and further reading	II.11-24
 CHAPTER 12. ROAD METEOROLOGICAL MEASUREMENTS	 II.12-1
12.1 General.....	II.12-1
12.2 Establishment of a road meteorological station	II.12-2
12.3 Observed variables	II.12-8
12.4 Choosing the road weather station equipment.....	II.12-5
12.5 Message coding	II.12-6
12.6 Central control and data-acquisition computer	II.12-6
12.7 Communications considerations.....	II.12-7
12.8 Sensor signal processing and alarm generation.....	II.12-7
12.9 Measurement quality control	II.12-7
12.10 Road weather station maintenance	II.12-8
12.11 Training	II.12-9
References and further reading	II.12-10