WMO
Technical Regulations

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Dr M. Ondráš, WMO,
Chief, Observing Systems Division

WMO Technical Regulations

- Determined by Congress,
- Should ensure adequate uniformity and standardization in the practices and procedures.
- Two types of Practices and Procedures:
  - Standard (**necessary** to follow and implement - Manuals), **shall** used in E text,
  - Recommended (**desirable** to follow and implement - Guides) **should** used in E text.

Manual on the GOS

(WMO-No. 544)

Annex V to WMO Technical Regulations

Guide on the GOS

(WMO-No. 488)

Describes in more detail the practices and procedures Members are invited to follow

Guide to Meteorological Instruments and Methods of Observation (CIMO Guide)

(WMO-No. 8)

Manual on the GOS

Volume I – Global Aspects

Part I: Organization and Implementation

Part II: Requirements for Observational Data

Part III: Surface-based Subsystem

Part IV: Space-based Subsystem

Part V: Quality Control

Volume II – Regional Aspects

Part I: General principles

- Purpose of the GOS
- Organization and Design of the GOS
- Implementation of the GOS

Part II: Requirements for Obs. data

- Classification of Requirements
- Procedures for elaboration of Requirements
- System for meeting Requirements

Part III: Surface-based Subsystem

1. Composition of the Subsystem
2. Implementation of Elements of the Subsystem
3. Equipment and Methods of Observation

1. Composition of the Subsystem

(*a*) Surface synoptic stations:

(i) Land stations (manned, automatic)

(ii) Sea stations (fixed, mobile, automatic)

(*b*) Upper-air synoptic stations (rawinsonde, radiosonde, radiowind, PIBAL)

(*c*) Aircraft meteorological stations

(d) Aeronautical meteorological stations;

(e) Research and special-purpose vessel stations;

(f) Agricultural meteorological stations;

1. Composition of the Subsystem

(g) Climatological stations:

- (Reference, principal, ordinary, GSN, GUAN);

(h) Special stations, e.g.:

- Weather radars,
- Radiation stations;
- Wind profilers;
- Atmospherics detection stations;
- Global Atmosphere Watch stations;
- Planetary boundary-layer stations ;
- Tide-gauge stations.

2. Implementation of the Subsystem

- Networks of observing stations
  - Global, regional, national (RBSN, RBCN, GSN, GUAN, GAW).
- Observing stations
  - General (description, Members' obligation),
  - Location and composition (spacing, obs. Programme),
  - FRQ and timing of observations.

3. Equipment and Methods of Observation

a)General requirements of a met. Station

(e.g., siting and exposure, calibration, inspection, observers, etc.)

b) General requirements of instruments

(e.g., comparison and traceability)

c) Surface observations

(e.g., details on how measurements and observations should be made for defined variables)

Guide on the GOS

Structure: similar to the Manual on the GOS

Purpose:

- To provide practical information on the development, organization, implementation and operation of the GOS;
- To explain and describe GOS practices, procedures, specifications;
- To assist the staff of NMSs responsible for the obs. networks.

Guide on the GOS

Part I: Purpose, scope, requirements and organization of the global observing system

Part II: Observational data requirements

Part III: The Surface-based subsystem

Part IV: The Space-based subsystem

Part V: Reduction of level I data

Part VI: Data quality control

Part VII: Monitoring the operation of the global observing system

Part VIII: Quality management

Part III: The Surface-based subsystem

- **Design of observational networks,**
- **Planning of networks and stations,**
- **Management of networks:**
  - Administrative arrangements and operational tasks,
  - Staff,
  - Logistics and supplies,
  - Establishment of new station,
  - Regular inspections,
  - Procurement of instruments,
  - Instrument check, maintenance, calibration,
  - Coordination, planning and budgeting,
  - Network performance monitoring.

Part III: The Surface-based subsystem

- **Stations:**
  - Siting and location,
  - Observing & measurement area,
  - Premises;
  - Station staff,
  - Staff training,
  - Station identification,
  - Telecommunications,
  - Quality standards,
  - Data processing and archiving,
  - Etc.

CIMO Guide

Part I: Measurement of meteorological variables

Part II: Observing systems

Part III: Quality Assurance and Management of Observing Systems

Part I: Measurement of met. Variables (related to GRUAN)

Chapter 1: General
Chapter 2: Measurement of temperature
Chapter 3: Measurement of atmospheric pressure
Chapter 4: Measurement of humidity
Chapter 5: Measurement of surface wind
Chapter 7: Measurement of radiation
Chapter 8: Measurement of sunshine duration
Chapter 12: Measurement of upper air pressure, temperature, humidity
Chapter 13: Measurement of upper wind
Chapter 15: Observation of clouds
Chapter 16: Measurement of ozone
Chapter 17: Measurement of atmospheric composition

Chapter 12: Measurement of upper air pressure, temperature, humidity

12.1 General (Definitions, units, requirements, methods of measurements)
12.2 Radiosonde electronics
12.3 Temperature sensors
12.4 Pressure sensors
12.5 Relative humidity sensors
12.6 Ground station equipment
12.7 Radiosonde operations
12.8 Errors of radiosondes
12.9 Comparisons, calibration, maintenance
12.10 Computations and reporting procedures

Part II Observing Systems Chapter 5

Special profiling techniques for the boundary layer and the troposphere:

- Ground-based remote sensing techniques
- In situ measurements

Special profiling techniques for the boundary layer and the troposphere

1. **Ground-based remote sensing techniques**
   - Acoustic sounders (sodars)
   - Wind profiler radars
   - Radio-acoustic sounding systems (RASS)
   - Microwave radiometers
   - Laser radars (lidars)

Special profiling techniques for the boundary layer and the troposphere

2. **In situ measurements**
   - Balloon tracking
   - Boundary layer radiosondes
   - Instrumented towers and masts
   - Instrumented tethered balloons

IOM Report Series

- National/Regional Procedures of **GPS Water Vapour** Networks and Agreed International procedures (IOM 92 (TD 1340));
- Operational Aspects of Different **Ground-based Remote Sensing Observing Techniques** for Vertical Profiling of Temperature, Wind, Humidity and Cloud Structure (IOM 89 (TD 1309));
- Operational Use of **Ground-based Remote Sensors**: A Review (IOM 63 (TD 860)).

Manual on the GOS
Part III: Surface-based Subsystem (GRUAN)

1. Composition of the Subsystem
2. Implementation of Elements of the Subsystem
3. Equipment and Methods of Observation

Manual on the GOS
Part III: Surface-based Subsystem
1. Composition of the Subsystem

- Add GRUAN under Climatological stations (network)

Manual on the GOS
Part III: Surface-based Subsystem (GRUAN)
2. Impl. of the Elements of the Subsystem

(a) Networks (add GRUAN to existing networks);
(b) Obs. Stations (general description and Members' obligations);
(c) Composition;
(d) Location (spacing, density);
(e) Station identification;
(f) Observing programme;
(g) Frequency and timing;
(h) Performance and monitoring;
(i) Quality standards.

Manual on the GOS
Part III: Surface-based Subsystem (GRUAN)
3. Equipment & Methods of Observation

(a) General requirements for instruments:

- Selection procedure;
- Replacement strategies (dual obs., (inter) comparisons, tests);
- Siting & exposure;
- Inspection & maintenance;
- Testing & calibration;
- Traceability & uncertainty;
- Operational procedures for instrument use;

(b) General requirements measurements:

- Details on how measurements should be made for defined variables;
- Data & data exchange (validation of data, standard set of metadata elements, data formats, archiving).