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| **World Meteorological Organization**  **Commission for Instruments and Methods of Observation**  **First Session of the CIMO Editorial Board (CIMO EdBd)** Offenbach am Main, Germany, 30 January – 1 February 2018 | **CIMO/EdBd-1/Doc. 6(1)** |
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# miscellaneous minor modifications to the cimo guide chapters

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| **Summary and purpose of document**  This document provides information on miscellaneous minor modifications to the CIMO Guide chapters received from different sources, but not included in a track-change mode into relevant chapters, yet. |

**Action proposed**

The Meeting is invited to review the proposed modifications and decide on their suitability to be implemented in the 2018 update of the CIMO Guide, and/or develop a list of topics that require further work/coordination, that would have to be addressed in the next update.

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**Appendix:**  [Environmentally friendly radiosondes](#Appendix).

**miscellaneous minor modifications to the CIMO Guide chapters**

1. The proposals in this document have been received from different sources as indicated before each proposal. They also include some comments that were not addressed for 2014 edition of the CIMO Guide. The meeting is invited to consider which of the proposals should be included into 2018 edition of the CIMO Guide and agree on further work towards their implementation, as well as to identify those that would have to be dealt with in a later update of the guide because they require additional preparatory work that cannot be completed for the 2018 edition.
2. **Throughout the Guide**

(proposed by the Secretariat)

* To initiate a review of all the references to the International Meteorological Tables (WMO-No. 188), 1966 to clarify whether these reference are still appropriate or whether they should be replaced by more recent references.

1. **Part I / All chapters**

(proposed by KNMI, the Netherlands)

* to get rid of “Measurement of” and “Observation of” from the title of the chapters.

1. **Part I / Chapter 1 (General)**

* Section 1.3.3.1, (proposed by CIMO MG):
  + Figure 1.1. should be improved by adding a position for wind measurement.
* Section 1.5.3, (proposed by J. Van der Meulen, KNMI):
  + To specify notation of specific variables and formulas (from IUPAP list);
  + To consider specifying a unified symbol to be used for wind speed (current symbol “*U*” is also used for relative humidity).
* Annex 1.A, section B / RICs with basic capabilities and functions (proposed by the Secretariat), to add the text in red:

“Capabilities: (a) A RIC must have, or have access to, the necessary facilities and laboratory equipment to perform the functions necessary for the calibration of meteorological and related environmental instruments;”.

1. **Part I / Chapter 4 (Humidity) / Annex 4.B**

(proposed by J. Van der Meulen, KNMI, the Netherlands and H. Voemel, UCAR, USA)

* To ensure that appropriate saturation vapour pressure formulae are recommended by the CIMO Guide (the existing formulae in the Guide are not consistent with those that were available in WMO-No. 49, Vol I, ed. 1988, updated in 1990, and in addition, they do not reflect the recommendation (section 13.3, fourth bullet) from the WMO Intercomparison of High Quality Radiosonde Systems (IOM report No. 107)).

1. **Part I / Chapter 5 (Wind Measurement)**

* Section 5.1.2, (proposed by the Secretariat):
  + Instead of describing reporting practice, the text should be paraphrased to describe measurement practice.
* Annex, (proposed by the Hong Kong Observatory and B. Grisogono, University of Zagreb, Croatia):
  + 2nd para (proposed modifications are in red):

“Over sea, the task could be~~is~~ relatively simple because if~~of~~ the uniform fetch is assumed. The so-called Charnock relation can be applied. It expresses the sea surface roughness to the friction velocity u\* and the ~~gravitational~~ acceleration due to gravity g by means of z0u = α u\*2/g, where α is an empirical constant approximately equal to 0.014.”;

* Eq 5.A.2: “U” at left-hand-side of the equation should be deleted.

1. **Part I / Chapter 6 (Precipitation)**

(proposed by BMKG, Indonesia)

* Section 6.5.3: to add more detailed calibration and maintenance procedure.

1. **Part I / Chapter 7 (Radiation)**

* Section 7.3 (proposed by CMA, China):
* to clarify differences between “*zero offset*”, “*thermal offset*”, “*zero irradiance signal*” and “*zero irradiance offset*”; and to add a definition of “*Zero irradiance signal”;*
* to describe test methods for all characteristics mentioned in the table 7.5.
* Section 7.4.2, (proposed by J. Grobner, PMOD, Switzerland): to mention that a recommended method for measurements of total radiation is the separate measurement of short and longwave radiation by pyranometers and pyrgeometers, respectively. Measurement of pyrradiometers should be discontinued.
* Section 7.4.3, (proposed by J. Grobner, PMOD, Switzerland): to review this section.
* Section 7.4.4, 3rd para:(modifications proposed by J. Grobner, PMOD, Switzerland are in red):

“Additionally, where polythene domes are used, it is necessary to check from time to time that UV effects have not changed the transmission characteristics. ~~A half-yearly exchange of the upper dome is recommended.~~”.

* Section 7.4.4., 4th para, (modifications proposed by J. Grobner, PMOD, Switzerland, are in red):

“Since it is not generally possible to directly measure the reflected solar radiation and the upward long-wave radiation exactly at the surface level, it is necessary to place the pyranometers and ~~pyrradiometers~~ pyrgeometers at a suitable distance from the ground to measure these upward components.".

* Section 7.5, (proposed by CMA, China): to add calibration method and measurement standards for photosynthetic active radiometers.
* Section 7.6, (proposed by CMA, China): to add characteristics and requirements for broadband radiometers; calibration method and measurement standards for photosynthetic active radiometers.

1. **Part I / Chapter 11 (Soil Moisture)**

(proposed by UK Met Office, UK)

* to include other measurement techniques, e.g. COSMOS.

1. **Part I / Chapter 12 (Upper air pressure, temperature, humidity)**

(proposed by CIMO ET-DIST)

* to add text on environmentally friendly radiosondes, which is available in the [Appendix](#Appendix).

1. **Part II / Chapter 3 (Aircraft-based Observations)**

* (Proposed by J. Van der Meulen, KNMI, the Netherlands): to use the same abbreviations for units as in other chapters (see 1.5.3) and use SI units (possibly “ft” can be used together with “m”, but not without).
* Section 3.9.2, (proposed by UK Met Office, UK): to add description of Automated Flight Information Reporting System (AFIRS)characteristics and requirements for broadband

1. **Part II / Chapter 10 (Road Measurements)**

(proposed by Vaisala, Finland)

* to updated this chapter.

1. **Part III / (Space-based Observations)**

(proposed by UK Met Office, UK)

* to use a new terminology for division of troposphere, to be consistent with WMO RRR, as follows: instead of “*upper troposphere*” and “*lower troposphere*“ to use “*free troposphere*” and “*planetary boundary layer*”, respectively.

1. **Part III / Chapter (Remote-sensing Instruments)**

(proposed by KNMI, the Netherlands)

* to replace text about SCIAMACHY, which was lost in 2012, by description of a new instrument, TROPOMY/Sentinel-5.

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**APPENDIX**

**Environmentally friendly radiosondes**

*~~“Environmentally friendly (also eco-friendly, nature friendly, and green) are terms that refer to objects that people buy (called goods), services, laws, and rules that either do not harm the environment or do very little harm to it.” ("nature-friendly". Webster's New Millennium Dictionary of English, Preview Edition (v 0.9.7). Lexico Publishing Group, LLC.)~~*

About 620,000 radiosondes are launched worldwide annually. After reaching a certain height the balloon bursts and the radiosonde fall to the ground. All radiosondes with balloons and flight train remnants remain usually on the ground or in the sea as garbage and thus create an environmental pollution problem.

Balloon-borne trash has the ability to make it into very remote areas and is often the only source of anthropomorphic trash in inland wilderness areas, wildlife sanctuaries and other environmentally sensitive areas.

Flight trains pose a particular environmental issue. They often cause the radiosonde payload to get caught up in trees, powerlines, towers and float in the oceans where it can remain for years. Flight trains also pose a long term entanglement threat to wildlife on land and in the oceans.

The main issues for the environmentally friendly radiosondes producing possibility are materials. Almost all radiosonde parts are made from non-degradable materials, so after fall down to the earth surface or in the sea they remain there as a garbage.

There are biodegradable plastics, but for now only Meisei have tried to make a radiosonde housing from such materials. Other manufacturers should attempt to use a biodegradable plastic for radiosondes production too.

The dimensions and weight of some type of radiosondes are not small and they may do a harm in case of contact with people and animals during a falling down. Current technologies allow to manufacture radiosondes with a very small dimensions and weight. For example, Vaisala RS41 radiosonde has weight 109 g and dimensions 63x46x155 mm, while Meisei iMS-100 radiosonde has weight 38 g and dimensions 55x53x131 mm. All manufacturers should follow these examples.

An advantage of small weight and dimensions of radiosondes is that they require reduced balloon size for the radiosonde launch. The less weight of the balloon means the less pollution material on the earth surface.

Flight trains are often made of non-biodegradable cord, such as nylon, which can persist in the environment for decades. Switching flight train material to a biodegradable cordage, such as cotton twine, is strongly recommended. This would reduce the long term entanglement risk to wildlife in the oceans and on land, and would allow radiosonde payloads that get caught up in trees, powerlines and other structures to potentially come down faster on their own. Switching to a biodegradable flight train material would be easy to implement and could be done with little if any change in net operating expenditure or performance.

The balloons that have been made from the natural rubber latex are biodegradable. Although the biodegrade rate of natural latex is slow, the synthetic latex based upon polychloroprene has much slower rate because it is made from the petroleum using polymer techniques. So latex balloons are preferable for the upper air observations in case of environmentally safety.

Almost all batteries contain a number of either toxic or corrosive chemicals. There are some types of the batteries for radiosondes power for now. These are alkaline, lithium and water-activated batteries. The lithium batteries have the lowest environmental impact, but these batteries can make the additional impacts in hot dry summers under the direct sun lights.

The radiosondes manufacturers and national meteorological and hydrological services should encourage the people to collect and return used radiosondes back to the manufacturers or dispose them as a garbage.

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