RIC-Tsukuba (Japan, RAII)

20 Feb. 2013

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Scientific Officer

Regional Instrument Centre Tsukuba

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Japan Meteorological Agency

気象庁 Japan Meteorological Agency

高層気象台

Aerological Observatory

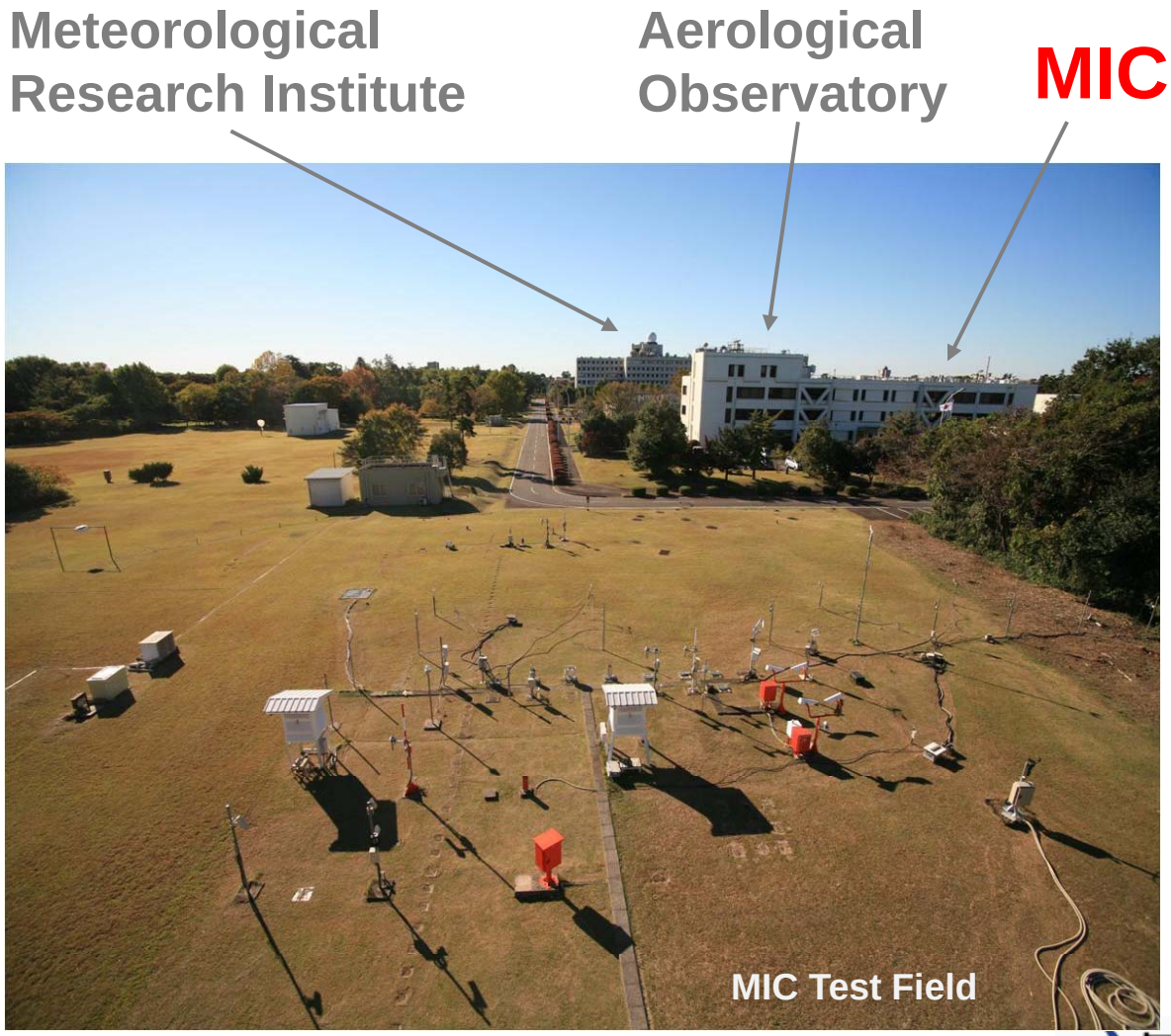
気象測器検定試験センター

Meteorological Instruments Center

WMO RIC Tsukuba

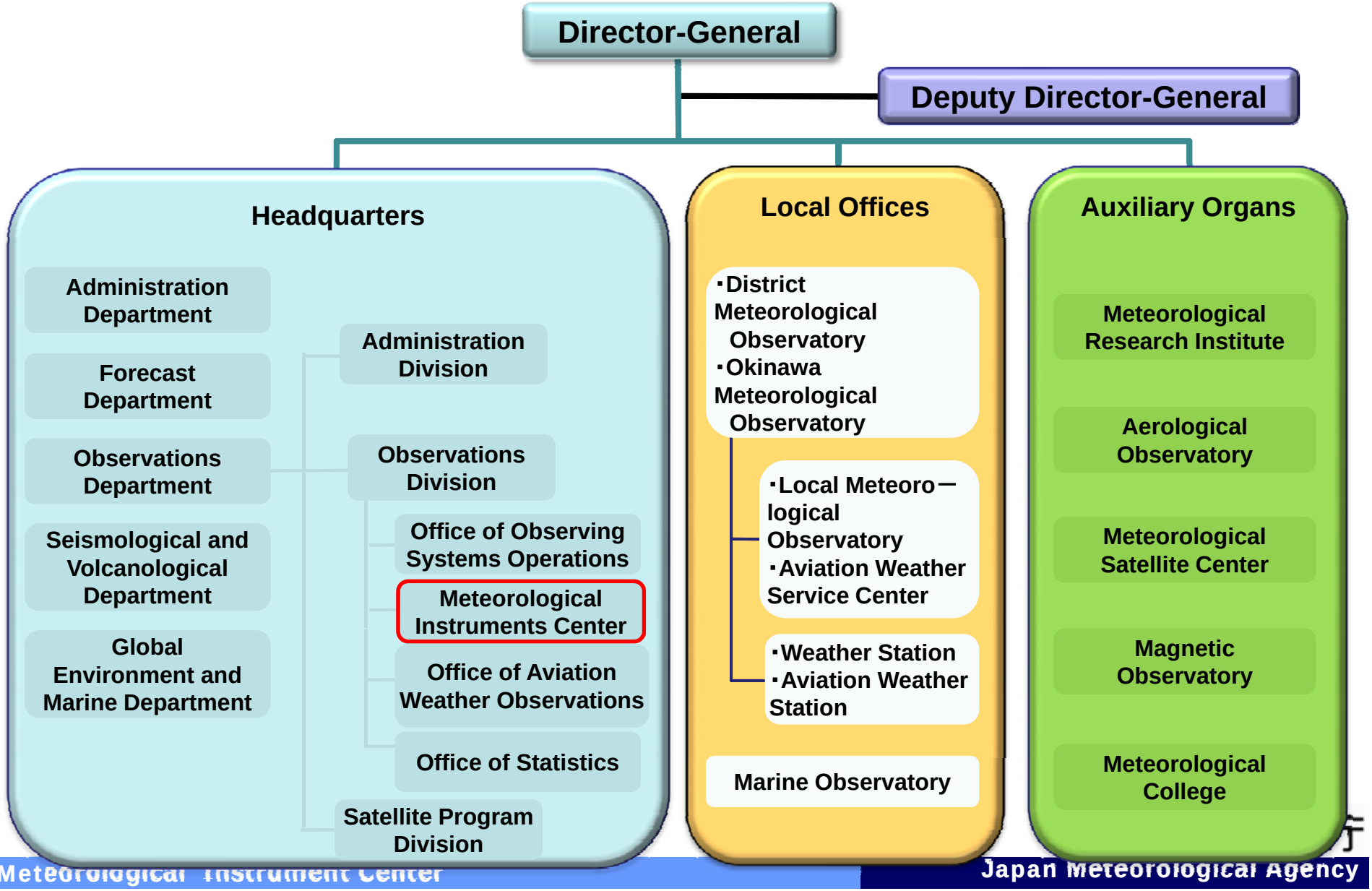
Meteorological Instruments Center (MIC)

Meteorological Instruments Center (MIC)

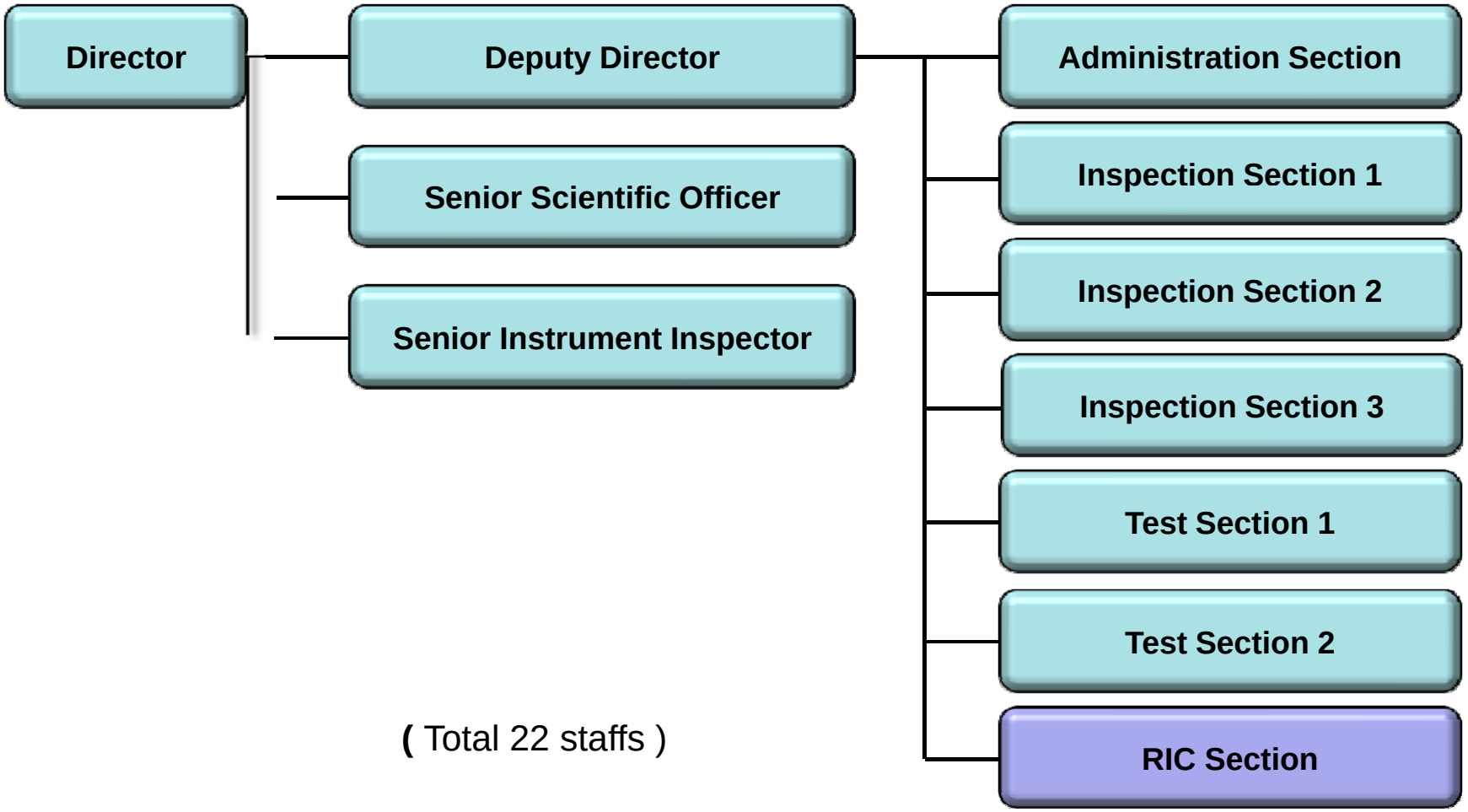


気象庁

Organizational structure of JMA



Organizational structure of MIC



(Total 22 staffs)

Main services of MIC

- **Quality assurance of meteorological instruments**

  To inspect meteorological equipments to maintain high-precision meteorological observations in Japan, and to maintain meteorological standard instruments and their traceability.

- **Research and development**

  To research and develop meteorological instruments, and to research site environment and methods of observation

- **Activities of RIC Tsukuba**

  To assist Members of the Region II through calibration and comparison with meteorological instruments, and to support to train instrument specialists as Regional Instrument Center (RIC) in Asia.

Outline

1. Regional Instrument Centre(RIC)
2. Activities of RIC-Tsukuba
3. Importance of correct calibration
4. Tentative report on “Questionnaire on Meteorological Instruments, Calibration and Training in Regional Association II (Asia)”

1. Regional Instrument Centre(RIC)

Establishment of RIC(1)
<background>

- Globally uniform, high-quality meteorological data are required to enable accurate weather forecasting and appropriate monitoring of global climate change.

- It is necessary to maintain the meteorological instruments of individual countries to a high standard of accuracy and train instrument specialists.

Establishment of RIC(2)
<history>

- ***1985***

  CIMO(Commission for Instruments and Methods of Observation) recommended to establish Regional Instrument Centres at CIMO-IX.

- ***1986***

  The Executive Council of WMO, at its 38th session, adopted a resolution to establish Regional Instrument Centres (RICs) in each Region.

- ***1996***

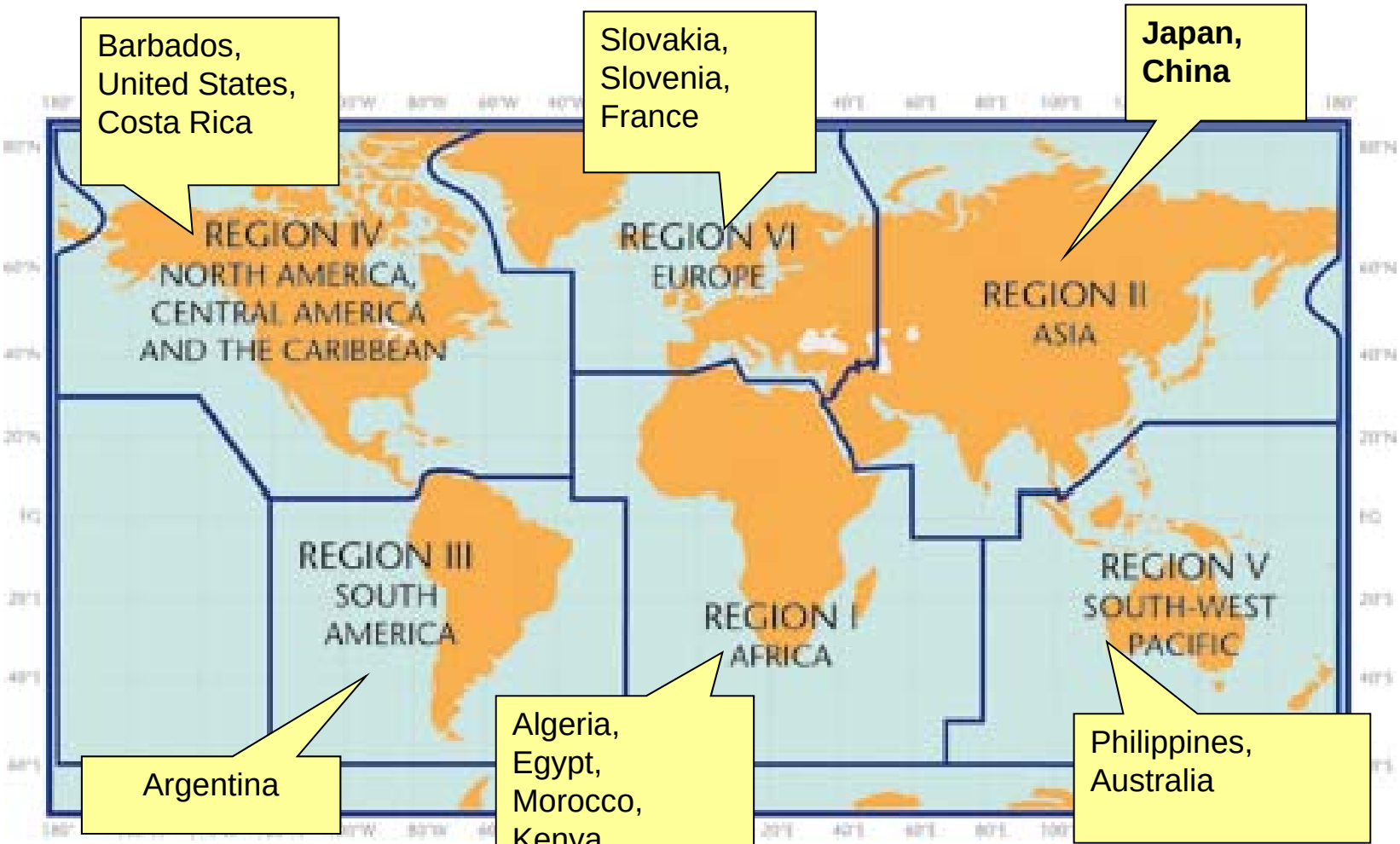
  In RA II, Japan and China were designated as RICs at 11th session of the Regional Association II.

- ***Currently***

  16 National Meteorological Services are designated as RICs.

RIC website(WMO): http://www.wmo.int/pages/prog/www/IMOP/instrument-reg-centres.html

WMO Regional Instrument Centres (RICs)



RICs' Terms of Reference(TOR)

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;

(b) A RIC must maintain a set of meteorological standard instruments and establish the traceability of its own measurement standards and measuring instruments to the SI;

(c) A RIC must have qualified managerial and technical staff with the necessary experience to fulfil its functions;

(d) A RIC must develop its individual technical procedures for the calibration of meteorological and related environmental instruments using calibration equipment employed by the RIC;

(e) A RIC must develop its individual quality assurance procedures;

(f) A RIC must participate in, or organize, inter-laboratory comparisons of standard calibration instruments and methods;

(g) A RIC must, when appropriate, utilize the resources and capabilities of the Region according to the Region's best interests;

(h) A RIC must, as far as possible, apply international standards applicable for calibration laboratories, such as ISO/IEC 17025;

(i) A recognized authority must assess a RIC, at least every five years, to verify its capabilities and performance;

<CIMO Guide Chapter 1. Annex 1.A>

RICs' Terms of Reference(TOR)

Corresponding functions:

(j) A RIC must assist Members of the Region in calibrating their national meteorological standards and related environmental monitoring instruments;

(k) A RIC must participate in, or organize, WMO and/or regional instrument intercomparisons, following relevant CIMO recommendations;

(l) According to relevant recommendations on the WMO Quality Management Framework, a RIC must make a positive contribution to Members regarding the quality of measurements;

(m) A RIC must advise Members on enquiries regarding instrument performance, maintenance and the availability of relevant guidance materials;

(n) A RIC must actively participate, or assist, in the organization of regional workshops on meteorological and related environmental instruments;

(o) The RIC must cooperate with other RICs in the standardization of meteorological and related environmental measurements;

(p) A RIC must regularly inform Members and report, on an annual basis, to the president of the regional association and to the WMO Secretariat on the services offered to Members and activities carried out;

<CIMO Guide Chapter 1. Annex 1.A>

2. Activities of RIC-Tsukuba

History and main activities

1996: Japan and China were designated as RICs of RAII at the 11th session of RAII.
1998: RIC Tsukuba held training workshops cooperating with WMO.
1998, 2002: Exchanging the information on activities of RIC Tsukuba and RIC Beijing (in Japan).
2010: Calibration test using RIC Tsukuba's travelling pressure standard in cooperation with TMD.
2010: RIC-Tsukuba and RIC-Beijing conducted reciprocal visits of their experts.
2010: Building a RIC-Tsukuba’s Website.
2010: Publication a RIC-Tsukuba’s leaflet and sending to RAII members and RICs.
2010: JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia).
2012: Meteorological Instruments Center, JMA is accredited to ISO/IEC17025 in temperature calibration.

Background

Regional Association II (Asia) 14th session
(Tashkent, 5-11 December 2008)

Continuous evaluation of Regional Instrument Centres (RICs) and Regional Radiation Centres (RRCs) to verify their capabilities and performance

4.4.28

The Association noted that the WMO Congress and Executive Council had requested regional associations to further strengthen RICs/RRCs and to initiate the process of continuous evaluation of RICs and RRCs under their responsibility to verify their capabilities and performance.

The Association requested its Members who operate RICs and RRCs to carry out such periodic evaluations, in liaison with CIMO, and to report their outcomes to the next session of the Association. The Association also requested its RICs to organize capacity-building activities in view of sharing their knowledge of meteorology, in particular on the procedure to be used for the calibration of meteorological and environmental instruments, with other Members.

(ftp://ftp.wmo.int/Documents/PublicWeb/mainweb/meetings/cbodies/governance/ra_reports/english/pdf/1037_en.pdf)

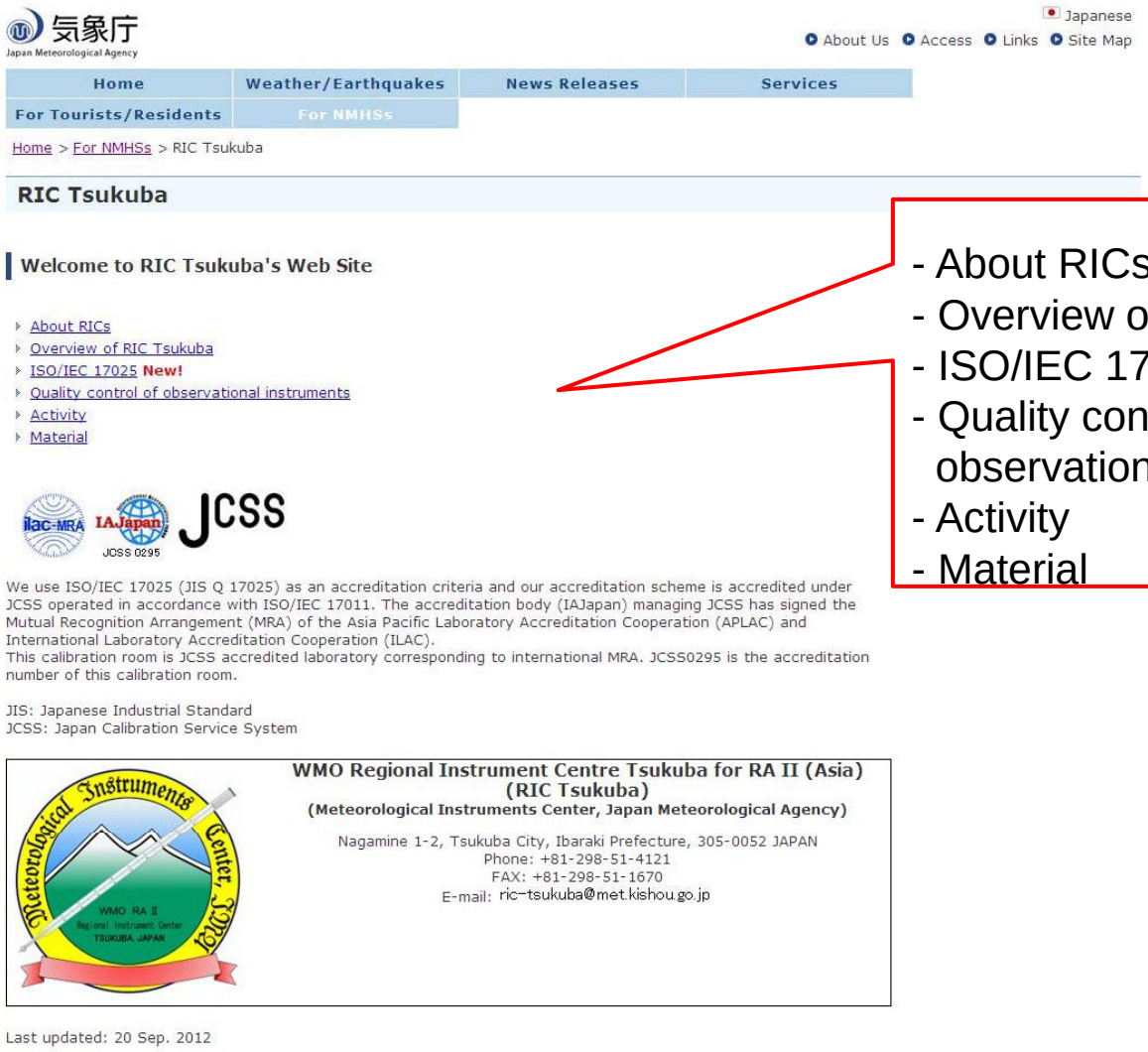
Training workshop with WMO (1998)

WMO and RIC Tsukuba held the workshop for "training instrument specialists in RAII and improvement of instrument maintenance and calibration technique" inviting the trainees from 16 Members in RA II (Nov. 1998).

Practice in the above training workshop

RIC-Tsukuba and RIC-Beijing conducted reciprocal visits of their experts (2010)

Building a RIC-Tsukuba's Website (2010)



- About RICs
- Overview of RIC Tsukuba
- ISO/IEC 17025
- Quality control of observational instruments
- Activity
- Material

http://www.jma.go.jp/jma/jma-eng/jma-center/ric/RIC_HP.html

JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in RA II (Asia)

(27-30 July 2010 Tokyo, Tsukuba, Japan)

Recommendations of the Workshop (some extractions with RIC)

6. Members should acquire at least one working standard which is traceable to international standard for each observation type with technical assistance and/or financial assistance from RICs and WMO respectively, if necessary.
7. Members without calibration laboratories, to acquire travel standards for basic variables that would be calibrated in one of the RICs and be then used for field adjustments and checking. RICs are requested to examine the effect of use of traveling standards.
8. RICs to provide regular calibration services to Members in calibrating their working and/or traveling standards, and provide information through their websites.

http://www.jma.go.jp/jma/en/Activities/qmws_2010/qmws_2010.html

ISO/IEC17025 accreditation (2012)

RICs' Terms of Reference(TOR)

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;

(b) A RIC must maintain a set of meteorological standard instruments and establish the traceability of its own measurement standards and measuring instruments to the SI;

(c) A RIC must have qualified managerial and technical staff with the necessary experience to fulfil its functions;

(d) A RIC must develop its individual technical procedures for the calibration of meteorological and related environmental instruments using calibration equipment employed by the RIC;

(e) A RIC must develop its individual quality assurance procedures;

(f) A RIC must participate in, or organize, inter-laboratory comparisons of standard calibration instruments and methods;

(g) A RIC must, when appropriate, utilize the resources and capabilities of the Region according to the Region's best interests;

(h) A RIC must, as far as possible, apply international standards applicable for calibration laboratories, such as ISO/IEC 17025;

(i) A recognized authority must assess a RIC, at least every five years, to verify its capabilities and performance;

ISO/IEC17025 accreditation (2012)

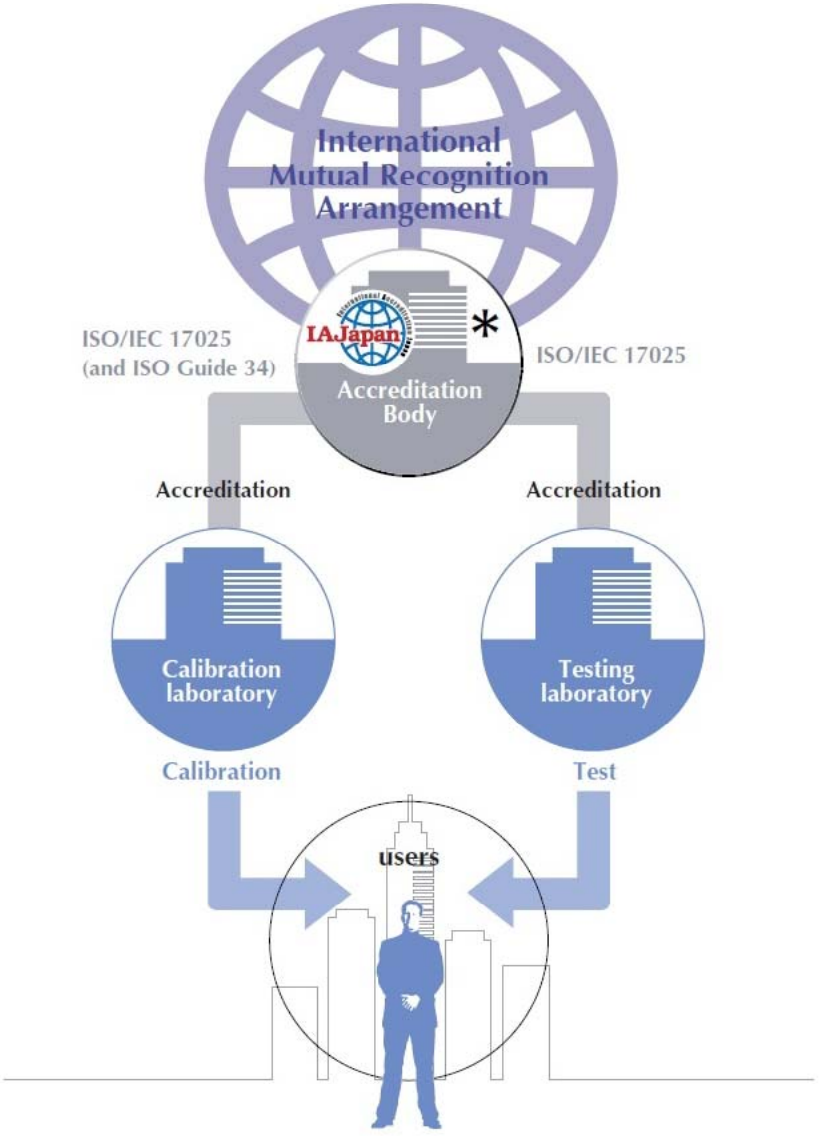
What is “ISO/IEC17025”?

General requirements for the competence of testing and calibration laboratories

A worldwide Laboratory Accreditation scheme

What is Laboratory Accreditation ?

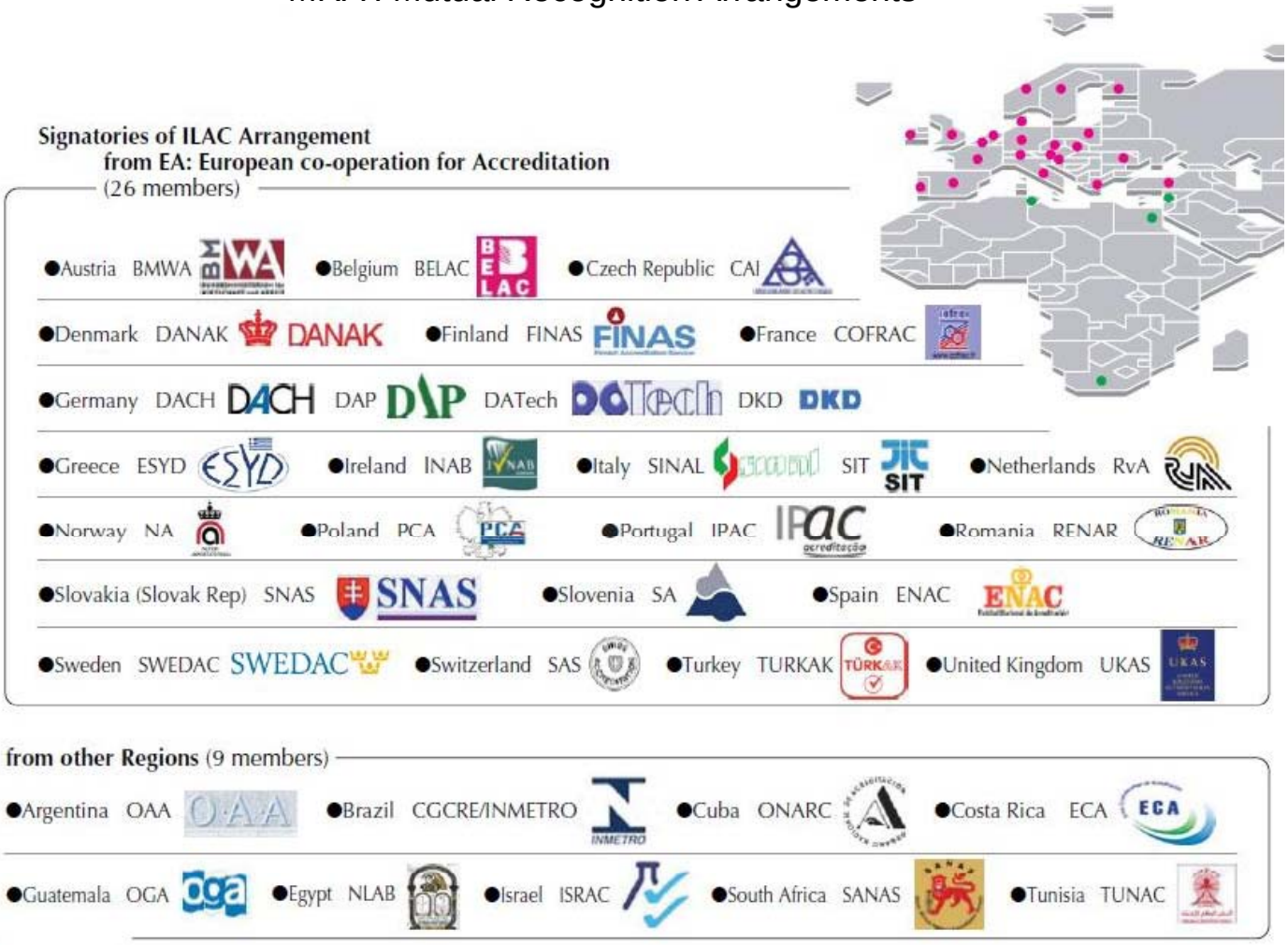
Laboratory accreditation is a scheme in which an authoritative accreditation body accredits laboratories that conform to certain requirements for their competence to conduct test and calibration in specific technical areas. The aim is to assure the confidence and reliability of the data measured, tested, and calibrated by laboratories.



Accreditation bodies

- ILAC/MRA signatories and their logos-

ILAC : International Laboratory Accreditation Cooperation
MRA : Mutual Recognition Arrangements

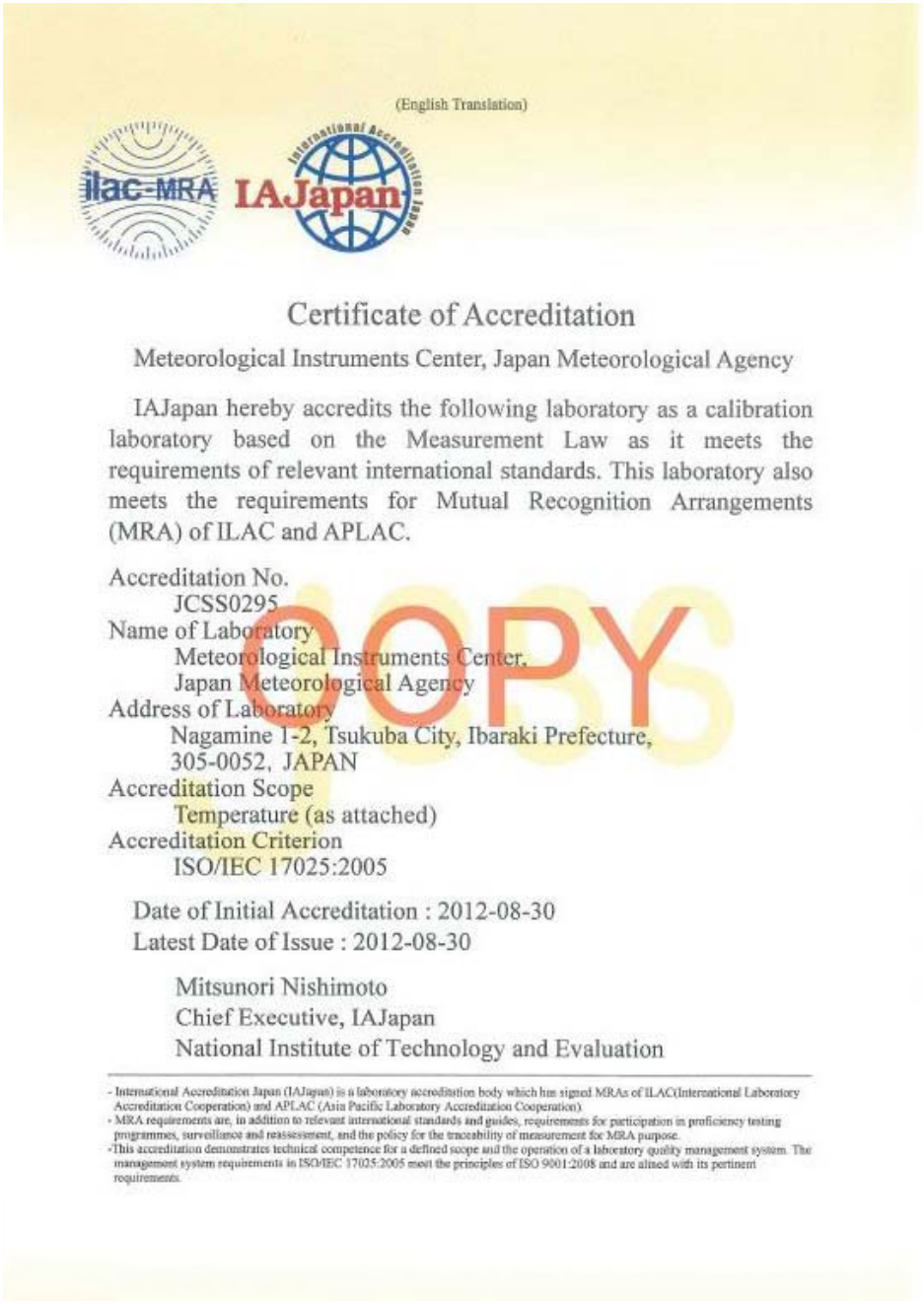


http://www.iajapan.nite.go.jp/jcss/pdf/pamph_iajapan_200902e.pdf

Accreditation bodies

- ILAC/MRA signatories and their logos-

http://www.iajapan.nite.go.jp/jcss/pdf/pamph_iajapan_200902e.pdf



(English Translation)

Certificate of Accreditation

Meteorological Instruments Center, Japan Meteorological Agency

IAJapan hereby accredits the following laboratory as a calibration laboratory based on the Measurement Law as it meets the requirements of relevant international standards. This laboratory also meets the requirements for Mutual Recognition Arrangements (MRA) of ILAC and APLAC.

Accreditation No.
JCSS0295
Name of Laboratory
Meteorological Instruments Center,
Japan Meteorological Agency
Address of Laboratory
Nagamine 1-2, Tsukuba City, Ibaraki Prefecture,
305-0052, JAPAN
Accreditation Scope
Temperature (as attached)
Accreditation Criterion
ISO/IEC 17025:2005

Date of Initial Accreditation : 2012-08-30
Latest Date of Issue : 2012-08-30

Mitsunori Nishimoto
Chief Executive, IAJapan
National Institute of Technology and Evaluation

- International Accreditation Japan (IAJapan) is a laboratory accreditation body which has signed MRAs of ILAC(International Laboratory Accreditation Cooperation) and APLAC (Asia Pacific Laboratory Accreditation Cooperation).
- MRA requirements are, in addition to relevant international standards and guides, requirements for participation in proficiency testing programmes, surveillance and reassessment, and the policy for the traceability of measurement for MRA purpose.
- This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system. The management system requirements in ISO/IEC 17025:2005 meet the principles of ISO 9001:2008 and are aligned with its pertinent requirements.

MIC, JMA is accredited to ISO/IEC17025 in temperature calibration.

General Field of Calibration: Temperature
Date of Initial Accreditation of the Field: 2012-08-30

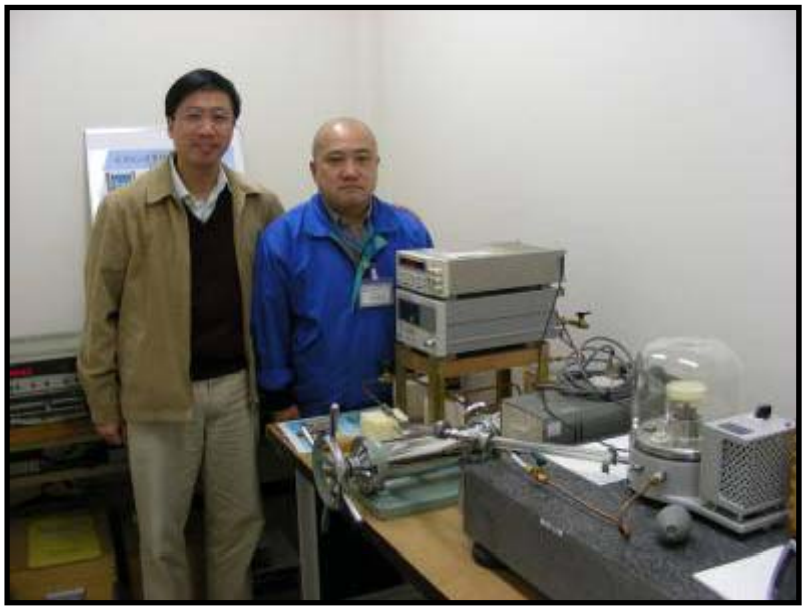
Next Step;

Trying to be accredited in humidity and pressure now.

Calibration or inspection in MIC, JMA

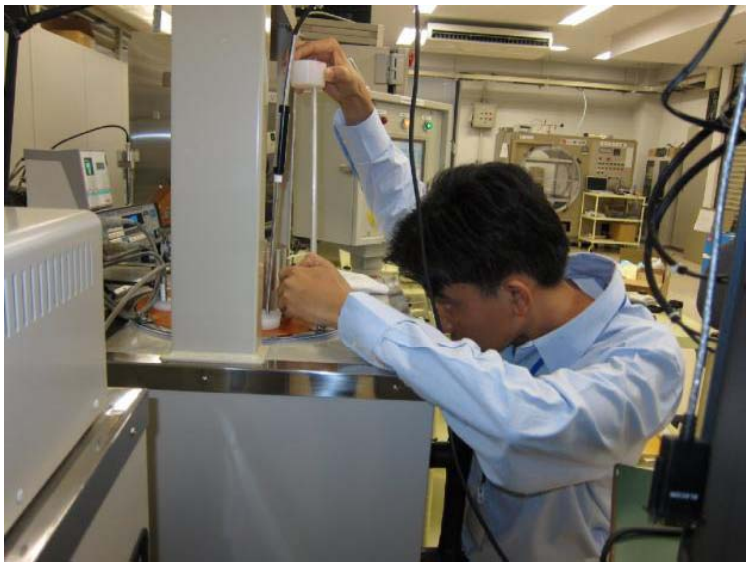
2000: Thailand (barometer, thermometer)
2001: Republic of Korea (anemometer)
2006: Philippines (pyranometer)
2007: Thailand (barometer, thermometer)
Hong Kong, China (barometer)
2010: Thailand (barometer, thermometer, anemometer)
2012: Oman (barometer, thermometer, hygrometer)
Indonesia (barometer, thermometer, hygrometer)

Calibration (Hong Kong, China 2007)

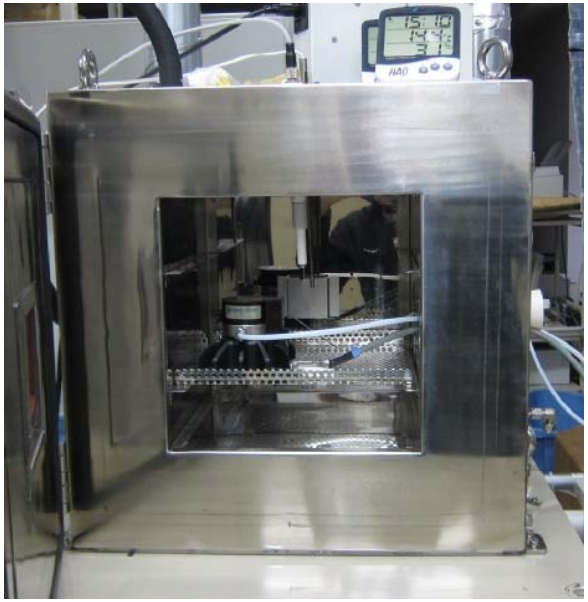


Calibration of Barometer (Electrostatic Capacity Barometer)

Calibration (Thailand, 2010)



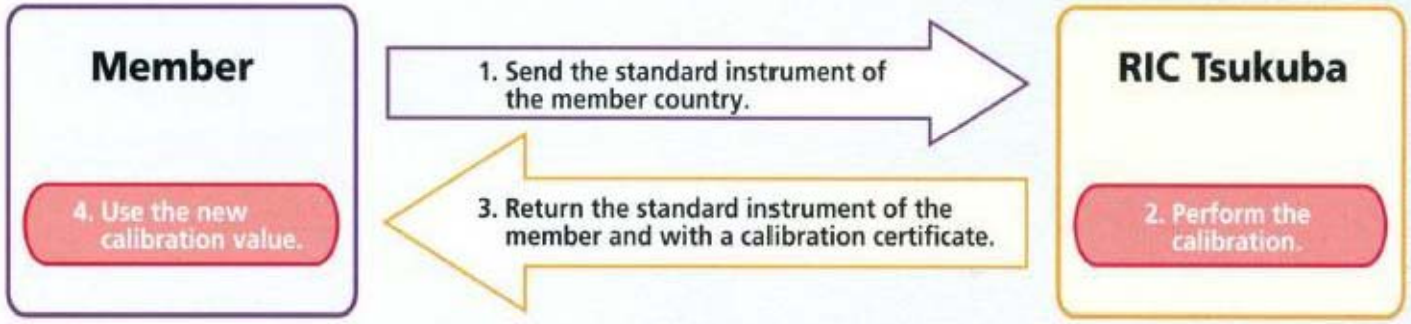
Calibration (Oman, 2012)



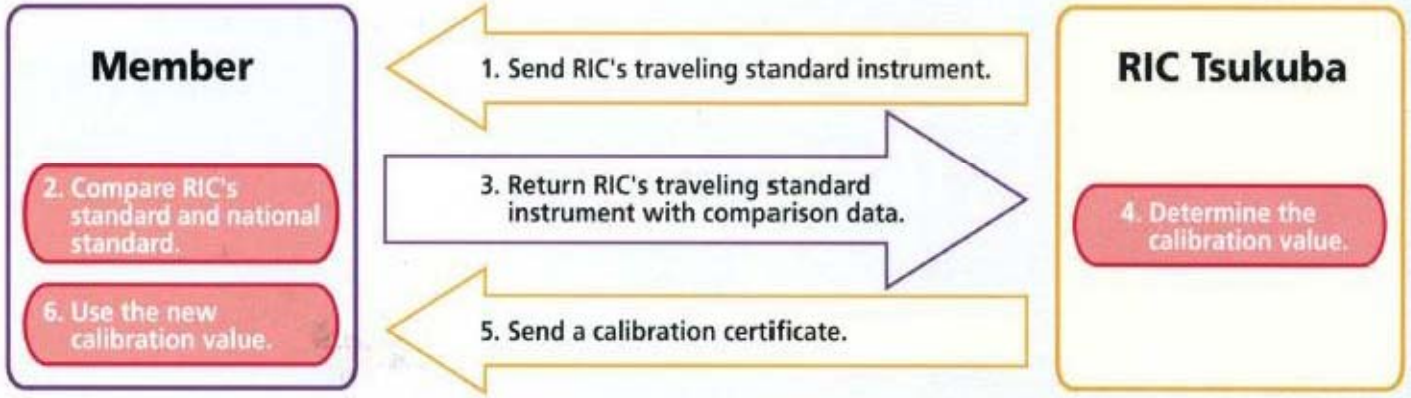
Calibration procedures of standard instruments of Member countries

Members can choose one from the following two ways. RIC Tsukuba can calibrate standard barometer, thermometer, and hygrometer instruments. Anemometers can be calibrated by only (1).

(1) A Member sends a standard meteorological instrument to be calibrated at RIC Tsukuba, and then RIC Tsukuba compares it with a regional standard instrument.



(2) RIC Tsukuba sends a traveling standard instrument that has been calibrated by a regional standard instrument in RIC Tsukuba to a Member, then the Member compares its own standard instrument with a traveling standard.



Calibration schedule (a model)

3 months before calibration (at least)

Contact RIC

Judge availability of calibration for instrument by RIC

Fix visiting periods in detail
Send official letter to JMA

Calibration in RIC (1 – 2 weeks)

1 months after calibration

RIC send Calibration certificate

Charges for accommodation, travel, transportation of instruments will be covered by members country.

RIC's Traveling standard instruments

Temperature

Platinum resistance thermometer
TS81A (CHINO, Japan)

Alternating current bridge
F-250
(ASL, UK)

Humidity

Hygrometer (sensor)
D2 (General Eastern, USA)

Hygrometer (controller)
Hygro M2
(General Eastern, USA)

Pressure

Digital barometer
PTB220 (Vaisala, Finland)

3. Importance of correct calibration

Lead Centre Monitoring

Lead Centres have been established by CBS for coordinating the monitoring results of specific observation types.

The Lead Centres produce six-monthly consolidated reports of the observations of the data type they have been entrusted to monitor that display consistently low quality.

These reports are also known as 'suspect' lists. The following lead centres have been established.

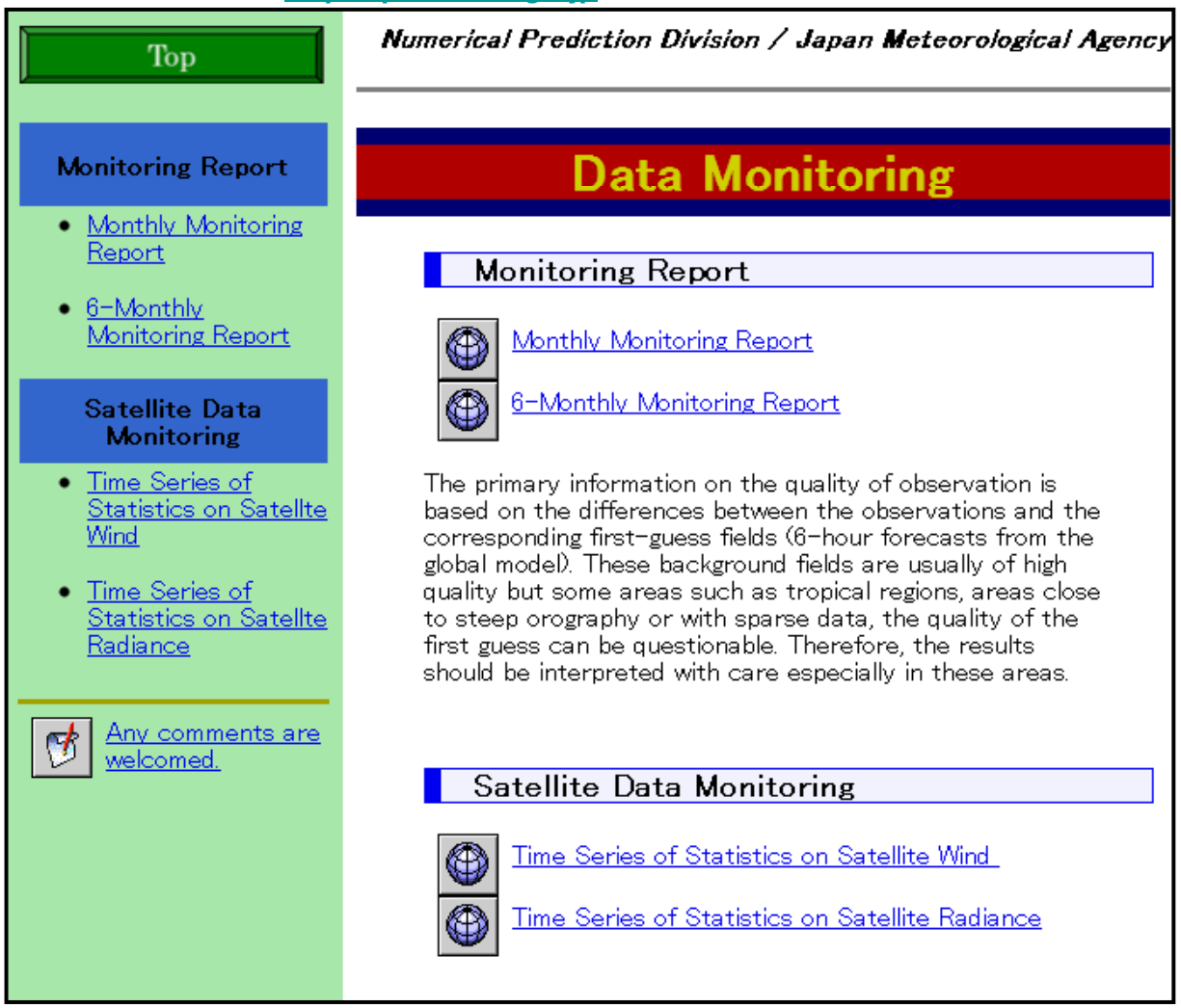
	Centre	Data Type	Area of responsibilty
	WMC Washington	aircraft and satellite data	global
	RSMC ECMWF	upper-air data	global
Met Office	RSMC Exeter	surface marine data	global
	RSMC Nairobi	land surface observations	RA I
	RSMC Tokyo	land surface observations	RA II
	RSMC Buenos Aires	land surface observations	RA III
	RSMC Montreal	land surface observations	RA IV
	WMC Melbourne	land surface observations	RA V
DWD	RSMC Offenbach	land surface observations	RA VI

http://www.wmo.int/pages/prog/www/DPS/Monitoring-home/mon-leadcentre.htm

RSMC(Regional Specialized Meteorological Center) Tokyo publishes “Report on the Quality of Land Surface Observations in Region II (Asia)” in a half year as a lead center for monitoring the quality of land surface observations.

These reports are shown in following Website.

http://qc.kishou.go.jp



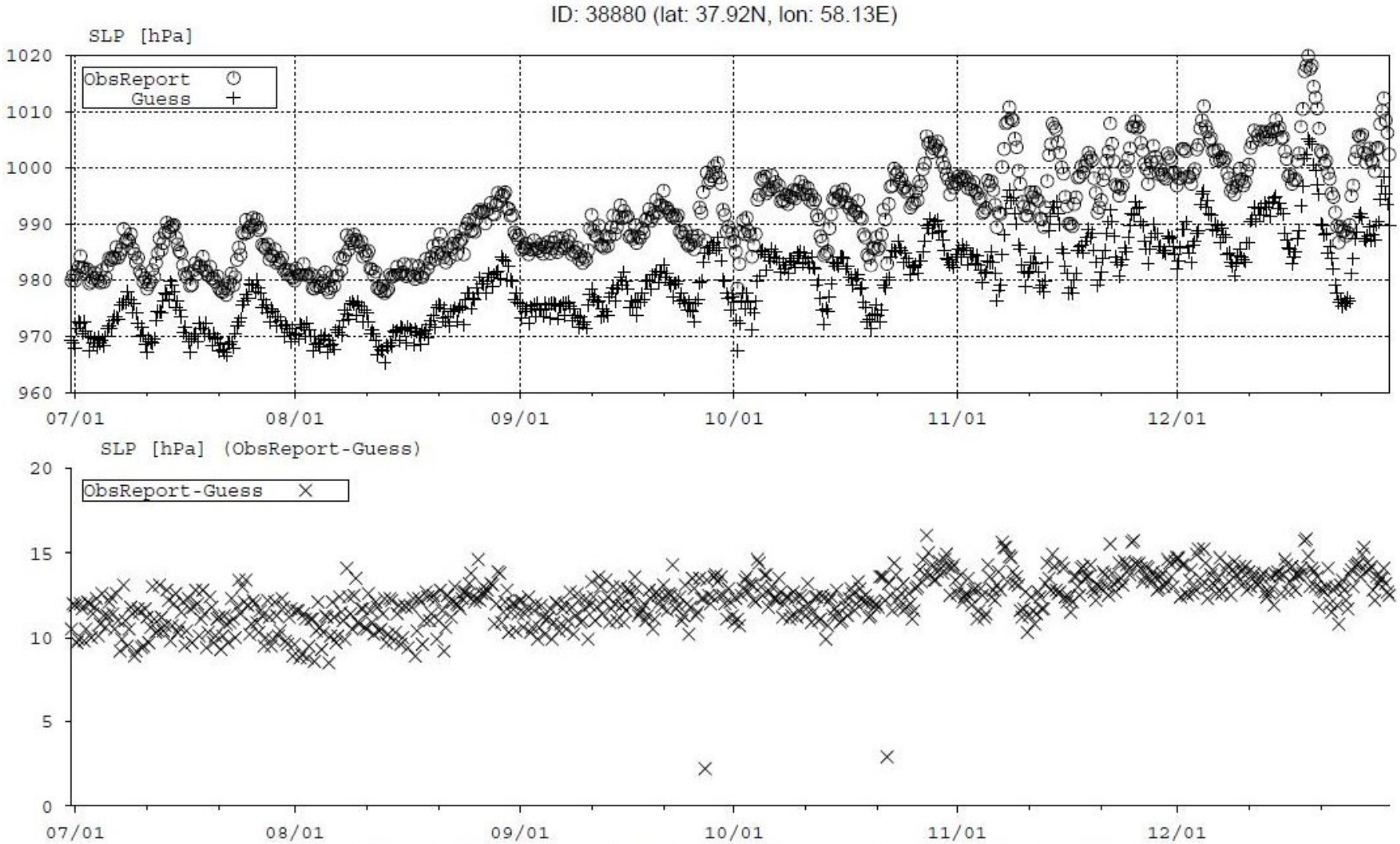


Figure 05 Time series of SLP observations minus first-guess increments for station 38880.

38880 – Positive bias at the station level .

Possible causes of remarkable and sustained observation biases

a. The barometer used for the observations is not correctly calibrated.

b. Latitude, longitude or altitude of the station in the WMO Publication No. 9, Volume A is not updated timely and appropriately.

c. Otherwise, there are biases specific to the NWP model used in the quality monitoring.

Note: The model biases are likely to appear in relatively large areas.

4. Tentative report on “Questionnaire on Meteorological Instruments, Calibration and Training in Regional Association II (Asia)”

World Meteorological Organization
Organisation météorologique mondiale

Secrétariat
7 bis, avenue de la Paix – Case postale 2300 – CH 1211 Genève 2 – Suisse
Tél.: +41 (0) 22 730 81 11 – Fax: +41 (0) 22 730 81 81
wmo@wmo.int – www.wmo.int

TEMPS • CLIMAT • EAU
WEATHER • CLIMATE • WATER

Our ref.: DRA-AP/RA II/OBS (Survey) GENEVA, 12 December 2011

Annex: 1 (available in English only)

Subject: Questionnaire on Meteorological Instruments, Calibration and Training in Regional Association II (Asia)

Action required: Completed questionnaire to be returned to the Regional Instrument Centre Tsukuba (Japan) not later than **31 January 2012**

Dear Sir/Madam,

I would like to inform you that the JMA/WMO Workshop on Quality Management in Surface, Climate and Upper-air Observations in Regional Association II (Asia) held in Tokyo, Japan, in July 2010, concluded that the primary factors adversely affecting data quality in RA II are calibration and maintenance of instruments mainly due to lack of traceability of measurements to international standards and calibration facilities. It indicated that there are strong needs for capacity building programmes on calibration and data quality management among Members. It recommended that services of Regional Instrument Centres (RICs) should be fully utilized by RA II Members to address these issues.

The Commission for Instruments and Methods of Observation (CIMO), at its fifteenth session held in Helsinki, Finland in September 2010, recommended that RICs maintain a database of the standards used by the Members of the Region and already calibrated by the RICs, develop necessary training materials, and organize training events to improve understanding of traceability of measurements to international standards in the Region in collaboration with CIMO.

With regard to measurement of radiation, Regional Radiation Centres (RRCs) are designated to serve as centres for intraregional comparisons of radiation instruments within the Region and to maintain the standard instrument necessary for this purpose and they shall provide the necessary outdoor facilities for simultaneous comparison of national standard radiometers from the Region.

To: Permanent Representatives of Members of Regional Association II (ASE-603)

cc: President of RA II)
Vice-president of RA II) (for information)
President of CIMO)

The attached questionnaire is based on the work of RIC Tsukuba and RIC Beijing together with RRC Tokyo and RRC Pune to assess the capability of calibrations of the RA II Members as well as their needs for services provided by RICs and RRCs including provision of training materials and training events to the Members. The results of the survey will be utilized for RICs and RRCs to enhance their capability and available services for improvement of quality of observational data in RA II in an efficient and effective manner.

In this connection, and to facilitate the work of RICs and RRCs, I would appreciate it if you could kindly send to the RIC Tsukuba (Japan) the duly completed questionnaire as soon as possible, but preferably **not later than 31 January 2012**.

Your cooperation in this matter will be highly appreciated.

Yours faithfully,

(M. Jarraud)
Secretary-General

"Questionnaire on Meteorological Instruments, Calibration and Training in Regional Association II (Asia)"

Member : RIC Tsukuba, RIC Beijing,
RRC Tokyo, RRC Pune

Date:12 December 2011

Members of response (N = 24)

(RAII members : 35, response rate : 69%)

Afghanistan
Bangladesh
China
Hong Kong, China
Iran, Islamic Republic of
Japan
Kazakhstan
Kuwait
Lao People's Democratic Republic
Macao, China
Maldives
Mongolia
Myanmar
Nepal
Oman
Pakistan
Republic of Korea
Russian Federation
Sri Lanka
Thailand
Turkmenistan
United Arab Emirates
Uzbekistan
Viet Nam

(Member's name based on WMO-No.5)

Outline of questionnaire

Part I. Instruments and calibration

Q 1. Instruments in operational use

Q 2. National meteorological standards and traceability to an international standard

Q 3. Needs for calibration of standard instruments with RIC or RRC standards

Q 4. Calibration laboratories

Part II. Training

Q1. Do you wish to join any training courses on meteorological instruments held by RICs?

Q2. If your answer is “Yes” in Q1., which kind of trainings do you require?

Q3. If your answer is “Yes” in Q2., how do you wish the training programs are conducted ?

Q4. Do you have any training courses or materials which can be shared among RAII members?

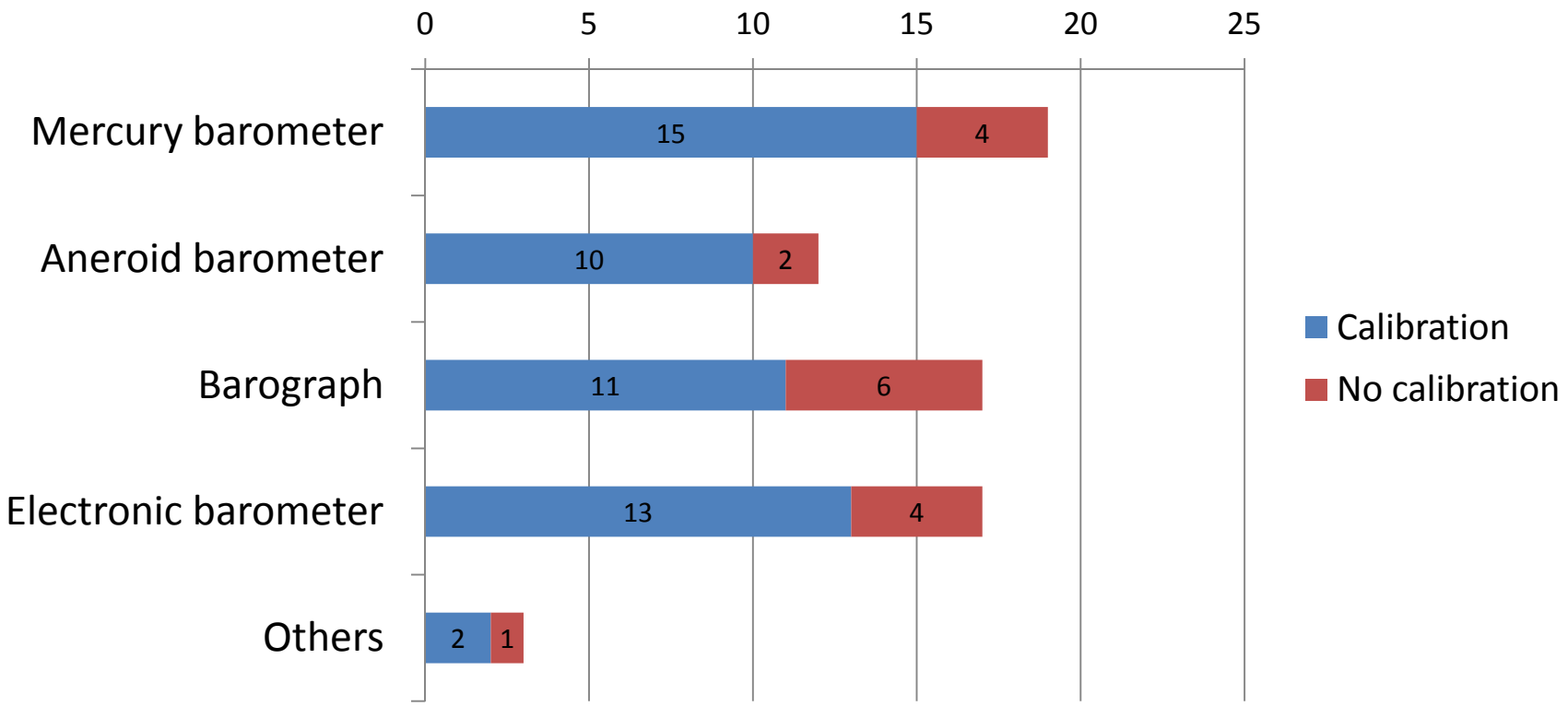
Q5. Supplementary comments with regard to Q1-Q4, if any.

Q6. Questions or comments about trainings, if any.

Part I. Instruments and calibration

Q 1. Instruments in operational use

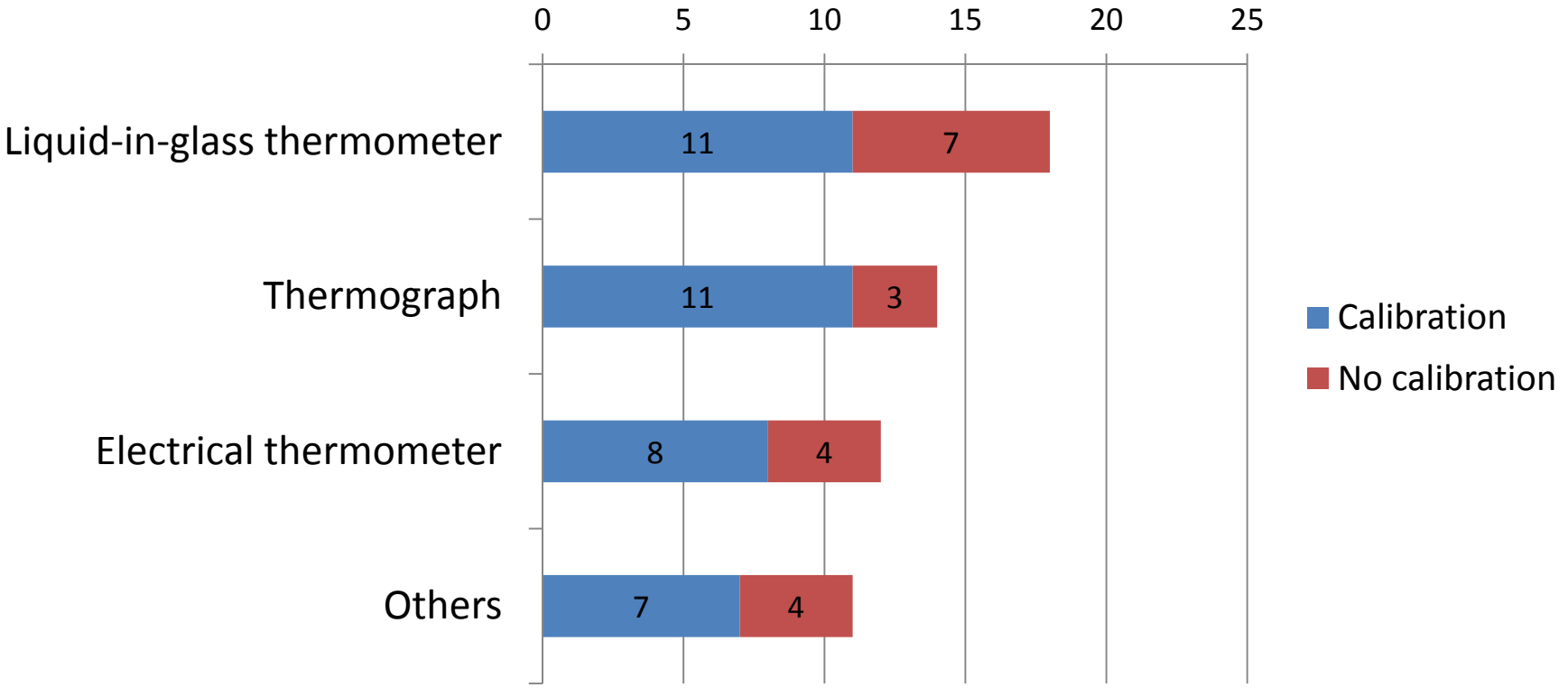
(a) Pressure



79% use mercury barometer.
71% use barograph, electronic barometer.

Q 1. Instruments in operational use

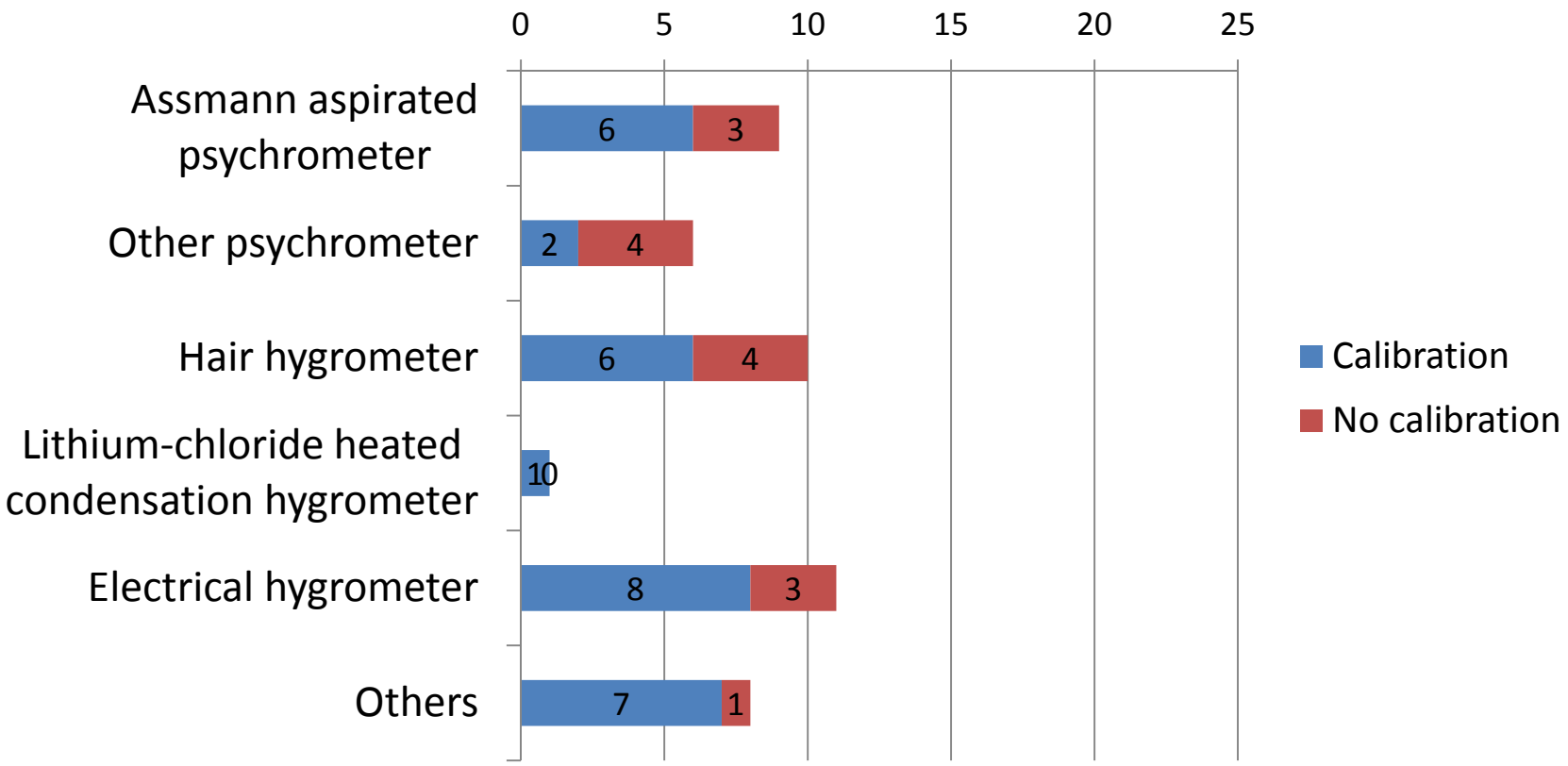
(b) Temperature



75% use liquid-in-glass thermometer.
58% use thermograph.

Q 1. Instruments in operational use

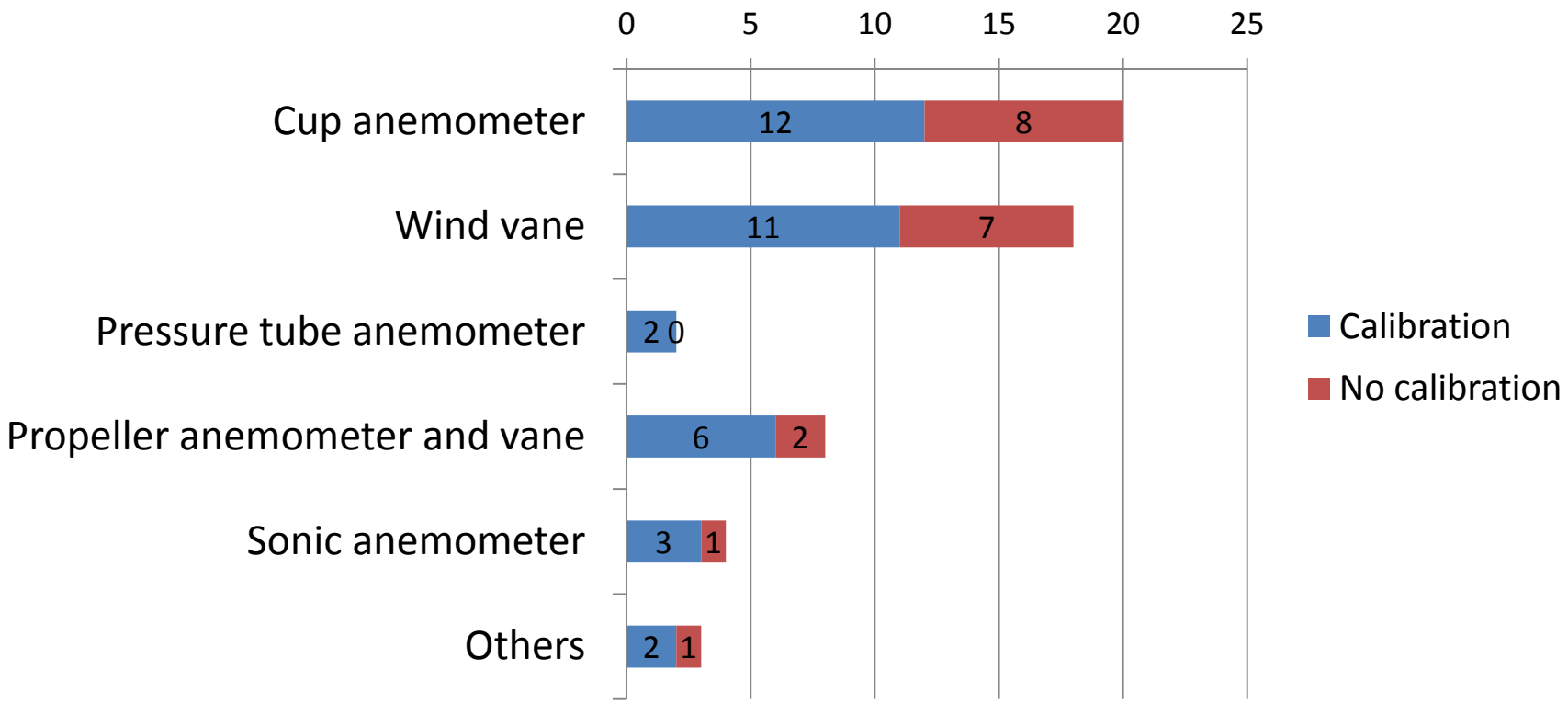
(c) Humidity



46% use electrical hygrometer.
42% use hair hygrometer.

Q 1. Instruments in operational use

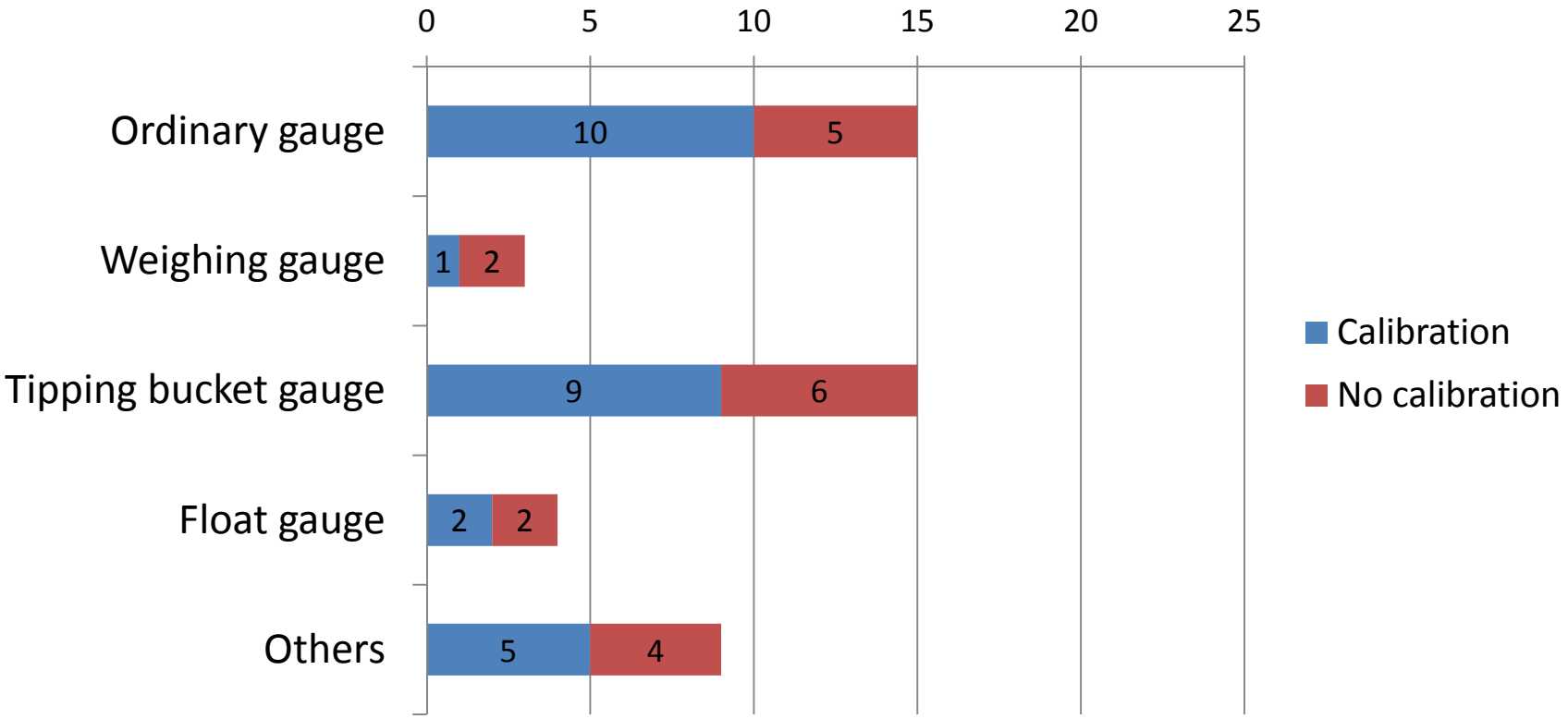
(d) Wind



83% use cup anemometer (for wind speed).
75% use wind vane (for wind direction).

Q 1. Instruments in operational use

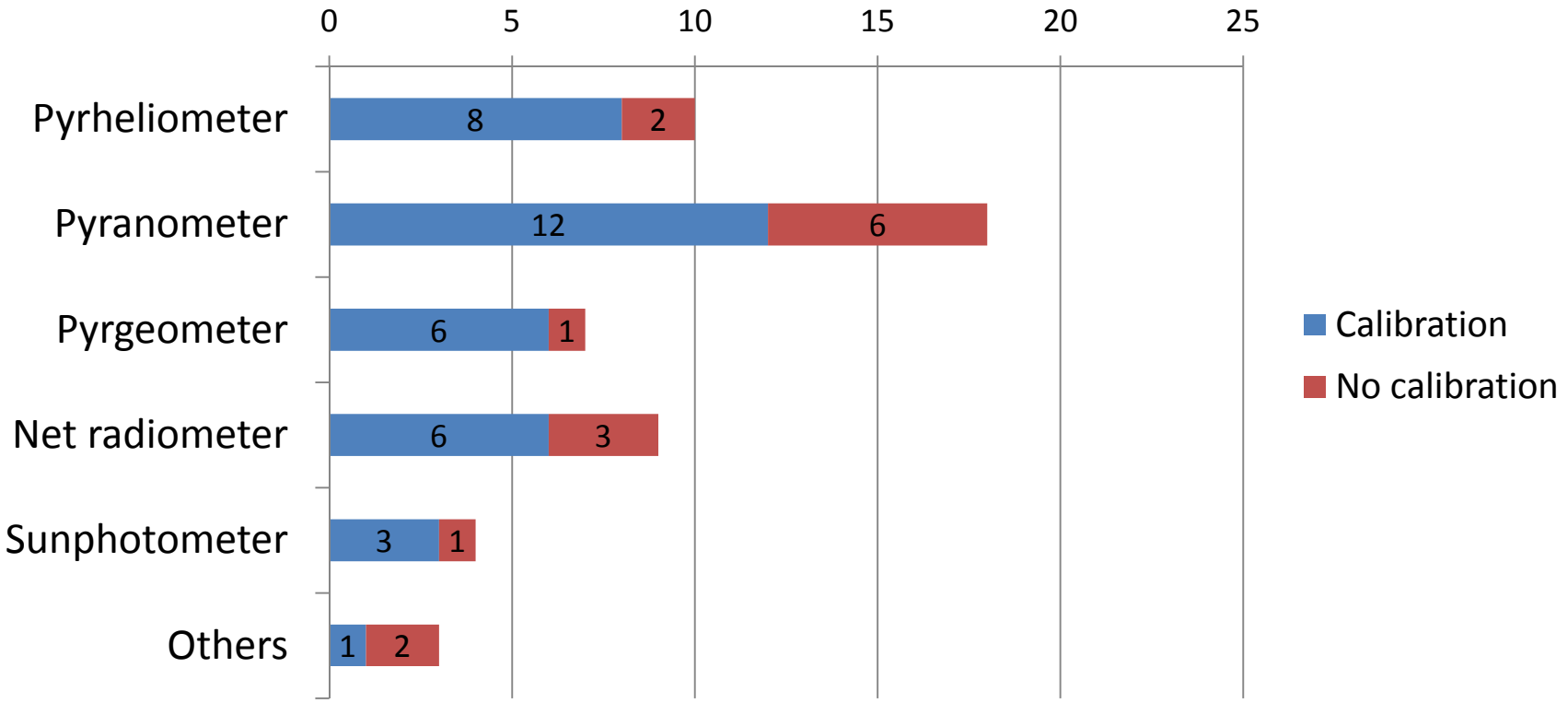
(e) Precipitation



63% use ordinary gauge, tipping bucket gauge.

Q 1. Instruments in operational use

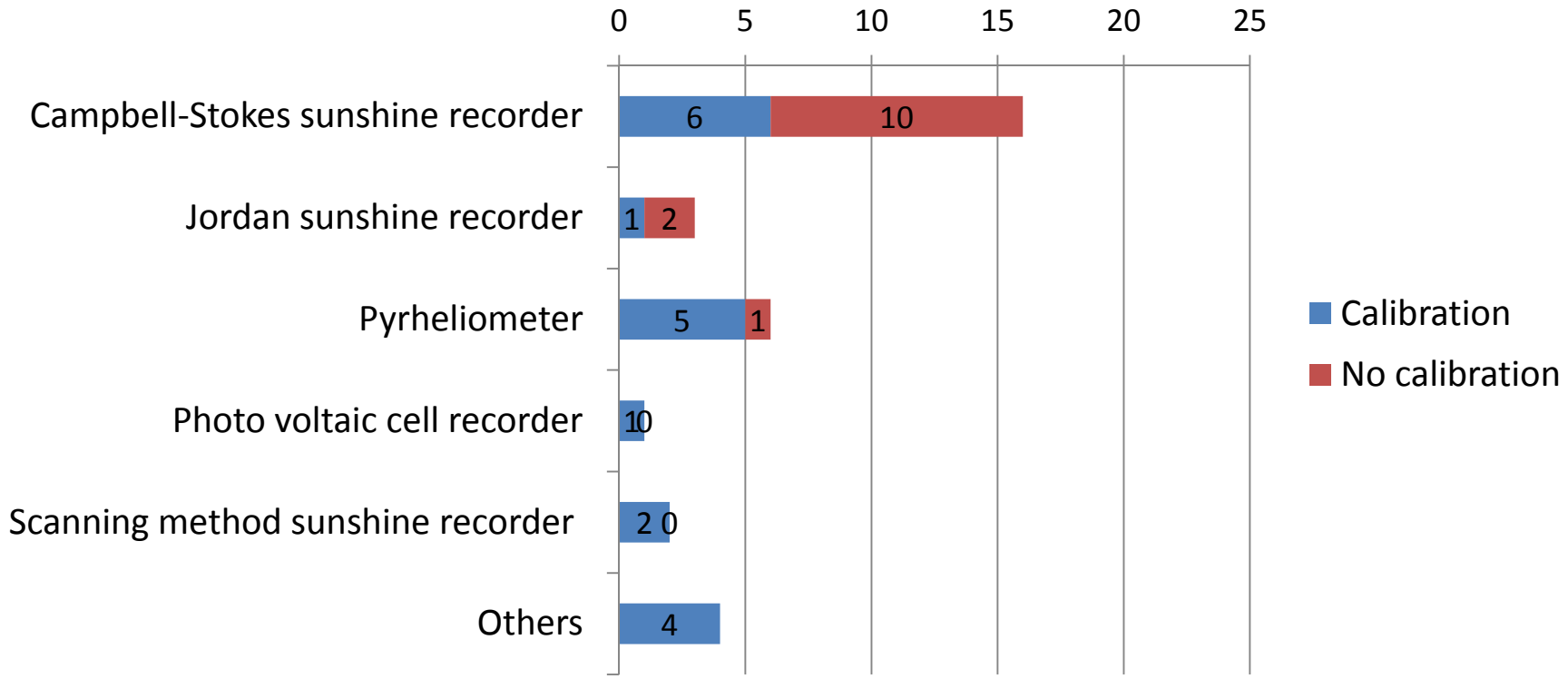
(f) Radiation



75% use pyranometer.
42% use pyrheliometer.

Q 1. Instruments in operational use

(g) Sunshine duration



67% use Cambell-Stokes sunshine recorder.
25% use pyrheliometr.

Q 1. Instruments in operational use

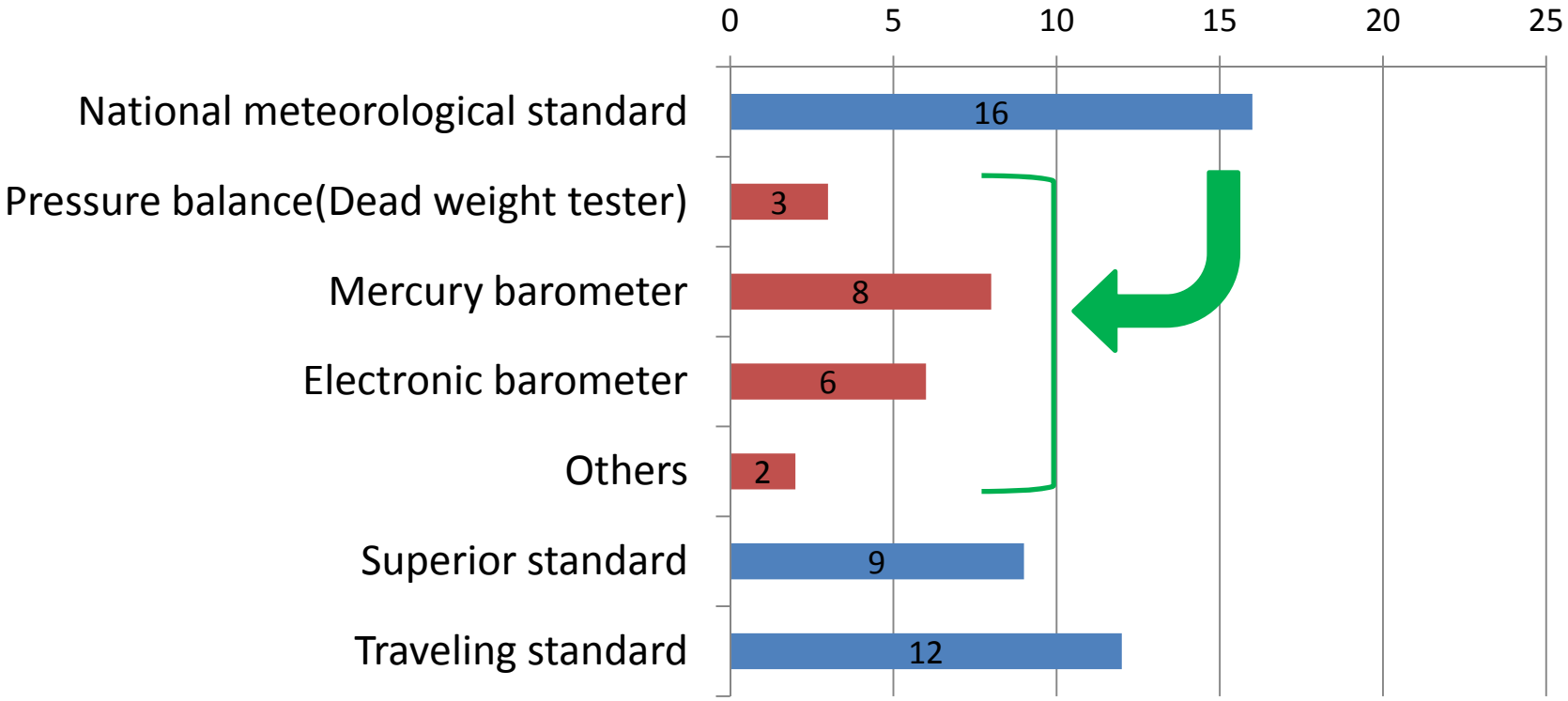
Summary

(1) Conventional instruments are still commonly used in RAII members.
(For example: mercury barometer, barograph, liquid-in-glass thermometer, thermograph, hair hygrometer, ordinary gauge and Campbell-Stokes sunshine recorder, etc.)

(2) About 50 - 80 % of instruments are calibrated.

Q 2. National meteorological standards and traceability to an international standard

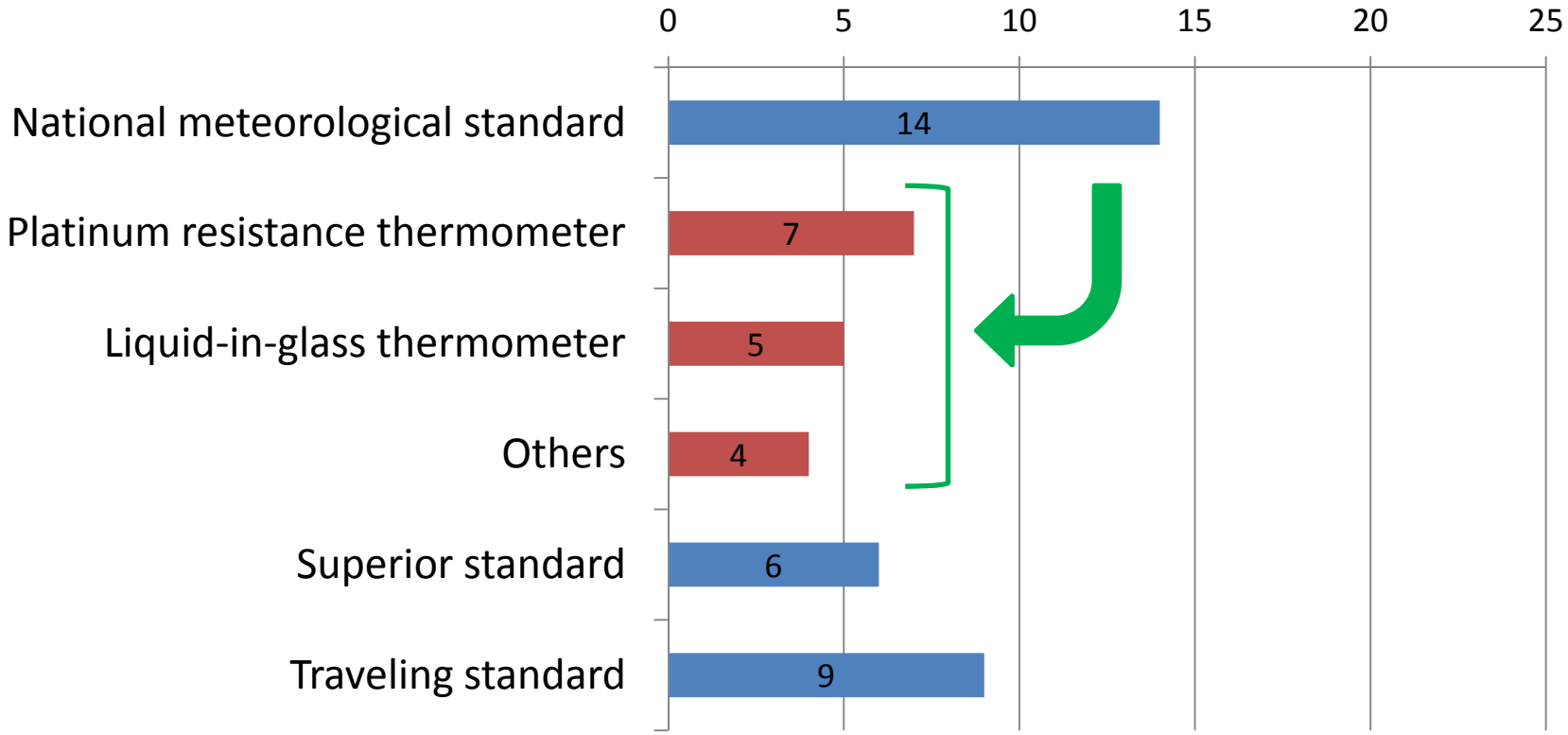
(a) Pressure



67% maintain national meteorological standard.
56% of them is calibrated with superior standards.

Q 2. National meteorological standards and traceability to an international standard

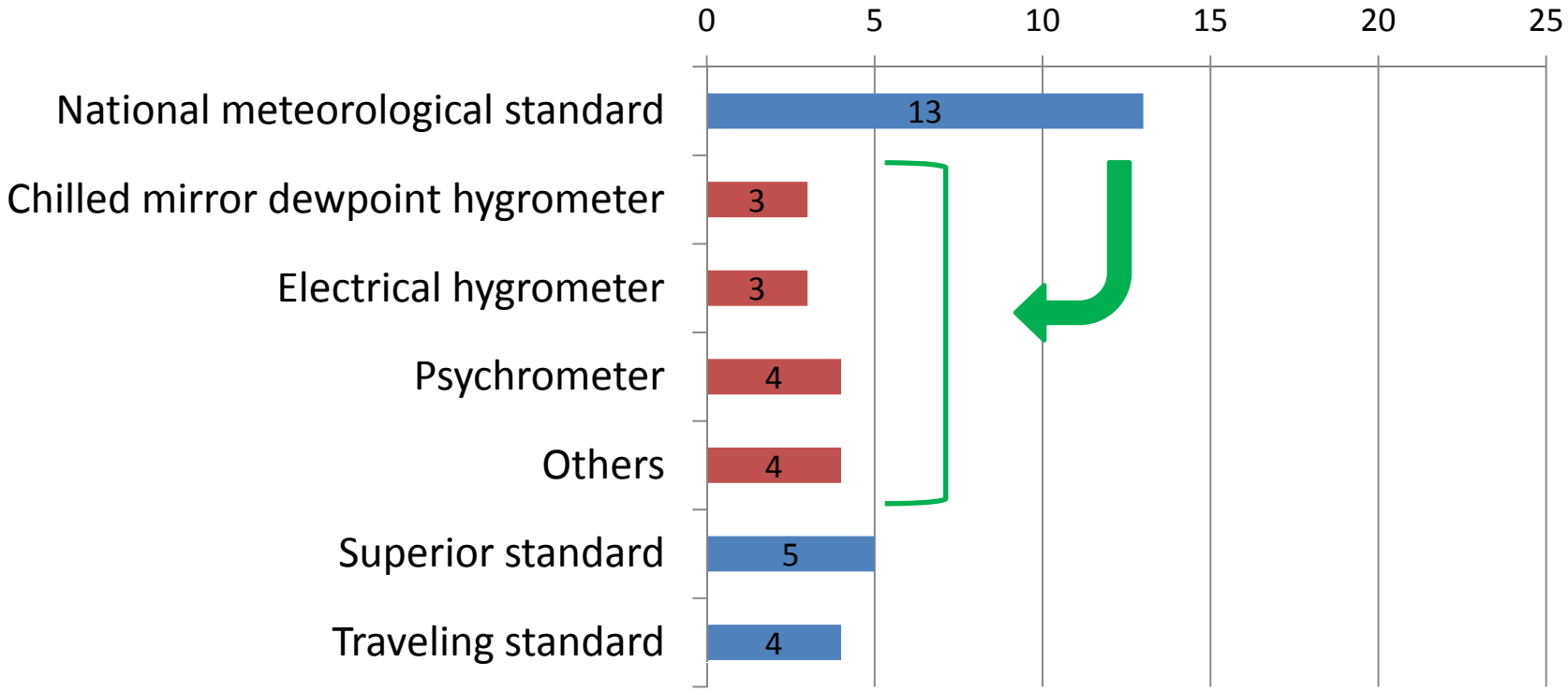
(b) Temperature



58% maintain national meteorological standard.
43% of them is calibrated with superior standards.

Q 2. National meteorological standards and traceability to an international standard

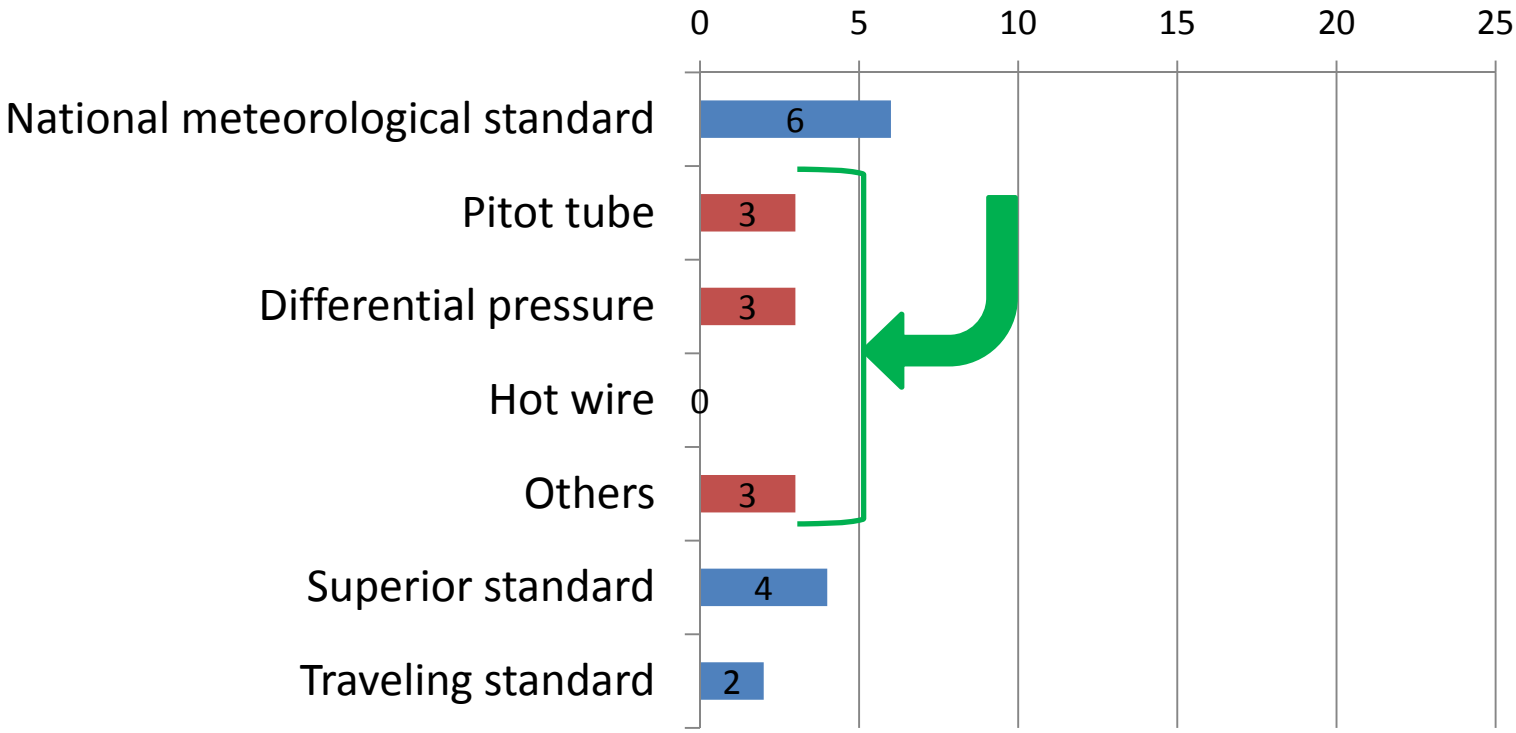
(c) Humidity



54% maintain national meteorological standard.
38% of them is calibrated with superior standards.

Q 2. National meteorological standards and traceability to an international standard

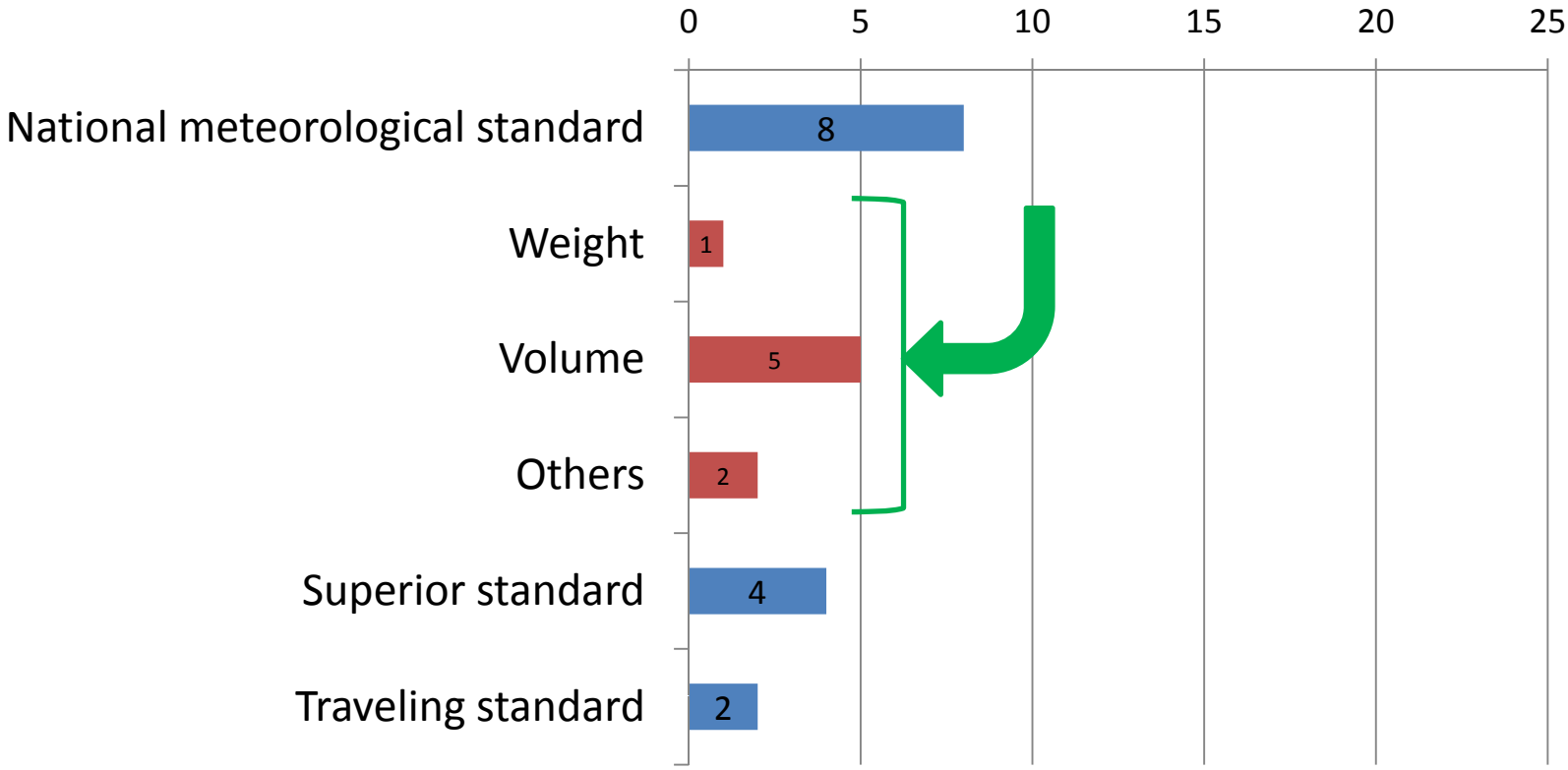
(d) Wind



25% maintain national meteorological standard.
67% of them is calibrated with superior standards.

Q 2. National meteorological standards and traceability to an international standard

(e) Precipitation

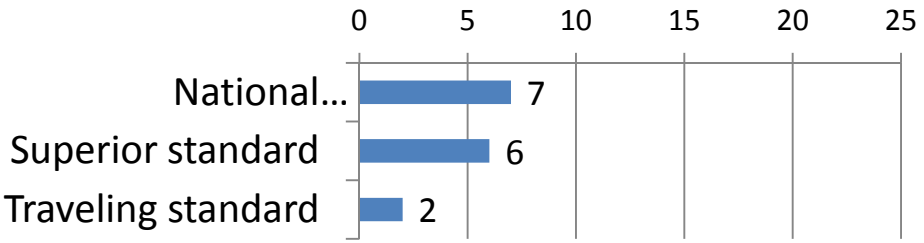


33% maintain national meteorological standard.
50% of them is calibrated with superior standards.

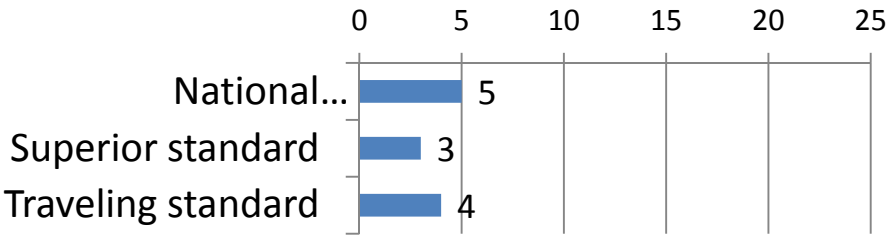
Q 2. National meteorological standards and traceability to an international standard

(f) Radiation

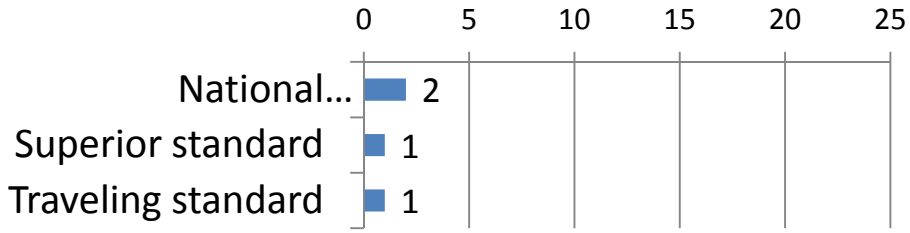
(f-1) Pyrheliometer



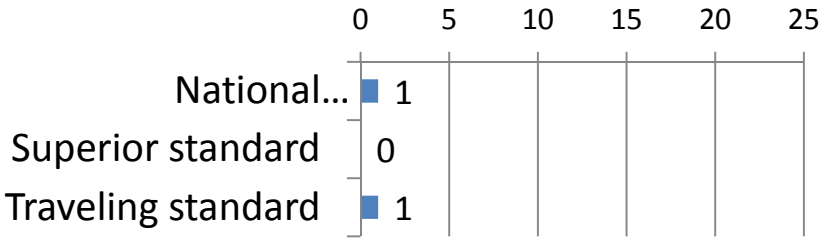
(f-2) Pyranometer



(f-3) Pyrgeometer



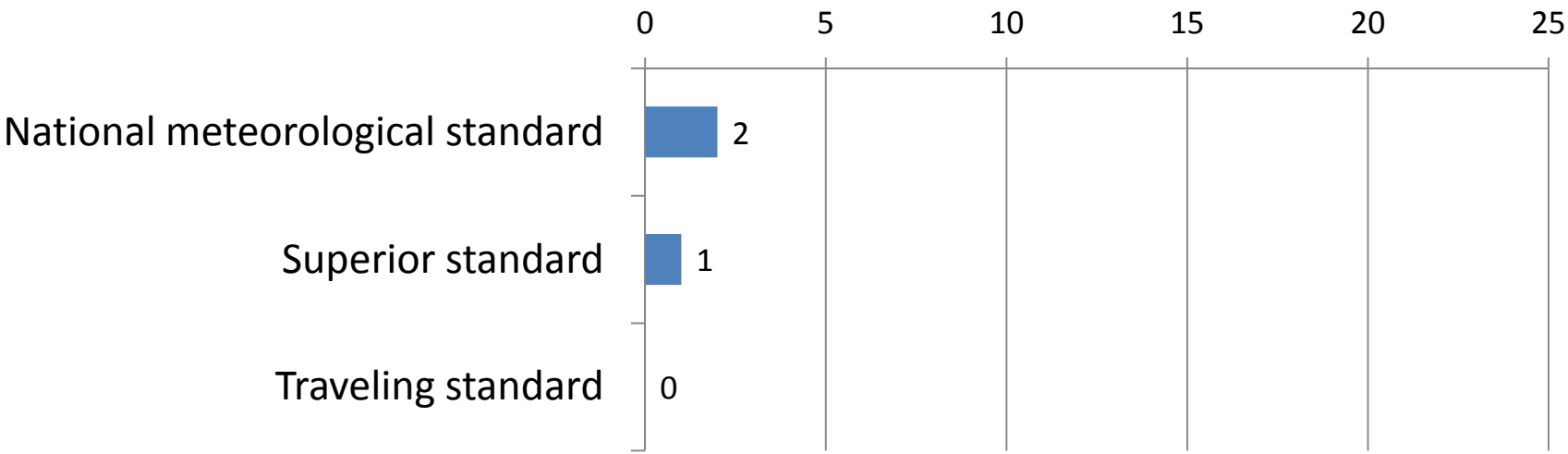
(f-4) Sunphotometer



29% maintain national meteorological standard(pyrheliometr).
21% maintain national meteorological standard(pyranometer).
Few maintain national meteorological standard(pyrgeometer, sunphotometer)

Q 2. National meteorological standards and traceability to an international standard

(g) Sunshine duration



Few maintain national meteorological standard.

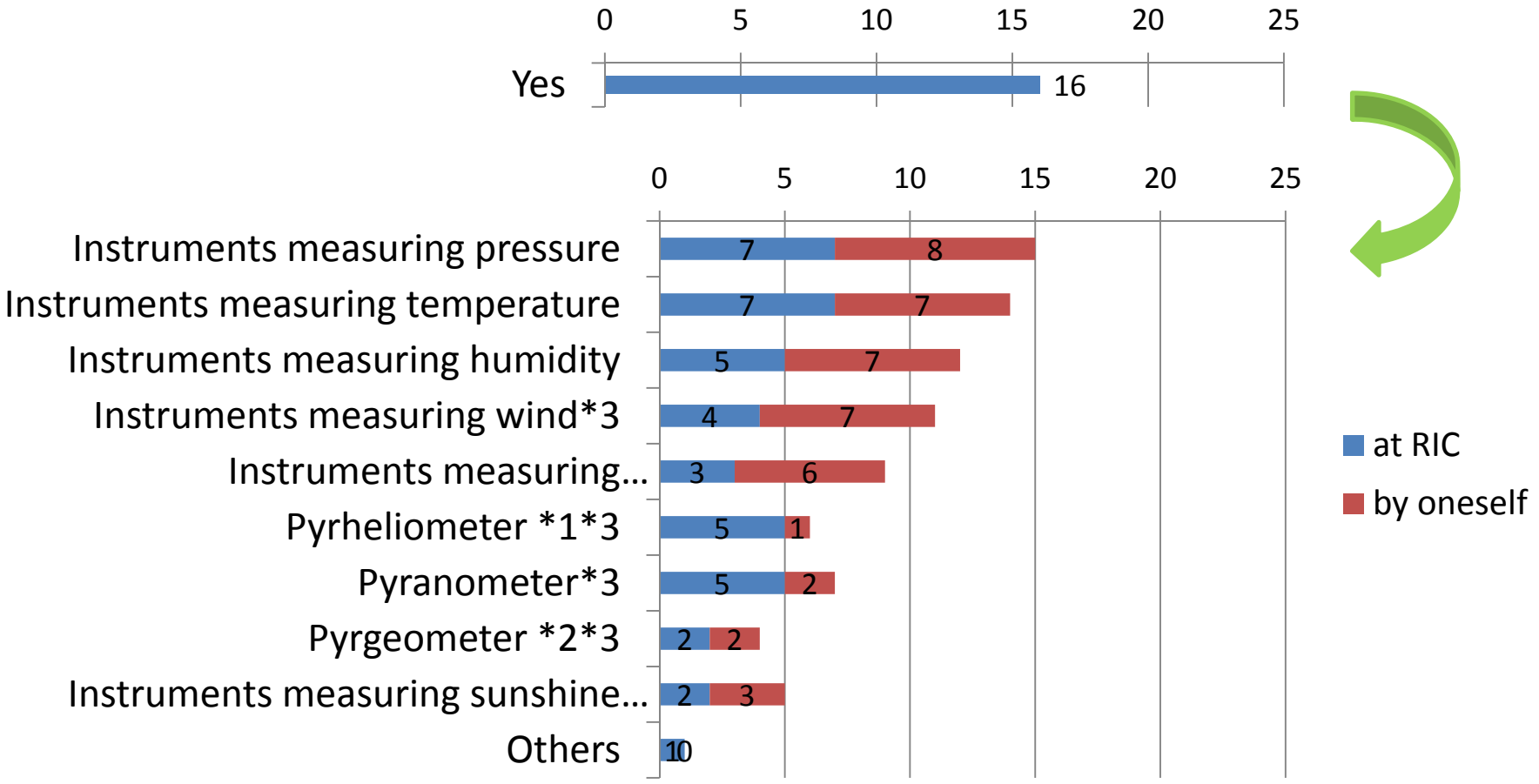
Q 2. National meteorological standards and traceability to an international standard

Summary

(1)With regard to pressure, temperature and humidity, over 50% members have national meteorological standards. But, only less than 50% have them with other meteorological valuables.

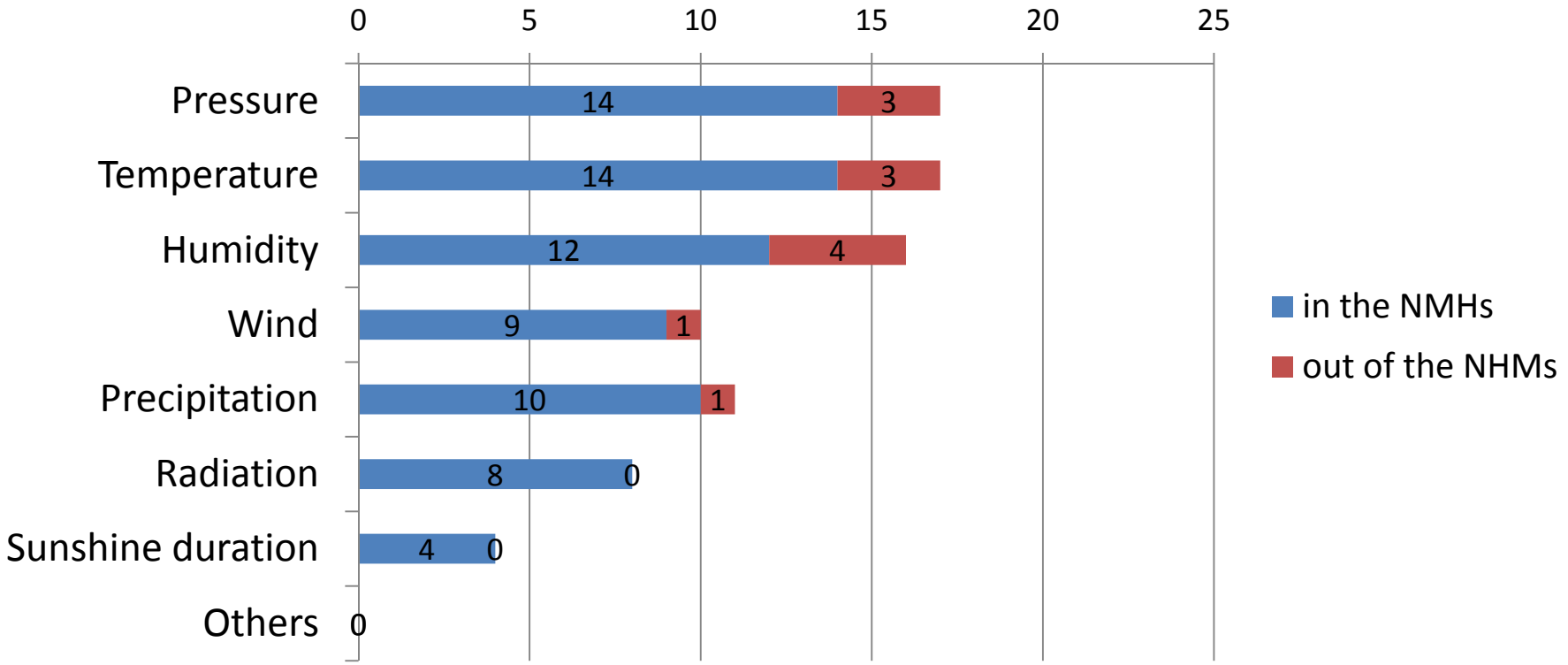
(2) Small number of members calibrate their national meteorological standards with superior standards which are traceable to international standards.

Q 3. Needs for calibration of standard instruments with RIC or RRC standards



67% has needs of calibration with RIC or RRC standards.
Top 3 of needs are pressure, temperature and humidity.

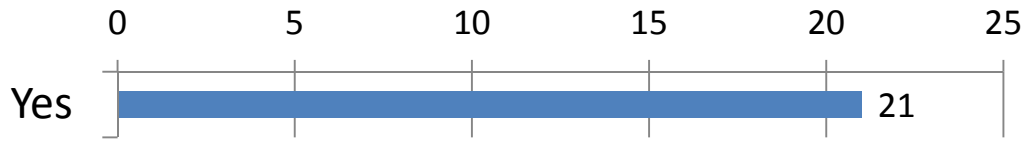
Q 4. Calibration laboratories



Over 67% have calibration laboratories in pressure, temperature and humidity.

Part II. Training

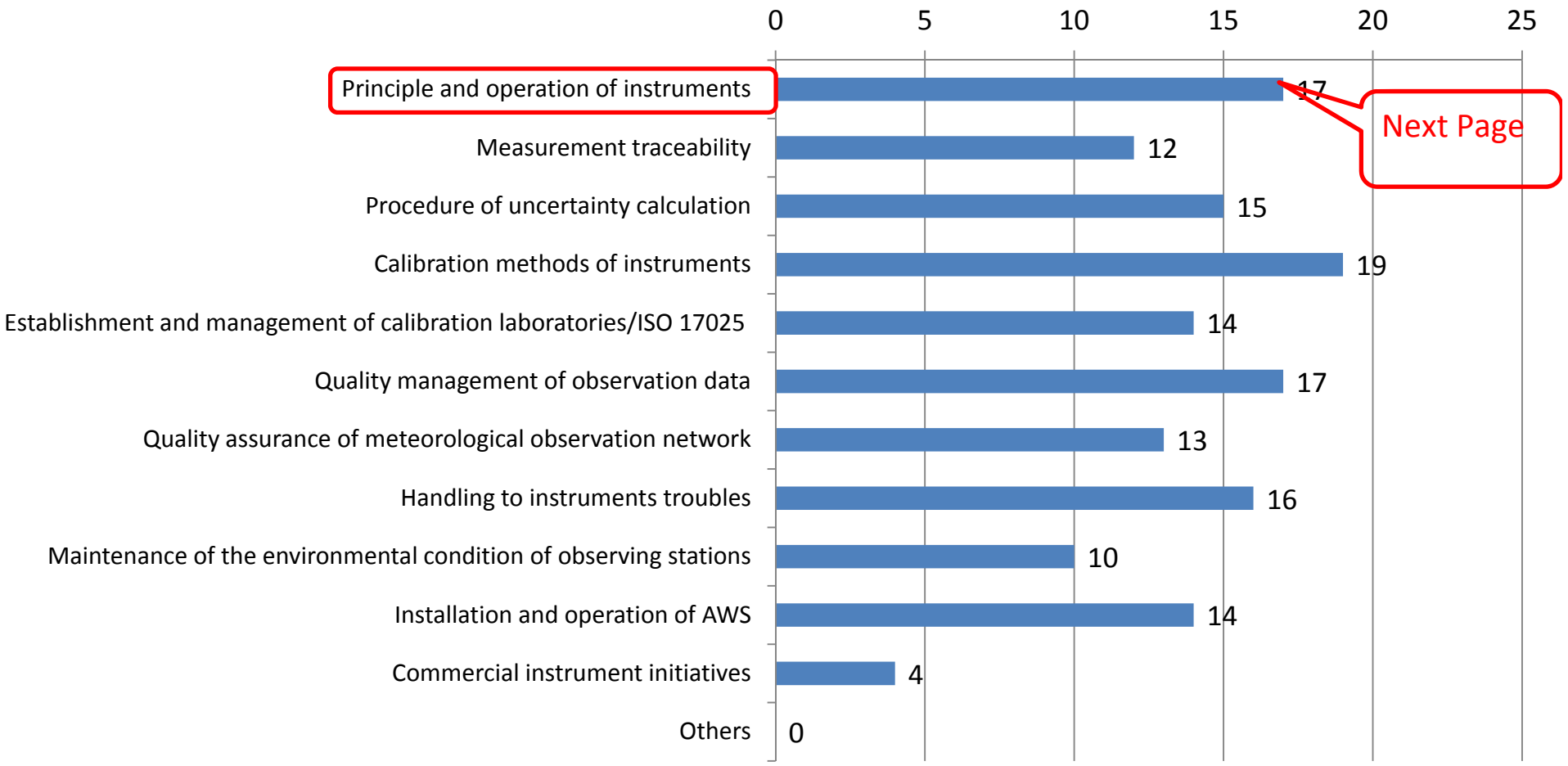
Q 1. Do you wish to join any training courses on meteorological instruments held by RICs?



89% wish to join training courses.

Q 2. If your answer is “Yes” in Q1., which kind of trainings do you require? Please tick the appropriate boxes.

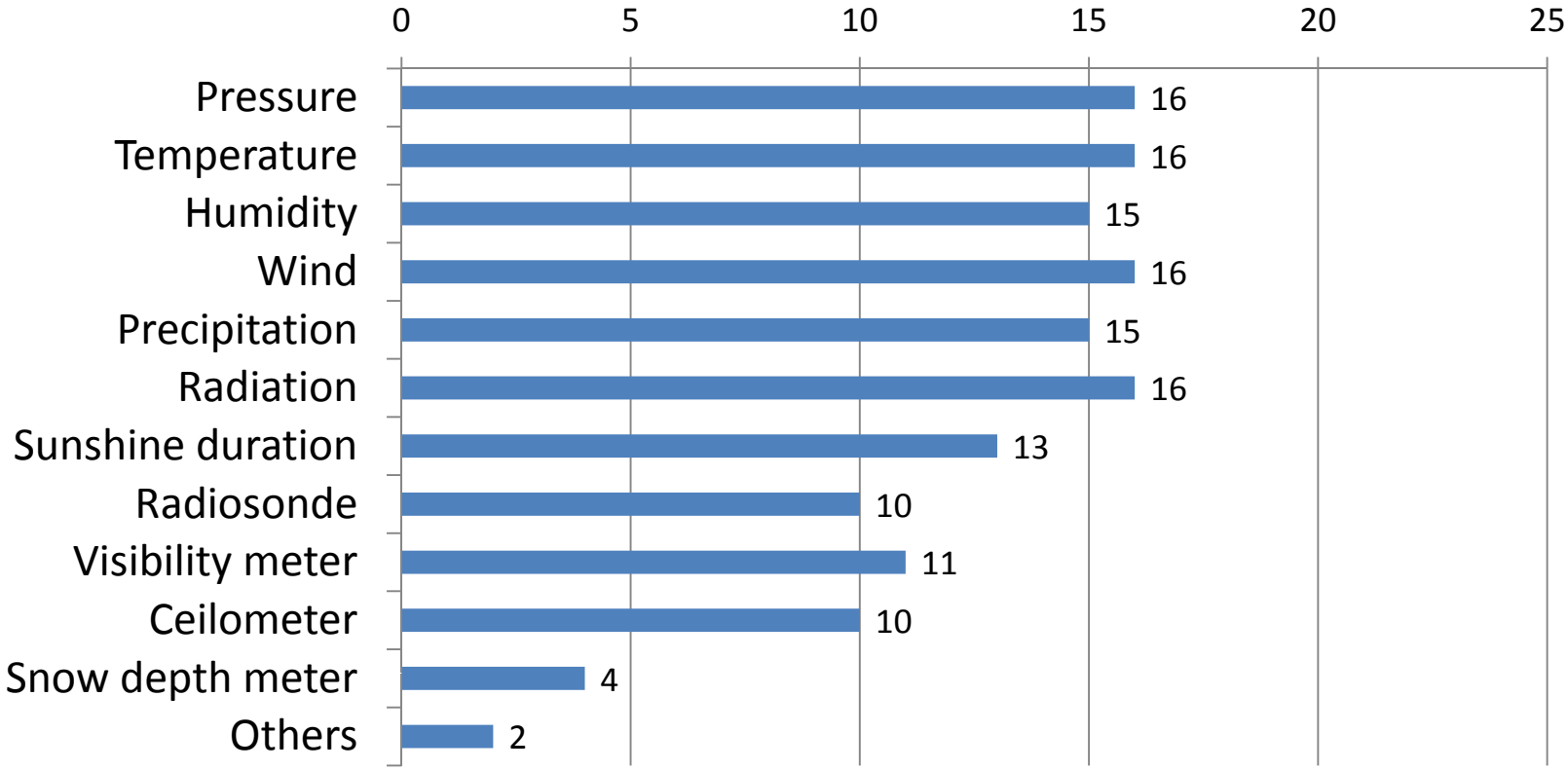
Q 2. If your answer is “Yes” in Q1., which kind of trainings do you require? Please tick the appropriate boxes.



Q 2. If your answer is “Yes” in Q1., which kind of trainings do you require? Please tick the appropriate boxes.

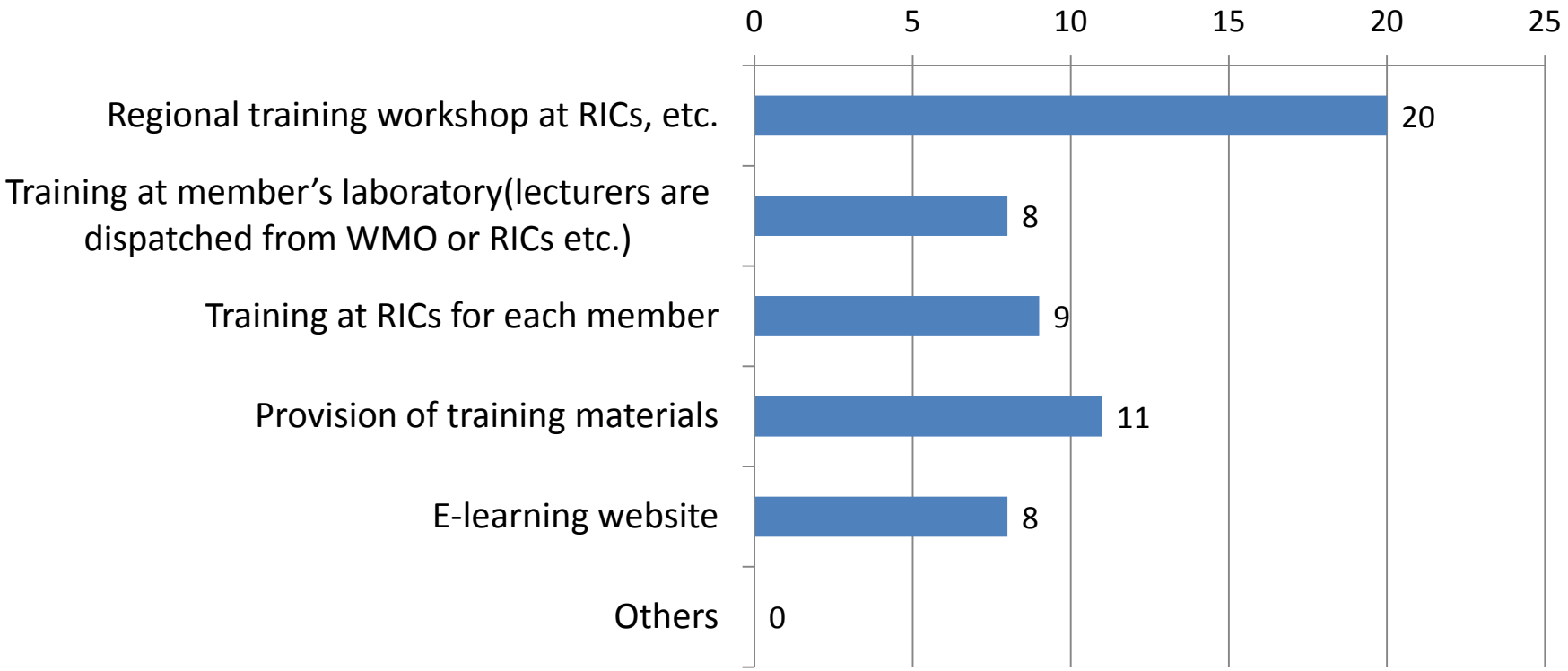
Principle and operation of instrument

Which instruments do you wish to be trained about?



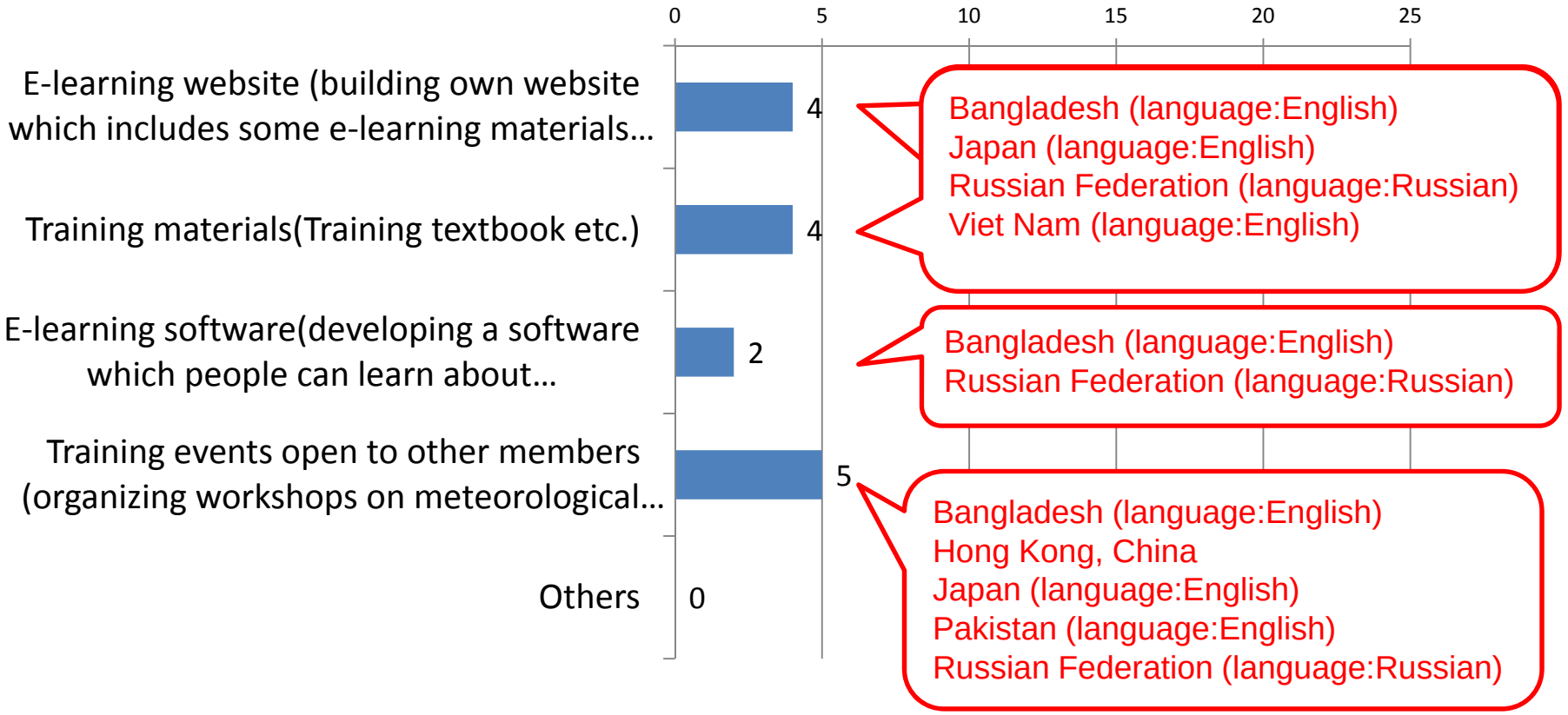
Most of them wish pressure, temperature, humidity, wind, precipitation and radiation.

Q 3. If your answer is “Yes” in Q2., how do you wish the training programs are conducted ?



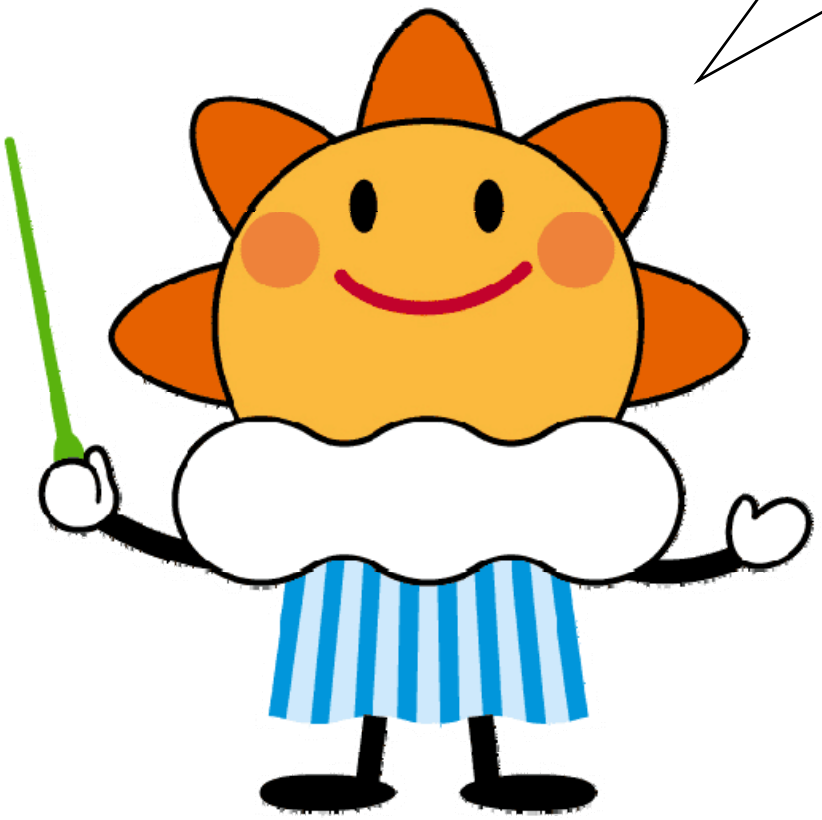
83% wish regional training workshop at RICs, etc.

Q 4. Do you have any training courses or materials which can be shared among RAII members? Please tick the appropriate boxes.



English and Russian language course or materials can be offered by some members.

Thank You!



Mascot of JMA ”Harerun”