



## **EURAMET Task Group ENVIRONMENT**

**Andrea Merlone**

Madrid and Tres Cantos, Spain  
15 – 18 May 2017

# EMRP and EMPIR ENV calls

2009	Energy	
2010	Environment	
	Metrology for Industry	
2011	Health	
	SI broader scope	
	New Technologies	
2012	Metrology for Industry	
	SI broader scope	
	Open excellence call	
2013	Energy	
	Environment	

Year	Call	EU contribution M€	Target % for non NMI/DIs
2014	2014-1 Industry JRPs	23.00	30 %
	2104-2 Research Potential JRPs	1.50	10 %
	2014-3 SIPs	0.50	0 %
2015	2015-1 Health JRPs	20.40	35 %
	2015-2 SI JRPs	12.00	20 %
	2015-3 Normative JRPs	4.80	30 %
	2015-4 Research Potential JRPs	2.30	10 %
	2015-5 SIPs	0.50	0 %
2016	2016-1 ENV JRPs	20.00	35 %
	2016-2 ENV JRPs	20.00	35 %
	2016-3 Normative JRPs	4.70	30 %
	2016-4 Research potential JRPs	2.30	10 %
	2016-5 SIPs	0.50	0 %
2017	2017 -1 Fundamental JRPs	15.60	40 %
	2017-2 Industry JRPs	24.30	30 %
	2017-3 Normative JRPs	4.80	30 %
	2017-4 Research Potential JRPs	2.30	10 %
	2017-5 SIPs	0.50	0 %
2018	2018-1 SI JRPs	21.00	20 %
	2018-2 Health JRPs	21.00	35 %
	2018-3 Normative JRPs	5.00	30 %
	2018-4 SIPs	0.50	0 %
2019	2019-1 ENV JRPs	20.00	35 %
	2019-2 ENV JRPs	20.00	35 %
	2019-3 Normative JRPs	4.80	30 %
	2019-4 undefined JRPs	2.20	0 %
	2019-5 SIPs	0.50	0 %
2020	2020-1 Industry JRPs	14.80	30 %
	2020-2 Fundamental JRPs	15.80	39 %
	2020-3 Normative JRPs	5.00	30 %
	2020-4 undefined JRPs	8.90	0 %
	2020-5 SIPs	0.50	0 %
Total		300.00	

**In spring 2016 EURAMET publishes the first impact report about the joint research project and activities started with the EMRP call of 2010.**

EMRP projects’:

[www.euramet.org/emrp-industry-environment-2010](http://www.euramet.org/emrp-industry-environment-2010)

and

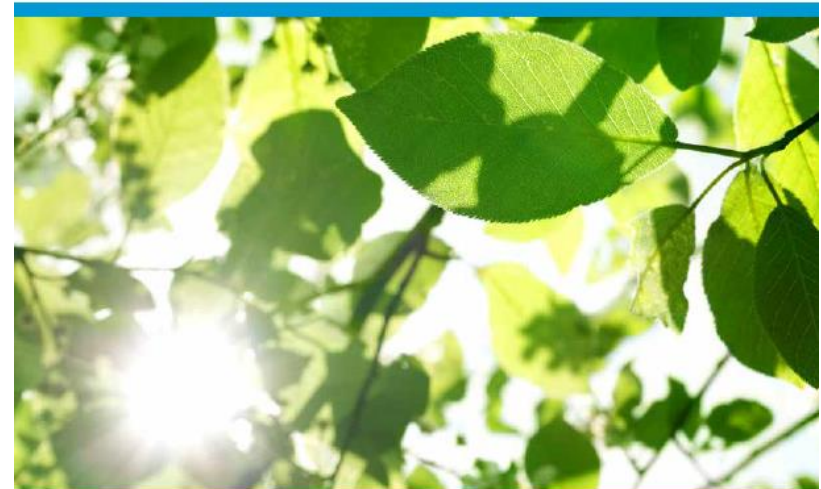
[www.euramet.org/emrp-energy-environment-2013](http://www.euramet.org/emrp-energy-environment-2013)

Case studies

[www.euramet.org/metrology-for-societys-challenges/metrology-for-environment/impact-casestudies-emrp-environment-theme/](http://www.euramet.org/metrology-for-societys-challenges/metrology-for-environment/impact-casestudies-emrp-environment-theme/)



European Metrology  
Research Programme



## Environment impact report

A summary of the outputs and impact of the first EMRP joint research projects in Environment.

The aim of this theme is to improve data quality for environmental policy making, underpin environmental research activities and stimulate technological innovation. The research is focused at both the local environmental level for air, water and soil quality and at the global level for challenges relating to climate change.

EURAMET e.V. - the European Association of National Metrology Institutes

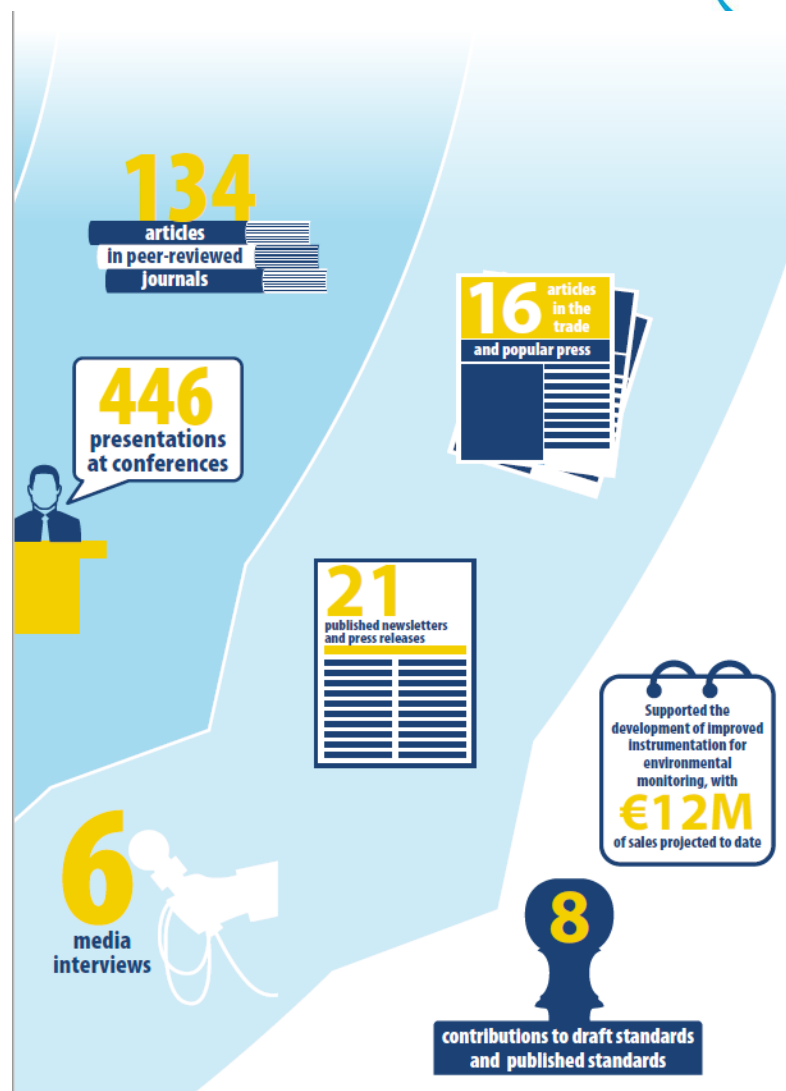
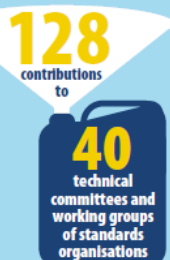
# EURAMET Environment Projects impact numbers



## First EMRP Environment projects at a glance



Pooling expertise of  
**45** NMIs and **25** European countries  
plus the NMIs from **USA, Japan, Korea, and New Zealand**



- TG members are **experts in the different areas completing the several environmental metrology aspects**. They represent the competence of the member organizations in EURAMET in such fields. **Representatives of relevant Institutions** operating in the field of environmental sciences are included with the status of observers.



# EURAMET TG ENV Members



## Convener



Andrea Merlone  
INRiM



Annarita Baldan  
VSL



Carmen Garcia I.  
CEM



Ryszard Broda  
Polatom



Bernd Güttler  
PTB



Volker Ebert  
PTB



Richard Brown  
NPL



Julian Groebner  
PMOD - WRC



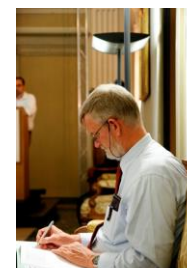
Eric Georgin  
LNE - CETIAT



Ragne Emardson  
SP



Bertrand Calpini  
WMO – CIMO  
(MeteoSwiss)



Roger Atkinson  
WMO - CIMO

- To develop a Strategic Research Agenda for metrology for environment;
- To support and to complement the work of the EURAMET TCs in metrology for environment;
- To liaise with relevant Institutions working in the field of environmental sciences, including International Organizations, public and private research centers, universities, environmental protection and hydro meteorological agencies, manufacturers,
- To support and act for the development of standards, best practice, measurement methods and measurement structures;
- To facilitate proposals for research topics for joint research projects and to update and elaborate roadmaps;
- To disseminate when appropriate expertise and knowledge on metrology for environment through seminars, guides and conferences.

## 2.2.2 Environmental Grand Challenge

### KEY CHALLENGES

The European Union (EU) have stated that “*Environmental quality is considered central to health and well-being.*”, and have introduced laws “*... to ensure the careful use of natural resources, to minimise adverse environmental impact of production and consumption ...*” Furthermore, the EU strives for “*... tighter environmental standards and for effective action against climate change*”<sup>1</sup>.

Many of the challenges that Europe faces in order to promote innovation and ensure sustainable growth in the future are dependent on addressing environmental grand challenges, specifically in the areas of **climate change** [e.g. Directive 2003/87/EC<sup>2</sup>], and **environmental sustainability and pollution** [e.g. Directives 2004/107/EC<sup>3</sup>, 2008/50/EC<sup>4</sup>, 2000/60/EC<sup>5</sup>, 2010/75/EU<sup>6</sup> and 2002/49/EC<sup>7</sup>]. Furthermore, there are international protocols and treaties to which the Member States in Europe are party, e.g. Geneva Convention on Long-range Transboundary Air Pollution<sup>8</sup>, Kyoto Protocol<sup>9</sup>, ‘Rio +20’<sup>10</sup>, and Minamata Convention on Mercury<sup>11</sup> that demand and drive international collaboration on environmental metrology.

*“To prevent the most severe impacts of climate change, the international community has agreed that global warming should be kept below 2 °C compared to the temperature in pre-industrial times.”<sup>12</sup>*

*“Preventing dangerous climate change is a strategic priority for the European Union.”*

*“Reining in climate change carries a cost, but doing nothing would be far more expensive in the long run.”<sup>13</sup>*





A survey to all TCs was prepared and circulated, to include all areas of interest in the SRA.

The input were also based on TCs roadmaps



Task Group “Metrology for Environment”



## Meetings with TCs

Survey on EURAMET Technical Committees activities in “Metrology for Environment”.

Please fill the table below, with as many rows as the major activities of your TC and TC members in Metrology for Environment.

TC	Scientific area	Short motivation (Max 500 characters)
TC-T	Air temperature	Earth air temperature records are nowadays the basis for climate trend analysis through historical series homogenisation. Studies for complete evaluation of uncertainty components on air temperature are required both for ground based and upper air measurements
	Humidity	Water vapour is the most important greenhouse gas and a key component of atmospheric effects. Measurement of atmospheric humidity is essential to understand atmospheric radiation transport, atmospheric chemistry, cloud formation or precipitation.
	Sea temperature	Sea temperature is a critical input quantity for atmospheric circulation, forecast models and climatology. Although calibration uncertainties can be checked by research laboratories “at” the calibration points, it appears more difficult to verify whether stability of the instruments, environmental conditions linearization equations preserves such accuracy. Numerous studies are being conducted in the marine environment, where the temperature of the water column has a fundamental contribution.

# Two main areas



## *Climate*

**Creation of reference network of comparable ground based stations.**

**Marine environment**

**Atmospheric physical parameters**

**Paleo-Climatoogy**

**Arctic environment - Cryogeny**

**Satellite based observations**

**Environmental forensics  
Noise pollution**

## *Pollution*

**Chemistry of gas**

**Aerosols (particulates in ambient air)**

**Carbon**

**reference materials for contaminants**

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# Interaction with global networks



European NMIs have become members of institutions and committees dealing with environmental issues, e.g. WMO commissions, GAW, ISTI, GCOS GRUAN, BSRN, IRS, GEO and CEOS. Conversely, experts in meteorology and climatology now participate in working groups and task groups of CIPM's CCs and EURAMET.



# WMO Commission of Instruments and Methods of Observation



WMO-OMM  
Dr W. Zhang  
Director, Observing and Information Systems  
Department  
7 bis, avenue de la Paix  
Case Postale 2300  
CH- 1211 Genève 2  
Suisse

Sèvres, 14 November 2014

Dear Dr Zhang,

I have the pleasure to accept your kind invitation, for representatives of the Consultative Committee for Thermometry (CCT) of the CIPM, to participate in a number of WMO CIMO Expert Teams where collaboration would be pertinent, perfectly in line with the signature made by the WMO of the CIPM MRA in 2010. For this purpose, I have identified five expert teams where CCT participation could be of mutual benefit. These are listed in the enclosed annex, as well as the contact details of the persons that I have nominated, respectively.

The CCT, under the auspices of the CIPM, has recently formed a Task Group on Environment – particularly dedicated to issues related to thermometry and humidity – to notably identify where our particular expertise in metrology and associated technologies may best contribute to progress within climatology and environmental issues. The group has also the task to promote a coherent and comprehensive approach on thermal metrology for environment. It would be of great value if one representative of the WMO CIMO may participate in this group. For this reason I kindly invite you to nominate a member to take part.

I am looking forward to a constructive collaboration.

With my best regards,

Dr Yuning Duan  
President of the Consultative Committee for Thermometry  
Member of the International Committee for Weights and Measures (CIPM)

**BIPM**



Andrea Merlone (INRiM) on A1 Expert Team on  
Operational In Situ Technologies

Michael de Podesta (NPL) on A.2 Expert Team on  
Developments in Situ Technologies

Carmen Garcia Izquierdo (CEM) on A.3 Expert Team on  
Instrument Intercomparisons

Michael de Podesta (NPL) on C.1 Expert Team on  
Operational Metrology

Christian Monte (PTB) on A.5 Task Team on  
Radiation References

**BIPM**  
**CCT TG ENV**



**WMO RIC6**  
**Drago Grosely**  
**ARSO**  
**GRUAN**

**Peter Thorne**

# WMO Commission for Climatology



Weather • Climate • Water  
Temps • Climat • Eau

WORLD METEOROLOGICAL ORGANIZATION

CLPA/CCI-16, ANNEX II

## SIXTEENTH SESSION OF COMMISSION FOR CLIMATOLOGY (CCL-16)

### NOMINATION FOR MEMBERS OF OPEN PANELS OF CCI EXPERTS (OPACEs)

Please complete the form in English and return by e-mail ([cca@wmo.int](mailto:cca@wmo.int)) or fax (+41 22 730 80 42)

Country: Italy

1. Title: Dr  
3. Surname: Merlone  
5. Nationality: Italy

2. Gender: Male  
4. First name: Andrea  
6. Date of Birth: 04-01-1970

#### 7. Contact details:

Address:  
Str. delle Cacce 91,  
10135  
Torino

Tel: +39 011 3919 734  
Telefax: +39 011 3919 747  
E-mail: [a.merlone@inrim.it](mailto:a.merlone@inrim.it)

8. Highest Degree: Ph.D.

9. Affiliation: Istituto Nazionale di Ricerca Metrologica

10. Position Held: Senior Researcher

#### 11. Previous contributions to WMO activities:

BIMP-CCT Member of WMO CIMO A1 Expert Team on Operational In Situ Technologies

#### 12. Level of knowledge of working languages:

English Good French Fair Russian None Spanish Fair

#### 13. Nominated as member of the following OPACE (see Annex I)

Please select one or more items within the related OPACE, that pertain to your area of competence.

##### OPACE 1: Climate Data Management

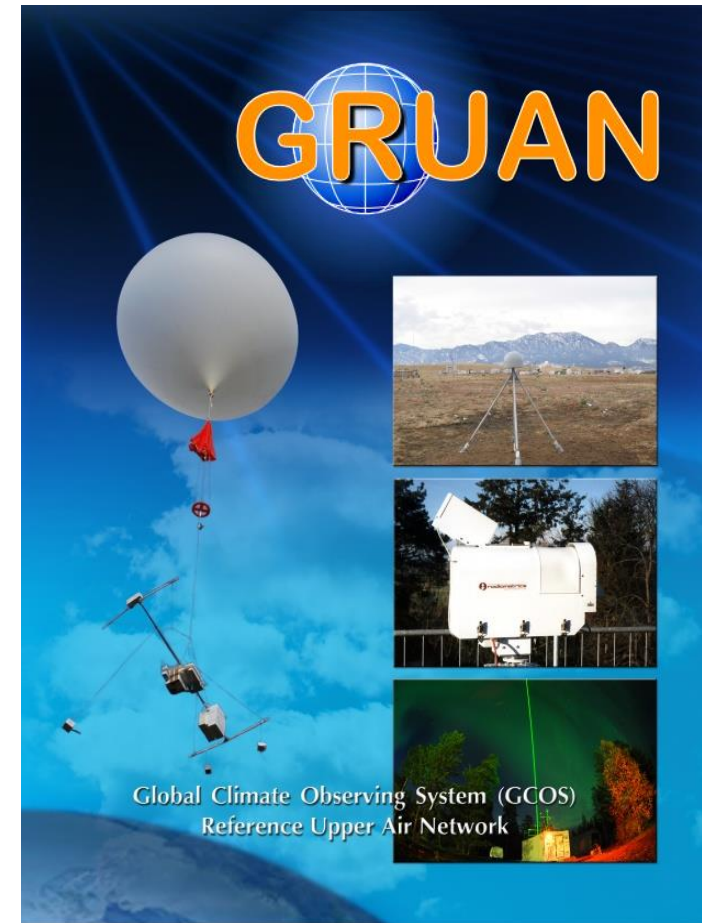
- ☐ Climate Data Management Systems
- ☒ Climate Observations Standards and Practices
- ☒ Climate Observational Needs
- ☐ Climate Data Rescue
- ☒ Climate Data Quality Control

On February 2015 Andrea Merlone  
(**INRiM**) is nominated member of the  
OPACE1 of WMO **Commission for  
Climatology**



# GRUAN Goals

- Maintain observations for several decades
- Focus on complete estimates of measurement uncertainty
- Ensure traceability of measurements to SI units or internationally accepted standards
- Ensure long-term stability by managing instrumental changes
- Measure a large suite of co-related climate variables with deliberate measurement redundancy
- A. Merlone (INRiM), T. Gardiner (NPL)





**2014 CCT launches TG ENV - (A. Merlone Chair)**  
**Links with CCPR**

***Climate***

**Permanent activities in CCQM**

***Pollution***

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Calling all interested parties from standardisation and metrology communities

CEN-CENELEC and EURAMET announce the  
**2<sup>nd</sup> STAIR EMPIR Meeting**

on Thursday, 17 December 2015 at the CEN-CENELEC Meeting Centre in  
 Brussels (Belgium)

with a focus on pre- and co-normative research in metrology  
 for the 2016 EMPIR call

The European Metrology Programme for Innovation and Research, EMPIR, will launch a call for proposals on pre- and co-normative research projects in 2016.

Participants at this meeting are invited to present and discuss ideas for the call and explore related opportunities for cooperation between the standardisation and metrology communities.

The meeting will start with oral presentations on lessons learnt from the 2015 EMPIR call for pre- and co-normative research projects and the EMPIR process. In addition, focussing on Energy and Environment, speakers from the metrology and standardisation communities, will be given the opportunity to present their ideas:

- The EURAMET Task Groups on Energy and Environment will present the technical expertise in previous metrology research projects and their ideas for the EMPIR call 2016
- Standardisation Groups concerned with energy and environment will present the normative research needs necessary to provide the scientific and technical basis for the development of their standards.

Round table discussions and face to face meetings will then follow, giving the opportunity for standardisers and EURAMET representatives to discuss potential research topics that address the standardisation research needs using the expertise of metrology institutes. A break out room will be available for face to face meetings should these be needed.

All interested parties from standardisation and metrology communities are welcome to attend.

Information and registration: [research@cencenelec.eu](mailto:research@cencenelec.eu)  
 Deadline for registration: 9 December 2015 (please note that places are limited)



Carmen Garcia I.  
 CEM

# Standards for users





# Standards for users



**Bertrand Calpini**  
WMO – CIMO  
President

WEATHER CLIMATE WATER  
TEMPS CLIMAT EAU

## Panel discussion session 3

Bertrand Calpini, Bruce Forgan, Jitze van der Meulen



**WMO OMM**

World Meteorological Organization  
Organisation météorologique mondiale

**Sept 2016 @ TECO**



# Current CIMO mission

Promote:

- high quality observational data
- world-wide compatibility

by:

- Defining technical standards,
- Testing and calibration
- Performing instrument intercomparisons,
- Implementing quality control procedures.
- Increasing expertise and Capacity-building

for:

- Improving quality of products and services

**mission**

**achievement**

**vision**



## Future Mission (draft)

Members achieve fit-for-purpose  
environmental measurements through  
appropriate standards and observing  
technologies.



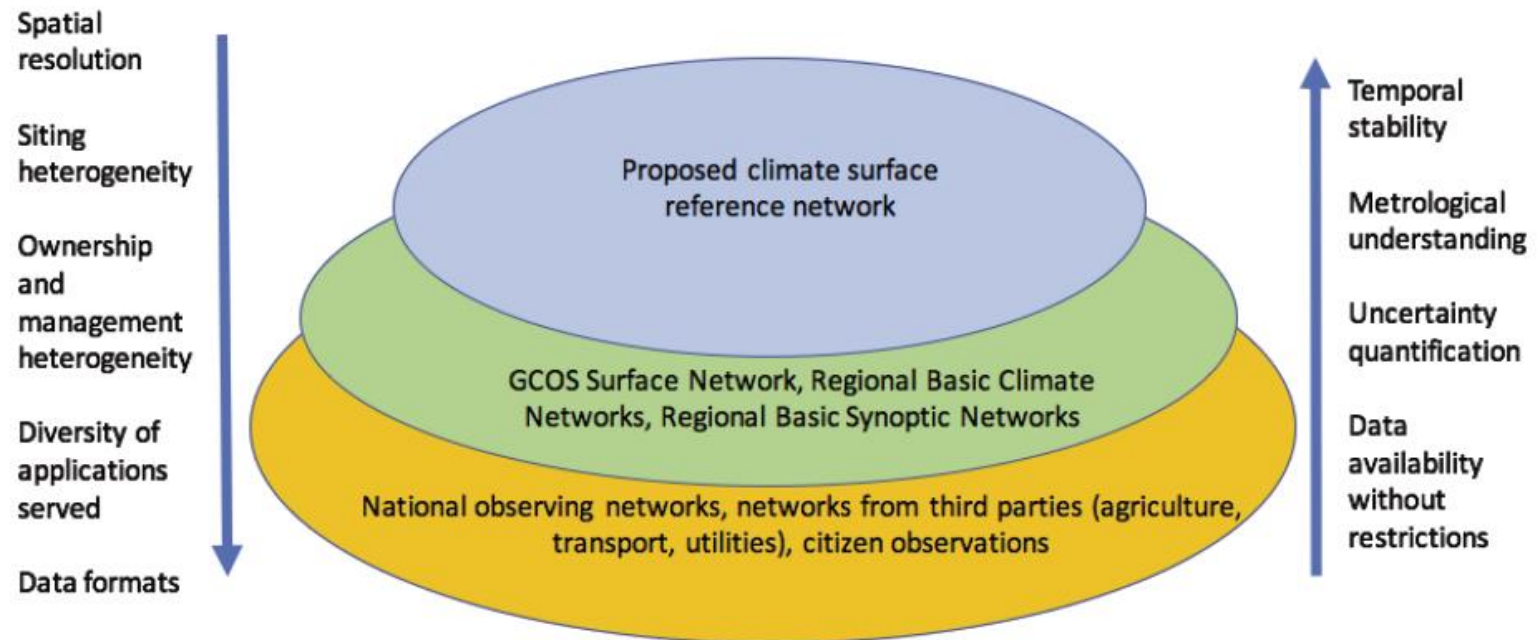
WMO OMM

# The results / outcomes (vision)

- We are used as the source of information on suitability of measurements for specific environmental intelligence (applications)
- Users and providers understand the importance of the measurement process in the environmental information chain.
- Users and providers are committed to traceability of ECV measurements.
- The quality and utility of emerging measurements is documented in the CIMO Guide and reference material.



# Towards a global land surface climate reference network



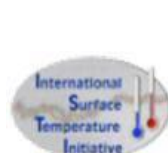
- Focus on complete estimates of measurement uncertainty
- Ensure traceability of measurements to SI units

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# MMC *Slovenija* 2014



METROLOGY FOR METEOROLOGY AND CLIMATE



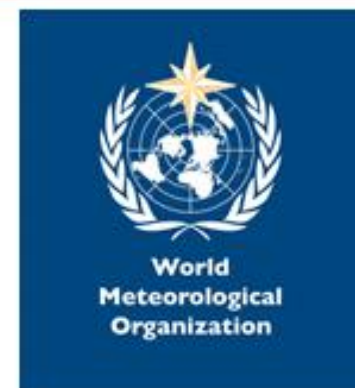


**MMC** <sup>Spain</sup> **2016**



METROLOGY FOR METEOROLOGY AND CLIMATE

**&**



**26-30 September 2016**  
**Spain (Madrid)**

**CIMO-TECO**

***ENVRIPlus Meeting***  
***Soil Moisture Workshop***  
***MeteoMet2 plenary meeting***



**BIPM**



World  
Meteorological  
Organization

**TC-T**

Thermometry  
• EURAMET Technical Committee



**GRUAN**



**TC12**

**APMP**

## NEWS

### Successful international conference on meteorology and climate



Photograph of the opening panel at the WMO TECO and MMC-2016 – Courtesy of INRIM

*MMC-2016, organised as part of EMRP project, facilitated communication and co-operation between metrology and meteorology communities*

The second International Conference on Metrology for Meteorology and Climate (MMC-2016), organised as part of EMRP project [Metrology for essential climate variables](#) (ENV58 MeteoMet2), hosted a number of scientific sessions and satellite events that motivated the in depth discussion of metrology applications for meteorological observations and climate change evaluations.

The conference also covered the achievements of EMRP project ENV58, which investigated the traceability of essential climate variables to the SI.

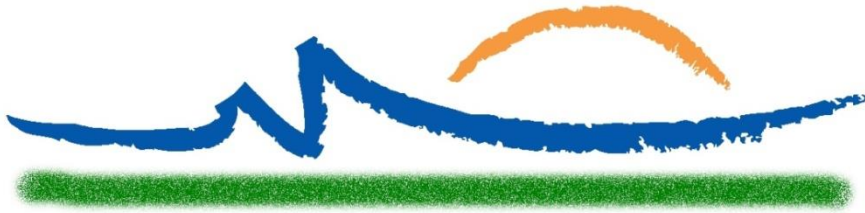
MMC-2016 was held in Madrid at the end of September 2016. It was organised in conjunction with the WMO 'TECO' conference and the Meteorological Technical World Expo 2016.



## Satellite events



MMC <sup>Spain</sup> 2016



METROLOGY FOR METEOROLOGY AND CLIMATE

*27 September*

*2 pm to 6 pm*



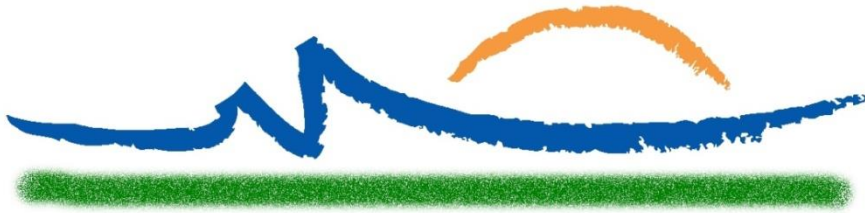
*ENVRIPlus Meeting*  
*Chair Vito Vitale*  
*ISAC CNR*



## Satellite events



MMC <sup>Spain</sup> 2016



METROLOGY FOR METEOROLOGY AND CLIMATE

*28 September*

*9 am to 5 pm*

***SOIL MOISTURE  
WORKSHOP***

*Chair Stephanie Bell  
NPL*

# MMC 2019

Hosted by

Tempmeko & Tempbeijing

October 2019

Beijing - China



Conference Announcement ¶

MMC <sup>Beijing - China</sup> 2019



METROLOGY FOR METEOROLOGY AND CLIMATE

October 2019 in Beijing - China ¶

Hosted by Tempmeko & Tempbeijing ¶

Organised by MeteoMet ¶

and the National Institute of Metrology (NIM), Beijing - China ¶

The conference will bring together world-leading experts in measurement for meteorology and climate, in a joint event with the thermal metrology community attending Tempmeko, the International Symposium on Temperature and Thermal Measurements in Industry and Science, and Tempbeijing, the International Conference on Temperature and Thermal Measurement. ¶



For preliminary information on the event, venue, exhibition, please contact ¶

Andrea Merlone — [a.merlone@inrim.it](mailto:a.merlone@inrim.it) ¶





# •Break out session @ Arctic Circle 2015



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REGISTER FOR THE  
2015 ASSEMBLY  
16 -18 OCTOBER

## 2015 PROGRAM

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[2014](#) [IMAGES](#) [VIDEO](#)



HÁSKÓLINN Í REYKJAVÍK  
REYKJAVÍK UNIVERSITY

### THE FUTURE OF ENERGY SECURITY IN THE ARCTIC

The Iceland School of Energy will organize a session on Thursday, October 15th, about the future of Arctic energy, with considerations of environmental and human security. The session will be organized in cooperation with the Harvard Kennedy School of Government and the Fletcher School of Law and Diplomacy at Tufts University.



### THE FOREIGN MINISTER OF CHINA

The Opening Session of the 2015 Arctic Circle Assembly will include an address by the Foreign Minister of the People's Republic China, Wang Yi.



### METROLOGY FOR ENVIRONMENT IN THE ARCTIC

High-accuracy measurements are needed to understand the evolution of the Arctic environment in its many extremes. EURAMET, the European Association of National Metrology Institutes, is hosting a breakout session promoting common activities between metrology and Arctic scientific research to improve data quality.

REYKJAVIK, ICELAND  
FRIDAY, OCTOBER 16, 2015



PARIS2015  
UN CLIMATE CHANGE CONFERENCE  
COP21·CMP11





## Arctic Circle 2015 2015 ASSEMBLY

Reykjavík, Iceland  
October 15-18

Arctic Circle 2015 Assembly, Reykjavík, Iceland, October 15-18



# •Break out session @ Arctic Circle 2015

Bureau  
International des  
Poids et  
Mesures

Letter for the Opening of the Breakout Session "Metrology for Environment in the Arctic"  
at the occasion of the Arctic Circle Assembly  
18 October 2015  
Dr Martin J. T. Milton  
Director of the International Bureau of Weights and Measures  
Pavillon de Breteuil, Sèvres



**Martin Milton**  
**BIPM Director**

Stable references and a  
I am therefore delighted, as  
Director of BIPM, to endorse and  
support the session  
«Metrology for Environment  
in the Arctic»  
of the Arctic Circle Assembly

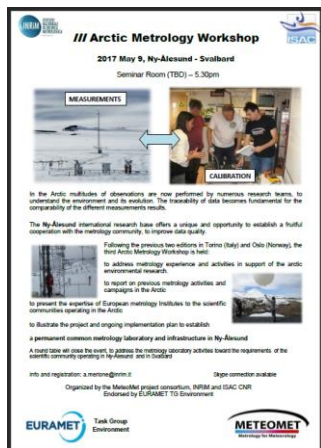
A handwritten signature in blue ink, appearing to read "M. Milton", written in a cursive style.

INTERNATIONAL  
BUREAU  
OF WEIGHTS AND MEASURES

PAVILLON DE BRETEUIL F-92312 SÈVRES CEDEX  
TEL: +33 1 45 07 70 70 - FAX: +33 1 45 34 20 21  
[www.bipm.org](http://www.bipm.org)



# Arctic Metrology Workshops



1<sup>st</sup> Torino, April 2015  
2<sup>nd</sup> Oslo, May 2016  
3<sup>rd</sup> Ny-Ålesund, May 2017





## New Arctic Meteo in-situ calibration

Accurate assessment of climate change relies on a world-wide network of monitoring stations that provide the high-quality data used in climate models to produce climate predictions. This requires measurements of internationally agreed essential climate variables, such as pressure, temperature and humidity, which must be comparable regardless of where they're collected – be it from a mountain in the Himalayas or an Arctic peninsula.

### Europe's National Measurement Institutes working together

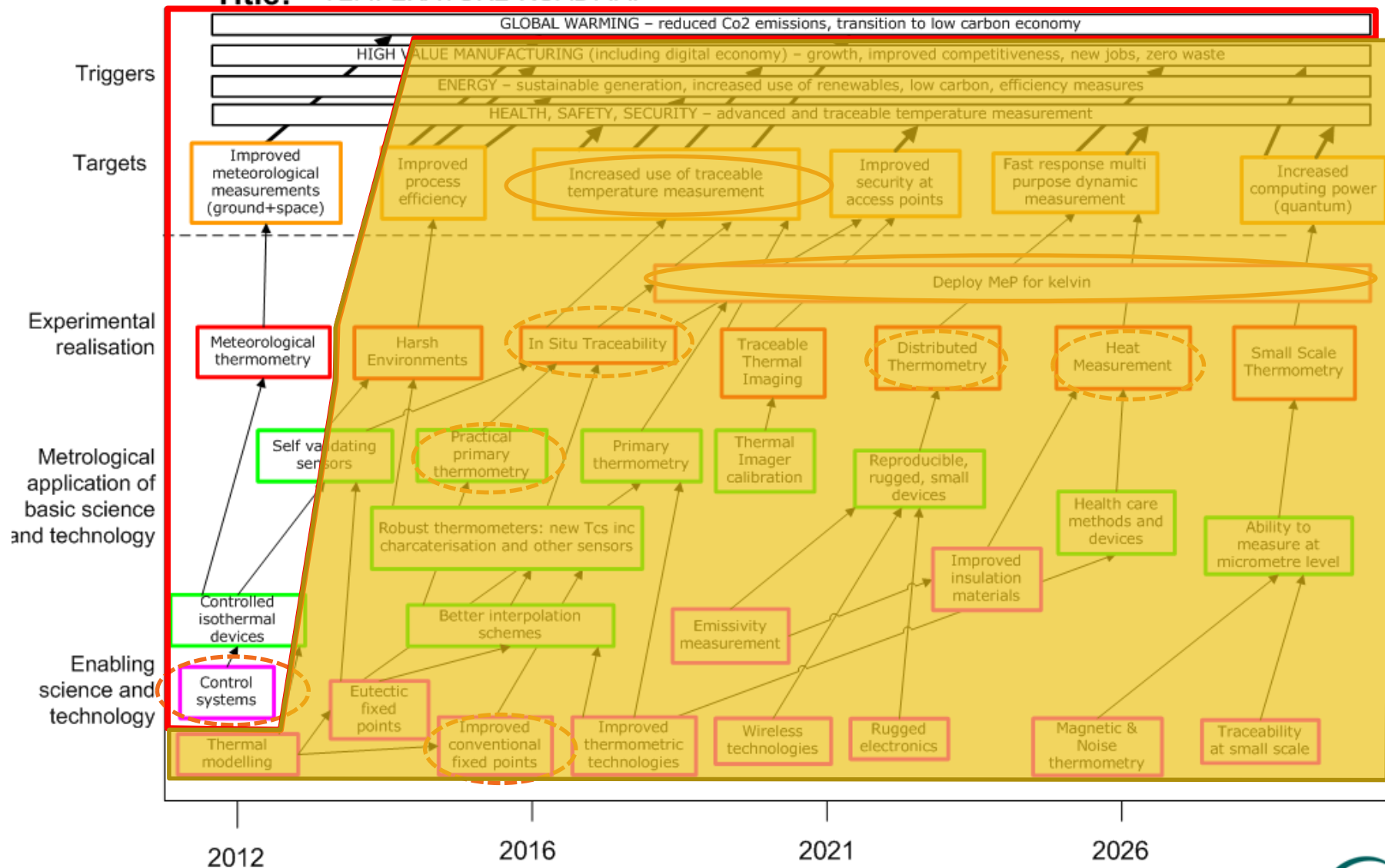
The European Metrology Research Programme (EMRP) brings together National Measurement Institutes in 23 countries to address key measurement challenges at a European level. It supports collaborative research to ensure that measurement science meets the future needs of industry and wider society.



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## Title: TEMPERATURE ROADMAP



## Areas of interest for future activities of TC-T members Meeting planned in 2018.

- ❑ Improved earth observation for climate monitoring using remote sensing techniques is becoming increasingly common and important and includes the **traceable linkage between space based and surface based remote sensing measurements**
- ❑ **Atmospheric upper air measurements (i.e. GCOS - GRUAN), ocean science**
- ❑ Climate trends in **key environmental areas**, like **arctic and alpine regions** are significantly amplified: accurate measurements to quickly capture trends are there of unique importance at a global scale [...] and require self-validating in situ measurements and calibration devices operating in **arctic-based research stations**
- ❑ Small to medium scale of **network of reference stations**, purposely installed for **climatology** are missing and required for the future work of harmonisation and homogenisation
- ❑ Support in **measurement uncertainty evaluations**
- ❑ **Creation, development of common infrastructures, Intercomparisons...**

European Metrology Programme for Innovation and Research

## WORKSHOP

*Presentation of ideas in preparation for the:  
 Targeted Programme Environment in 2016*

**1st December 2015**

Organised by EURAMET Task Group "ENVIRONMET" and INRiM

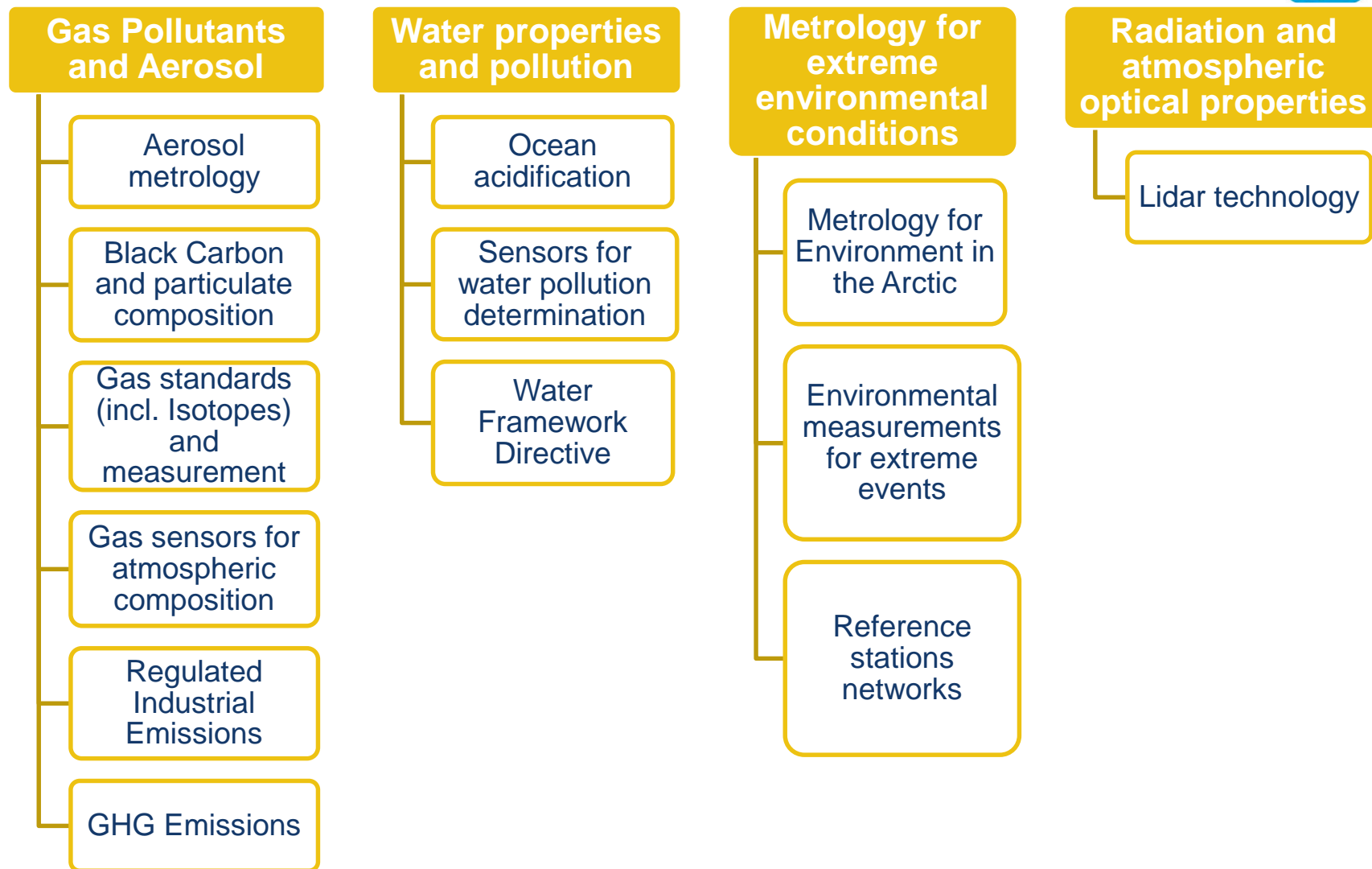
## DRAFT AGENDA

9:00 - 9:30	Registration	<b>First name</b>	<b>Last name</b>
9.30	Opening	Andrea	Merlone
09.40	Welcome from INRiM President	Massimo	Inguscio
9.50	EURAMET-EMPIR - BoD Connection	Maria Luisa	Rastello
10.00	Task Group Environment	Andrea	Merlone
	<b>Keynote lecture</b>	<b>Room</b>	<b>Sala conferenze</b>
10.20	Role of metrology in support of the long-term atmospheric composition observations	Oksana	Tarasova
10.50	<b>Coffee break</b>	<b>Room</b>	<b>Sala espositiva</b>
	<b>Plenary session</b>	<b>Room</b>	<b>Sala conferenze</b>
11.20	Emerging challenges in gas and particle measurements for atmospheric and emissions science	Richard	Brown
11.40	Ideas in gas chemistry and flow for the EMPIR Environment call	Annarita	Baldan
12.00	Metrology in support of long-term assessment of oceanic observables: challenges in the carbonate system measurements	Paola	Fiscaro
12.20	Metrology for environmental extremes	Tom	Gardiner
	Gravity measurements for monitoring environmental		

Presentations available on  
 INRiM home page:

Or directly at  
[http://www.inrim.it/luc/meteo/Presentazioni\\_1\\_dic/Workshop%20Environment/](http://www.inrim.it/luc/meteo/Presentazioni_1_dic/Workshop%20Environment/)

# 2015 EMPIR Workshop outcome



# From EURAMET SRA



Traditionally operating in individual fields, metrology has focused on the improvement of standards for units, carrying out independent research and dissemination.

**Metrology has a critical role to play in**

- ☐ **Monitoring, understanding and predicting climate change**
- ☐ **Enabling the enforcement of EU policies in environment**



Such challenges require global solutions which often exceed the capacity and capability of individual nations and their National Metrology Institutes (NMIs).

Pooling of metrological resources across national boundaries is essential.



**Metrology has a critical role to play in**

- ☐ **Monitoring, understanding and predicting climate change**
- ☐ **Enabling the enforcement of EU policies in environment**

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☐ **Monitoring, understanding and predicting climate change**

☐ **Enabling the enforcement of EU policies in environment**

***Pollution***

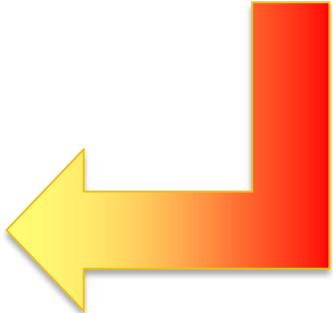
***Climate***

Temperature (Air, sea, ice, sol)  
Humidity, moisture  
Sea water thermophysical properties  
Solar radiation (land-based and remote)  
Wind - Pressure

Air and water quality  
Black Carbon  
Gas monitoring and standards  
Aerosols  
Nuclear (monitoring – wastes)



**TC-T**  
**TC-PR**  
TC-F  
TC-L



**TC-MC**  
**TC-IR**  
TC-AUV  
TC-M

# From EURAMET SRA



## *Climate*

Creation of reference network of comparable ground based stations.

Marine environment

Paleo-climatology (i.e. permafrost)

Arctic Environment

Satellite based observations



**TC-T**  
**TC-PR**  
**TC-F**  
**TC-L**

## *Pollution*

Chemistry of gas

Aerosols (particulates in ambient air)

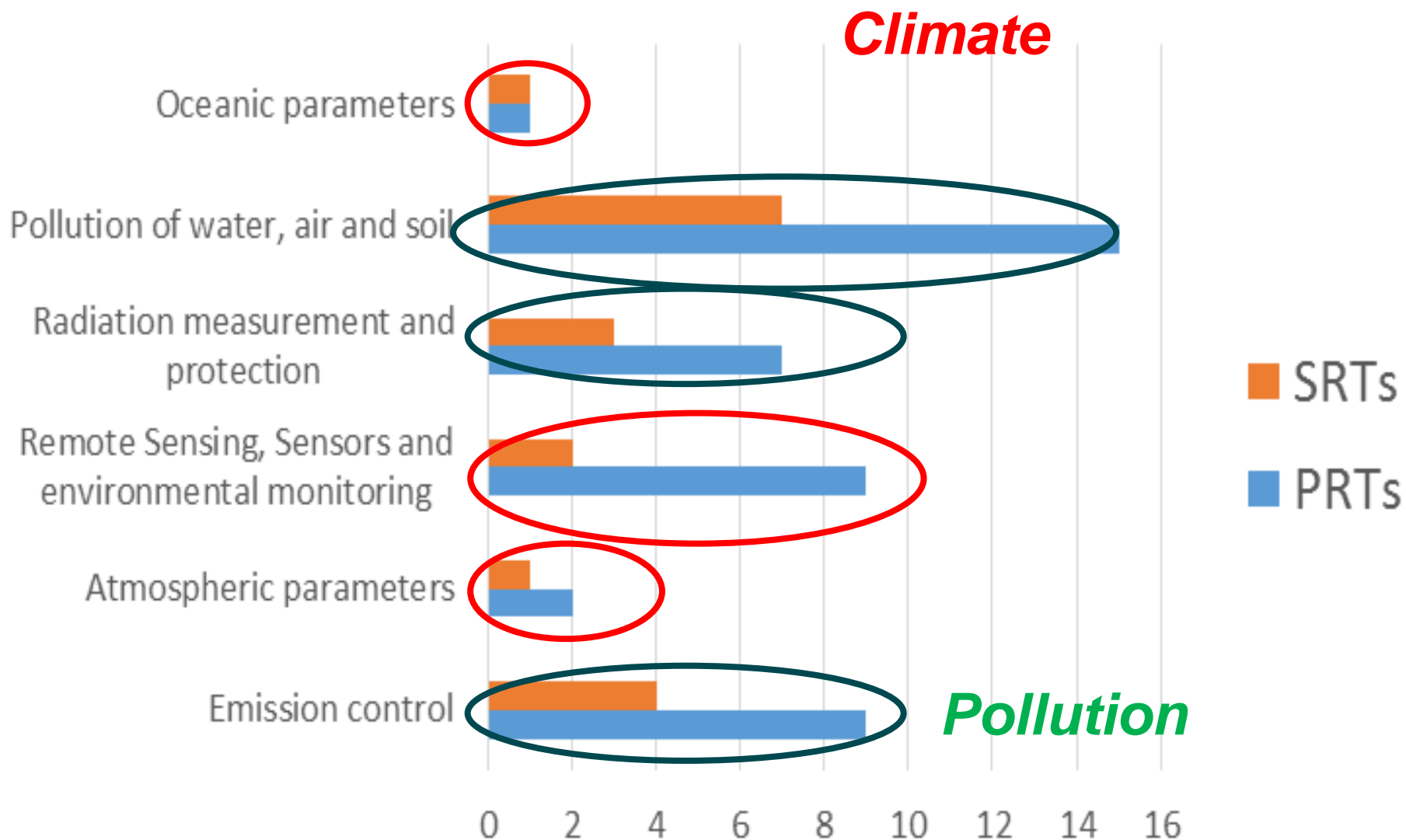
Carbon

Reference materials for **contaminants**

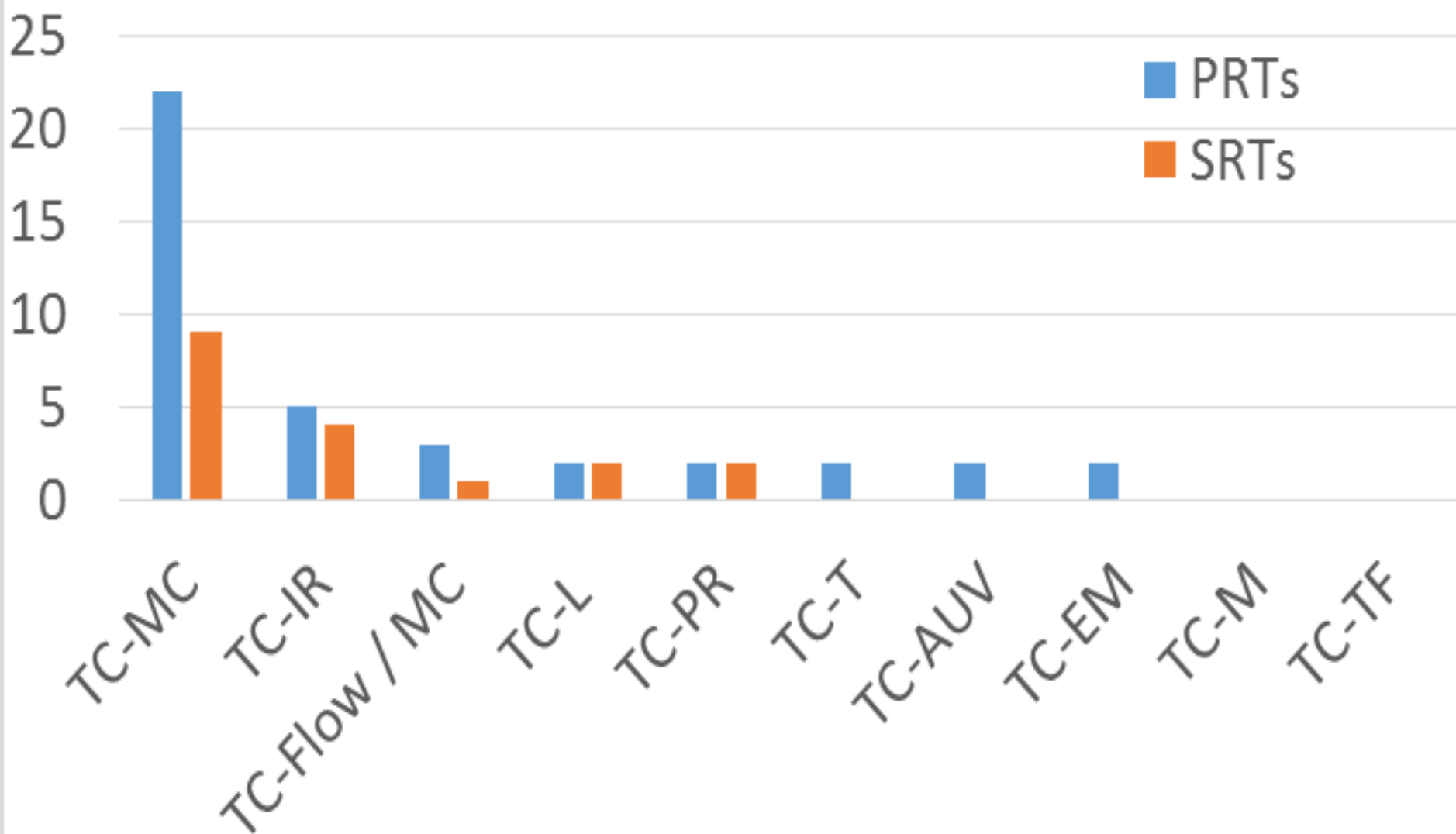


**TC-MC**  
**TC-IR**  
**TC-AUV**  
**TC-M**

# EMPIR Environment Call 2016. Topic classification



## EMPIR Environment Call 2016. TC



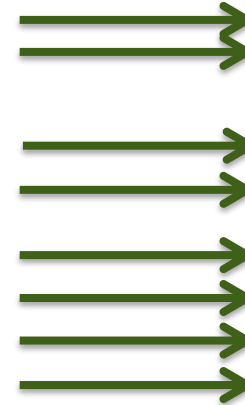
# From 2016 call



*Climate*



Environment ranked list			
1	16ENV01	JRP-v08	MercOx
1	16ENV02	JRP-v15	Black Carbon
3	16ENV03	JRP-v12	MetEOC-3
3	16ENV04	JRP-v18	Preparedness
5	16ENV05	JRP-v16	MetNO2
6	16ENV06	JRP-v07	SIRS
7	16ENV07	JRP-v10	AEROMET
7	16ENV08	JRP-v11	IMPRESS 2
9	16ENV09	JRP-v05	MetroDECOM II
10	16ENV10	JRP-v03	MetroRADON
11		JRP-v17	COLMET
12		JRP-v06	MetAQ
13		JRP-v09	EMANATE
14		JRP-v04	Microplastic
15		JRP-v14	IREMET
15		JRP-v01	TOCCMe
17		JRP-v13	KEY-VOCs II



*Pollution*



**TC-T**  
**TC-PR**  
**TC-F**  
**TC-L**

**TC-MC**  
**TC-IR**  
**TC-L**  
**TC-M**





**2019 call to complete  
and re-balance the SRA topics**



**More focused call scope**



**PRT decisions based also on participating external  
Institutions (i.e. WMO).  
Experts of the topics invited to review PRTs.**

**Stable metrology research services are needed.**

**The three years call schedule hardly matches the dynamics of the stakeholders communities.**



**Creation of permanent joint initiatives in collaboration with the involved communities.**



**A bottom-up processes involving already existing cooperation within and outside NMI.**

**«Hidden joint actions» are already existing within TCs and JRPs.**

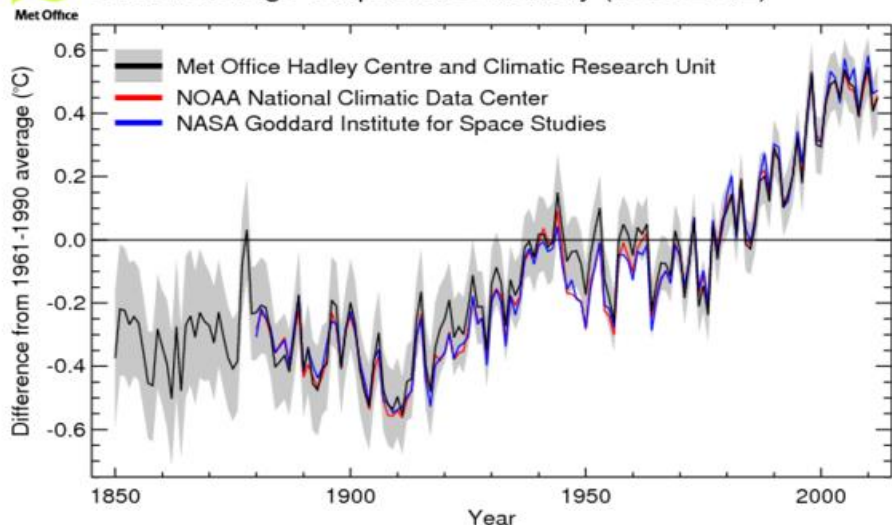
**Launch EURAMET events to support joint JRPs presentations for increasing impact at the end of the calls**

**Official participation of EURAMET to conferences and exhibitions**

**Funds available for inviting relevant experts to TCs and JRPs meeting.**

# Thank you

Global average temperature anomaly (1850-2012)



**Climate**

**Pollution**

Atmospheric CO<sub>2</sub> at Mauna Loa Observatory

