



European Metrology Research Programme (EMRP/EMPIR)

Impact on society and industry

Presented by

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MIRS/UL-FE/LMK

EURAMET Vice-chair (GA)

Prepared with the support

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EURAMET Secretariat Braunschweig, JPC, MSU Teddington



DFM

Danish National Metrology Institute



- EU Metrology Research / HLEG M&T / 5th FP / INITIATION / REGMET / METROTRADE
- MERA, iMERA, iMERA plus, EMRP, EMPIR/CB
- METEOMET

MEASUREMENTS AND TESTING

A European research area orientated activity

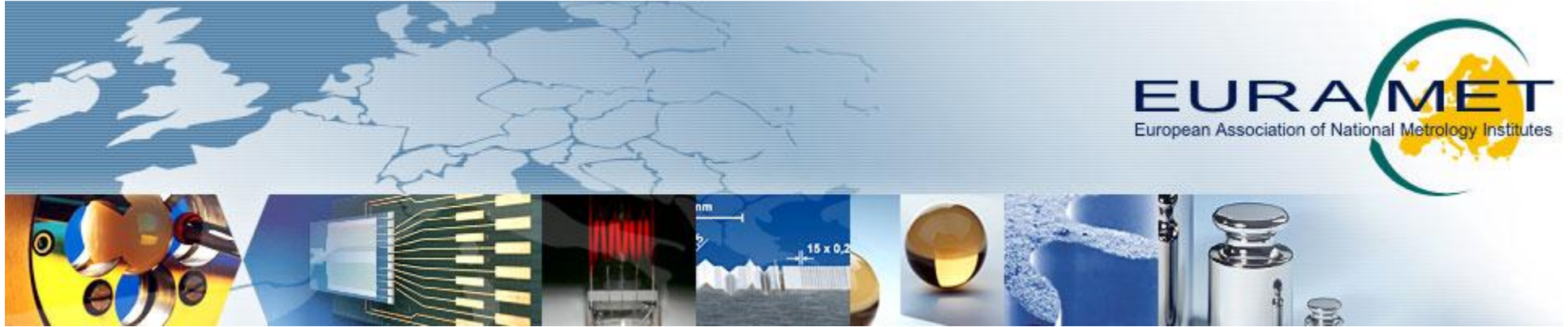
*"There is no science without measurements, no quality
without testing and no global market without standards"*

High Level Expert Group

Brussels, October 27, 2000

VISION

The Measurements and Testing activity (M&T) contributes to the vision of a united, competitive, sustainable and safer Europe by supporting research activities that expand the ability to measure and make the mutual acceptance of measurement and testing results possible. The M&T activity underpins the very development of society: scientific progress, industrial development, globalisation of trade and policy making



Position paper on

M&T Needs in Candidate New Member States

Compiled by the High Level Expert Group on Measurements and Testing under the 5th European Framework Programme Research and Development

MEASUREMENTS AND TESTING IN RELATION TO THE FIGHT AGAINST CRIME AND FRAUD

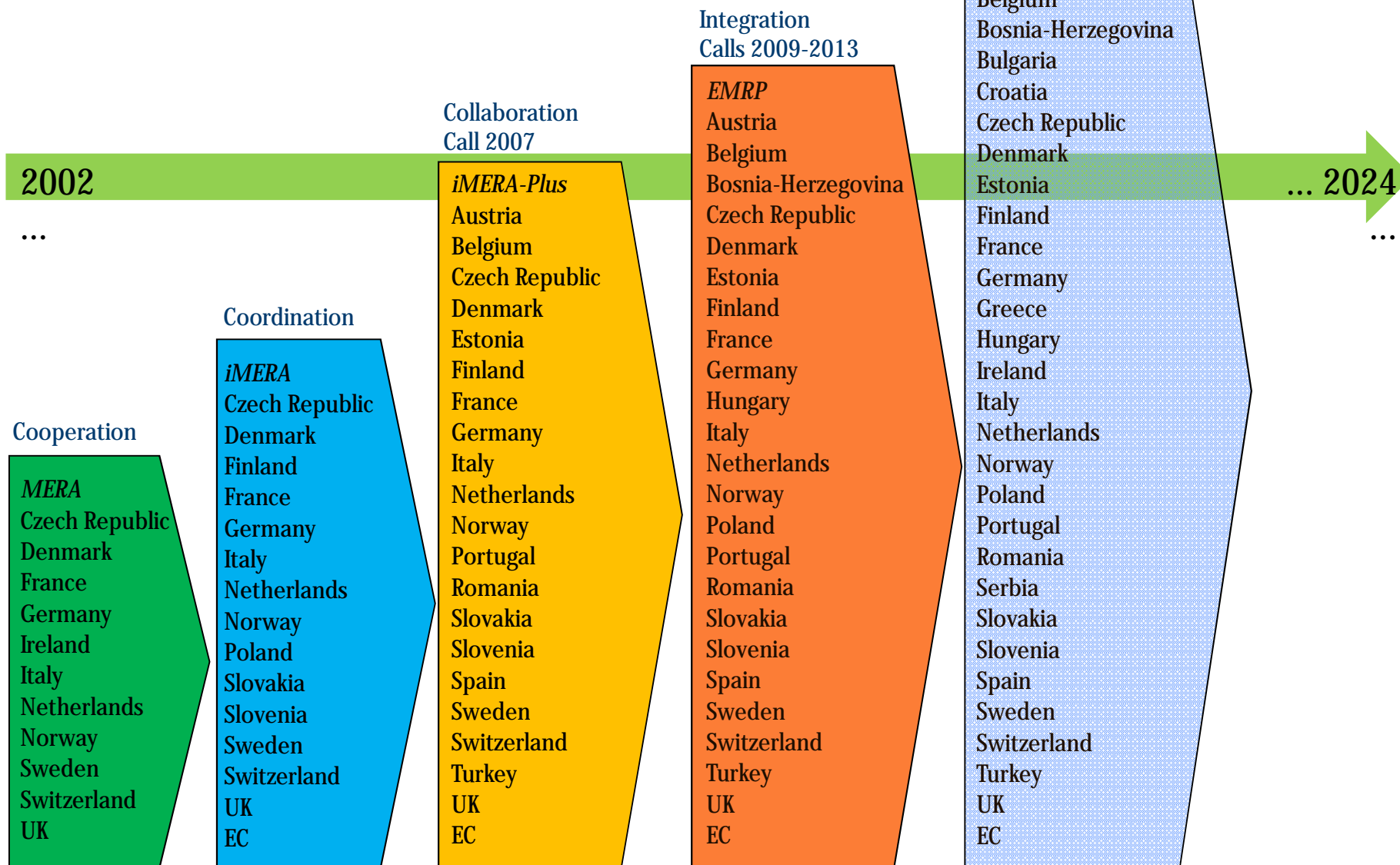
High Level Expert Group for Measurements and Testing

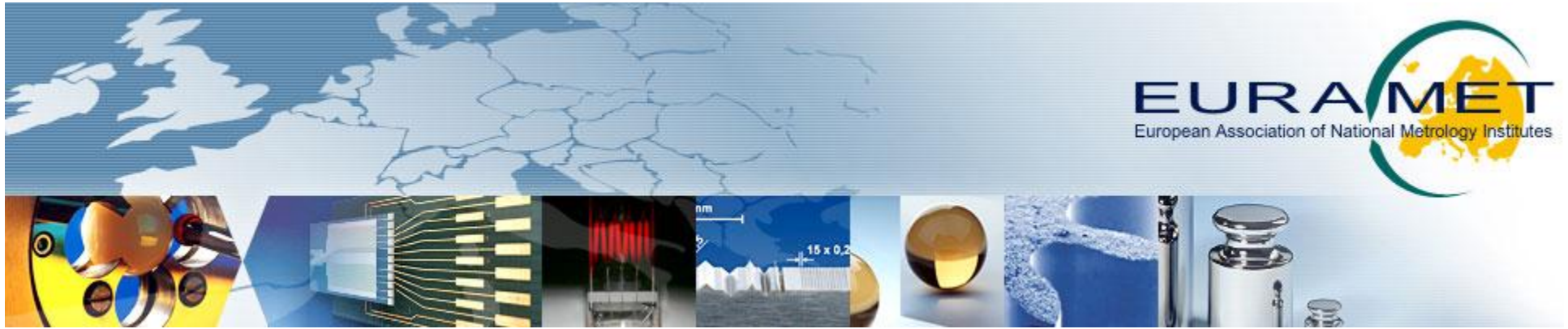
The High Level Expert Group is an advisory panel set up by the European Commission to provide advice on the implementation of the Measurements and Testing generic activity within the GROWTH programme. The group has sixteen members from twelve Member States and two Associated States and is chaired by Mr. Claes Bankvall of the Swedish National Testing and Research Institute.



Expanding Membership in European Research

Reach Out
From 2014





EMRP data summary

Projects selected	119
JRP funding contracted	€285 923 344
RG funding contracted	€32 358 784
Funded years in JRPs	1660
Unfunded years in JRPs	158
Funded years in RG	416
Total participations	1792



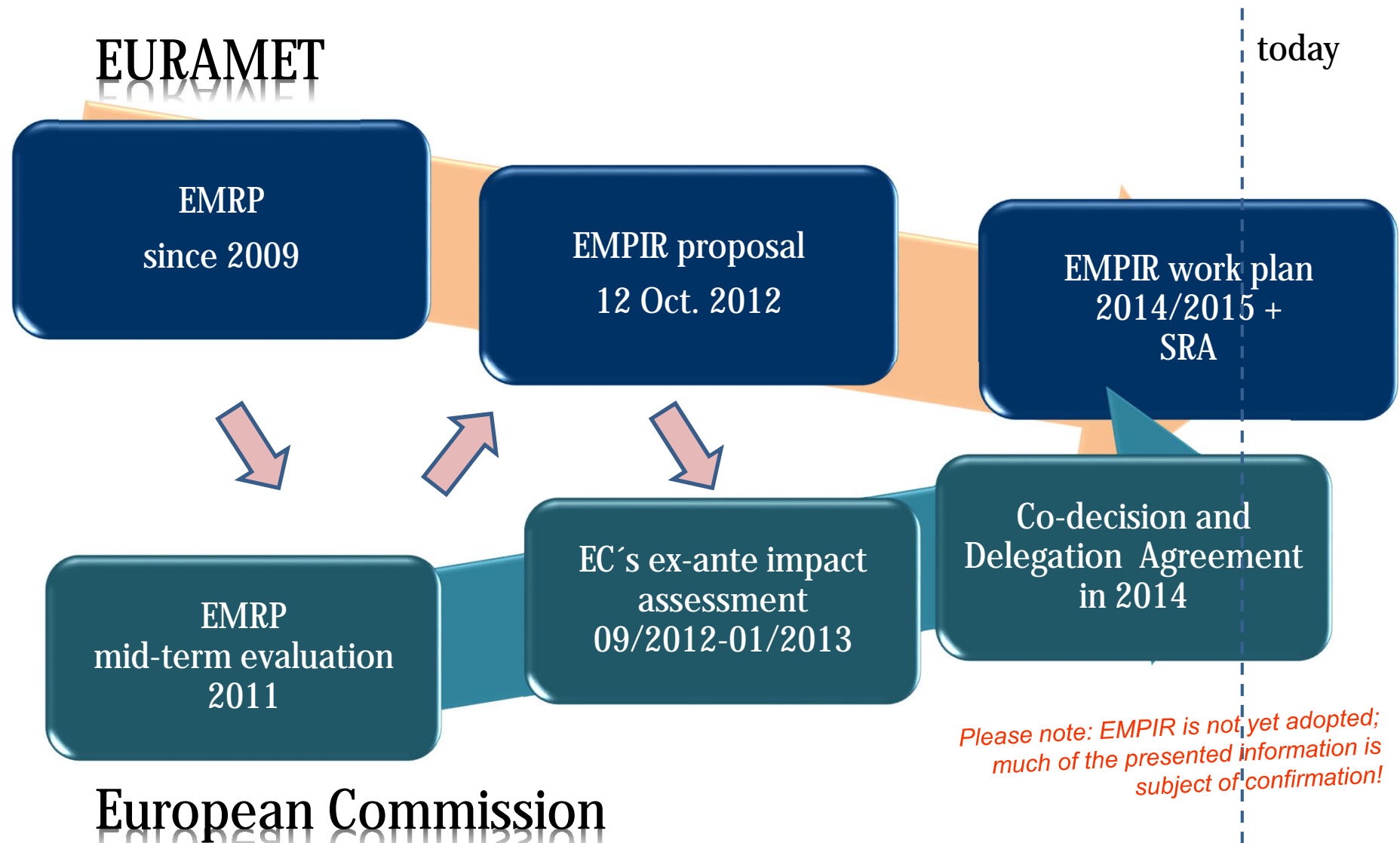
TP	Total JRP funding	Total RG funding	Projects	Value per project	funded months per project	RG months per project	unfunded months per project	partners per project	RGs per project	Collaborators per project
Energy (2009)	€30 074 897	€2 181 684	9	€3 341 655	222	40	14	15	3	4
Environment (2010)	€37 546 682	€2 958 470	9	€4 171 854	309	47	24	13	3	10
Industry (2010)	€48 782 771	€5 011 170	17	€2 869 575	204	47	15	12	3	8
Health (2011)	€30 221 399	€4 150 126	11	€2 747 400	189	53	36	8	3	6
SI Broader Scope (2011)	€29 785 167	€3 683 147	10	€2 978 517	210	60	31	10	4	7
New Technologies (2011)	€23 298 934	€3 608 345	9	€2 588 770	174	55	12	9	4	5
Industry (2012)	€37 199 353	€4 810 575	13	€2 861 489	196	55	16	10	3	2
SI Broader Scope (2012)	€41 337 407	€3 269 427	14	€2 952 672	206	45	19	10	3	1
Open Excellence (2012)	€7 676 734	€2 685 839	4	€1 919 183	124	98	4	5	4	
Energy (2013)			13							
Environment (2013)			10							

Participation by country

country	JRP funding	RG funding	Funded months	unfunded months	REG months	RMG months	collaborators
Australia				6			4
Austria	€692 708	€740 177	84	12	102	0	
Belgium	€621 540	€689 570	62	4	106	12	6
Bosnia and Herzegovina		€127 396			0	46	
Brazil				12			1
Bulgaria		€17 477			0	6	1
Canada				10			5
Chile							1
China				117			
Croatia		€18 628			0	6	
Czech Republic	€7 480 956	€798 587	1051	7	130	24	14
Denmark	€2 896 648	€336 066	178	21	42	0	3
Egypt							1
Estonia	€729 701	€56 756	120		12	0	
European Commission	€5 790 232		433				
Finland	€13 283 649	€2 206 430	939	39	273	0	10
France	€28 754 350	€1 706 489	2273	42	231	3	17
Germany	€98 610 027	€8 741 313	6684	247	1401	21	75
Greece		€137 204		23	24	0	2
Hungary	€1 226 427	€195 594	91		32	6	1
India				3			
Ireland				8			1
Italy	€22 852 397	€2 224 948	1754	48	334	3	31
Japan				43			5
Latvia		€78 714			12	0	
Liechtenstein				7			
Mexico				9			1
Montenegro		€3 792			0	1	1
Netherlands	€14 163 376	€1 502 088	716	73	235	0	8
New Zealand				11			1

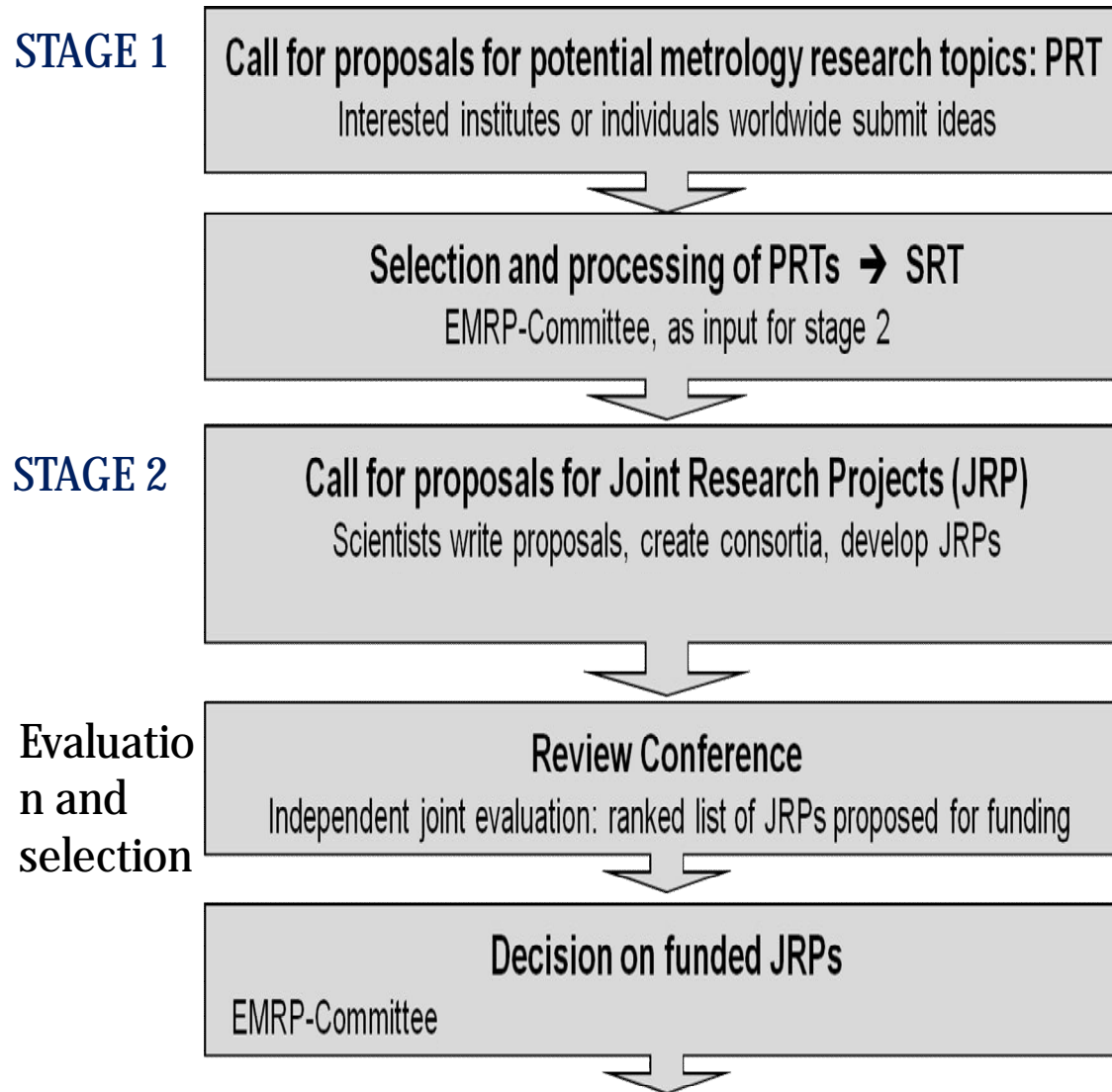
country	JRP funding	RG funding	Funded months	unfunded months	REG months	RMG months	collaborators
Norway	€1 189 671	€389 988	54		42	0	
Poland	€790 225	€472 161	193	24	77	24	6
Portugal	€946 947	€376 984	141		66	9	6
Republic of Korea				76			3
Romania	€362 444	€19 760	134		0	8	2
Russian Federation				25			3
Serbia		€17 914			0	6	1
Slovakia	€1 802 635	€35 650	258		0	13	3
Slovenia	€2 466 728	€69 741	266	13	12	2	5
Spain	€4 500 281	€619 007	385	65	104	3	13
Sweden	€4 611 883	€934 516	228	11	110	0	3
Switzerland	€8 777 995	€1 107 891	429	5	155	0	12
Taiwan				35			
Turkey	€3 619 782	€113 548	469		12	16	3
Ukraine				3			
United Kingdom	€59 752 742	€9 394 586	2976	76	1121	0	48
United States				5			24

EMPIR inputs



EMPIR Call & Selection Process

Mostly continuation from EMRP



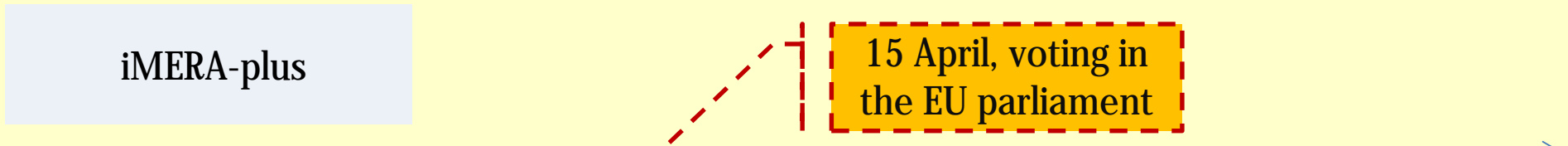
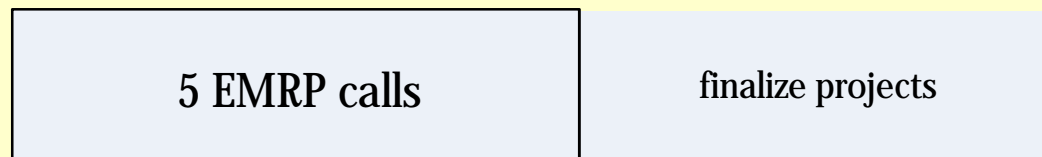
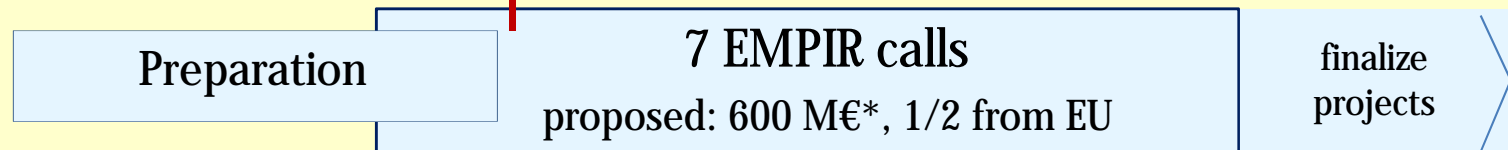
Changes:

- Discontinuation of REGs
- Research Council focuses on advice
- One stage submission for coordination and support actions
- Expert evaluation without a review conference

EMRP EMPIR timeline

- Interim evaluation EMRP 2011
- Ex-Ante impact assessment 2012
- Start codecision process 2013
- Ahead-of-contract start 2014
- Formal start expected 2015

formal start
of program



2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | | 2024

FP7

Horizon 2020

Participating states must declare their national commitments by 31 March 2014

Country		Commitment	
1	Austria	840.000	15 Italy 24.000.000
2	Belgium	1.200.000	16 Netherlands 16.500.000
3	Bosnia & Herzeg.	920.000	17 Norway 3.750.000
4	Bulgaria	840.000	18 Poland 2.500.000
5	Croatia	700.000	19 Portugal 840.000
6	Czech Republic	8.600.000	20 Romania 2.000.000
7	Denmark	3.710.000	21 Serbia 700.000
8	Estonia	910.000	22 Slovakia 200.000
9	Finland	12.000.000	23 Slovenia 2.249.333
10	France	27.000.000	24 Spain 6.000.000
11	Germany	88.000.000	25 <i>Sweden</i> <i>2.388.854</i>
12	Greece		26 Switzerland
13	Hungary	1.050.000	27 Turkey 12.000.000
14	Ireland	600.000	28 United Kingdom 83.000.000
Total			302.498.187

Research and innovation actions

Action primarily consisting of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service or solution. For this purpose they may include basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment.

Minimum: 3 NMI/DI partners from 3 different EMPIR countries

Examples:

- TP JRPs
- RPot

Coordination and support actions

Actions consisting primarily of accompanying measures such as standardisation, dissemination, awareness-raising and communication, networking, coordination or support services, policy dialogues and mutual learning exercises and studies ...

**NO
research!**

Minimum: 1 eligible partner from an EMPIR country

Examples:

- Extensions
- HI-CB

Module 4: Capacity building	a) R&D measurement capabilities
	b) Capacity building projects, accompanying measures (RPot and HI-CB)

- a) Allows to continuously improve Europe's R&D measurement capabilities
 - towards better services for industry and other stakeholders
 - coordinated along stakeholder needs; avoiding duplication
- b) Foresees Capacity Building projects (mainly addressed for catching up countries) with activities related to institutional, human resources and technical capabilities development
 - Follows a demand-oriented strategy
 - Link to structural funds and other comparable sources possible
 - Includes coordinating support measures provided by EURAMET e.V.

Indicative breakdown

The structure of EMPIR			
Module 1: Science	Fundamental scientific metrology	TP OE	48 %
	Grand challenges Energy, Environment, Health	TP ENG, ENV, HEA	
Module 2: Innovation	Industry-driven joint research	TP IND	22 %
	Technology-transfer projects		
Module 3: Pre-normative	Pre- and co-normative metrology R&D		10 %
Module 4: Capacity building	R&D for measurement capabilities	TP SIB	15 %
	RPot & HI-CB		
Administrative costs			5 %

Classification of potential research topics, 2014



EMPIR Work Programme

EMPIR Call 2014

Potential Research Topics – Classifications

Document: P-PRG-GUI-019

Version: 1.0

Approved: EMRP Programme Manager

2014-01-20



To assist EURAMET in the early stages of reviewing the Potential Research Topics (PRTs) submitted at Stage 1, the submitter is asked to associate their PRT with a "Classification" from the list below. This is only used to make it more likely that similar topics are reviewed together.

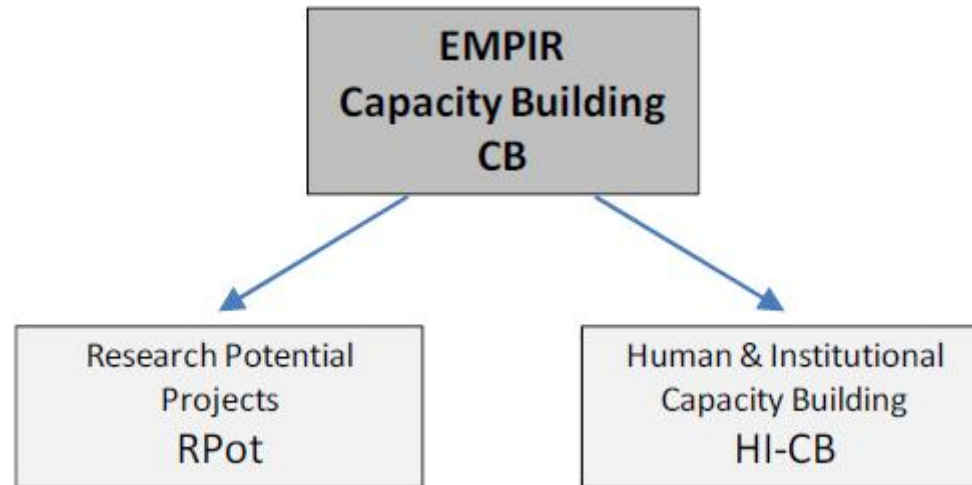
The Classifications for the 2014 call are:

TP	Classification	
Industry	Dimensional metrology	
	Temperature and related quantities metrology	
	Electrical and magnetic metrology	
	Time and frequency metrology	
	Ionising radiation metrology	
	Chemical metrology	
	Mass and related quantities metrology	
	Flow metrology	
	Optical metrology	
	Acoustical metrology	
	Metrology for manufacturing technologies and process control	
	Other	
	Research Potential	RPOT

EMRP Midterm Evaluation 2011:

*“EMRP is not having the desired effect in terms of **capacity building** in those countries with limited or no metrology research capability ...”*

Capacity building has been included in EMPIR as the Module 4.



First call in 2014
First projects to start in 2015

**Reasonable adaptation of
JRP rules**

RPOT_guiding_principles_v131114

Continuation / transfer of current FG activities
Financing in 2014 by PTB Q.5
Envisaged to be financed within EMPIR from
2015 on

Rules to be developed during 2014

Objective of RPOT:

The objective of RPOT as a CB instrument is the development of the potential for metrology research and/or the establishment of a competitive metrology infrastructure, responding to an existing gap in emerging EURAMET member countries or regions.

One specific aim is that as a result of RPOTs, participating organisations would have the capability to eventually participate in EMPIR JRPs should they choose to do so, and this might eventually provide input to other aspects such as research, innovation and patenting.

EMRP Midterm Evaluation 2011:

“EMRP is not having the desired effect in terms of capacity building in those countries with limited or no metrology research capability ...”

In order to respond to an existing capability gap in emerging EURAMET member countries and regions, Capacity Building instruments have been included within EMPIR. The overall strategic aim of the metrology capacity-building activities on different technological levels is to achieve a balanced and integrated metrology system in the participating states, enabling them to develop their scientific and technical capabilities in metrology. Competitive metrology capabilities affect all other aspects of the technical quality infrastructure of the participating NMIs and DIs, therefore directly contributing to increased European economic welfare.

Research Potential Projects (RPOTs) are a Capacity Building instrument for the development of the potential for metrology research of the participating organisations which will subsequently provide input to other aspects of technology transfer, innovation and all other aspects of research.

EMRP Midterm Evaluation 2011:

“EMRP is not having the desired effect in terms of capacity building in those countries with limited or no metrology research capability ...”

The needs identified within the Potential Research Topics (PRTs) should recognise that RPOTs will be demand oriented, will have a European dimension and critical mass, will focus on EURAMET’s internal infrastructure and expertise to provide appropriate internal knowledge transfer to emerging members, will be based on horizontal collaboration for the development of new metrological infrastructures in a coordinated way ("smart specialisation") and will need to demonstrate significant impact to the entire quality infrastructure.

RPOTs should include some research and development activities and in this respect they differ from the technical assistance nature of cooperation, however they do not need to address fundamental scientific challenges.

An important element of RPOTs is the collaboration between NMIs/DIs that are less experienced in a relevant field with NMIs/DIs with greater experience, with the aim of establishing and developing metrology capabilities and the potential for metrology research.

Participation in RPOT:

Same rules as for JRPs

1. Partners on contractual basis:

- funded internal partner: EMPIR-member NMI or DI
- funded external partner (not to exceed 5%)
- unfunded partner

2. Collaborators:

Open to NMIs and DI from any EURAMET Member (not EMPIR-member)

- Minimum 3 funded internal partners from different countries
- KT-aspect: “Experienced NMI supports emerging NMI(s)”
- No funding of significant capital equipment
Equipment must be available when project is starting

Evaluation and selection in RPOT:

Similar rules as for JRPs

- Competitive at all stages
- Evaluation against 3 standard criteria: excellence / impact / implementation
(definition of criteria compatible to Horizon 2020 rules, still under fine tuning)*
- Evaluation by independent referees
- Preparation of ranking list

BUT

- No review conference
- RPOT are competing only among themselves and not with JRPs

Governance:

Following bodies participate in call process, generation and administration:

- 1. EMPIR Committee:**
Decision making (as for JRPs)
- 2. EMPIR SC-CB:**
Similar as SC-R, role and composition see later
- 3. MSU:**
Administration of the call process at all stages
- 4. FG-FNMID:**
Similar role as TCs for JRPs
(proposing needs, input to call scope, facilitating generation of ideas for PCBT, supporting establishment of project consortia)
- 5. Secretariat (BS)**
Help desk for partnering, questions on drafting, etc.

Scope and topics of RPOT:

RPOTs should address the following aspects:

- **Demand orientation**
- **European Dimension:**
develop metrology potential in a European context.
- **EURAMET collaboration:**
make use of EURAMET internal expertise
- **Horizontal coordination:**
aiming at “smart specialisation”
- **Critical mass:**
- **Impact:**
significant improvement of measurement capability and quality on a national or European level

“Research Potential” Projects (RPot)

- Project duration and volume shall be set by the consortia
- Project coordinator shall be one NMI or DI from an emerging EMPIR member state;
- Consortium partners shall comprise at least one NMI and/or DI. The minimum consortium must consist of three partners from three different EU (EMPIR) countries.

Eligible costs:

- Costs for staff involved in project activities
- Travel and subsistence for project staff (e.g. for short-term staff exchanges, participation at metrology events, etc.)
- Costs for consumables as required for project activities
- Contracts for external parties, e.g. for consultancies supporting the SWOT analysis

Not eligible: Investments in metrology equipment

2014 call:

IND JRP 43.5 M€ in total, average project size (full cost) 2.5 M€, cap 3.5 M€

RPOT 3 M€ in total, Up to 1 M€

Extension 1 M€

2015 call:

Health 40 M€, SI 25 M€, Pre-norm 10 M€, RPOT 5 M€, Extensions 1 M€

HI-CB

2016 call (preliminary proposal):

ENG, ENV, FUN, RPOT, Extensions

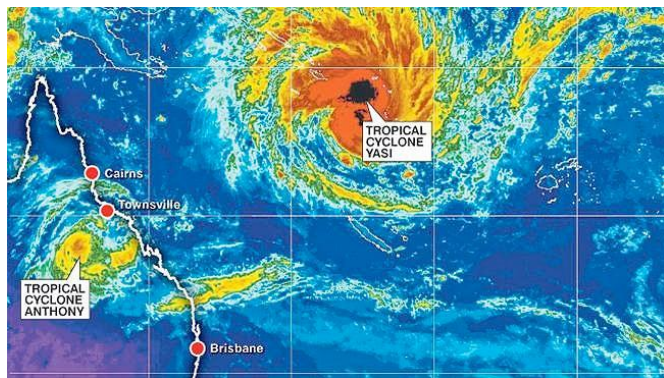


Metrology fo Meteorology: from MeteoMet to MeteoMet2 ...and more

Andrea Merlone

Meteorology

Meteorology is the interdisciplinary scientific study of the atmosphere.



Metrology

Metrology is the science of measurement.



Meteorology



Geneve - Swiss

Founded (as IMO) in 1873

Metrology



Sevres - France

Convention of the metre in 1875

Meteorology



World Meteorological Organization
Weather • Climate • Water

The mission of WMO is to:

Facilitate worldwide cooperation in the establishment of networks of stations for the making of meteorological observations as well as hydrological and other geophysical observations related to meteorology, and to promote the establishment and maintenance of centres charged with the provision of meteorological and related services;

Promote the establishment and maintenance of systems for the rapid exchange of meteorological and related information;

Promote standardization of meteorological and related observations and to ensure the uniform publication of observations and statistics;

Further the application of meteorology to aviation, shipping, water problems, agriculture and other human activities;

Promote activities in operational hydrology and to further close cooperation between Meteorological and Hydrological Services;

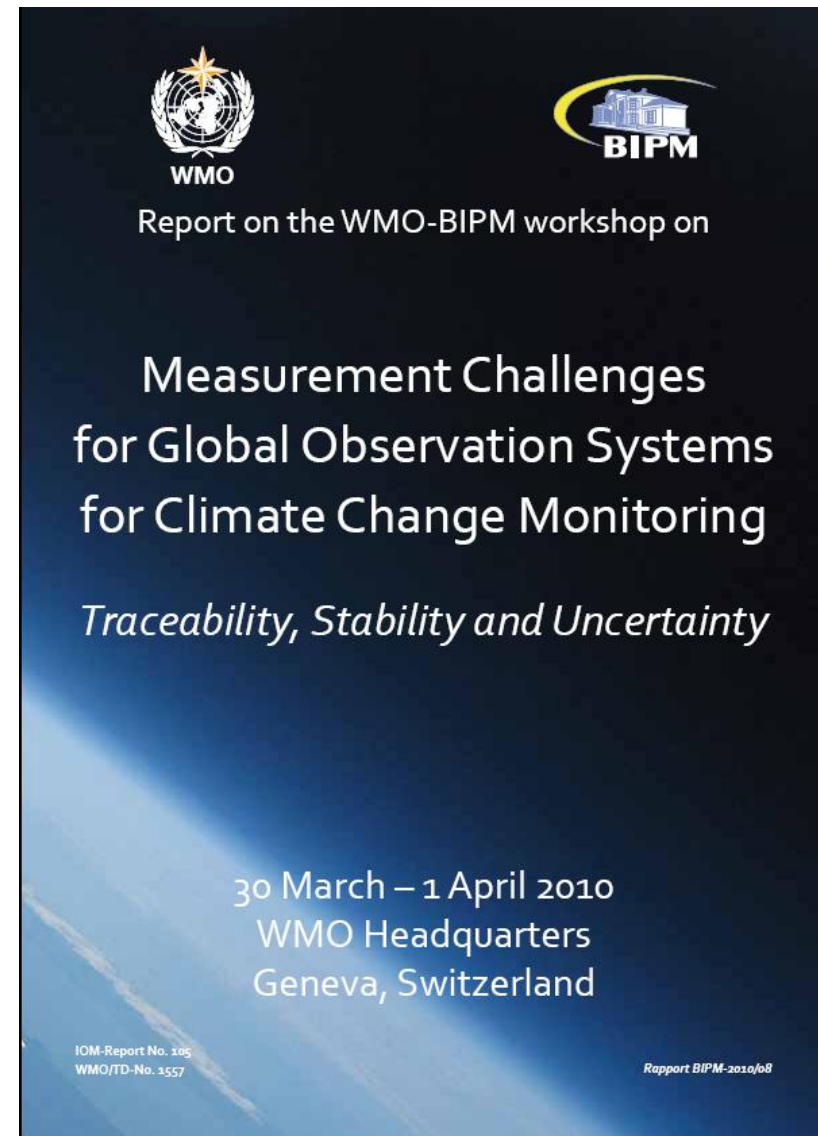
Encourage research and training in meteorology and, as appropriate, in related fields, and to assist in coordinating the international aspects of such research and training.

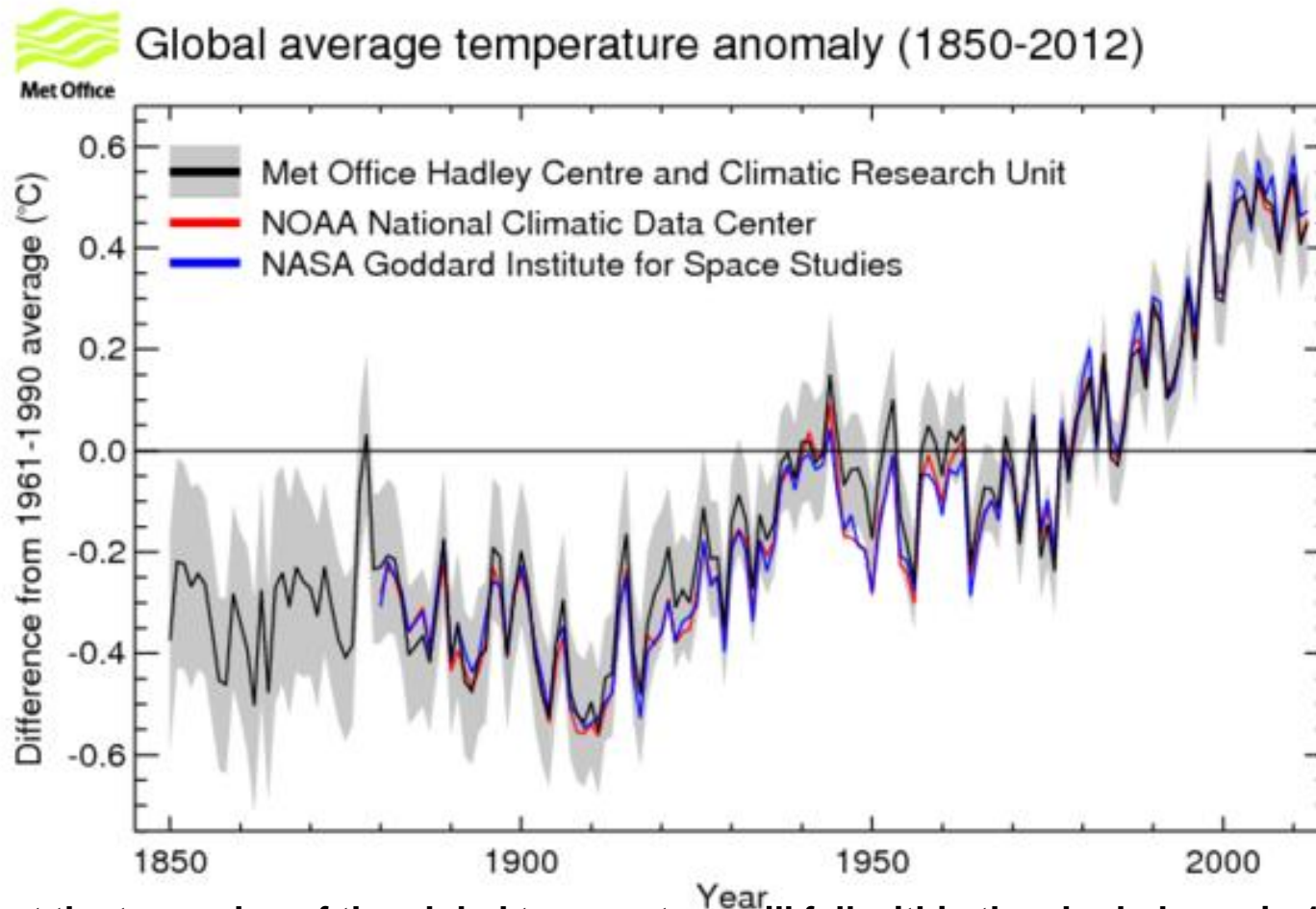
2010 April 1.

A piece of history in science is jointly written by WMO¹ and BIPM².

WMO signs the Mutual Recognition Arrangement (MRA)

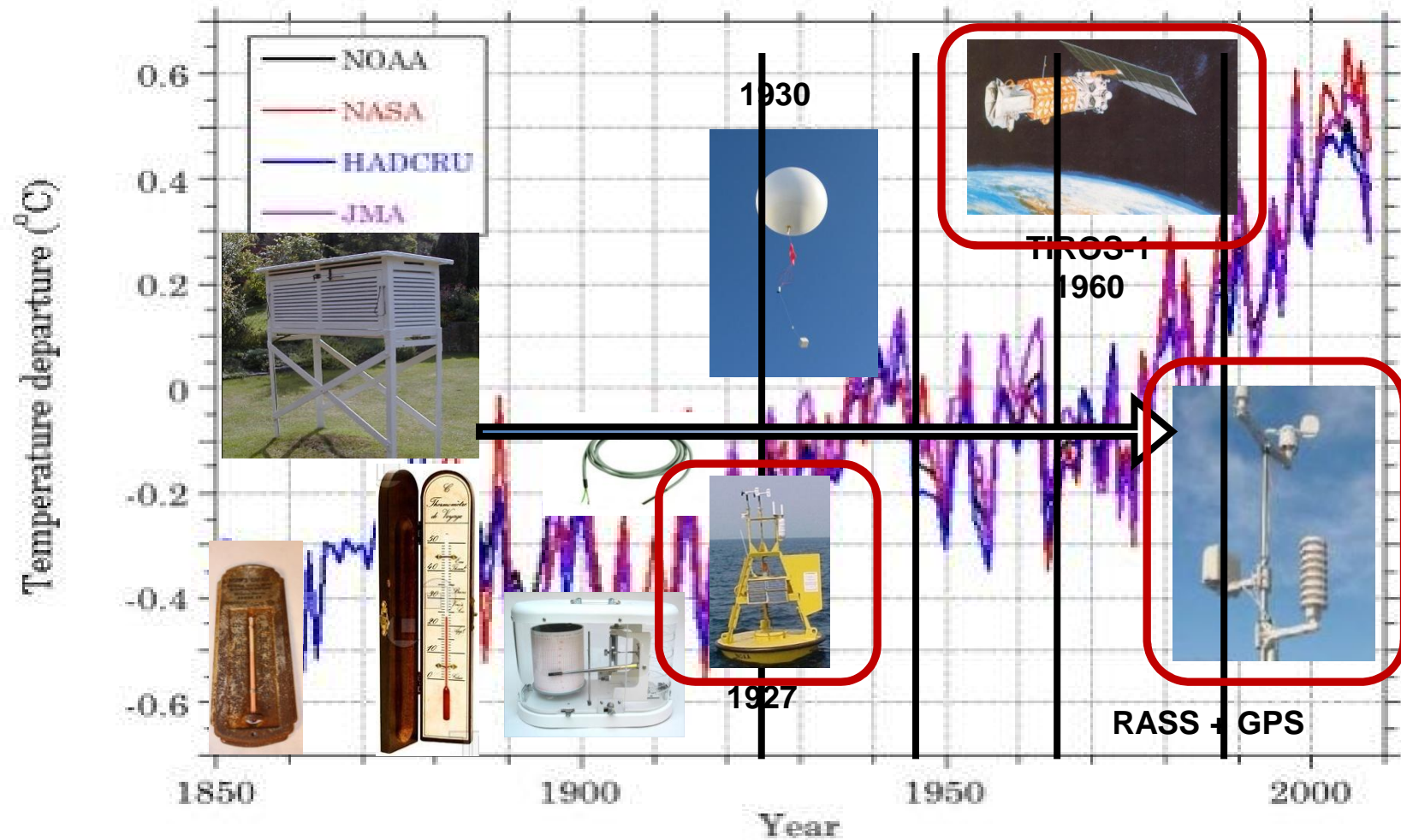
1. World Meteorological Organization Official United Nations' authoritative voice on weather, climate and water, scientific organization.
2. Bureau International des Poids et Mesures

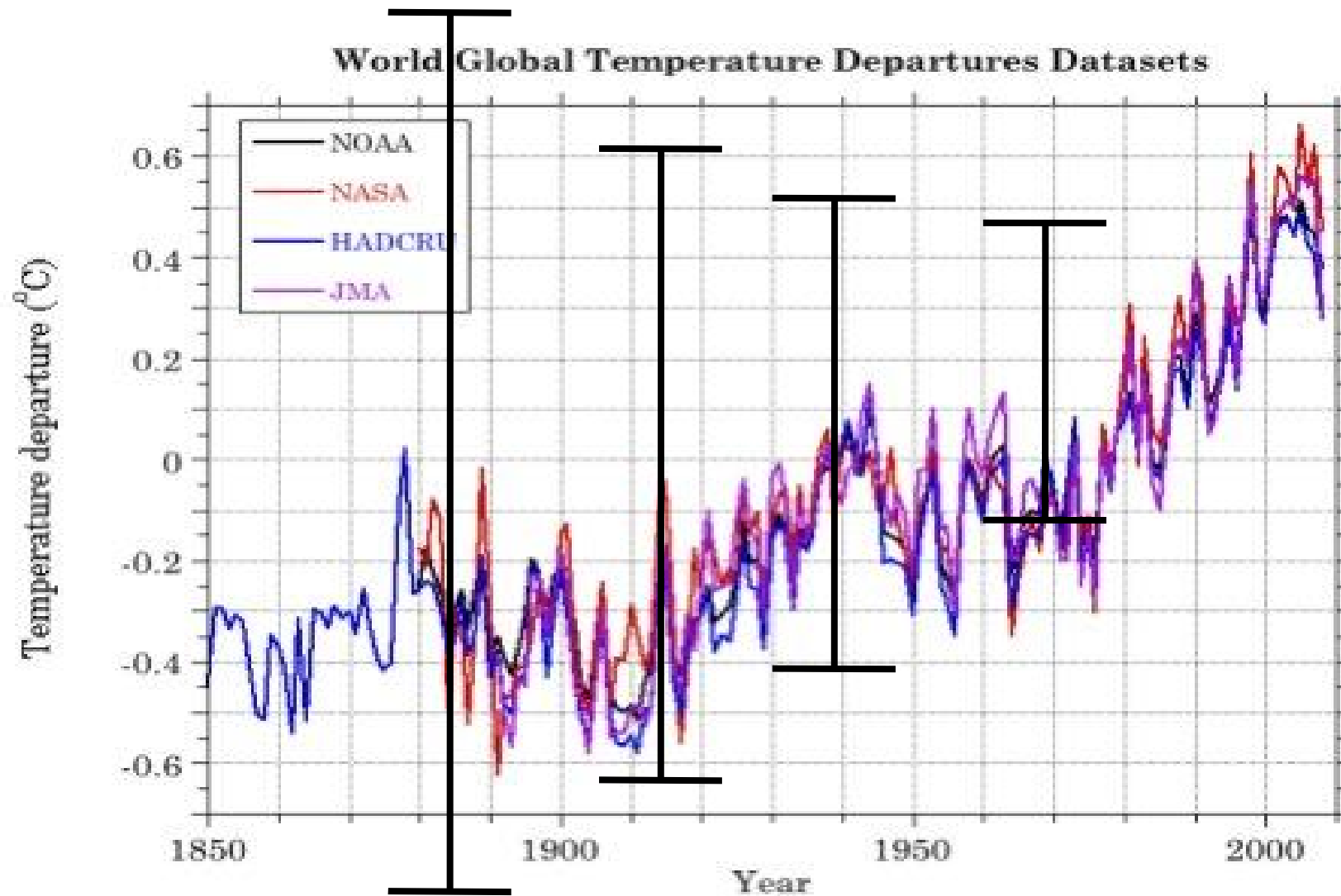




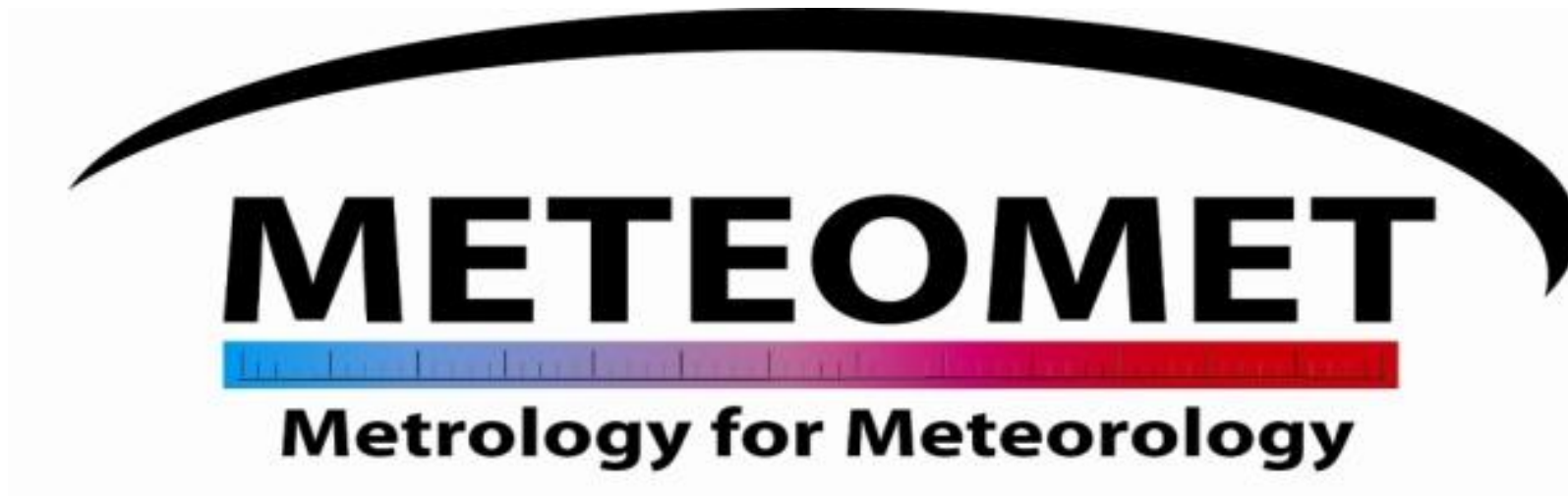
It is expected that the true value of the global temperature will fall within the shaded area in 19 out of 20 cases.

World Global Temperature Departures Datasets





2011 October 1.
MeteoMet Joint Research Project official start date!



•MeteoMet numbers

- 18 Funded Partner
- 3 Un-funded Partners
- 3 REG Home Org.
- 34 Collaborators

•6 Work packages
62 Tasks
170 Deliverables

- 377 man/women-months
- 5 REGS -> 64 months
- Total 441 nan-months

Budget = 4 413 682.82 €

+ 485 000

Biggest EMRP
Consortium ever!

A huge amount of
work...

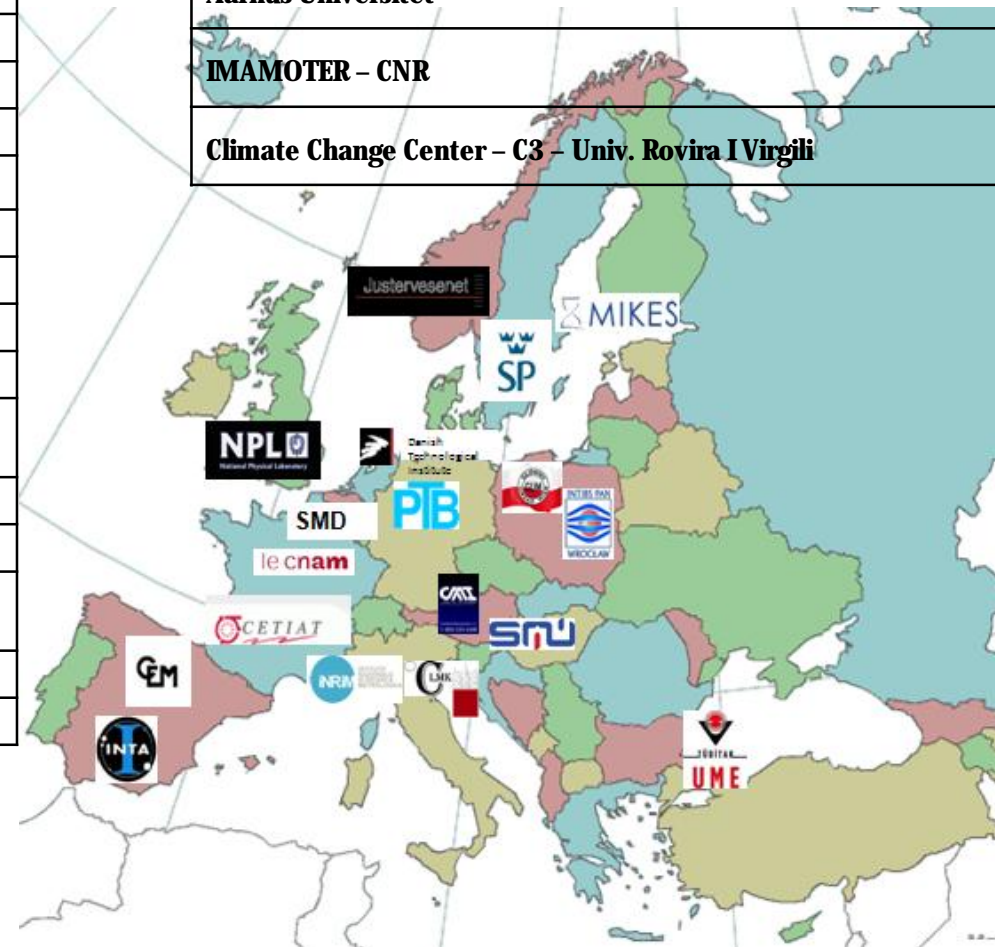
~37 years!

Funded Partners

Grants

Centro Español de Metrología	Spain
Czech Metrology Institute	Czech Republic
Danish Technological Institute	Denmark
Główny Urząd Miar	Poland
Instytut Niskich Temperatur i Badaw Strukturalnych	Poland
Instituto Nacional de Técnica Aeroespacial	Spain
Istituto Nazionale di Ricerca Metrologica	Italy
Justervesenet	Norway
Laboratoire Commun de Métrologie	France
Centre Tec. des Industries Aérauliques et Thermique	France
Metrology Institute of Slovenia - Univ Ljubiana	Slovenia
Mittatekniiikan keskus'	Finland
National Physical Laboratory	United Kingdom
Physikalisch-Technische Bundesanstalt	Germany
Scientific Metrology	Belgium
Slovensky Metrologický Ustav	Slovak Republic
Technical Research Institute of Sweden	Sweden
Ulusal Metroloji Enstitüsü	Turkey

Comitato EV-K2-CNR
Karlsruher Institut für Technologie
Aarhus Universitet
IMAMOTER – CNR
Climate Change Center – C3 – Univ. Rovira I Virgili



Aarhus Universitet	Denmark
Chalmers University of Technology	Sweden
Uniwersytet Wroclawski	Poland

Unfunded Partners

A large Consortium

Why?

The World is divided into countries, but...

- *Climate has no borders*
- *Expertise requires no borders*

**“The climatic world is one world even if politically we are not.” —
Reid Bryson at May 26, 1976 United States Congress**

*Reliable climate data is
geographically equally relevant!*

Needs

Data users requirements:

Define measurements standard

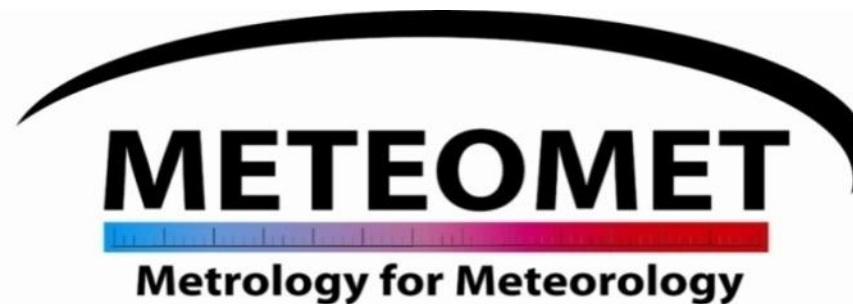
Traceability to national standards

Define Calibration procedures

New devices and instruments

Data reliability

Uncertainty-evaluation methods



Improve data quality, continuity and homogeneity

Interpretation historical data series

European common approach

WP1

**Upper air measurements:
sensors and techniques**

WP2

**Novel methods, instruments and
measurements**

WP3

**Traceable measurement and
protocols for land observations**

WP4

**Assessment of the historical
temperature data, harmonisation**



REG1

EV- K2

REG2

Aquavit 2

REG3

Mars simulator

REG4

Metrology for meteorology in
agricultural sites

REG5

Instrument change
in historical data series

RMG01

IMBiH





Ref: A. Merlone

4 TV Broadcast
8 Internet articles
5 Newspaper articles



ISTI and GRUAN
Monthly teleconfs



7 Journal articles published
5 Journal articles submitted
14 conference papers presented
5 university lectures and seminars

International Events

- **WMO CIMO Training Workshop on Metrology November 21-25, 2011**
- **4th GRUAN Implementation Meeting (ICM-4), March 5– 9, 2012 - Tokyo**
- **Meteo services workshop Satellite Euramet TC-T Istanbul 22 April 2012**
- **WMO-CIMO-TECO Conference Brussels 16-18 October 2012**
- **5th GRUAN (ICM-5), 25 Feb – 2 Mar, 2012, De Bilt**
- **12th EuroMeteo Society (EMS) & 9th Euro-Conf on App. Climatology (ECAC)**
- **1st annual EarthTemp Network meeting, June 2012**
- **Joint “Ocean” and “MeteoMet” meeting, Braunshweig, January 23 2013**
- **Round table on AWS comparison, March 21 2013**
- **MeteoMet presented at EURAMET TC-T meeting, Praha, April 2013**
- **European Geosciences Union, General Assembly 2013, Vienna 07 – 12 April 2013**
- **MeteoMet presented at EURAMET General Assembly, Iceland, 27 May 2013**
- **MeteoMet at ICAM 2013 - International Conference on Alpine Meteorology, June 7, 2013, Kranjska Gora, Slovenia**
- **Tempmeko 2013, Madeira – October 13-19 2013**

4 TV Broadcast
8 Internet articles
5 Newspaper articles



ISTI and GRUAN
Monthly teleconfs



7 Journal articles published
5 Journal articles submitted
14 conference papers presented
5 university lectures and seminars

National Events

- Italian Consortium meeting, *Italy April 13 2011,*
- IV Krajowa i V Miedzynarodowa Konferencja, *Poland 12-14 September 2011*
- JMA Meeting *March Poland, 13 2012*
- NMIJ Meeting *March Poland, 14 2012*
- UME Seminar *April, Turkey 17 2012*
- *European night of research 2012*
- *Training course in metrology for meteorological operators, April 20 2013*
- *AEMET workshop, Madrid, June 13 2013*
- *MeteoMet at school of technical physics, Benevento, 8-12 July 2013*
- *Innovative technologies summer camp, Meteo Met workshops , August 18 - 23, 2013*
- *One day «Metrology for Meteorology» workshop at MIKES, September 10 2013*
- *Workshop at NAST, Nepal, September 9 2013*
- *Training at NAST, Nepal, September 9 2013*
- *Calibration techniques for high mountains weather sensors, September 17 2013*
- *European night of research, September 27 2013*

MeteoMet wins the EURAMET prize as best project in metrology

(Impact prize 2013)



COMMUNITY NEWS

Andrea Merlone wins EURAMET Impact Prize 2013

Andrea Merlone, JRP-Coordinator of EMRP Joint Research Project “Metrology for pressure, temperature, humidity and airspeed in the atmosphere” (MeteoMet) and senior researcher at INRIM (Istituto Nazionale di Ricerca Metrologica, Italy) is the winner of the EURAMET Impact Prize 2013.

Metrology and meteorology are two words that are easily confused. One concerns the science of measurement and the other the study of the atmosphere. The MeteoMet project is now bringing these two disciplines together in order to provide better measurements of temperature, pressure, humidity and airspeed, which are vital for our understanding of the Earth's



Andrea values the significance the award has for him and the whole project: “This prize has a deep meaning that even surpasses the great happiness of receiving it. It is the sign of having made it in a new attractive field of metrology. Years ago, as thermal metrologists, we started to think on how our role and experience could be devoted to climate science, with temperature being a key quantity involved in the global warming. We started to establish new collaborations between metrology and meteorology, two disciplines separated by just two



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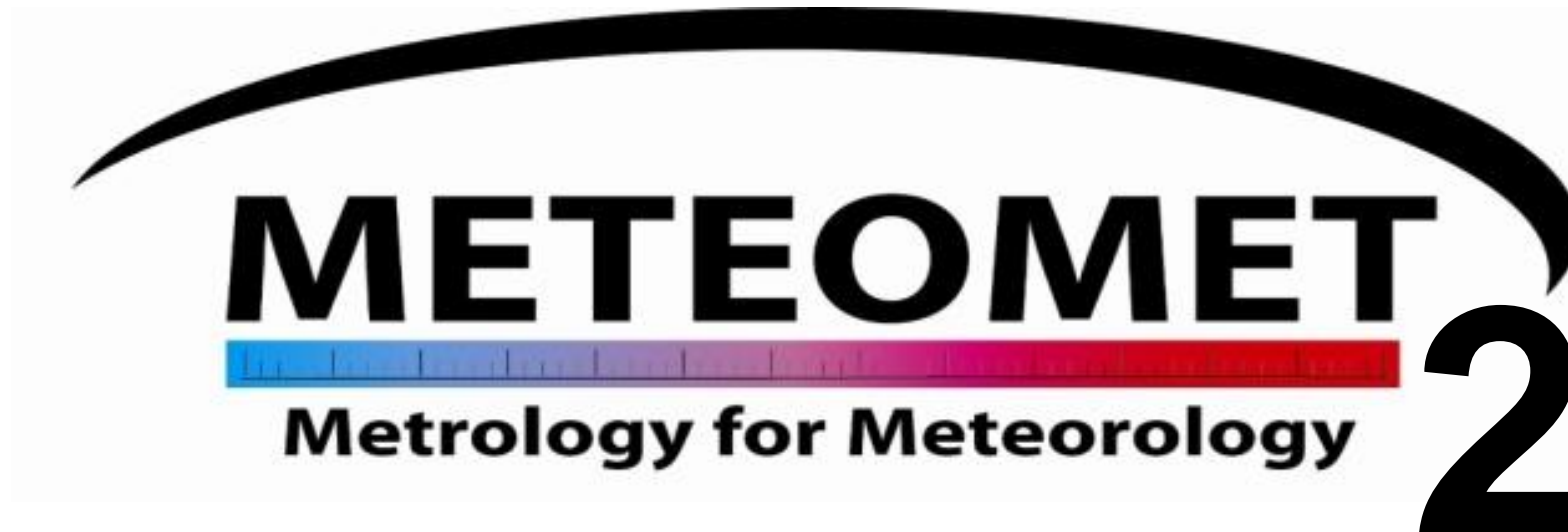
INTERGOVERNMENTAL
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GCOS Defines 50 Essential Climate Variables

All ECVs are technically and economically feasible for systematic observation.

It is these variables for which international exchange is required for both current and historical observations.





Metrology for Essential Climate Variables

15-18 September 2014 – Brdo – Slovenia.

MMC *Slovenija*
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Topics:

- Traceability and uncertainty. METROLOGY FOR METEOROLOGY AND CLIMATE
- Ground based systems. Temperature, humidity and pressure sensors. Wind speed and direction, solar radiation. Quantities of influence and mutual influences. Sensors dynamics.
- Upper air measurements. Aircraft-based measurements.
- Ocean research: metrological traceability to the SI system for the measurement of the key variables salinity, pH, composition and dissolved oxygen content of sea water.
- Water: water vapour, liquid water, ice, hygrometry, soil moisture. Rain and snow gauges. Permafrost temperature measurements: instruments, procedures and calibrations.
- Assessment of the historical temperature measurement data with respect to uncertainties on instruments used.
- Thermal and chemical metrology for environment.
- Instruments and measurements capabilities, calibration procedures, best practice and regulations.



The vision

**Establish a permanent cooperation
between the
Metrology and Meteorology
communities**

The Great Danes in Slovenia



Beyond metrology



EUROVISION
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