Andrea Merlone

CCT/17-49

CCT Task Group

Environment

Report to CCT

Andrea Merlone

BIPM 2017 June 1

Andrea Merlone

GCOS
GLOBAL CLIMATE OBSERVING SYSTEM

WMO IOC UNEP ICSU International Council for Science

WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION

GCOS Defines the 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.

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Measurement domain	Essential Climate Variables (ECVs)
Atmospheric	Surface: air temperature, wind speed and direction, water vapour, pressure, precipitation, surface radiation budget Upper-air: temperature, wind speed and direction, water vapour, cloud properties, Earth radiation budget, lightning Composition: carbon dioxide (CO_2), methane (CH_4), other long-lived greenhouse gases, ozone, aerosol, precursors for aerosol and ozone
Oceanic	Physics: temperature: sea surface and subsurface; salinity: sea surface and subsurface; currents, surface currents, sea level, sea state, sea ice, ocean surface stress, ocean surface heat flux Biogeochemistry: inorganic carbon, oxygen, nutrients, transient tracers, nitrous oxide (N_2O), ocean colour Biology/ecosystems: plankton, marine habitat properties
Terrestrial	Hydrology: river discharge, groundwater, lakes, soil moisture Cryosphere: snow, glaciers, Ice sheets and Ice shelves, permafrost Biosphere: albedo, land cover, fraction of absorbed photosynthetically active radiation, leaf area index, above-ground biomass, soil carbon, fire, land surface temperature Human use of natural resources: water use, greenhouse gas fluxes

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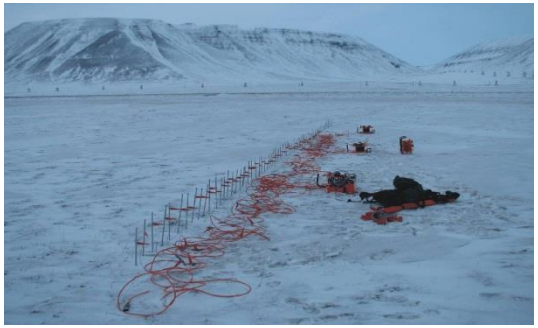
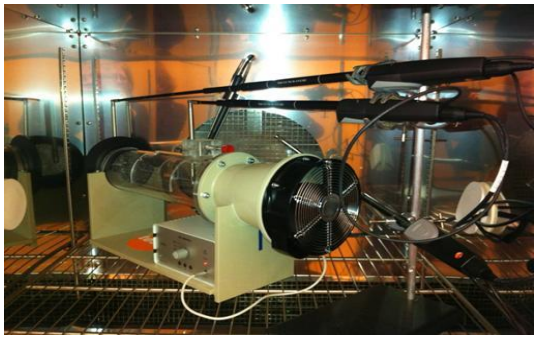
Temperature and **humidity** measurements of air, deep ocean and sea surface, ice and permafrost soil, are needed as input to numerical weather prediction models, in hydrology and agriculture and as indicator of the climatic variability and global warming.





World Meteorological Organization

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Current CIMO mission

Promote:
- high quality observational data
- world-wide compatibility

mission

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

achievement

for:
- Improving quality of products and services

vision

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.

Consultative Committee for Thermometry

Andrea Merlone

Task Group Environment

Meeting
Tuesday 30 May 2017 - BIPM, Sèvres (France)

Chairperson: Dr Andrea Merlone (INRIM)

Members:
Dr Michael De Podesta (NPL)
Dr Efrem Ejigu (NMISA)
Dr. Carmen Garcia Izquierdo (CEM)
Mr Drago Groselj (WMO-CIMO)
Dr Martti Heinonen (MIKES)
Dr Murat Kalemci (UME)
Dr Yong Gyoo Kim (KRISS)
Dr Christian Monte (PTB)
Dr Peter Pavlasek (SMU)
Dr Fernando Sparasci (LNE-Cnam)
Dr. Howard Yoon – in place of - Mr Gregory F. Strouse (NIST)
Dr. Naohiko Sasajima – in place of - Dr. T. Nakano – in place of -Dr. J. Tamba (NMIJ/AIST)
Dr. Eric van der Ham (NMIA)
Dr. Hao Xiaopeng – in place of - Dr Jintao Zhang (NIM)

Co-opted members:
Dr Stephanie Bell (Chair of CCT WG Hu (NPL)
Dr R. Feistel (Leibniz Institute for Baltic Sea Research)
Dr Prof. P. Thorne (Maynooth University Department of Geography)
Dr M.L. Rastello (CCPR President)

Invited to attend
D.Sc. Júlio D. Brionizio (INMETRO)
Dr. Victor Fuksov (VNIIM)
Dr. Eng. Aleksandra Kowal (INTiBS)
Dr. Edgar Mendez Lango (CENAM)

Observers
Volker Evert (PTB)
Tomas Kopunec (SMU)

15 + 4 + 4

Interaction with global networks

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International interactions with:
WMO commissions expert teams
ISTI,
GCOS GRUAN,
BSRN,

Regionally with WMO RIC Centers and research projects

Locally with hydro-meteo agencies and manufacturers

WMO Commission of Instruments and Methods of Observation

Andrea Merlone

BIPM → **WMO**

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,

Yuning Duan

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

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

Michaeld 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 – ISTI – WMO CCI
Peter Thorne

WMO Commission for Climatology

Andrea

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

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) or fax (+41 22 730 80 42)

Country: Italy

1. Title: Dr
2. Gender: Male
3. Surname: Merlone
4. First name: Andrea
5. Nationality: Italy
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

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

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CCT Task Group for Environment (CCT-TG-Env)

Mission | Members | Collaboration with the WMO | Members' area | CCT

→ The Instruments and Methods of Observation Programme of the World Meteorology Organization sets technical standards, quality control procedures and guidance for the use of meteorological instruments and observation methods in order to promote development documentation and world-wide standardization. The associated Commission for Instruments and Methods of Observations (CIMO) comprises a number of Expert Teams.

Members of the CCT-TG-Env have been invited to take part in five of these Expert Teams, and a WMO CIMO Expert Team member participates in the CCT-TG-Env. Further, the Chairman of the CCT-TG-Env has been invited to serve on the WMO Commission for Climatology's group of Rapporteurs on Climate Observational Issues.

- WMO CIMO Expert Team member participating in the CCT-TG-Env: Mr Drago Groselj (ARSO)
- CCT-TG-Env members participating in the WMO CIMO Expert Teams:

A1 Expert Team on Operational In Situ Technologies:	Dr Andrea Merlone (INRIM)
A2 Expert Team on Developments in *In Situ* Technologies:	Dr Michael de Podesta (NPL)
C.1 Expert Team on Operational Metrology:	Dr Michael de Podesta (NPL)
A3 Expert Team on Instrument Intercomparisons:	Dr Carmen Garcia Izquierdo (CEM)
A5 Task Team on Radiation References:	Dr Christian Monte (PTB)

- CCT-TG-Env member of the WMO Commission for Climatology's group of Rapporteurs on Climate Observational Issues: Dr Andrea Merlone (INRIM, CCT-TG-Env Chairman)

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WORLD METEOROLOGICAL ORGANIZATION

COMMISSION FOR INSTRUMENTS AND METHODS OF OBSERVATION

Joint Session of the Expert Team on Operational In Situ Technologies (ET-OIST) and the Expert Team on Developments in In Situ Technologies (ET-DIST)

GENEVA, SWITZERLAND

21-23 JUNE 2017

CIMO/ET-A1-A2/INF.1

(19.V.2017)

Original: ENGLISH only

DOCUMENTATION PLAN

(Updated 24 May 2017)

Agenda Item	Title	Doc No.	Prepared by
1	ORGANIZATION OF THE SESSION		
1.2	Provisional Agenda	1.2(1)	Secretariat
1.2	Explanatory Memorandum	1.2(2)	Secretariat
n/a	Provisional List of Participants	INF. 2	Secretariat
n/a	Information for Participants- How to get to WMO	INF	Secretariat
1.3	Working Arrangements	INF. 3	Secretariat
2	REPORTS OF THE CHAIRPERSONS		

- **WMO-CIMO A.3 Expert Team on Instrument Intercomparisons.**

-Proposals for a comparison of thermometers and radiation shields in (2018-2022) . C. García Izquierdo (CEM)

3	RELEVANT DECISIONS OF THE CIMO MANAGEMENT GROUP, THE WMO EXECUTIVE COUNCIL AND RELEVANT UPDATES ON THE WIGOS DEVELOPMENT		
3	Relevant decisions of the CIMO Management Group, thE WMO Executive Council and relevant updates on the WIGOS development	3	Secretariat
4	SITING AND SUSTAINED PERFORMANCE CLASSIFICATION FOR OBSERVING STATIONS ON LAND		
4.1	Review of experience of Members with implementation of the siting classification	4.1	Y-A. Roulet
	Temperature siting classification in Nordic Countries	INF. 4	
	Quality assessment using METEO-Cert - The MeteoSwiss classification procedure for AWSs	INF. 5	
4.2	Guidance material on implementation of the siting classification	4.2	Y-A. Roulet
4.3	Sustained performance classification for observing stations on land	4.3	O. Schultze
5	TRANSITIONING TO MODERN AND AUTOMATED MEASUREMENTS		
5.1	Guidelines on economical alternatives to AWSs	5.1	J. Warne / A. Ariffudin
5.2	Guidelines for replacement of mercury-based and obsolete instruments	WebEx-presentation	D. Goselj
5.3	Training modules on migration to AWSs	5.3	M. Molyneux
5.4	Automation of cloud observations	5.4	W. Wauben
5.5	Update of WMO guidance material on AWSs	5.5	M. Leroy / J. van der Meulen
6	USE OF ENVIRONMENTALLY FRIENDLY RADIOSONDES		
6	Proposal of the WMO position on the use of environmentally friendly radiosondes	6	A. Dubovetskiy / J. Hietanen
7	REVIEW OF CURRENT AND EMERGING TECHNOLOGIES AND UPDATE OF THE CIMO GUIDE		
7	Upper air measurement technologies	7(1)	A. Dubovetskiy
7	Surface T, P, RH measurement technologies	7(2)	J. Warne

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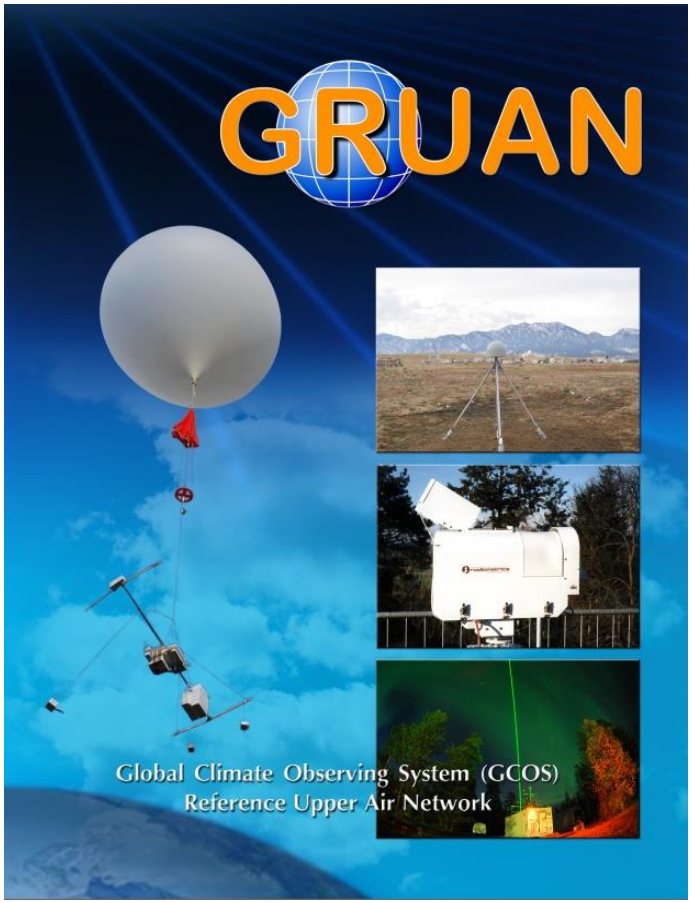
GRUAN Goals

GRUAN was established for generating reference-quality observations of temperature and water vapor, pressure, from the surface into the stratosphere to enhance the monitoring and understanding of climate variability and change



- Focus on complete estimates of measurement uncertainty
- Ensure traceability of measurements to SI units or internationally accepted standards

INRiM, VTT, NPL, KRISS and other NMIs are actively contributing in GRUAN goals

METEOMET
Metrology for Meteorology

Global warming. Support in the validation of temperature records.

Andrea Merlone

public.wmo.int/en/media/news/wmo-examines-reported-record-temperature-of-54%C2%B0c-kuwait

WORLD METEOROLOGICAL ORGANIZATION
Weather · Climate · Water

English

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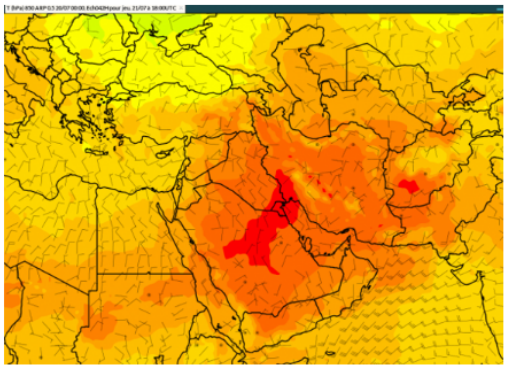

WMO examines reported record temperature of 54°C in Kuwait

26 Published 26 July 2016

WMO examines reported record temperature of 54°C in Kuwait, Iraq

WMO will set up a committee to examine whether Mitrabah, Kuwait, set a new highest temperature record for the Eastern hemisphere and Asia, with a reported temperature of 54.0°C (129.2°F) on 21 July 2016.

exceeding by a large margin the seasonal averages, and over a sustained period. This affected, in particular, the northern part of countries in the Arabian Gulf and North Africa.

Mitrabah reportedly saw a temperature of 54.0°C on 21 July and the city of Basra in Iraq recorded a temperature of 53.9°C (128°C) on Friday 22 July. Southern Morocco also saw temperatures of between 43°C and 47°C.

Governments issued heat-health warnings and took measure to minimise impacts on population. However the refugee population in the Middle East were the most affected, with heat exacerbating their fragile situation and suffering.

WMO is responsible for the official archives of World Weather and Climate Extremes (temperature, rainfall, wind gust, heaviest hailstone etc).

Latest WMO News

WMO retires Matthew and Otto from list of hurricane names
27 March 2017

New International Cloud Atlas: 19th century tradition, 21st century technology
22 March 2017

TEMPERATURE IS THE KEY QUANTITY IN DETECTING STATUS AND TRENDS OF OUR CLIMATE

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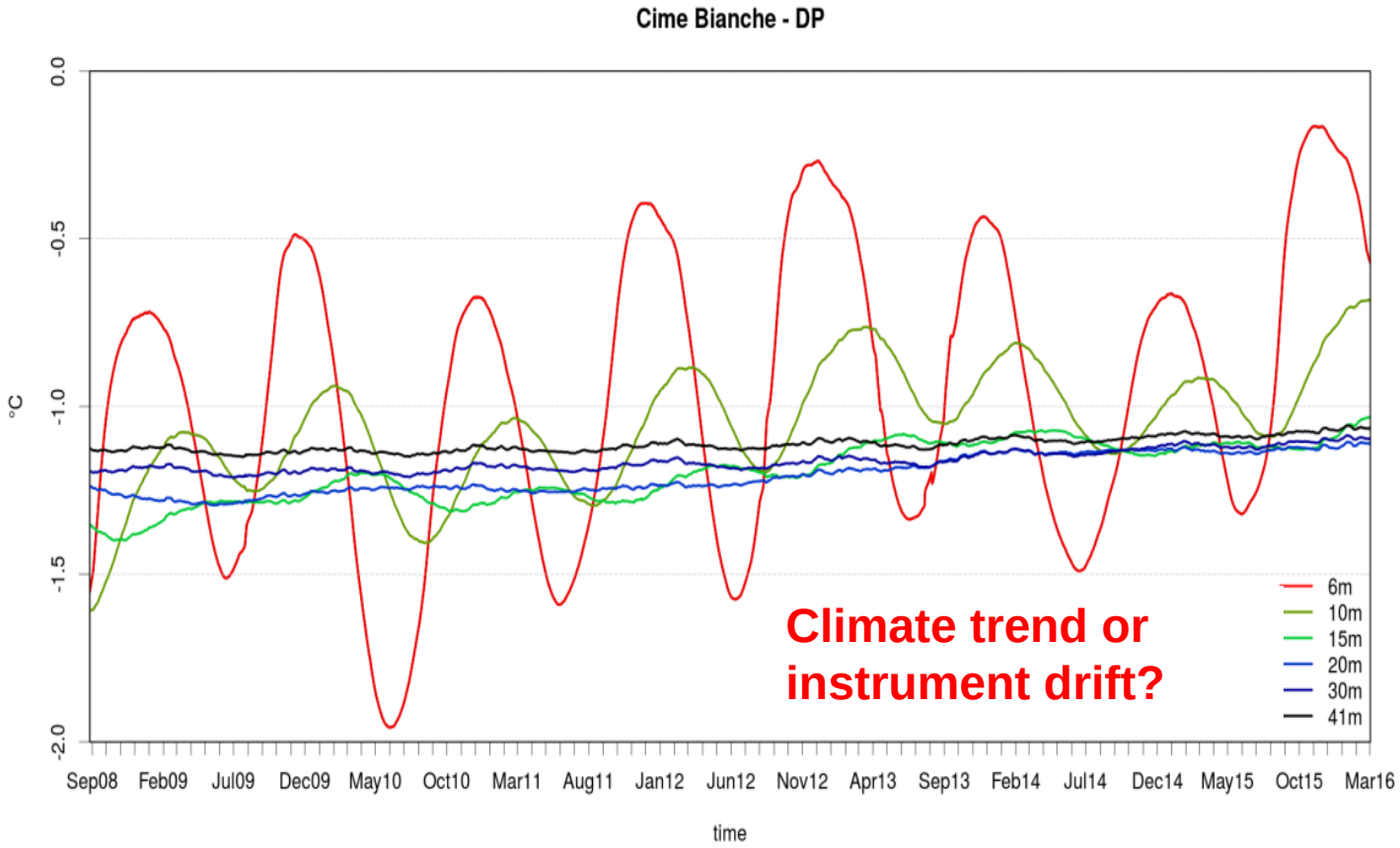
THE THERMAL METROLOGY COMMUNITY HAS A CENTRAL ROLE IN SUPPORTING DATA QUALITY (TRACEABILITY AND UNCERTAINTY)



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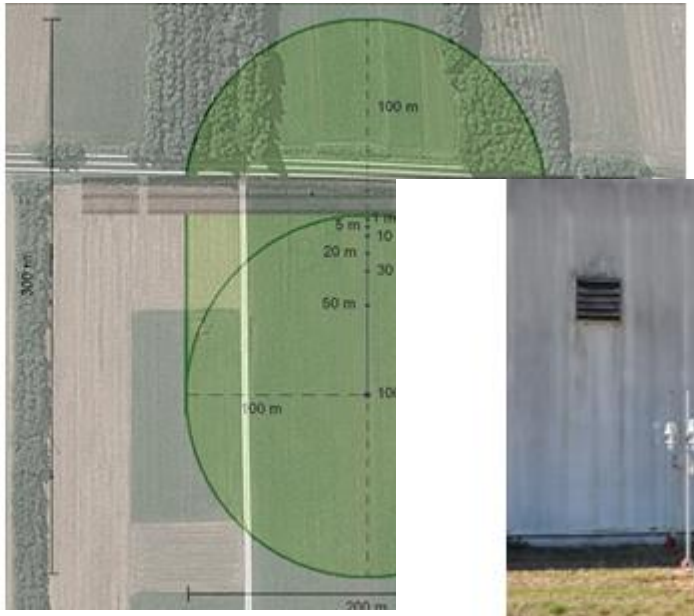
2015
Three new siting experiment

Presented at the WMO CIMO ET-OIST



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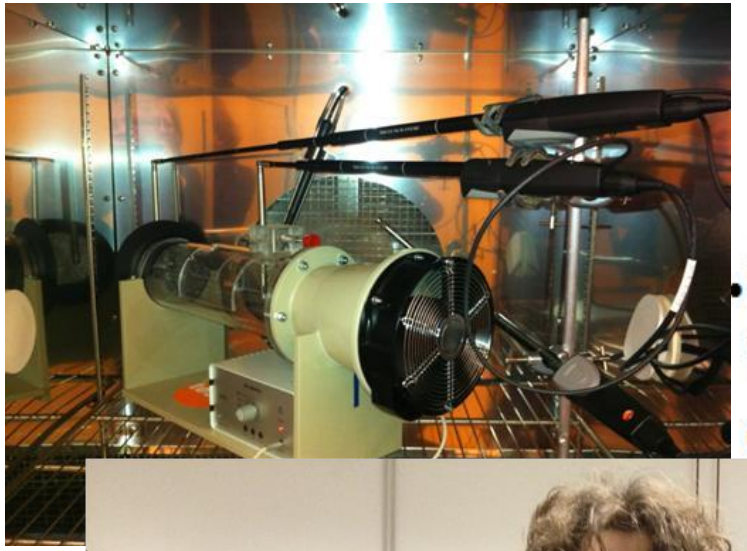

- The AquaVIT 2 intercomparison campaign with a highly
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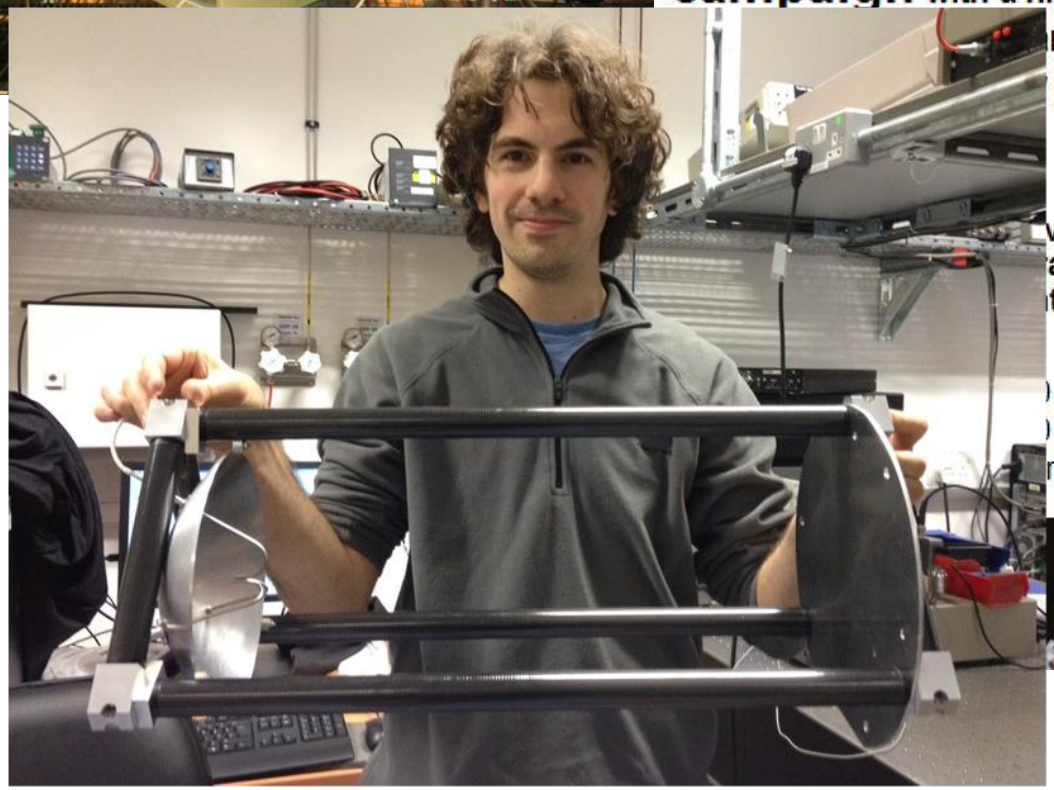

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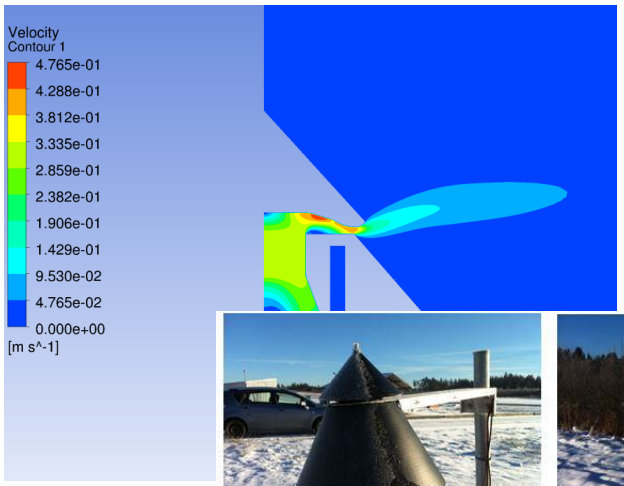

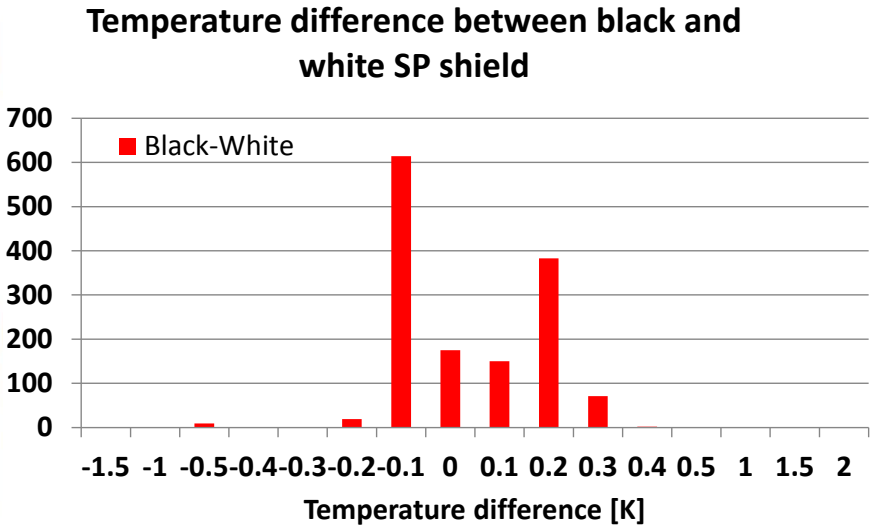

Task 3.3 – influence of seeding, rain and icing on ultrasound anemometers

DANISH TECHNOLOGICAL INSTITUTE

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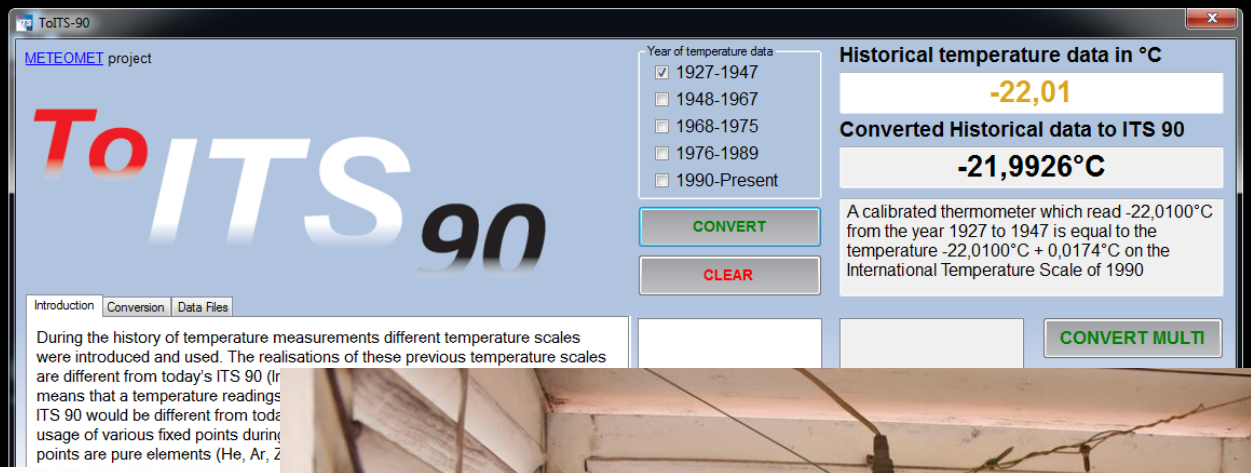

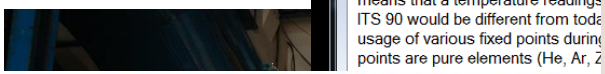

Towards full uncertainty char
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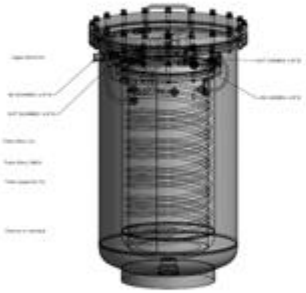
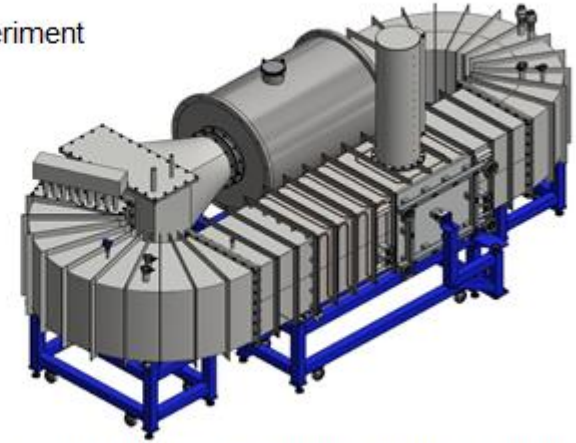
EDIE & EDDIE

Earth Dynamics Investigation Experiment





Earth Dynamics Direct Investigation Experiment

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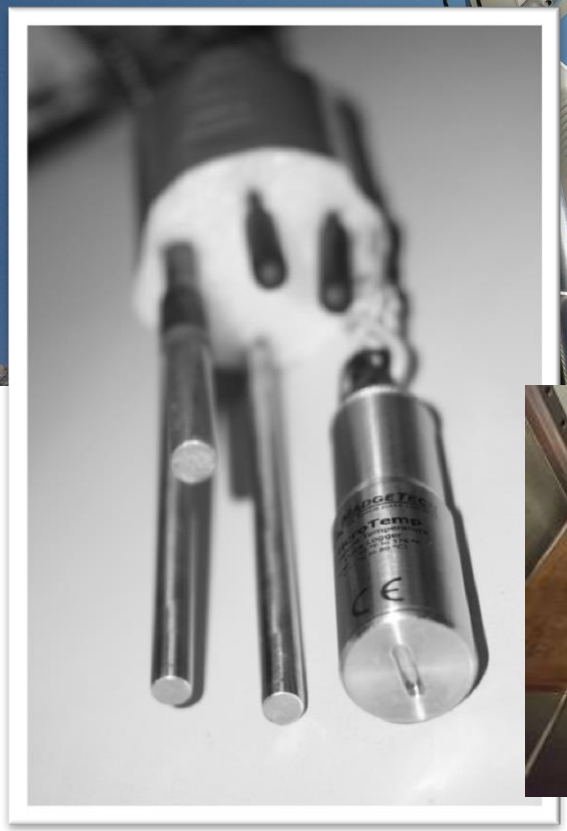

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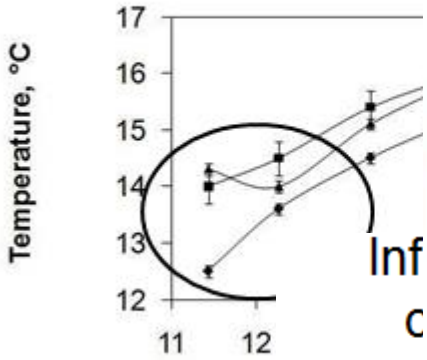
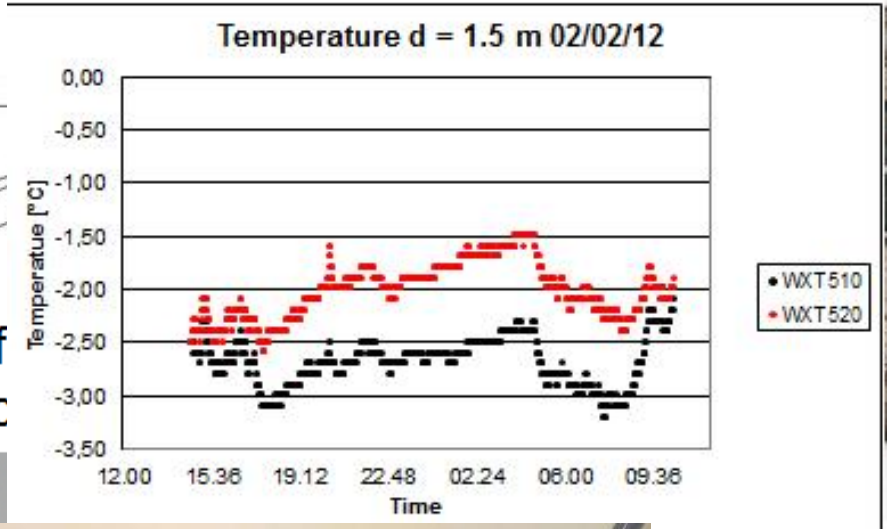
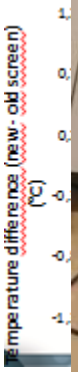
On site check Vs calibration







of the target uncertainty on
e and humidity measurements
improving the reliability of the
owing forecasting models

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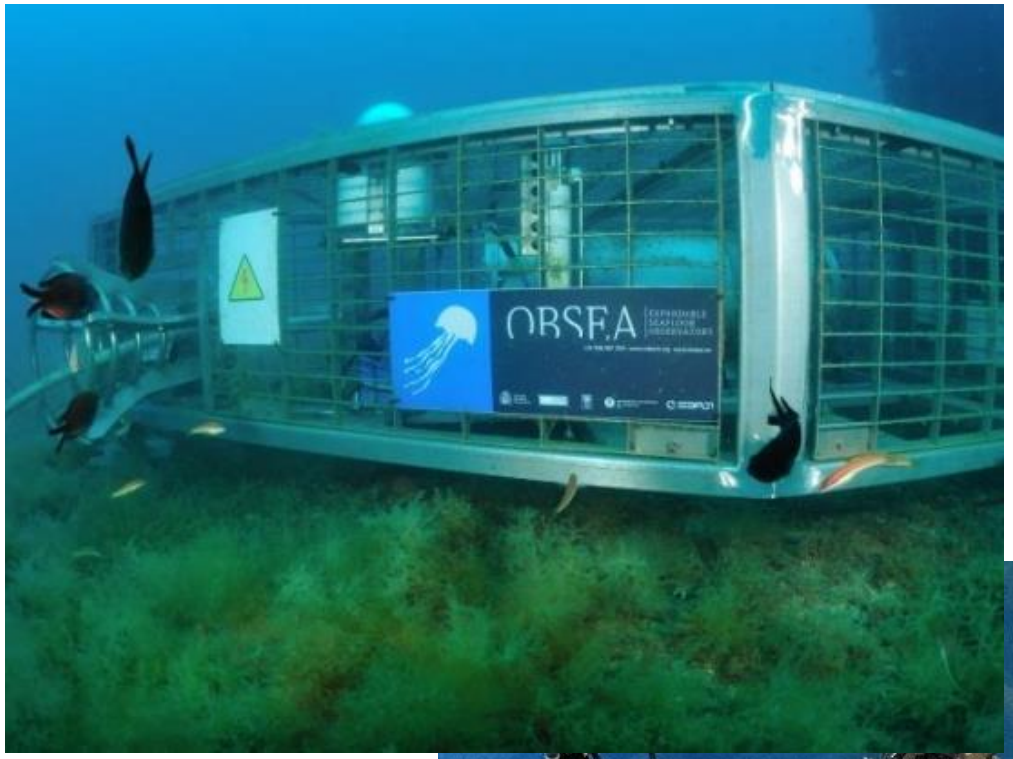

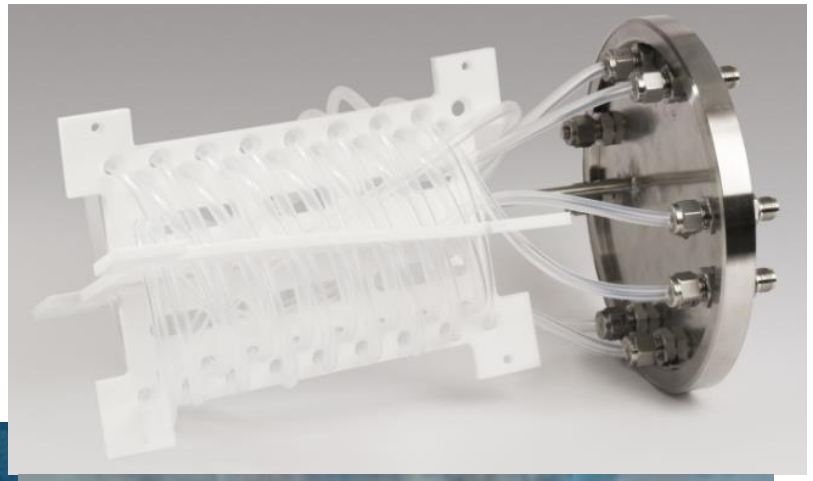

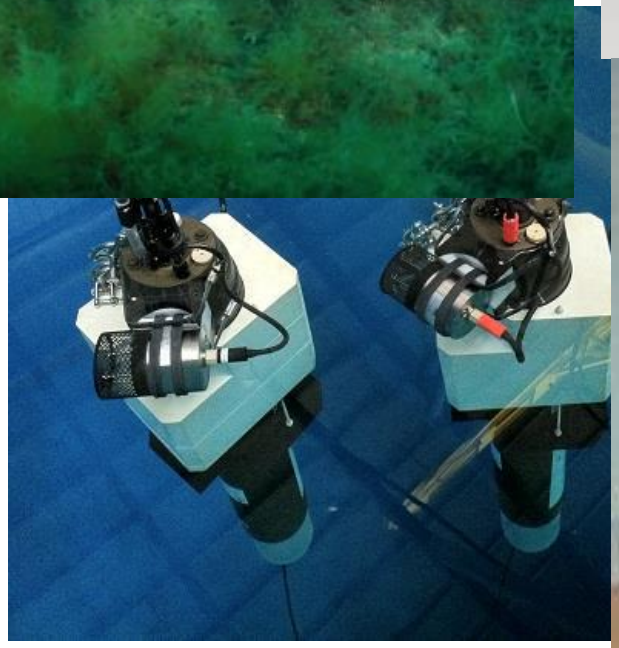

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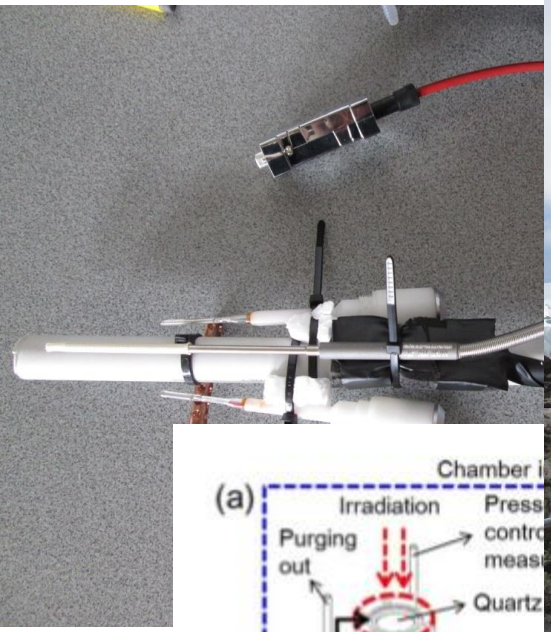
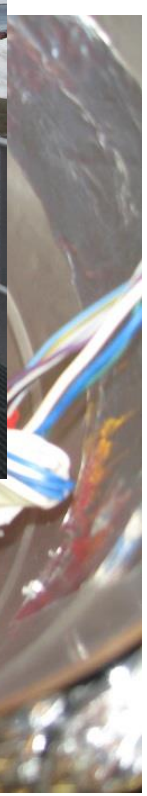
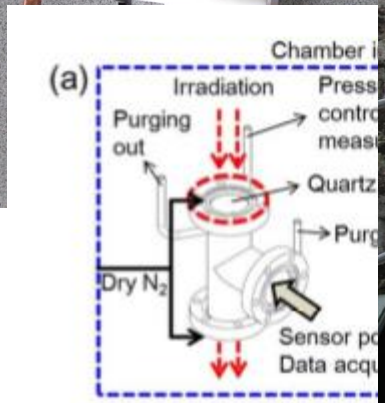
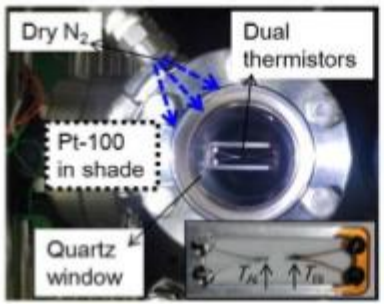
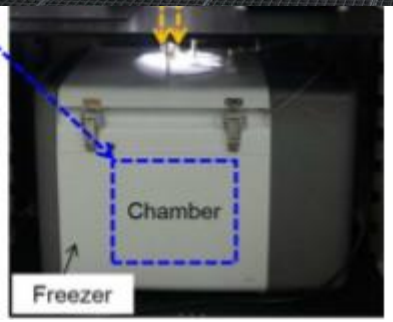
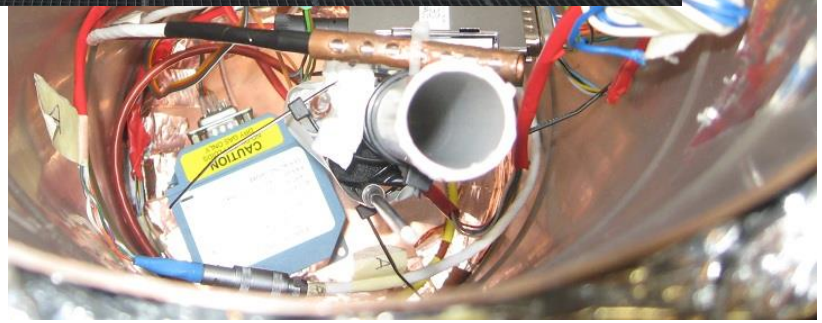





(a)
Irradiation
Purging out
Quartz
Dry N_2


(b)
Dry N_2
Dual thermistors
Pt-100 in shade
Quartz window


Chamber
Freezer



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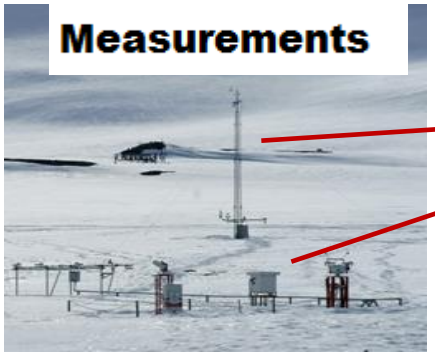
Mission “Arctic Metrology” 2014 & 2017

Arctic Metrology lab

Andrea Merlone

METEOMET
Metrology for Meteorology

EURAMET



le cnam

PTB Physikalisch Technische Bundesanstalt

CEM CENTRO ESPAÑOL DE METROLOGÍA

MIKES Centre for metrology and accreditation

pmod wrc

SP

INRiM ISTITUTO NAZIONALE DI RICERCA METROLOGICA

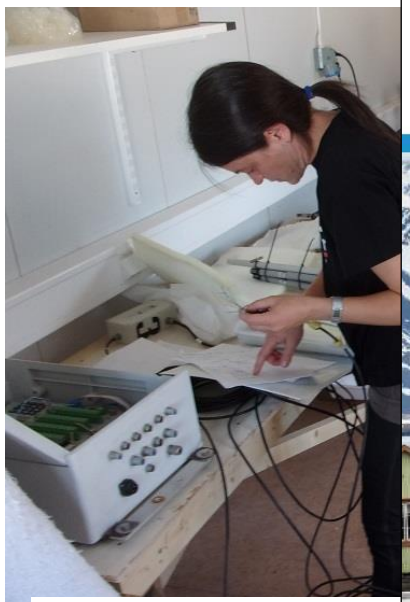
Seconda Università degli Studi di Napoli SUN

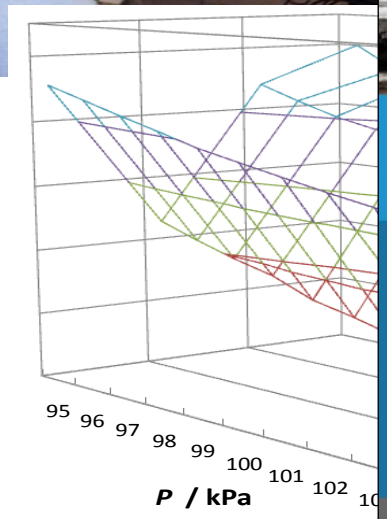
DANISH TECHNOLOGICAL INSTITUTE

Andrea Merlone

...ic ...gy lab

2017





European Metrology Research Programme
Delivering Impact

EURAMET

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.

2011 -> 2017

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METEOMET

Metrology for Meteorology

Meteomet is a EURAMET joint research project

11 M€ Budget

300 Deliverables

960 Man months

(80 years!)

MeteoMet is the larger EURAMET consortium

- 21 National Institutes of Metrology
- 12 Universities
- 13 Research centers
- 9 Instrument Companies
- 10 Meteo agencies

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A "MeteoMet – like" project submitted by 8 nations of SIM

April 2017

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REGIONAL FUND QUALITY INFRASTRUCTURE FOR BIODIVERSITY & CLIMATE PROTECTION IN LATIN AMERICA AND THE CARIBBEAN

Form sheet for Activity Proposal

Date 9/10/2016

Metrology for meteorology and climatology

Submitting Organisation ("Subproject Coordinator"):	*Javier Garcia Skabar,* ***INTI*** *Phone: +54 11 4724 6200/300/400 Interno 6583* *Mobil: +54 11 5877 5019* *Email: jskabar@inti.gob.ar* *Héctor Laiz* *Phone: +54 11 4724 6413* *Email: laiz@inti.gov.ar*
Implementing Partners ("Participating	*Eduardo Quagliata*

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Meetings

Workshops

Conferences

Trainings

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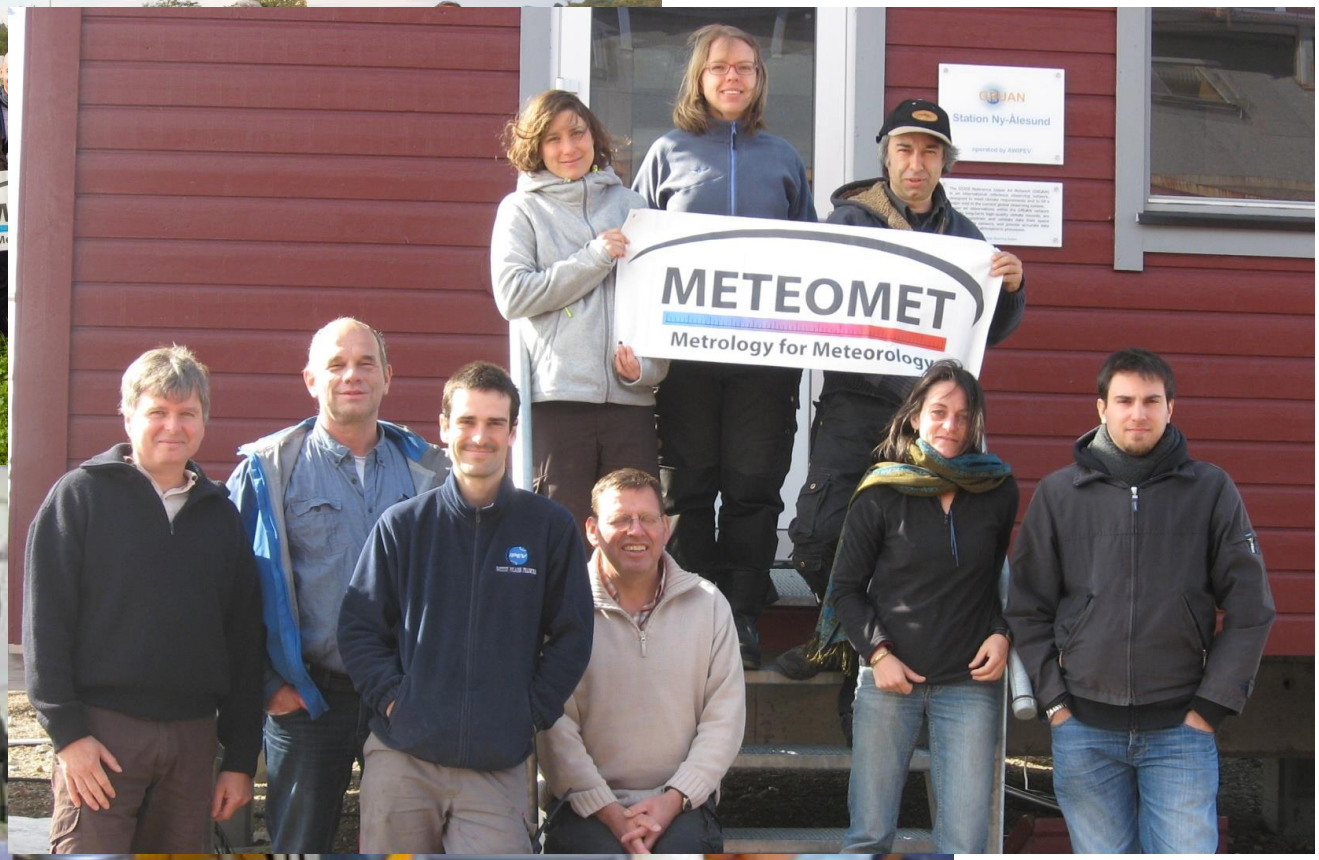

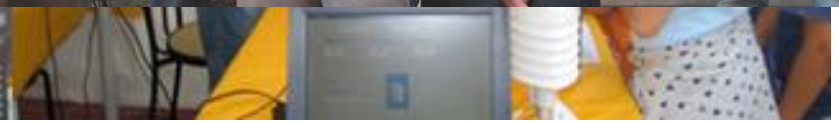

•Break out session @ Arctic Circle 2015

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REYKJAVÍK • ICELAND
ARCTIC CIRCLE 2015
OCTOBER 16 - 18

JOIN OUR MAILING LIST | ARCTIC NEWSWIRE | + SHARE

REGISTER FOR THE 2015 ASSEMBLY 16 -18 OCTOBER

2015 PROGRAM

ABOUT BOARD PARTNERS SECRETARIAT PRESS & MEDIA 2014 IMAGES VIDEO

HÁSKÓLINN Í REYKJAVÍK
REYKJAVIK 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.

EURAMET

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.

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•Break out session @ Arctic Circle 2015

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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

The International Bureau of Weights and Measures, the BIPM, ha
Metre Convention in 1875 as the intergovernmental organizat
comparability of measurements. It brings together national me
world to assure quality and comparability of measurements in phy

In this way, comparable and stable measurements of, for examp
dioxide, methane and other greenhouse gases are coordinated a
the BIPM. These measurements support international cor
greenhouse gases in the global environment.

In the field of thermometry, via the Consultative Committee for
international forum for the leading metrology institutes for the
trustable references and guidance in measurement of tempera
quantities. The last three quantities notably constitute impor
information about the state of the global environment.

Recently, within the framework of the Mutual Recognition
Committee for Weights and Measures, the World Meteorology O
their already established collaboration by a mutual exchange or
to thermometry and environmental issues.

Stable references and a metrologist's approach are necessary
may inform us about the past, the present and the future.

I am therefore delighted, as the Director of the BIPM, to endorse and support the session "Metrology for Environment in the Arctic" of the Arctic Circle Assembly.

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

INTERNATIONAL
BUREAU
OF WEIGHTS AND MEASURES

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www.bipm.org

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MMC Spain 2016

METROLOGY FOR METEOROLOGY AND CLIMATE

&

World Meteorological Organization

26-30 September 2016
Spain (Madrid)

CIMO-TECO

plus ENVRI

International Surface Temperature Initiative

World Meteorological Organization

TC-T Thermometry EURAMET Technical Committee

IMEKO TC12

GRUAN

APMP

+SOIL MOISTURE WORKSHOP

MMC Spain 2016

METROLOGY FOR METEOROLOGY AND CLIMATE

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World Meteorological Organization

Opening lecture from A. Merlone…

Andrea Merlone

…and invited talk from M. de Podesta

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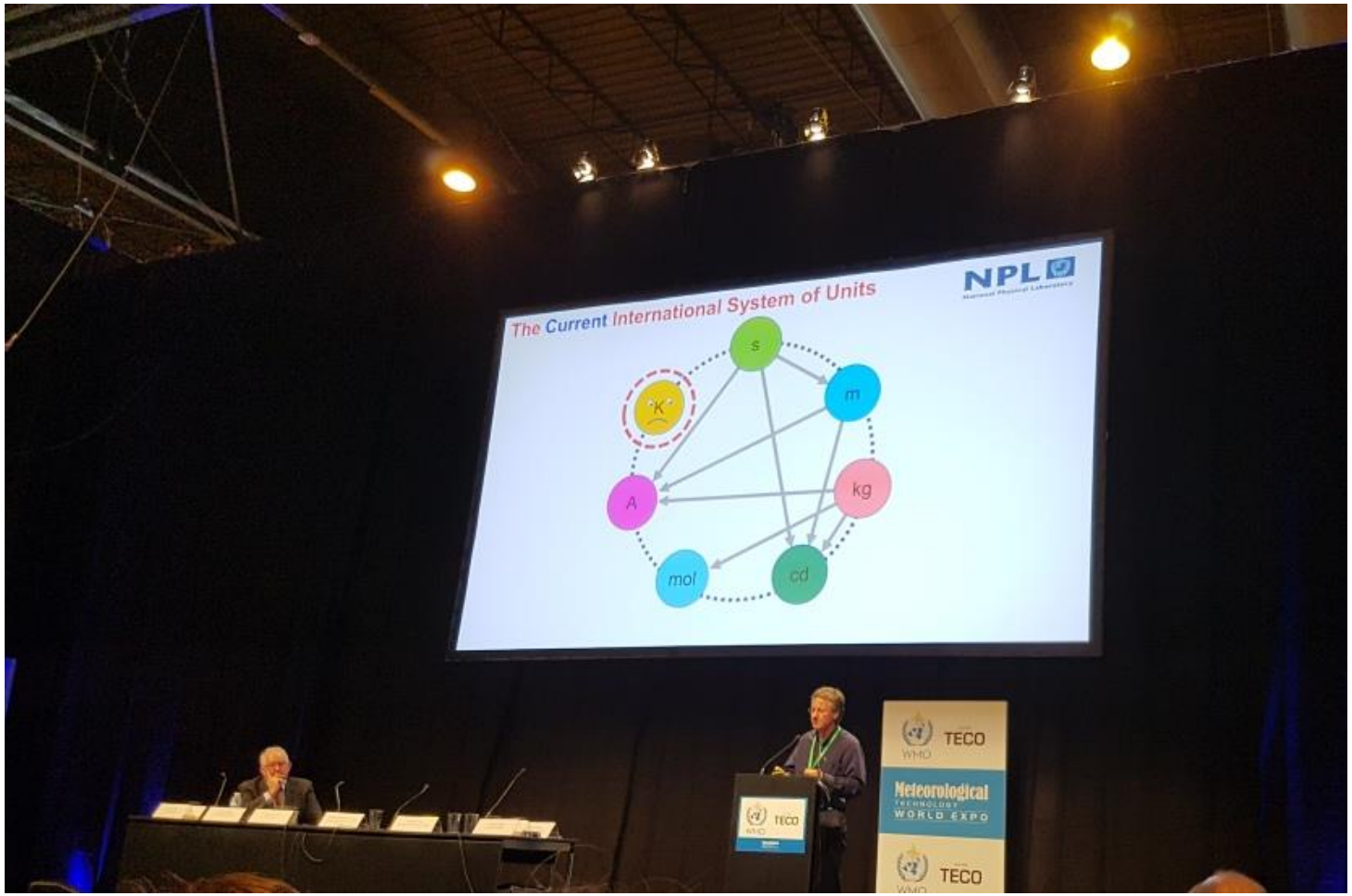

Arctic Metrology Workshops series

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1st Torino April 2015
2nd Oslo May 2016
3rd Ny-Ålesund 2017

Svalbard Integrated Arctic Earth Observing System - SIOS

2015 – 2017 Interlaboratory comparison of *P*, *T*, RH references in meteorological agencies

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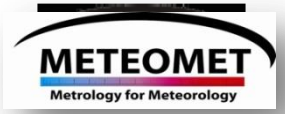
World Meteorological Organisation
Working Group on Technology Development and Implementation (WG TDI)
in RAVI
Task Team on Regional Instrument Centre

in cooperation with



Final ILC protocol

INSTRUCTION FOR THE PARTICIPANTS IN THE INTERLABORATORY COMAPRISON

Title: Intercomparison in the field of temperature, humidity and pressure
MM-ILC-2015-THP

2015 – 2017 Interlaboratory comparison of *P*, *T*, RH references in meteorological agencies

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2 pilot laboratories

17 participants

RA-VI WMO (Europe)

1 year!

Extension to Asia

Coordination through CCT TG ENV

2 Description of the equipment

2.1 General

Measuring quantity	Temperature		Relative humidity	Air Pressure
Measuring instrument	Keysight/Agilent Hewlett Packard 34420A digital readout, 2 x Pt100		Capacitive hygrometer	Barometer
Manufacturer	HP, ELPRO		Vaisala	Vaisala
Type	34420A, 2210 4700/X		HMP155 A2GB11A0A1A1A0A	PTB220 ACA2A3A1AB
Serial number	Loop 1 34420A: US34000601 Thermometers: 395050316 395060316	Loop 2 34420A: MY42002060 Thermometers: 395090316 395100316	Loop 1: K2250039 Loop 2: K2250040	Loop 1: A4610018 Loop 2: W4230005
Measuring range	(-200 ÷ 450)°C		(0.8 ÷ 100) %RH	(50 ÷ 110) kPa
Output	Temperature; Digital display, GPIB		Voltage (0..1V); Analog output	Pressure; Digital display, GPIB
Accuracy	0.05 °C at 20°C		1 %RH	15 Pa
Uncertainty	0.03 °C		-	-
Minimum immersion depth	150 mm		-	-
				

The instrument's owner: UL/FE-LMK.
For transportation purposes the measuring instruments will be placed in a protecting case.
In a case any of the above-mentioned equipment is missing at the receipt, the coordinator must be contacted.

Andrea Merlone

Towards a global land surface climate reference network

W. Thorne[1] , J. H. Lawrimore[2] , V. Venema[3] , A. Merlone[4] , M. Palecki[2] , Z., Hausfather[5] , S. Harrigan[6] , M. de Podesta[7] , K. M. Willett[8] , P. D. Jones[9] , B., Goodison[10], T. C. Peterson[11] , T. Oakley[8,12] , S. H. Abakar, C. Tassone[12] , B. Ingleby[13], D.H. Lister[9]

1 Department of Geography, Maynooth University, Maynooth, Ireland
2 National Oceanic and Atmospheric Administration's National Centers for Environmental Information, Asheville, NC, USA
3 Meteorological Institute, University of Bonn, Germany
4 Istituto Nazionale di Ricerca Metrologica and MeteoMet Consortium, Torino. Italy
5 Energy and Resources Group, UC Berkeley, USA.
6 Centre for Ecology and Hydrology, Wallingford, UK
7 National Physical Laboratory, Teddington, TW11 0LW, UK
8 Met Office, Exeter, UK
9 Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich, UK
10 TBD
11 WMO Commission for Climatology, Asheville, NC, USA
12 Global Climate Observing System Secretariat, Geneva, Switzerland
13 European Centre for Medium-Range Weather Forecasts, Reading, UK

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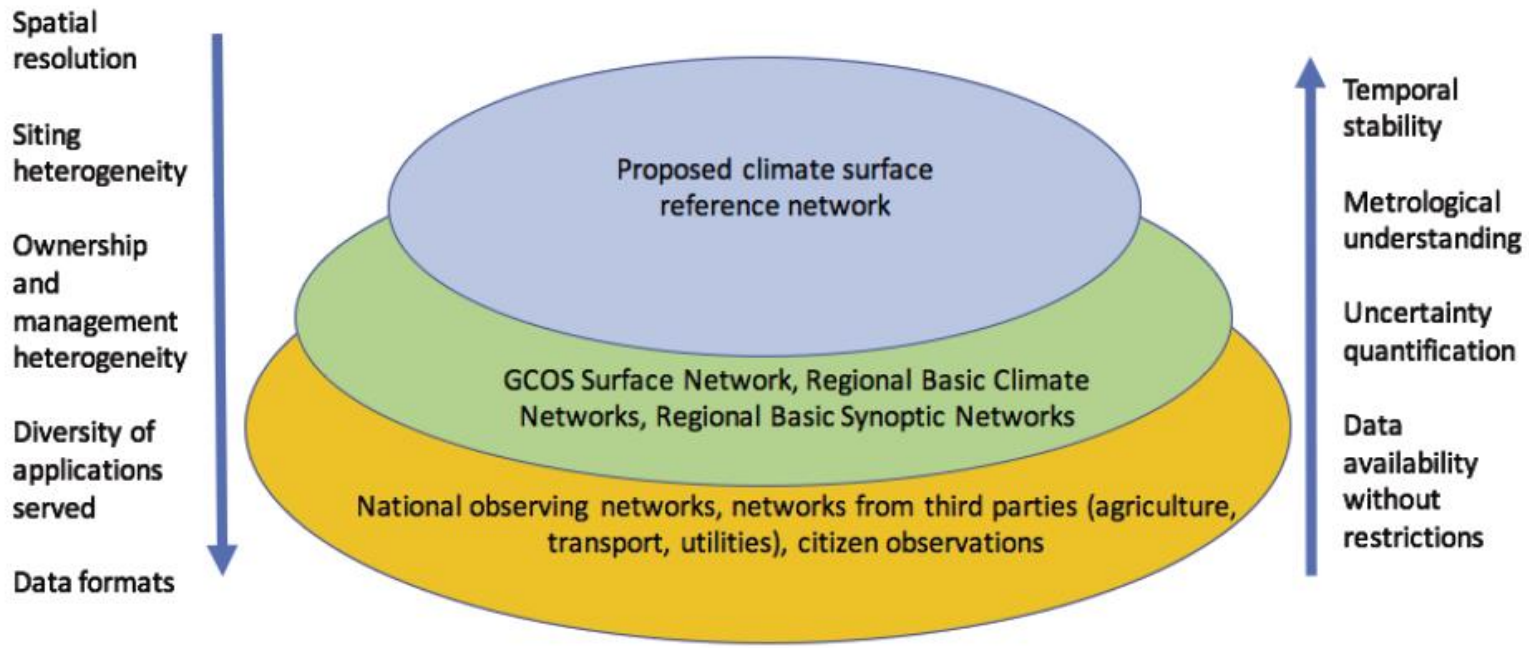
Metrology input: definition of references, calibration interval, achievable (and target) uncertainties, methods of observation



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Addressing problems in complete uncertainty budget for air temperature measurements

(ground based or upper air)

Calibration	Instrument	Quatities of influence	Measurand
Reference	Calibration	Correction	Comparability
Stability	Resolution	Knowledge	Definition
Uniformity	Sensibility	Definition	…
Repeatability	ADC	Siting	
…	Dynamics	…	
	Ageing		

Solved problems and open issues …

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EURAMET TC THERM 2017
WG Best Practice Meeting **Minutes**
Tres Cantos, 25 April 2017, 17:15 to 18:30

Participants:

Name, Institute
Miruna Dobre, SMD (WG chair)
Murat Kalemci, UME
Radek Strnad, CMI
Søren Lindholt Andersen, DTI
Graham Machin, NPL (TC-T chair)
Mohamed Sadli, LNE-CNAM (standing for Y. Hermier)
Jean-Remy Filtz LNE-CNAM (invitee)
Eric Georgin, CE
Andrea Merlone,
Aleksandra Kow
Ossi Hahtela, VT

Agenda:

- Welcome and revi
  a. Søren Lin
- Task 1 Guidelines
  a. Euramet g
  b. New versi
  pending: photos needed for cg13.
  c. Progress on new guide on **surface temperature calibrations** within EMPIR EMPRESS project: Writing not started yet. Guide delivered by the project is higher level than Euramet calibration guides Eric send the Cetiat guides to

asking for revision. Murat, Mohamed and Radek are willing to contribute to the revision, Graham will ask Jon if he wishes to coordinate the work.

- **Air temperature** sensors calibration guide: a task group is being formed for the preparation of a guide on calibration of thermometers in air.
- Other topics for further consideration: radiative properties, in-situ calibration of thermocouples

2017 - CCT TG ENV starts the preparation of a review paper on the uncertainties in air *T* measurements.

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TC-T Thermometry EURAMET Technical Committee

TC-T Strategy Group
A&D v1

Action and decision list of TC-T Strategy Group (1/2017)

Date: 27th April 2017
Time: 17:30 – 19:00
Venue:CEM, Sala del Consejo.

Present. Stephanie Bell (SB, NP
(DdC, CEM), Miruna Dobre (MD,
LNE), Ossi Hahtela (OH, MIKES
Tubitak UME), Graham Machin (G
(JN, DTI), Andrea Peruzzi (AP, VS

Invitees: Åge Olsen (ÅO, JV),
EURAMET), Domen Hudoklin (DH

This summary is to be read i
presentation.

1) Opening of meeting, reviev

7) Outputs of the TC-T and TGs engagement workshop (all).
All the attendees agreed on the successes of both workshops.
From the workshop on air temperature measurements interesting issues have been raised, about the need to progress in the studies of measurement uncertainty in this specific field. Calibration guides are also missing, as discussed in the BP group. Based on the importance of the topic and the wide range of applications involved, a group of volunteers should be identified to progress metrology on this subject. Different topics for technical workshops for the next TC-T meetings are discussed:
- Thermal imaging
- Sea and ice temperature measurements

The two first topics are finally agreed for 2018.
Action 2017-5: GM to ask Igor Pusnik to organize the Thermal Imaging workshop
Action 2017-6: AM and SR to organize the Sea and Ice Temperature Measurement workshop.

Sea and ice temperature measurements workshop (2018 TC-T April Sweden…)

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IMEKO TC19 Workshop on

METROLOGY FOR THE SEA

Naples, Italy | October 4th- 6th 2017

METROSEA

HOME | COMMITTEE | AUTHORS | PROGRAM | SOCIAL EVENTS | VENUE | TOURISM | SPONSORSHIP | CONTACTS

IMEKO TC19 WORKSHOP ON

METROLOGY FOR THE SEA

Naples, October 4th - 6th, 2017

"Learning to measure sea health parameters"

The Sea is the medium that allowed people to travel from one continent to another using vessels and even today despite the use of aircraft. It has been acting also as a great reservoir and source of foods for all living beings. However, for many generations it served as a landfill for depositing conventional and nuclear wastes, especially in its deep seabeds and there is a race to exploit minerals and resources, different from foods, encompassed in it. Its heath is a very challenge for the survival of all humanity since it is one the most important environmental components targeted by the global warming: Tsunami and El Niño are consequences and indicators of bad

IMPORTANT DATES

Abstract Submission
June 20, 2017

Abstract Acceptance Notification Date
August 4, 2017

Full Paper Submission
September 4, 2017

2017 - CCT TG ENV discussion on a proposal to improve the VIM definition of "traceability"

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Position document on the VIM definition of traceability[1]

Andrea Merlone[1], Walter Bich[2]

1. INRiM – CCT Task Group Environment Chair
2. INRiM – JCGM Working Group 1 Convener

[other authors have already supervised the text and will be mentioned at the final draft]…

Draft 3.3 – 2017_05_17

Introduction

In recent years, society has demanded higher quality products, processes and knowledge. This demand is directly reflected also in the strategies and priorities of National Metrology Institutes (NMIs) and Regional Metrology Organizations (RMOs). Several NMIs have assigned staff to new activities for directly disseminating best practice, defining dedicated calibration procedures and assisting evaluation of

Hence, **the definition could be revised** as follows:

property of a measurement result whereby the result is related to a reference through a documented unbroken chain of calibrations, and the measurement uncertainty is composed of each of the calibration uncertainties and contributions due to the measurement conditions.

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Actions from CCT TG ENV for consideration to CCT Strategy.

Outcomes of the TG ENV meeting of May 30 2017 at BIPM

CCT TG ENV Members,

- based on the activities at national, regional and world level reported by NMIs members participating in the CCT TG ENV meeting;
- considering the results achieved and planned by joint research projects in the field of thermal metrology for meteorology, environment and climate;
- having received expressed needs by the stakeholders community, in particular by the WMO expert teams, the GCOS GRUAN, the ISTI, the BSRN, the WMO Regional Instrument Centers, and other;
- considering the societal challenges as expressed in Strategic Research Agendas and roadmaps of national and international scientific and diplomatic bodies
- having attended to a number of joint measurement campaigns, technical meetings, workshops and conferences

recommend CCT to include in its strategy:

- all possible actions of within the expertise of the thermal metrology community contributing to improve measurement quality and knowledge on observation and monitoring of the environment and climate;

- the coordination of the efforts made by single NMIs, groups of NMI and RMOs towards
  - evaluation of uncertainty components for temperature measurements in air, sea water (deep sea and sea surface), ice and soil,
  - address problems in metrology of soil moisture, and also of air humidity measurements in challenging ranges such as those met by the instruments in the stratosphere
  - development of guidelines for calibration of thermometers in air, actually missing
  - implementation of dedicated metrology activities, such as field calibration and special laboratories and infrastructures to assist and support on site traceability of observations
  - continue the interaction with the stakeholder community through organization of joint events, conferences and mutual participation in expert teams
  - identification of appropriate actions to disseminate best practice and adoption of metrological methods and terminology, also considering the opportunity of adapting such methods and terminologies, to practical use and input from the external communities;
  - creation of formal joint research initiatives involving NMIs and the external community
  - support in definition of target uncertainties and instrumental aspects in the creation of reference observing networks for climatology
  - supporting metrology issues in managing changes and transition from different instrument typologies (manual to automatic recordings)

All the above require long term plans from CCT and participating NMIs, to establish continuous response to the growing demand for improved knowledge and traceability.

Include in CCT Strategy

all possible actions within the expertise of the thermal metrology community contributing to improve measurement quality and knowledge on observation and monitoring of the environment and climate;

…evaluation of uncertainty components for temperature measurements in air, sea water (deep sea and sea surface), ice, soil

…support in definition of target uncertainties and instrumental aspects in the creation of reference observing networks for climatology

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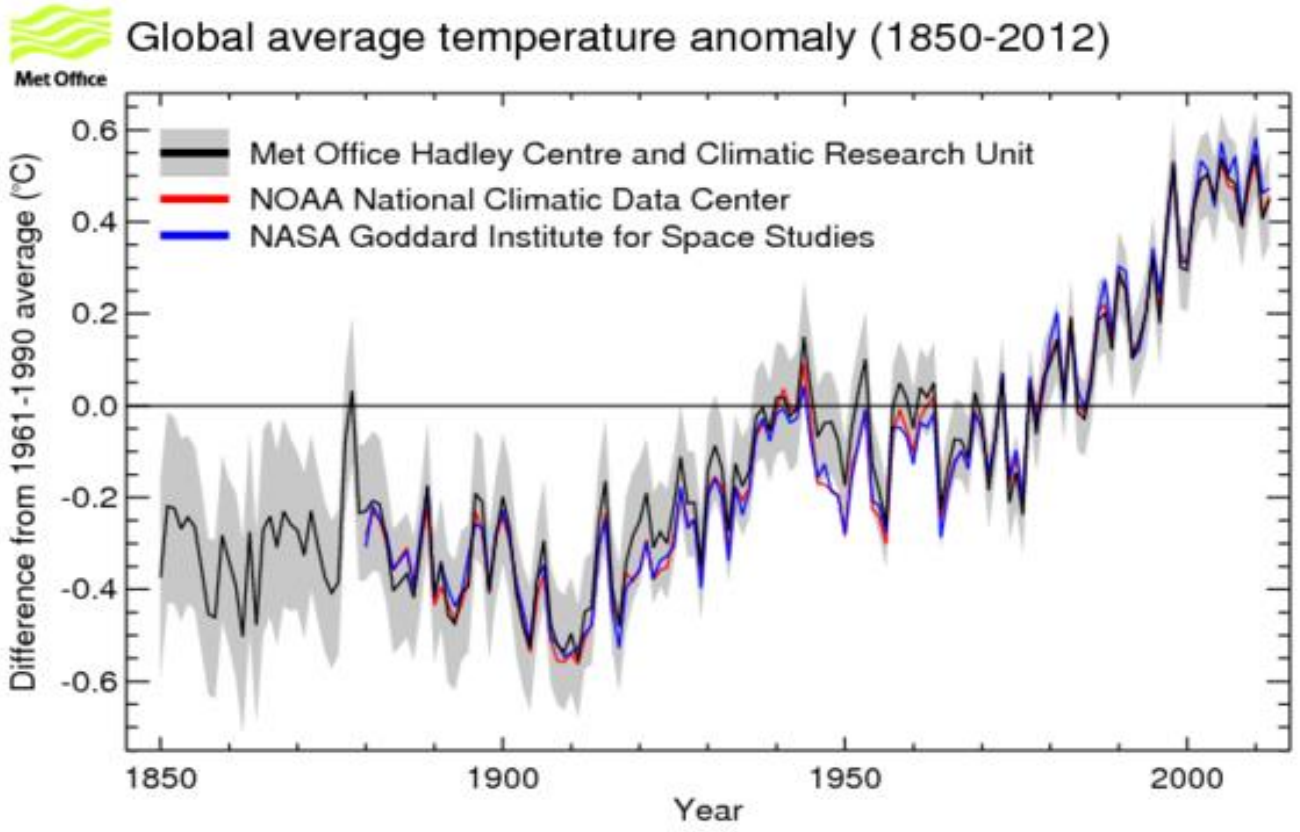
Thank you



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Consultative Committee for Thermometry

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Task Group Environment

Meeting
Tuesday 30 May 2017 - BIPM, Sèvres (France)

Chairperson: Dr Andrea Merlone (INRIM)

Members:
Dr Michael De Podesta (NPL)
Dr Efrem Ejigu (NMISA)
Dr. Carmen Garcia Izquierdo (CEM)
Mr Drago Groselj (WMO-CIMO)
Dr Martti Heinonen (MIKES)
Dr Murat Kalemci (UME)
Dr Yong Gyoo Kim (KRISS)
Dr Christian Monte (PTB)
Dr Peter Pavlasek (SMU)
Dr Fernando Sparasci (LNE-Cnam)
Dr. Howard Yoon – in place of - Mr Gregory F. Strouse (NIST)
Dr. Naohiko Sasajima – in place of - Dr. T. Nakano – in place of - Dr. J. Tamba (NMIJ/AIST)
Dr. Eric van der Ham (NMIA)
Dr. Hao Xiaopeng – in place of - Dr Jintao Zhang (NIM)

Co-opted members:
Dr Stephanie Bell (Chair of CCT WG Hu (NPL)
Dr R. Feistel (Leibniz Institute for Baltic Sea Research)
Dr Prof. P. Thorne (Maynooth University Department of Geography)
Dr M.L. Rastello (CCPR President)

Invited to attend
D.Sc. Júlio D. Brionizio (INMETRO)
Dr. Victor Fuksov (VNIIM)
Dr. Eng. Aleksandra Kowal (INTiBS)
Dr. Edgar Mendez Lango (CENAM)

Observers
Volker Evert (PTB)
Tomas Kopunec (SMU)

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MMC 2019

Hosted by

Tempmeko & Tempbeijing

October 2019

China

Conference·Announcement¶

MMC Beijing - China 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¶

METEOMET
Metrology for Meteorology

Andrea Merlone

TG Environment members

recommend CCT

to include in its strategy:

all possible actions of within the expertise of the thermal metrology community contributing to improve measurement quality and knowledge on observation and monitoring of the environment and climate;