

**WORLD METEOROLOGICAL ORGANIZATION
COMMISSION FOR INSTRUMENTS AND METHODS OF OBSERVATION**

JOINT

**CIMO EXPERT TEAM ON
SURFACE-BASED INSTRUMENT INTERCOMPARISONS AND
CALIBRATION METHODS**
Seventh (reduced) Session

AND

**INTERNATIONAL ORGANIZING COMMITTEE ON
RAINFALL INTENSITY INTERCOMPARISON**
Seventh (reduced) Session

**Sestola, Italy
22 – 27 June 2009**



FINAL REPORT

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EXECUTIVE SUMMARY

The seventh (reduced) session of the Joint Expert Team on Surface-Based Instrument Intercomparisons and Calibration Methods (ET) and International Organizing Committee on Surface-Based Instrument Intercomparisons (IOC) took place in Sestola, Italy, from 22 to 27 June 2009.

The ET/IOC finalized, reviewed and approved the final report of the Field Intercomparison of Rainfall Intensity Gauges, which was held in Vigna di Valle, Italy and which extended from October 2007 to April 2009. The report contains important conclusions as well as a number of recommendations on rainfall intensity measurements. They are not only directed at users, providing advice on the specific requirements of this type of measurements, their feasibility and instrument performance, but also at manufacturers and more generally at WMO, addressing for example the need to update the CIMO Guide, and lessons learned from this intercomparison.

The ET/IOC reviewed the status of the Intercomparison of Thermometer Screens/Shields in conjunction with Humidity Measuring Instruments that is presently being held in Ghardaia, Algeria and which started officially on 1st November 2008. The meeting made arrangements in view of the publication of the final report before CIMO-XV.

The meeting also reviewed the plans for an arctic intercomparison of Thermometer Screens/Shields in conjunction with Humidity Measuring Instruments that should be held in Iqaluit, Canada. The meeting decided to delay the start of this intercomparison to after CIMO-XV.

The ET/IOC addressed related standardization activities that are particularly important in the context of the development of the WMO Global Integrated Observing System (WIGOS) and decided to develop a standard on the classification of rainfall intensity gauges. The ET/IOC envisaged that, if sufficient support from WMO Members would be achieved, that standard could be proposed to ISO for the development of a common WMO-ISO standard.

The ET/IOC reviewed and supported the availability of Italy to propose a CIMO Lead Centre on Precipitation, including precipitation intensities.

GENERAL SUMMARY

1. ORGANIZATION OF THE SESSION

1.1 Opening of the Session

1.1.1 The seventh (reduced) session of the Joint Meeting of the Expert Team on Surface-Based Instrument Intercomparisons and Calibration Methods (ET) and the International Organizing Committee on Surface-Based Instrument Intercomparisons (IOC) was held at the Mountain Centre of the Italian Air Force (CAAM), in Sestola, Italy, from 22 to 27 June 2009. Mr Michel Leroy, Chairperson of the ET/IOC, opened the session. The list of participants is reproduced in Annex I to this report.

1.1.2 Lieutenant Colonel F. Malaspina, Director of CAAM, welcomed the participants to the meeting. Mr Malaspina was working in Vigna di Valle, the site of the Field Intercomparison of Rainfall Intensity Instruments, at the start of the intercomparison and had been involved in it.

1.1.3 Colonel G. Daddario, Director of the Italian Meteorological Service Centre of Meteorological Experimentation (ReSMA), Vigna di Valle, also welcomed the participants to the meeting. He expressed his appreciation for all the work done by the ET/IOC as well as by his staff and for the extremely fruitful cooperation that existed throughout the duration of the intercomparison. Mr Daddario thanked Mr Bruce Sumner for the help he provided in organizing the participants meeting that took place at the field site in 2007.

1.1.4 Dr M. Ondras, from the WMO Secretariat, thanked the organizers for inviting the ET/IOC to this wonderful area. He encouraged the ET/IOC to write the final conclusions and recommendations of the intercomparison in a way that all Members could benefit from the results of the past 19 months of measurements. Dr Ondras also stressed the great contribution that was provided by Italy in hosting this intercomparison.

1.1.5 On behalf of Mr Malaspina, Captain E. Vuerich, the Site Manager of the intercomparison in Vigna di Valle, presented the historical background and the present activities of CAAM. It is responsible for the observatory that is located on Mt Cimone and which field of view covers half of the Italian territory. A GAW station is installed on top of Mt Cimone. CO₂ monitoring has taken place there since 1979 and represents the longest European CO₂ time series. This site has exceptional climatological conditions and could be used for further intercomparisons, such as for radiation or icing intercomparisons.

1.1.6 On Tuesday 22 June, Colonel C. De Simone, Director of the National Centre of Meteorology and Climatology, officially welcomed the participants to the meeting. He thanked the ET/IOC for highlighting the important work done at ReSMA. He mentioned the difficult meteorological conditions present at Mt Cimone and expressed the willingness of Italy to support another intercomparison at Mt Cimone. He therefore invited the participants to identify for which type of intercomparisons those conditions would be most suitable.

1.1.7 Colonel P. Pagano from the Office of the Permanent Representative of Italy with WMO, welcomed the participants on behalf of Mr Capaldo. He recalled that he had been an initiator of the proposal of this intercomparison. He expressed his satisfaction towards the important results that had been achieved thanks to the dedicated work of the ReSMA staff.

1.2 Adoption of the Agenda

The ET/IOC adopted the Agenda for the meeting, which is reproduced at the beginning of this report.

1.3 Working Arrangements

The working hours and tentative timetable for the meeting were agreed upon.

2. REPORT OF THE CHAIRMAN

2.1 The Chairperson recalled that the main objective of the meeting was to review and approve the final report of the Field Intercomparison of Rainfall Intensity Gauges and in particular to agree on the recommendations originating from it. He highlighted the advanced state of the report that had been made possible thanks to the dedicated work of the local staff and ET/IOC. Indeed, the measurement phase of the intercomparison finished at the end of April and it is exceptional that the final report be ready for discussion so soon after. It was stressed that the ET/IOC needed to ensure that the substance of the results be understandable by Members and not only by specialist, so that they could see the value of this intercomparison and the benefits they could gain from it. Also, it would be beneficial if the report could identify ways in which manufacturers could improve their instruments.

2.2 Mr Leroy mentioned the state of the intercomparison of thermometer screens / shield in conjunction with humidity measuring instruments that is presently taking place in Algeria and that would be discussed in further details during the meeting. He recalled the link between this intercomparison and the intercomparison of the same instrument types that should be carried out in the Arctic as a follow-up. The planification of this intercomparison would also be discussed during the meeting.

3. FIELD INTERCOMPARISONS OF RAINFALL INTENSITY (RI) GAUGES, IN VIGNA DI VALLE, ITALY

3.1 Review of the Draft Final Report and approval of the Final Report

3.1.1 The Field Intercomparison of Rainfall Intensity Gauges proved to be very successful and lead to a number of important recommendations. It is expected that the results will help to improve rainfall intensity measurements and make them of relevance to a wide community, including for disaster risk reduction. Those results are expected to lead to a number of standardization activities that would be very relevant to the development of the WMO Integrated Global Observing System (WIGOS).

3.1.2 It is expected that following the promising results of this intercomparison, manufacturers will have information on how to improve their instruments and that these results will stimulate them to embark on such developments. This should also lead to further improvements of rainfall intensity measurements.

3.1.3 The ET/IOC had prepared a preliminary draft final report of the intercomparison that it had made available to manufacturers two and a half weeks before the start of the meeting to give them an opportunity to comment it and express any concern they might have with the evaluation procedures and presentation of the results. As some manufacturers had provided comments, the ET/IOC reviewed thoroughly each of them, seeking clarifications from the manufacturers in case of need. The ET/IOC provided answers to each of the comments at the beginning of the meeting and amended the report as appropriate. The ET/IOC was pleased with the very positive feedback and exchange of ideas that took place with them.

3.1.4 At the meeting, Mr Bruce Sumner, HMEI Executive Secretary, represented the manufacturers and relayed to the ET/IOC any correspondence he had with manufacturers that was relevant to the finalization of the report. He appreciated that manufacturers were given an opportunity to comment on the report, but recommended that, in the future, more time be given to them for replying.

3.1.5 As WMO Members had expressed the request that intercomparisons provide a clear rating of the instruments that participated, the ET/IOC developed a table with a rating of the performance of the instruments that should help users to select the instruments that best fit their needs. The ET/IOC considered the proposal from HMEI that the cost of the instruments was also an important factor in the selection of an instrument and could be included in the table in the form of broad cost categories. The ET/IOC agreed that this information should only be included if all manufacturers

were in agreement with the proposal. The ET/IOC requested the HMEI representative to ask HMEI members to provide the approximate cost of their instruments by the end of the week, so that this information could also be included in the table should they all agree. Several answers from participants to this request were negative therefore broad cost categories were not introduced in the summary table.

3.1.6 Based on the data policy of the intercomparison, the ET/IOC agreed that the manufacturers would be given the raw data of their instrument following the publication of the final report upon request. The ET/IOC agreed that those data would be accompanied by the 1-minute data of the rainfall intensity composite reference values of the precipitation events selected for the data analysis, and relevant ancillary data of the intercomparison. The ET/IOC requested the Site Manager to provide the manufacturers with their data upon request.

3.1.7 The ET/IOC also recalled that the intercomparison data base consisting of the 1-min rainfall intensity values could be made available to other parties for the purpose of scientific studies upon approval of the ET/IOC chair after the publication of the final report of the intercomparison. The ET/IOC recognized that this database had a potential for further studies and encouraged its further use.

3.1.8 The ET/IOC approved the procedure that was used for the data analysis. The ET/IOC recalled that the proposed procedure had been presented during TECO-2008 (27-29 November, St Petersburg, Russian Federation) at which a number of manufacturers were present and had been published in the proceedings of the conference. This method had been generally supported as no objection had been expressed at this occasion. The ET/IOC was reminded of the need to publish the final report of intercomparison within 6 months of the end of the measurement phase to meet Members requirements.

3.1.9 The ET/IOC agreed on the final report (see Annex II). The final report will be published by WMO, on the CIMO/IMOP website as an IOM report and later distributed to WMO Members and participating manufacturers. It is expected that a number of scientific papers will also be published on this subject. The complete intercomparison database will be kept by the WMO Secretariat, the ET/IOC Chair, the Project Leader and the Site Managers and will be available for further scientific studies.

3.1.10 The ET/IOC recalled that intercomparisons represented a significant financial contribution from the host countries. Indeed, the overall costs of this intercomparison that were covered by the host may be summarized in the following table:

WMO FIELD INTERCOMPARISON OF RAINFALL INTENSITY GAUGES			
LABORATORY PHASE (University of Genoa - DICAT)			
#	Description	INVESTMENTS	ACTIVITIES COSTS
1	Calibration activities, equipments maintenance and technical support, missions to Vigna di Valle intercomparison site, data elaboration and analysis, reports.		€ 36'000.00
2	Field calibration device: prototype design, hardware and software development, equipments, tests	€ 26'000.00	
3	Total - University of Genoa	€ 26'000.00	€ 36'000.00
FIELD PHASE (Italian Meteorological Service)			
4	Infrastructures: Realization of the intercomparison site and related equipments	€ 106'000.00	
5	Training, Know How, Developed expertise; activities related to the European Commission of Normalization	€ 25'000.00	

	(CEN) - TC318 "Hydrometry"		
6	Experiment set-up, management, maintenance, administration activities, missions to the laboratory of the University of Genoa and transportations of intercomparison instruments from Genoa to Vigna di Valle, organization activities, data elaboration and analysis, reports		€ 104'000.00
7	Total - Italian Meteorological Service	€ 131'000.00	€ 104'000.00
TOTALS (3+7)		€ 157'000.00	€ 140'000.00

The ET/IOC expressed its sincere appreciation to Italy for the great support and infrastructure that was provided for this intercomparison and which represented a significant cost and investment. The ET/IOC recommended that the developed expertise and infrastructure at the Intercomparison sites (both the field and the laboratory components) and any related available facilities be further exploited within WMO beyond the time limits of this intercomparison.

3.2 Proposal for development of a standard on RI measurements under the ISO-WMO working arrangements

3.2.1 The ET/IOC was informed about activities of its members related to the development of international standards. In combination with the Field Intercomparison of Rainfall Intensity Gauges, the local host had reviewed the standard ISO/EN13798:2002 (Reference Rain Gauge Pit) of the European Commission for Normalization (CEN). The proposed revision of this standard was approved by CEN Members on 18th June 2009 and would be available in November 2010.

3.2.2 A standard on rainfall intensity measurement providing a classification of instruments suitable for this purpose and based on their performance assessed in the laboratory is under development in Italy. It is being developed in collaboration with a number of instrument manufacturers who strongly welcome this development. The ET/IOC recognized that the development of such a standard at the international level would be very valuable as it would help users to choose instruments suitable for the need of their applications. This standard would also be of interest to other communities, such as the hydrology community and relevant to disaster risk reduction activities.

3.2.3 The ET/IOC was informed about the modalities of the ISO/WMO working arrangements to develop common ISO/WMO standards and about the procedure that needed to be followed within WMO in proposing such a common standard.

3.2.4 The ET/IOC recommended that this standard be further developed as an international standard by CIMO, in collaboration with other interested communities and requested Prof. Lanza to provide a draft of the standard for review to the ET/IOC as well as to do the preparatory work needed in view of getting the approval of the Executive Council, at its session of 2010, to embark on the development of a common ISO/WMO standard on the subject.

4. COMBINED INTERCOMPARISONS OF THERMOMETER SCREENS/SHIELDS, IN CONJUNCTION WITH HUMIDITY MEASURING INSTRUMENTS, IN VARIOUS CLIMATIC REGIONS

4.1 Review of the status of the Ghardaia intercomparison and preliminary evaluation report

4.1.1 The Chairman recalled the steps that had been followed in proposing and organizing the Intercomparison of Thermometer Screens/Shields in Conjunction with Humidity Measuring Instruments that is presently being held in Ghardaia, Algeria. A summary of his presentation is provided in Annex III.

4.1.2 He reminded the ET/IOC that the intercomparison had originally been planned for a duration of one year and had officially started on 1st November 2008. In view of the data obtained until now, it would indeed be important that the duration of one year be respected to cover a sufficient temperature range. It had been feared that customs matters might prevent the full duration of the intercomparison to be respected. The ET/IOC was pleased that these matters had been solved and that the intercomparison could be carried out over its originally planned duration.

4.1.3 The meeting was informed that one of the selected screens/shields had not been delivered by the manufacturer for installation in the field. In order to make best use of the intercomparison site, the host had decided to place a ventilated screen from Davis, that had originally not been officially selected for the intercomparison, at the place of the missing screen. The ET/IOC noted this information and agreed that this screen/shield could be used in the final analysis of the intercomparison.

4.1.4 The initial difficulties encountered during the instrument set-up phase and the start of the intercomparison were mostly resolved. The general availability of data is satisfactory and the overall quality of the data appears to be good. Therefore, plenty of material will be available for the data analysis. It was already clear that some interesting results will be derived from this intercomparison. The ET/IOC recalled that the data analysis would largely follow the procedures available in the ISO17714¹ standard and, in contrast to the Field Intercomparison of Rainfall Intensity Gauges, would not need to be fully newly developed.

4.1.5 Météo-France collaborated with Algeria to ensure that the quality controlled data be available in an appropriate format in the database. The data is available for the ET/IOC members on a restrictive FTP server.

4.1.6 The ET/IOC addressed the request of the CIMO Management Group to take all the necessary steps to ensure that the report of the intercomparison be published before CIMO-XV and to decide who would be carrying out the evaluation. In view of the fact that CIMO-XV will be held earlier than originally planned, in September 2010, the ET/IOC requested Météo-France to lead the evaluation phase and to collaborate with the local organizers in preparing the preliminary draft final report that should be available in March 2010 for review by the ET/IOC.

4.2 Planning of the Arctic Intercomparison

4.2.1 The ET/IOC held a teleconference with Mrs Rodica Nitu from Canada, who is in charge of the planning of the Arctic Intercomparison of Thermometer Screens/Shields in Conjunction with Humidity Measuring Instruments. This intercomparison is meant as an independent intercomparison that would follow-up on the results of the Ghardaia intercomparison, addressing the same subject but under different climatic conditions. It is consequently expected that a number of instruments taking part in the Ghardaia intercomparison would also take part in the arctic intercomparison. Also, some manufacturers might want to carry out modifications on their instruments following the publication of the final report of the Ghardaia intercomparison.

4.2.2 HMEI informed the ET/IOC that it would be difficult for manufacturers to provide new instruments before the publication of the final report of the Ghardaia intercomparison. HMEI recommended launching the call for instruments for the arctic intercomparison after the publication of the final report in view of having a better response rate of manufacturers.

4.2.3 The ET/IOC was pleased to know that the intercomparison site was ready for the intercomparison. The ET/IOC had expected that the arctic intercomparison could start in 2010.

4.2.4 The ET/IOC recalled that the installation of the instruments could only take place in the months of July and August. As CIMO is normally validating the plans of intercomparisons for the next inter-session period, the ET/IOC felt that it would be appropriate to wait for CIMO-XV, that will be held in September 2010, to (re)validate the plan. The ET/IOC therefore decided to postpone the start of the intercomparison to 2011 and thanked the local host for its willingness to rearrange its

¹ Error! Reference source not found.

own plans to accommodate this intercomparison. A tentative time schedule for the intercomparison was discussed and is reproduced in Annex IV.

4.2.5 Mrs Rodica Nitu offered to participate in the data analysis of the Ghardaïa intercomparison, with Météo-France and ONM (meteorological service of Algeria). This was welcomed by the ET/IOC and will help to prepare the Artic intercomparison.

4.2.6 The ET/IOC agreed that the sensors would be calibrated in Canada before the start of the field phase. The ET/IOC also agreed that it would be preferred that the same temperature sensors be used in all the screens, following the procedure that was used in Ghardaia. The ET/IOC accepted the offer of the host to kindly provide the sensors needed for that purpose.

4.2.7 The meeting agreed that the gathering of information on interested participants could be started prior to CIMO-XV and would also provide information on the support of members to this intercomparison. A draft questionnaire to participants is reproduced in Annex V and will be updated according to the decision of this meeting. However, the confirmation of the selected instruments would be communicated after CIMO-XV.

5. OTHER FUTURE INTERCOMPARISONS

5.1 Report on the evaluation of the questionnaire on solid precipitation

5.1.1 Mrs Nitu informed the ET/IOC that the evaluation of the questionnaire on solid precipitation was almost complete and that the final report would be distributed to the ET/IOC in July 2009. 55 completed questionnaires had been received. Their analysis showed that solid precipitation measurements were still mostly carried out manually. For those measurements, the results of past intercomparisons are still valid. However, for the automatic measurements, it appeared that an unexpectedly large variety of measuring principles and instruments were being used.

5.1.2 In view of the expected future increase of automatic measurements and the variety of measuring principles available, it appeared that it would be an appropriate time to start an intercomparison to provide advice to Members that are envisaging to change from manual to automatic measurements in the near future.

5.2 Plans for an intercomparison on solid precipitation including snowfall and snow depth measurements at automatic weather stations

5.2.1 The performances of rain gauges for the measurement of solid precipitations strongly depend on the climatic conditions in which they occur. Therefore, the results of an intercomparison that would be carried out at one single site would not be representative of most applications. This had already been recognized in the previous WMO solid precipitation intercomparison as it had been carried out at 7 different sites. Therefore, the ET/IOC recommended that, if such an intercomparison would be organized, it should be carried out at a number of sites with different climates. This would significantly complicate its organization. The ET/IOC also recognized that manual observations would be needed at each site as a verification and to assess the correlation if manual and automatic measurements.

5.2.2 The plans to carry out such an intercomparison should be further investigated at CIMO-XV and will strongly depend on the willingness of Members to provide sufficient measurement sites and to host the intercomparison.

5.3 Other proposals of intercomparisons

5.3.1 No additional proposal of intercomparison to those already presented in this report was discussed in details.

6. ANY OTHER BUSINESS

6.1 Proposal for the realization of a CIMO Test Bed on precipitation

6.1.1 The ET/IOC recommended that the developed expertise and the infrastructure of the Field Intercomparison of Rainfall Intensity Gauges should be further exploited within WMO beyond the time limits of the intercomparison. In the context of this recommendation, Prof. Lanza presented the availability of Italy to establish a Lead Centre on Precipitation Intensity. That Lead Centre would be distributed over different sites to make best use of the available know-how and infrastructure. It would consist of a field experimentation site for liquid precipitation at the Italian Meteorological Service Centre of Meteorological Experimentation (ReSMA) in Vigna di Valle, and of a laboratory site for instrument testing and calibration at the University of Genoa. Other suitable sites for solid precipitation measurements would be further envisaged and tested, as for example Mt Cimone. A description of the draft proposal, including very preliminary terms of reference is provided in Annex VI.

6.1.2 The ET/IOC appreciated the availability of Italy and recalled that Lead Centres are centres of excellence that support instrument development and testing. The ET/IOC strongly supported the establishment of a Lead Centre on Precipitation, including precipitation intensities, and recommended to CIMO to approve the establishment of this centre.

6.1.3 The ET/IOC requested Prof. Lanza and Cap. Vuerich to work with the Secretariat in view of refining the Draft Terms of Reference of the proposed Lead Centre to adapt them to the need of CIMO members and to formalize the proposal for presentation to CIMO-XV.

6.2 WIGOS

6.2.1 The meeting was informed about the development of the WMO Integrated Global Observing System (WIGOS) and that Pilot Projects (PP) had been established to test the concept. The scope of the CIMO PP for WIGOS was presented in more details and the expected need for standardization activities was highlighted.

6.2.2 The meeting noted the project and recognized that the activity that the ET/IOC had planned to carry out that addresses the development of a standard for the classification of rainfall intensity measuring instruments was very relevant to WIGOS and especially to the CIMO-PP on WIGOS. Indeed, this standard would not only be relevant to the CIMO community, but also to the hydrological community and useful for disaster risk reduction activities. In addition, this standard could also be a good candidate to propose to ISO as a common standard. The ET/IOC therefore recommended that this activity be included in the CIMO-PP on WIGOS.

7. DRAFT REPORT OF THE SESSION

7.1 The members of the ET/IOC reviewed the most critical sections of the report of the session and decided to approve the rest of the report by correspondence.

8. CLOSURE OF THE SESSION

8.1 The session was closed at 12:35 on 27 June 2009.

LIST OF PARTICIPANTS

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Final Report
WMO Field Intercomparison of Rainfall Intensity Gauges
Vigna di Valle, Italy
October 2007 – April 2009

See: <http://www.wmo.int/pages/prog/www/IMOP/publications-IOM-series.html>

Report on the Status of the Ghardaia Intercomparison of Thermometer Screens/Shields in Conjunction with Humidity Measuring Instruments

The questionnaires were sent to WMO members and HMEI in March 2006.

The selection of instruments was made in June 2006.

For sensors with an analog output, ONM (Office National de Météorologie, the national Algerian Met. Service) bought a data acquisition system manufactured by Yokogawa. A similar system is used by Météo-France (MF) /Trappes, which allows some assistance to ONM. For sensors with digital output, an acquisition software running on a PC was developed by MF.

Muriel Lacombe, Météo-France, went to Algeria (Algier and Ghardaïa) to assist ONM for the setting of the data acquisition system and analysis software supplied by MF.

Instruments which could be calibrated in laboratory, were shipped to Trappes at the end of 2006. Others were sent directly to Algeria.

Temperature probes and hygrometers were calibrated in the RIC of Trappes end of 2006 and beginning 2007. The results of these calibrations are available. Instruments were then sent to Algeria.

During the ET-IOC-SBII-4 meeting in Ghardaïa, in March 2007, the starting date of the intercomparison was foreseen on 1st July 2007.

Many problems with customs occurred, so the installation of the sensors took time in Ghardaïa. The installation was finished in November 2007. But a serious grounding problem was discovered and had to be solved by the Algerian national electricity company. It was solved in February 2008.

Some problems occurred to connect the HMT337 Vaisala sensors.

As the intercomparison had still not begun in March 2008, it was felt necessary to understand the problems in Algeria. Jérôme Duvernoy, from Météo-France volunteered to go to Algier and Ghardaïa. He was able to go the first week of June 2008. He brought new HMT337 instruments prepared by Vaisala and a portable humidity calibrator (General Eastern).

His findings and actions were the following:

- A lack of management and communication between the project manager (Algier) and the site manager (Ghardaïa).
- Connecting problems with HMT337 and TESTO sensors were solved.
- Some hygrometers were calibrated in Ghardaïa by Mr Duvernoy. Results were quite encouraging, showing only small drifts since the first calibration in Trappes.

Periods of exportation/importation for customs were extended.

The following months, some remaining technical problems were solved by a cooperation between Ghardaïa and Trappes.

It was decided to officially start the intercomparison on 1st of November 2008!

Raw data are available on a FTP server located in Ghardaïa, with a low speed Public Telephone Line. MF, Trappes, developed software to extract the data from the raw text files into a database. All data coming from sensors with analog output are available every 10 seconds. Data coming from sensors with digital output are available every 10 seconds or every minute, depending on the sensors.

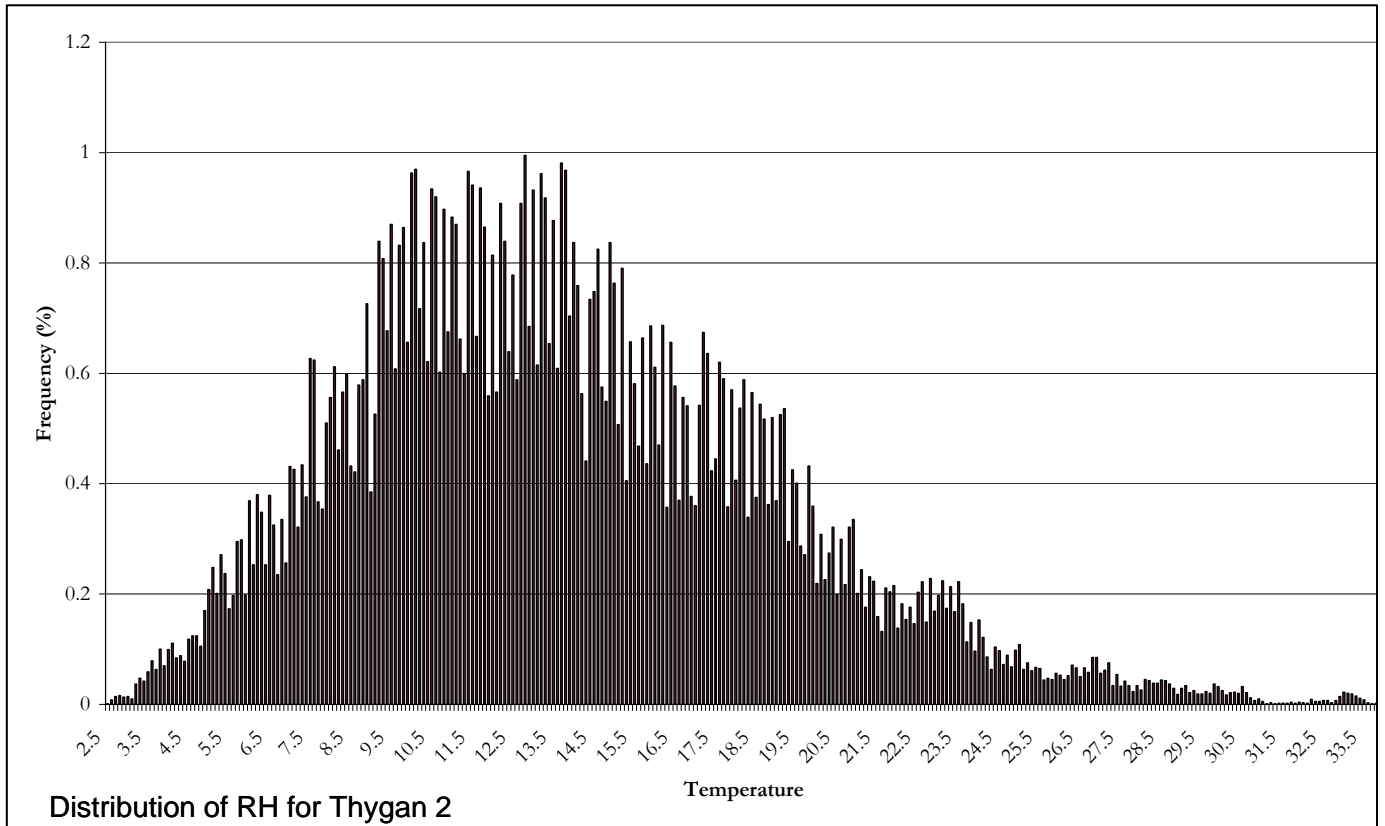
Following the March 2007 meeting, Data Quality Control was supposed to be done by ONM. MF, Trappes, developed the data quality control procedures in January and sent the associated software to Ghardaïa. This software includes calculation of a quality status (OK, doubtful, erroneous), standard deviation over 10 minutes, mean values over 1 minute. Due to differences between the time stamp of data coming from the 2 acquisition systems (analog and digital), this filtering process also shifts a set of parameters for good synchronization.

These software programs are run in Ghardaïa monthly and the results are compressed and made available on the FTP server. MF, Trappes, downloads and copies them on a restricted access WMO FTP server.

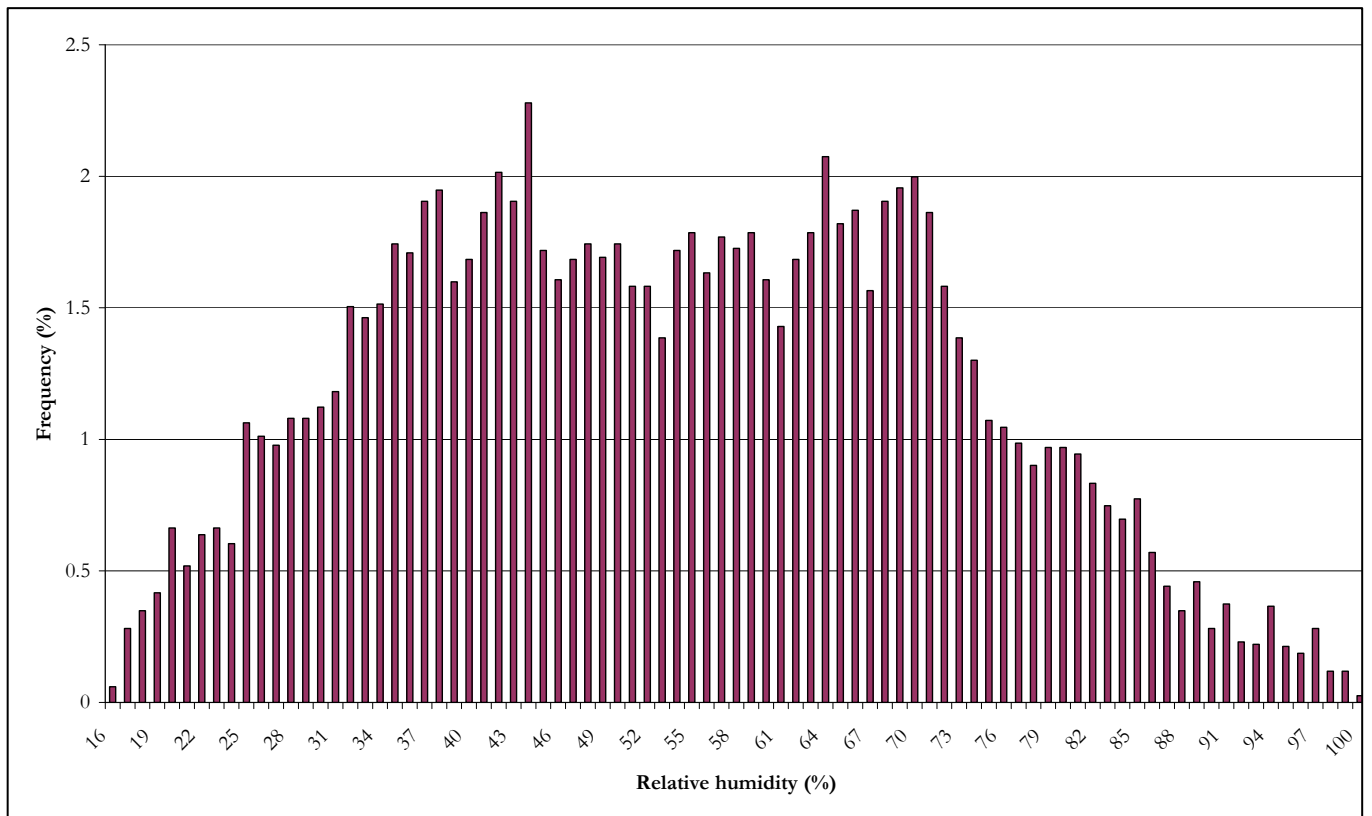
Data analysis started, both by ONM and MF in Trappes.

The following graph shows the range of temperature and relative humidity measured from November 2008 to April 2009.

Distribution of T for LCAS



Distribution of RH for Thygan 2



The following table summarizes the instruments, their type, status and data availability.

Participating instruments

Member country	Manufacturer	Type	Acronym	Screens				Humidity sensors		Acquisition	Status after 1 st November 2008 and data availability (01/11/08 → 30/04/09)	
				Type		Pt100 MF	Output	Number	Output			
				Nat.	Art.							
Algeria	Socrima	Large Stevenson Screen	LSOC	1		1	4-Wire			DAS	OK (1xT)	93.15 %
Australia	BoM	Small Stevenson screen	LBOM	1		2	4-Wire			DAS	OK (1xT)	93.15 %
Austria	Lanser	Large Stevenson Screen	LLAN	2		2	4-Wire			DAS	OK (2xT)	93.15 %
France	Socrima	BMO1195D	SSOC	2		2	4-Wire			DAS	OK (2xT)	93.15 %
Germany	Fischer	431411	VFIS		2	2	4-Wire	2	Voltage	DAS	OK (2xT, 2xRH)	93.15 %
Germany	Vaisala	HMT337 & HMT 330 MIK	SVAI	2			RS232	2	RS232	DS	OK with gaps (2xT, 2xRH)	SVAI1 56.31% SVAI2 49.52 %
Germany	Eigenbrodt / Vaisala	HMP45D / LAM630	VEIG UHMP		2	4	4-Wire	4	Voltage	DAS	OK (4xT, 4xRH)	93.15 %
Germany	Testo	AG/63379742	UTES					2	Voltage	DAS	OK after 1st Feb. (2xT, 2xRH)	48.01 %
Italy	CAE	TU20AS	SCAE	2			4-Wire	2	Voltage	DAS	OK (2xT, 2xRH)	93.15 %
Sudan	Casella	Stevenson Screen	LCAS	1		1	4-Wire			DAS	OK (1xT)	93.15 %
Switzerland	Meteolabor	Thygan VTP37 Airport	VTHY1		1		RS232	1	RS232	DS	OK with gaps (1xT, 1xRH)	44.85 %
Switzerland	Meteolabor	Thygan VTP37 Thermohygrometer	VTHY2		1		RS232	1	RS232	DS	OK with gaps (1xT, 1xRH)	45.12%
Switzerland	Rotronic	AG/RS12T & Hygroclip S3	VROT		2		Voltage	2	Voltage	DAS	OK but VROT2 noisy (2xT, 2xRH)	VROT1 93.14 % VROT2 55.63 %
UK/HMEI	Metspec	MET01	LMET	2		2	4-Wire			DAS	Screens not delivered	
UK/HMEI	Windspeed	T351-PX-D/3	SWIN	2			4-Wire			DAS	OK (2xT)	93.15 %
USA	Davis	PN7714	SDAV	2		2	4-Wire			DAS	OK (2xT)	93.15 %
USA/HMEI	Young	41003	SYOU	2		2	4-Wire			DAS	OK (2xT)	93.15 %
USA/HMEI	Young	43502	VYOU		2	2	4-Wire			DAS	OK (2xT)	93.15 %
USA	Davis		VDAV	2		2	4-Wire			DAS	OK (2xT)	93.15 %

Germany	Thies	Ultra Sonic anemometer with virtual temperature	ATHI							DS	OK (2xT)	ATHI1 84.76% ATHI2 80.12 %
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DAS stands for Data Acquisition Unit
DS stands for Dedicated Software

WORLD METEOROLOGICAL ORGANIZATION

QUESTIONNAIRE I

to potential participants

of the WMO Combined Intercomparison of Thermometer Screens/Shields
in Conjunction with Humidity Measuring Instruments
Iqaluit, Nunavut, Canada

1. Member Country:

2. Expert (point-of-contact) for the intercomparison:

Name, First Name:.....

Address:

Tel./Fax:

E-mail:

3. Basic information on the humidity sensor or screen/shield foreseen in the intercomparison: ^{(1), (2)}

Thermometer screen/shield natural ventilated []

Thermometer screen/shield artificially ventilated []

Humidity sensor []

3.1 Short description of the proposed humidity sensor or screen/shield:

.....
.....
.....
.....

3.2 Type of the humidity sensor or screen/shield:

a) Model/Type:.....

b) Manufacturer:..... Country:.....

c) Number of sites where the sensor or screen/shield is in operational use or is intended to be in your country:

d) Will you submit **one** [] or **two** [] identical instruments ^{(2), (3)}

3.3 Detailed information on the sensor or screen/shield:

3.3.1 **Thermometer screen/shield:**

• Performance characteristic (operating range):

• Estimated radiation error:.....

• Material used (construction):.....

• Aspiration rate (in case of artificially ventilated screen/shield):.....

• Suitable for the described temperature probe⁽⁴⁾ [] or must be used with a particular type [] ⁽²⁾

– If only for a particular, please specify the sensor or limits:

.....
.....
.....

• Suitable for any type of humidity sensor [] or only a particular type [] ⁽²⁾

- If only for a particular, please specify the sensor or limits:

.....
.....
.....

3.3.2 Humidity sensor:

- Parameter reported: Relative humidity [] Dew-point temperature [] ⁽²⁾
- Principle of measurement:.....
- Measuring range:.....
- Performance characteristic (operating range):
- Uncertainty:
- Time constant:.....
- Resolution:.....
- Long-term stability:.....
- Sampling interval (internal or recommended):.....
- Averaging interval (internal or recommended):.....
- Time resolution (if applicable):.....
- Output averaging time (if applicable):

Date

Signature of the Permanent Representative

NOTES:

Further information on organizational and technical issue for the preparation of the intercomparison will be distributed in due course to the experts designated by you, as appropriate.

It is intended to calibrate the temperature probes and the humidity sensors in laboratory before and after the intercomparison. The calibration will be conducted by Meteorological Service of Canada (MSC). Nevertheless, the sensors must be calibrated and adjusted by the manufacturer or the member country proposing the sensors.

- (1) In case it is intended to submit more types of sensors, attach another completed copy(ies) of this questionnaire.
- (2) Please tick the appropriate box.
- (3) To achieve more confidence in the results, preferences will be given to testing of two identical instruments; however this is not a condition for participation.
- (4) For the intercomparison of the screens, it is preferred to use the same type of temperature probe. Meteorological Service of Canada (MSC) has offered calibrated temperature probes, with characteristics given in the Attachment. Such a probe will be used in each screen with which it is compatible. Therefore, the compatibility between the MF probe and the proposed screen must be indicated. If there is any reason for not using the MF probe (size, probe characteristics, calibration uncertainty, etc., this should be indicated.

Please return the completed questionnaire, as soon as possible,
but not later than **June 30, 2010** to the WMO Secretariat, to the attention of:

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Senior Scientific Officer,
Observing System Division
World Weather Watch Department
P.O. Box 2300
1211 Geneva 2, Switzerland

Tel.: +(41 22) 730 8278
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DRAFT TERMS OF REFERENCE FOR A LEAD CENTRE ON PRECIPITATION INTENSITY (LC-PRIN)

Basic concept: To establish a Lead Centre with the aim of providing specific guidance to Members about instrument calibration and their achievable accuracy, performing laboratory and field tests and providing research/technical developments about the measurement of precipitation intensity and the related data analysis and interpretation.

Considering:

1. The results of the Laboratory Intercomparison of rainfall intensity gauges (2004-2005) and the results of the Field Intercomparison of rainfall intensity gauges (2007-2009),
2. The need for improving dynamic calibration procedures in laboratory and the achievable accuracy of intensity measurements in field conditions to meet increasing needs for high quality meteorological and hydrological data,
3. The requirement for general standardization of precipitation intensity measurements,
4. The need for building the hierarchy of the traceability of precipitation intensity measurements to International System of Units standards,
5. The current projects of revision of the ISO/EN 13798:2002 (Reference Rain Gauge Pit) and the development of a technical report about rainfall intensity measurements both approved by the resolutions of CEN/TC 318 Hydrometry;
6. The need for international comparisons and evaluations of precipitation gauges in support of instruments development, data compatibility and homogeneity,

The following “profile” is proposed for the establishment of a Lead Centre (LC) on Precipitation Intensity (PRIN):

- a) The LC-PRIN shall have, or have access to, the necessary facilities and laboratory equipment to perform dynamic calibration of precipitation gauges in the laboratory, according to the recommended CIMO procedures (CIMO XIV – Recommendation n°2);
- b) The LC-PRIN shall develop technical procedures and improve the laboratory capabilities concerned with the results of the Field Intercomparison of RI gauges, e.g. the evaluation of stability of 1 minute measurements, the determination of the 1 minute step response function, the recommendation for accurate time synchronization of 1 minute intensity measurements, the evaluation of possible standard calibration procedures for non-catching type precipitation gauges, etc.;
- c) The LC-PRIN shall maintain suitable equipment for laboratory calibration and the traceability of its measurement standards and measuring instruments;
- d) The LC-PRIN shall perform research on suitable equipment and procedures for routine field testing of network precipitation gauges to be proposed as recommended for the standardization of field calibrations of precipitation gauges during operational use;
- e) The LC-PRIN shall have the necessary test beds and equipped facilities, located in suitable climatic locations for solid or liquid precipitation or both, to perform regular laboratory/field measurement campaigns or international/regional comparisons with the purpose to test the performance of different measuring principles for precipitation intensity and the effects of laboratory calibrations mentioned above on the measured intensities;
- f) The LC-PRIN, in dealing with liquid precipitation measurements, shall maintain a set of gauges acting as a working reference for field measurements of rainfall intensity; the working reference rain gauges should be inserted in a pit according to the ISO/EN 13798:2002 revision 2009 (Reference Rain Gauge Pit) to minimize the effect of weather related errors on measured rain intensities;

- g) The LC-PRIN, in dealing with solid precipitation measurements, shall maintain a working reference for field measurements of snowfall intensity to be installed according to the WMO reference standard (DFIR) to minimize the effect of weather related errors on measured snow intensities;
 - h) The LC-PRIN shall cooperate with regional RICs for the development of quality assurance procedures, guidance material to Members regarding the performance and maintenance of precipitation intensity gauges;
 - i) The LC-PRIN will propose standards on precipitation intensity measurements for consideration in WMO and ISO technical committees (under ISO/WMO working arrangement on 16th September 2008);
 - j) The LC-PRIN shall regularly provide the Members and WMO-CIMO/ET with technical reports of its laboratory and field activities;
 - k) The LC-PRIN shall cooperate with regional RICs and other international test bed facilities for the organization and participation in field tests for specific purposes or in international/regional intercomparisons;
 - l) The LC-PRIN shall have a dedicated managerial and technical staff with the necessary expertises and experience in fulfilling its functions.
 - m) The regional RIC will assess the LC-PRIN, at least every five years, to verify its capabilities and performance.
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