

Acquisition system used by the Algerian ONM for WMO Combined Intercomparison of Thermometer Screens/Shields in Conjunction with Humidity Measuring Instruments

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Introduction

The WMO combined intercomparison of thermometers screens/shields in conjunction with humidity measurements was decided to take place at the location of Ghardaia, situated about 600 km south of Algiers.

Ghardaia meteorological station is situated near the airport, about 25 km from the city centre. Climatic data reveals wide ranges of daily variations of temperatures and humidities. For the intercomparison, the Algerian national meteorological service (ONM: Office National de la Météorologie) had to fully develop the experimental field, starting from levelling ground.

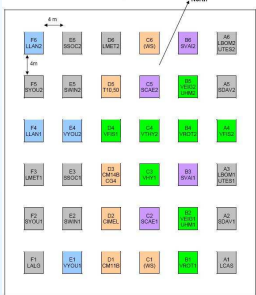
In this poster, all the instruments selected are reminded. After a global presentation of the experimental field, we focus on the acquisition system of all sensors.

Global set-up of the experimental field

All sensors are installed according to CIMO Guide n°8, on natural soil, sand and stones in this location and according to ISO 17714 standard.

Sensors are at a minimum distance of 4 meters from each other. Screens are installed so that all temperature measurements are representative of the height of 1.5 meter.

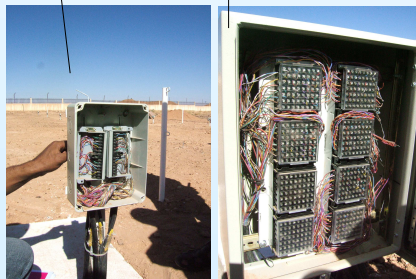
The experimental field is set of 6 rows of 6 sensors each. Sensors are first connected to a small box, near each stand of instruments. All sensors in a row are then connected to a medium box, then to one big box, that includes all sensors of the experimental field.



Up, left: Positioning of the instruments in the experimental field
Up, right: Overview of the test site. In the background is the outer wall of Ghardaia met station.

Down, left: An example of medium connection box. One similar box is installed for each row.

Down, right: The global connection set. Cables are linked directly from there to a similar box in the met station building.



Instruments selected

30 screens (16 different models) and 12 hygrometers (6 different models) were selected.

Temperature measurements are mainly done with calibrated Pt100 probes supplied by METEOFRANCE, except for screens whose manufacturer supplied its own probe.

In addition to these basic measurements, ancillary measurements are made, either in the test site (their acquisition is similar to the one used for basic measurements), or in the Ghardaia AWS.

No.	Member Country	Manufacturer/ Type of the sensors/screen	Numbers			Name	
			Type of the screen	Hu mid /y	Screen & RH		
			Nat	Art			
1	Australia	BOM		2		LBOM	
6	France	Socimat/ BMO 1195 D 0000		2		SSOC	
9	Germany	Vaisala/HMT 231 & HMT 330/MIK	2	2	2	SSOC	
10	Germany	Eigentool/AM232, Vaisala HMP45D		2	2	UTES/UTES	
11	Germany	Testo AG/3379/42		2	2	UTES	
14	Italy	CME SpA/TU20AS	2	2	2	UTES	
21	Sudan	Casella	1			UTES	
23	Switzerland	Meteolabor AG/Thygan VTP37 Airport		1	1	1	VTHY
24	Switzerland	Meteolabor/Thygan VTP37		1	1	1	VTHY
25	Switzerland	Rotronic AG/RS12T		2	2	2	VTHY
27	UK (H&M)	Metspec/ MET 01		2			LMET
29	UK (H&M)	Windsped Int/ TRSL-PX-D/3		2			SWIN
35	USA/H&M	Young 4100S		2			YVYO
36	USA/H&M	Young 4350Z			2		YVYO
A1	Algeria	Socimat/ Grand modele	1				LSOC
A2	USA/H&M	Davis Inst./ PN 7714		2			SDAV
A3	Austria	Lanser		2			LANA
A4	Germany	Fisher		1/2	1/2		VTHY

Up: the set of selected instruments in this intercomparison

Ancillary measurements

Ancillary sensors are installed in the test site in the same way as screens. Each sensor has a small connection box and power supply near its stand.

Measurement	Model	Output
Wind at 2 m height	Windsoric	RS232
Wind at 2 m height	Thies	RS232
Wind at 10 m height		
Pressure		Local AWS
Precipitation		Ghardaia station
Global solar radiation	CM11B	Voltage
Duration of sunshine	Cimel	Pulse
Long-wave net radiation	CG4	Voltage
Surface albedo	CM14B	Voltage
Ground temperature	PT100	4-Wire
Temperature profile	PT100	4-Wire

Left: the set of instruments for ancillary measurements of this intercomparison

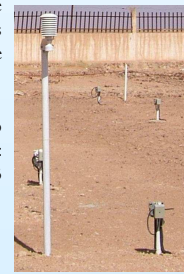
Right: Typical set-up of an ancillary sensor: the pyranometer



Typical set-up of screens/shields

Near the stand of each screen a connection box and 220V AC power supply are available. If necessary for example, a 12V DC power inverter can be settled. Data cables and power cables are separated.

Right: Typical set-up of a screen/shield: the Young 41003 screen



Protection against mains power failure

To protect data acquisition against mains power failure, PCs and experimental field power are connected to a generator set (see picture below). This generator switches on automatically in case of electric failure.



The acquisition system for analogical sensors

All temperature probes and voltage sensors are connected to a data acquisition system model MW100 from manufacturer Yokogawa. This system is the same as METEO-FRANCE has recently bought for its own experimental field in Trappes, that makes its configuration and its control easier. The board also includes one battery and one inverter in case of shut down of mains power. It is also a protection for the acquisition system against dust, especially during sand blowing.

The ONM has bought two identical acquisition system in order to prevent the risk of failure of one system.

The acquisition of the analogical sensors is set every 10 s. Raw data are stored locally within the system on a compact flash memory card, and transferred to a PC by Ethernet connection.

Left: the global acquisition system for analogical sensors. In the bottom, the inverter and battery system, in case of mains power problem.

Right: Details of the Yokogawa main unit MW100. In the upper part of the picture are the surge protection switches

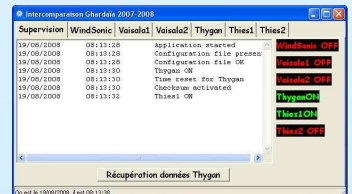


The acquisition system for numerical sensors

Due to the distance between the met station building and the experimental field, the RS485 transmission protocol is used. Small RS232-RS485 converters enable data acquisition using serial port of a PC.

The ONM had acquired two multiport cards model AcelePort Xr920 from manufacturer Digi International. These cards allows acquisition of 16 serial lines.

A specific software has been developed to get messages and store them in ascii files. It is in French language, easier to understand for local staff.



Up: A screen capture of the software dedicated to the acquisition of numerical sensors

Outlook - Conclusion

For this intercomparison, the ONM had to fully install an experimental field, including infrastructures. The ONM has acquired a complete data acquisition system and many sensors dedicated to ancillary measurements. A great job has been achieved since now.

The first data are now available. The next great step will be the data processing. METEO-FRANCE will continue to assist the ONM in this project: special database tools developed by METEO-FRANCE will be used to analyse data.

References

- WMO Guide to Meteorological Instruments and Methods of Observation, WMO publication No. 8, 6th Edition, 1996.
- Final report of the 4th (reduced) session of the Expert Team on Surface-Based Instrument Intercomparisons and Calibration Methods and of the 4th (reduced) session of the International Organizing Committee on Surface-Based Instrument Intercomparisons, Ghardaia, 19-23 March 2007.
- Meteorology -- Air temperature measurements -- Test methods for comparing the performance of thermometer shields/screens and defining important characteristics, ISO/FDIS 17714:2007, Edition 1, 2007