

COMPARISON OF CLASSICAL INSTRUMENTS AND AUTOMATIC HYDRO METEOROLOGICAL SYSTEMS.

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Abstract

For measuring the air temperature , humidity , the dry and wet bulb, water level of river, we use the traditional instruments and automatics in the member's countries of world meteorological organization (WMO) .

In Chad, modern screens were installed in 1995.

The results of measuring vary significantly. The air temperature measured in the new type of the screens in the morning (0600 TU) is higher than that of the old one and the air temperature at noon (1800 TU) in the modern screen is lower than in the old one.

For the first the difference is ranging from 0 to 0,7°C while humidity differs by 5%.

For the second, this difference is ranging from 0,1 to +2°C in certain station and 0,1 to 0,2°C in the other.

Then, the level water measured in automatic instruments (PCD) and traditional is ranging from 2cm to 5cm.

This difference of all measurements cannot give a good result in climatology.

Introduction

There are many changes at measurement level with the new automatic network in Chad: data acquisition, frequency , instruments characteristics, installation features etc....

Many impacts can be produced on data series, by this changes, which many appear at post processing level or climatological analysis.

The purpose of this work is not to find data series inhomogeneities but it is to try to reassure some of the main changes that we can expect on the new data series that result from now methodological errors. These are mainly due to the different time response and measuring frequency of sensors witch limit their atmospheric scales to be observed.

The classical hydrometeorological system (CHS) values and automatic hydrometeorological system (AHS) located in Sarh/Banda CST (humidity and temperature) and Moundou (level water of rivers) were compared in one month (July).

The wide use of AHS in CHAD network is a major change in the methods of classical observation because the data in long climatological series have been recorded with those methods. It's pertinent to ask if we can continue old series with new data coming from AHS.

With the new automatic network there are many changes at measurement level; for example data acquisition, frequency, instruments characteristics installation feature....

The impact produced by these changes like inhomogeneities in data series, which many appear on climatological analysis.

This work is about getting knowledge on the difference between results obtained with classical and automatic systems for the daily maximum air temperature, humidity, the dry and wet bulb, and level water of rivers value using statistical methods for the comparison of data series. Data from two stations in Chad been using : Sarh/Banda Cst for humidity and maximum air temperature, Moundou for level water of logone(river). Both sites had good regular functioning of classical and automatic systems. For this we can compare only one month (July) and see the difference of CHS and AHS in value.

Classical hydrometeorological systems are measured by qualified personnel. On the other hand (AHS) use electrical sensors to record the air temperature, humidity, the dry and wet bulb level of rivers value every minute or hours (sampling interval complies with WMO recommendation all day long).

The factory characteristics and installation of P100 sensors results in the uncertainty of +0 to 0,2 or 2°c in certain times. This values, like the ones for the classical thermometers, are within the range recommended by WMO for day maximum air temperature observes.

At selected site AHS sensors were installed as near as possible to the corresponding classical (CHS), depending on local conditions and logistic.

For the humidity, his captor is very sensibility and serious control to adjust it. This captor with his principle working put always down the measure's problem. This problems are obvious when the humidity value maintains at 100% during long period, or contrary, when the value of down under 30 to 40% , it is difficult to differentiate a value of 75% of a real value of 65%, the sounding's control can be realize with the witness sounding witch the values are correct.

This difference is obtained when we compared AHS and CHS (psychrometre and hygrograph)

See annex 1 and table 1.

Then, the level water measured with automatic instruments called PCD (data collect platform) and stage gauges has been used in several stations of hydrology.

The difference is ranging to 1 centimeter to ten.

See annex 2 and table 2.

The inconvenient of this instrument (AHS) is the battery that we can recharge all five months of the use and the duration of charge is three to four hours. But if the tension comes down to 6 VDC it is very difficult to recharge it or to use .

We don't interested to the discharge for our study.

CONCLUSION:

The evaluation of this parameters summarize is that:

Temperature: unexpected results were nowhere found: For one station the monthly difference fluctuated between 0 and 0.2°C. it is necessary to tell some words about the circumstances of comparison. We placed both thermometers into the same thermometer screen, in this case no considerably differences were found according the above. AHS and CHS are same value. With this choice the homogeneity of the temperature data is guaranteed at 0600 TU or 1800 TU .

Humidity: the next is the study of relative humidity data. In the case of relative humidity comparison, the results show poor consistency (see table 1).This table can be considered somewhat typical we can find good agreement in the range of higher humidity, the AHS measures less values then the psychrometer or hygrograph. In extremely dry air condition the difference exceeds 10% in relative humidity. , in the same table we present another value of the hygrograph ,

data obtained at the one of our station , the difference is positive for whole measuring range. We feel that quite big uncertainly in interpreting humidity comparison results remained for study in climatology analysis.

Level water of river: the end of our parameter is the level water of river; we cannot immediately accuse AHS because the reading of stage gauges has many factories:

One is the parallax error and the second is the wave. But this difference value is insignificantly in hydrology.

Annex 1

Table 1: comparison of humidity

Month: July

Station: banda/cst

Value: in percent

Date	Psychrometer	Hygrograph	AHS
1	96	96	65
2	96	96	65
3	97	97	75
4	96	96	75
5	98	98	65
6	96	95	75
7	100	96	75
8	100	96	75
9	96	96	75
10	96	97	65
11	96	96	65
12	100	100	75
13	98	98	75
14	100	100	75
15	99	100	75
16	100	100	75
17	100	100	75
18	100	100	75
19	100	100	75
20	98	98	75
21	100	100	75
22	100	99	75
23	97	98	75
24	96	96	75
25	98	98	75
26	100	100	65
27	100	99	75
28	100	100	75
29	100	100	75
30	100	100	75
31	100	100	75

Annex 2

Table 2: comparison of STAGE GAUGES and PCD (daily water level)

Station: Moundou

Value: in centimeter

Date	Stage gauges	PCD
1	210	—
3	238	
4	236	
5	227	220
6	243	237
7	261	259
8	254	253
9	249	242
10	244	236
11	258	251
12	272	269
13	277	274
14	267	261
15	260	256
16	254	247
17	256	244
18	260	252
19	268	263
20	261	256
21	261	253
22	273	268
23	266	259
24	274	254
25	282	273
26	281	274
27	267	261
28	264	253
29	359	329
30	359	352
31	338	331

N.B: the 1, 2 , 3 have no reading.