

WORLD METEOROLOGICAL ORGANIZATION

Distr.: RESTRICTED
CBS/OPAG-IOS
(EMCGG-1)/DOC.4/Add.1
(10.IV.2002)

COMMISSION FOR BASIC SYSTEMS OPEN PROGRAMME
AREA GROUP ON INTEGRATED OBSERVING SYSTEMS

CBS/GCOS EXPERT MEETING ON COORDINATION
OF THE GSN AND GUAN

Item : 3

OFFENBACH, GERMANY, 15-17 MAY 2002

Original: ENGLISH

SURFACE DATA QUALITY MONITORING ACTIVITIES IN RA I

(Submitted by Mr I. Gitonga)

Summary and Purpose of Document

The document contains a review of surface data quality monitoring activities carried out by the Regional Specialized Meteorological Centre (RSMC) Nairobi in Region I.

ACTION PROPOSED

The meeting is invited to take into consideration the information appended to this document when discussing how the existing arrangements can be used to improve monitoring of CLIMAT and CLIMAT TEMP reports.

Appendix: Surface data quality monitoring activities in RA I

Surface data quality monitoring activities in RA I

SECTION I:

SURFACE PRESSURE QUALITY MONITORING IN RA I

1.0 INTRODUCTION

In 1985, the Commission for Basic Systems (CBS) of the World Meteorological Organization (WMO) agreed that there was a need for the major *Numerical Weather Prediction centers* to monitor the quality of observation by comparing the model first guess with the observation at the station and exchange monthly lists of stations that are persistently in error. The model first guess fields are obtained by interpolating to the observation point.

In 1988, the commission (CBS) appointed 3 lead centers to co-ordinate the results from the observing stations and inform the WMO secretariat of the persistent errors obtained, produce **monthly** reports and consolidate **six monthly** reports. The three centers were:

ECMWF-----For radio sonde and pilot observations

Bracknell----For marine surface observations

Washington--For aircraft and satellite observations.

Other centers nominated by CBS for the monitoring of the quality of land surface stations are:

Nairobi-----Regional Association I

Tokyo-----Regional Association II

Buenos Aires-----Regional Association III

Montreal-----Regional Association IV

Melbourne-----Regional Association V

Offenbach-----Regional Association VI

These centers are supposed to produce *monthly* lists of observing stations that persistently report erroneous observations. They are also supposed to compile *six monthly* consolidated lists of suspect stations (stations reporting erroneous data). The purpose of this is to investigate possible sources of the errors on the reported data with the aim of correcting the errors so as to improve on the data quality.

Below (1.1) are some possible sources of errors.

1.1 POSSIBLE SOURCES OF ERRORS

1. -----Coding errors.
2. -----Incorrect sea-level adjustment for height of barometer.
3. -----Corruption during transmission.
4. -----Position errors.
5. -----Barometric errors: - Wrong calibration.
 - Faulty barometer etc.

2.0 METHODOLOGY

The monitoring of surface pressure currently going on in NMC Nairobi for Regional Association I is based on the results of the Numerical Weather Prediction (NWP) Model used by the UK Met. Office. The UK MET Office runs a six-day forecast twice a day plus other two day forecasts grid point model with a horizontal resolution of 0.556 degrees latitude by 0.833 degrees longitude with 30 levels in the vertical. Data assimilation is performed in a continuous six-hour cycle using a 3-dimensional variation system. (Details: see Lorenc *et al* (2000, quarterly Journal of the Royal Met. Soc)).

The basis of all the data quality monitoring are the observation minus background (O-B) differences often referred to as the bias where O = observation at station, B = *background* or simply the *first guess from*. Systematic errors from the observations can be identified by taking averages of the (O-B) over a sufficiently long period e.g. one month. By this method, persistent low quality observations can easily be detected. Besides the differences (differences of the observation (O) and first guess (B), calculation of the means and the root mean squares (RMS.) of the same (O-B) are also done. All these analyzed for a reasonably sufficient length of time (at least one month) are used to detect stations with erroneous reports.

2.1 ERROR DETECTION CRITERIA

The O-B statistics having been obtained i.e. mean, RMS, number of observation and percentage gross errors for a given station; cut-off values for error detection are designated. These cut-off values are entirely objective depending on the availability of data and period of time being monitored. The monitoring is done on monthly and six-monthly periods, each of which has its own error detection criteria.

2.1a. For monthly monitoring

* Number of observations = or > 20 and one of the following.

(i) Magnitude of Mean (O-B) = or > 4 hPa or

(ii) Standard deviation = or > 6 hPa or

Percentage gross error at least 25%

NB: The gross error is defined as an observation that depart from the background by at least 15 hPa.

2.1b. For six-monthly monitoring:

* Number of observations = or >40 and one of the following.

(i) Magnitude of Mean (O-B) = or >3.5 hPa. or

(ii) Standard deviation = or >5 hPa or

Percentage gross error at least 25%.

NB: a) the gross error is defined as in 2.1a above.

b) * The number of observations varies in case of land surface synops

depending on the availability of data but remains unchanged for ship reports (pressures).

Presentation of Results

a) Tables

i) All suspect stations for a given period eg. July – Dec 2001

	Stn.No	Stn.Name	Elev	Country	First Date	Last Date	Lat.	Long.	No.of Obs	Mean O-B	SD O-B	% G/Error
1	60437	Medea	981	Algeria	7/2/01 12:00	12/30/01 12:00	36.3	2.75	168	-6.5	0.97	8.93
2	60476	Khenchela	1116	Algeria	7/2/01 12:00	12/31/01 12:00	35.4	7.15	166	9.7	0.85	62.65
3	60728	Nabeul	5	Tunisia	7/2/01 12:00	12/31/01 12:00	36.5	10.73	165	-4.9	4.45	33.33
4	62790	Nyala	655	Sudan	7/1/01 0:00	12/31/01 12:00	12.1	24.88	270	3.8	1.89	56.67
5	63170	Hargeisa	1326	Somalia	7/4/01 12:00	12/26/01 12:00	9.5	44.08	57	7.0	1.06	40.35
6	63175	Burao	1032	Somalia	7/2/01 12:00	12/26/01 12:00	9.52	45.57	49	7.2	0.83	4.08
7	63333	Combolcha	1903	Ethiopia	7/3/01 12:00	12/31/01 12:00	11.1	39.73	63	5.1	0.63	15.87
8	63334	Debremarcos	2515	Ethiopia	7/2/01 12:00	12/31/01 12:00	10.3	37.67	60	11.4	0.65	1.67
9	63402	Jimma	1725	Ethiopia	7/2/01 12:00	12/31/01 12:00	7.67	36.83	62	7.5	0.72	1.61
10	63450	A/ Ababa-Bole	2354	Ethiopia	7/2/01 12:00	12/31/01 12:00	9.03	38.75	53	4.0	0.87	1.89
11	63453	Metehara	930	Ethiopia	7/2/01 12:00	12/31/01 12:00	8.87	39.9	63	-4.3	0.85	3.17
12	63471	Diredawa	1260	Ethiopia	7/2/01 12:00	12/31/01 12:00	9.6	41.85	61	9.9	0.81	1.64
13	63478	Gode	295	Ethiopia	7/2/01 12:00	12/31/01 12:00	5.9	43.58	47	5.3	0.87	0.00
14	63680	Kampala	1140	Uganda	7/2/01 12:00	12/21/01 12:00	0.32	32.62	67	-7.7	0.91	0.00
15	63801	Kigoma	885	Uganda	7/1/01 12:00	12/21/01 12:00	-4.9	29.63	55	8.2	0.90	14.55

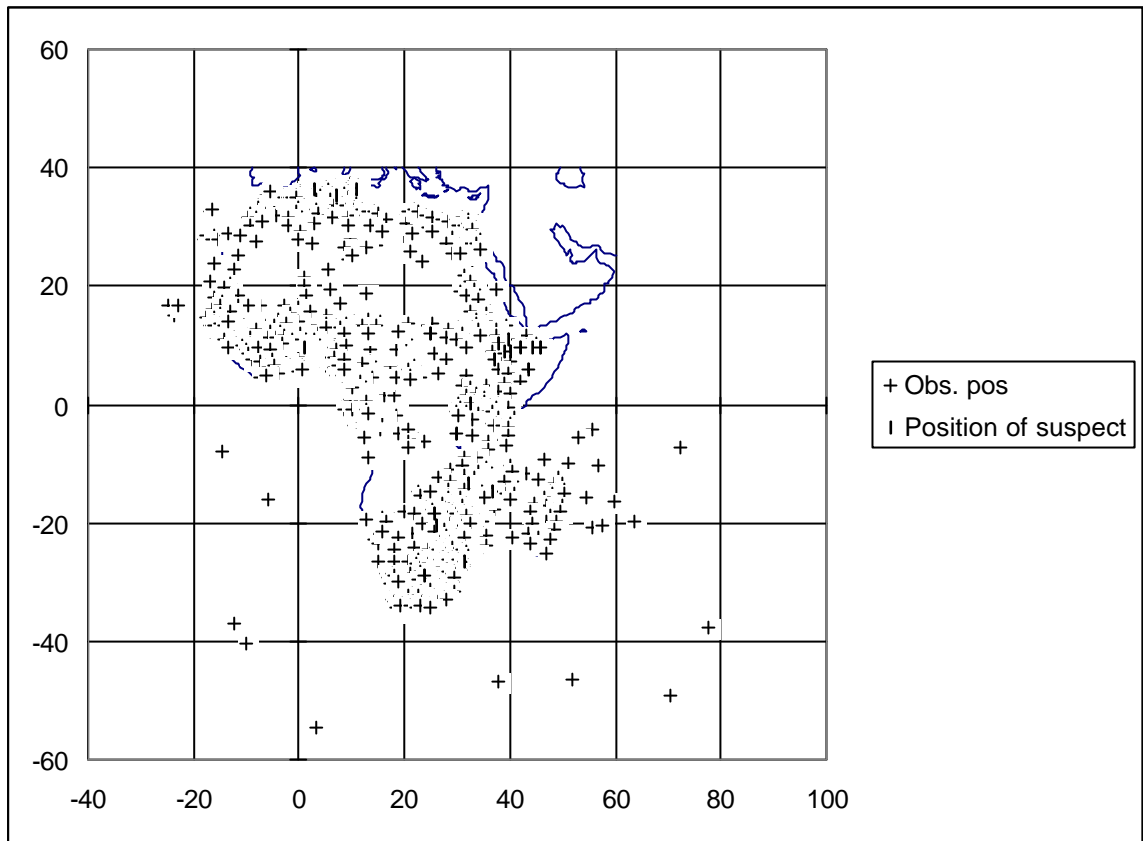
16	65355	Niamtougou	343	Togo	9/17/01 0:00	12/31/01 12:00	9.77	1.1	149	-12.2	2.03	65.77
17	67231	Cuamba	607	M/bique	7/5/01 12:00	12/31/01 12:00	-15	36.53	126	3.6	1.38	3.17
18	67599	Mfuwe	570	Zambia	7/17/01 12:00	12/29/01 12:00	-13	31.93	44	4.1	1.00	4.55
19	68030	P/ntenga	1071	Botswana	7/1/01 12:00	11/30/01 12:00	-19	25.63	140	5.6	0.80	0.00
20	68038	Sua- Pan	904	Botswana	7/1/01 0:00	11/30/01 12:00	-20	25.98	133	4.9	1.02	0.75
21	68396	Manzini/M Airport	641	Swaziland	7/1/01 12:00	11/30/01 12:00	-27	31.3	137	4.8	1.26	24.09
22	68530	Douglas	995	S/ Africa	7/1/01 12:00	11/29/01 12:00	-29	23.75	96	4.0	3.42	65.63

ii) **Retentions:** Showing stations that have re-emerged as suspects.

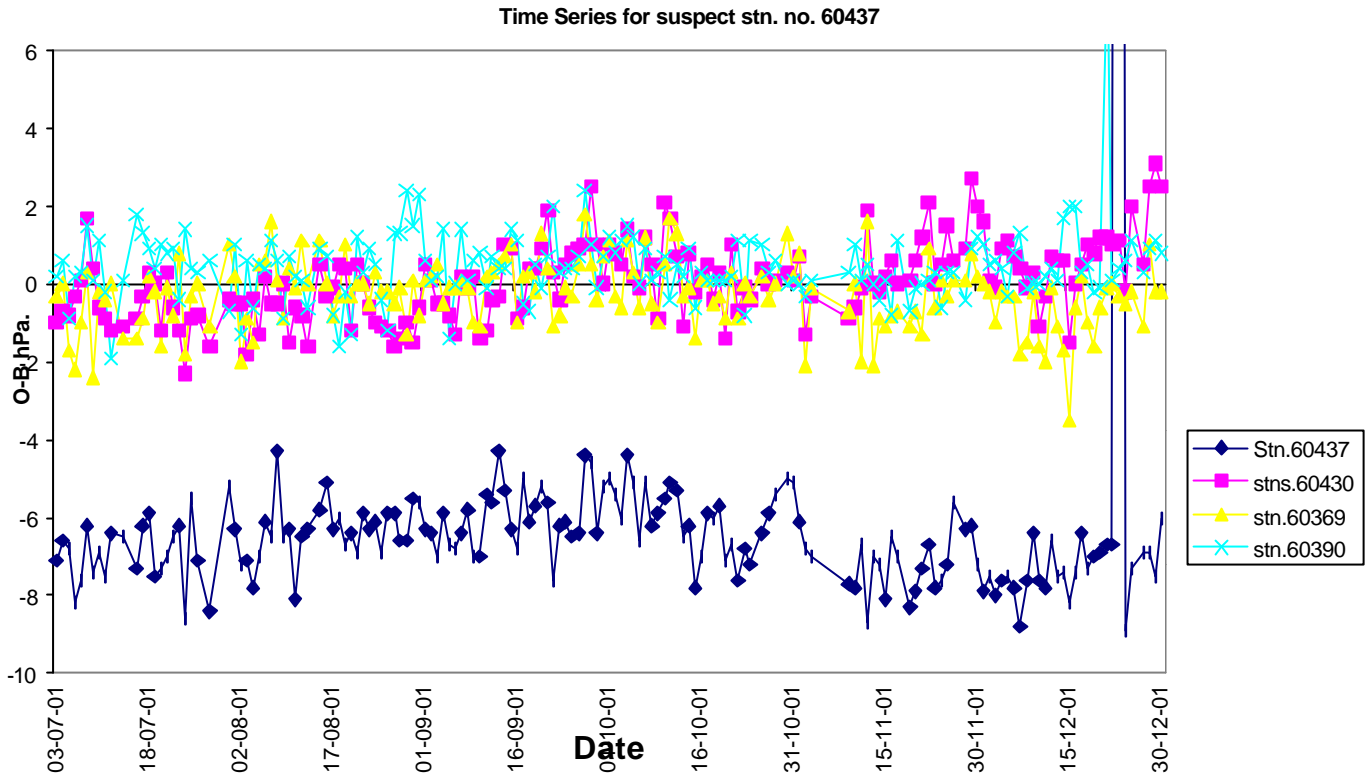
	Stn.No	Stn.Nam e	Country	No.of Obs	Mean O- B
1	62790	Nyala	Sudan	270	3.8
2	63453	Metehara	Ethiopia	63	-4.3
3	63471	Diredawa	Ethiopia	61	9.9
4	63680	Kampala	Uganda	67	-7.7
5	63801	Kigoma	Uganda	55	8.2
6	68030	P/ntenga	Botswan a	140	5.6
7	68038	Sua- Pan	Botswan a	133	4.9
8	68396	Manzini	Swazilan d	137	4.8

iii) **New Suspects:** A table of newly emerged suspect stations is drawn as well.

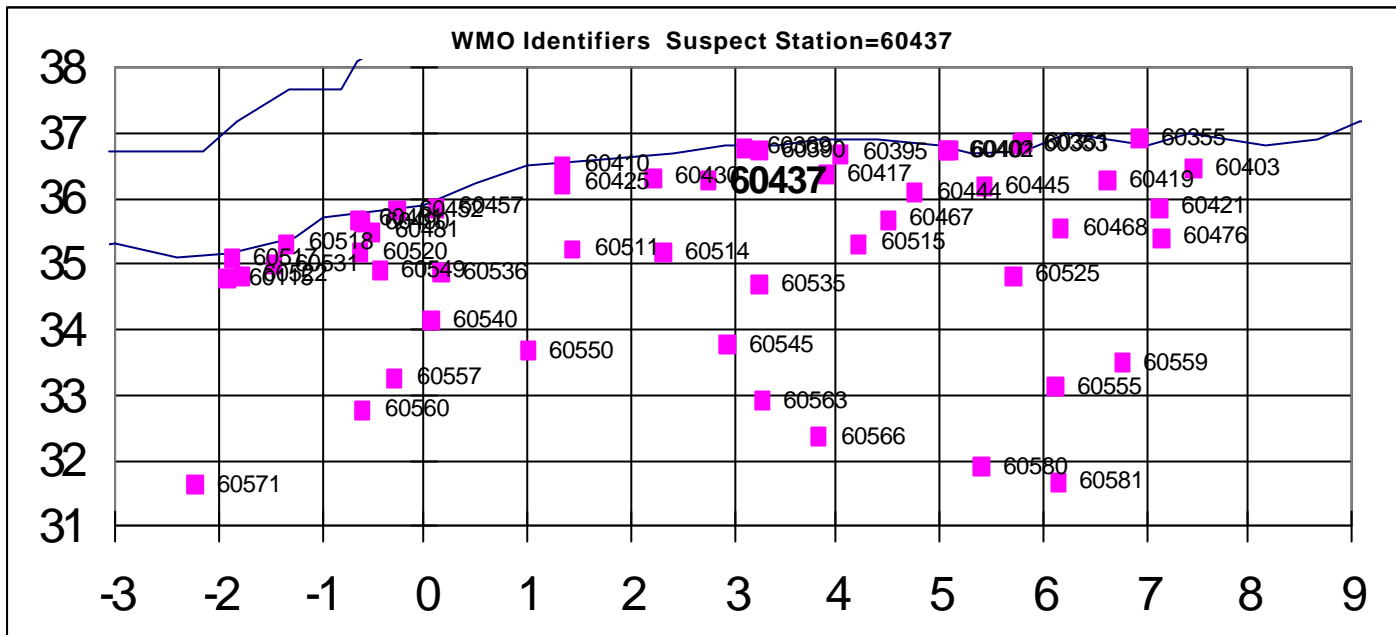
b) **Maps** – Geographical locations of suspect stations in the Region for the period monitored. In this case, July-December 2001.



b) Time Series: The suspect station, (stn no, 60437 for Jul-Dec 2001 period) shows a mean of a higher magnitude than other co-located stations within 200km.

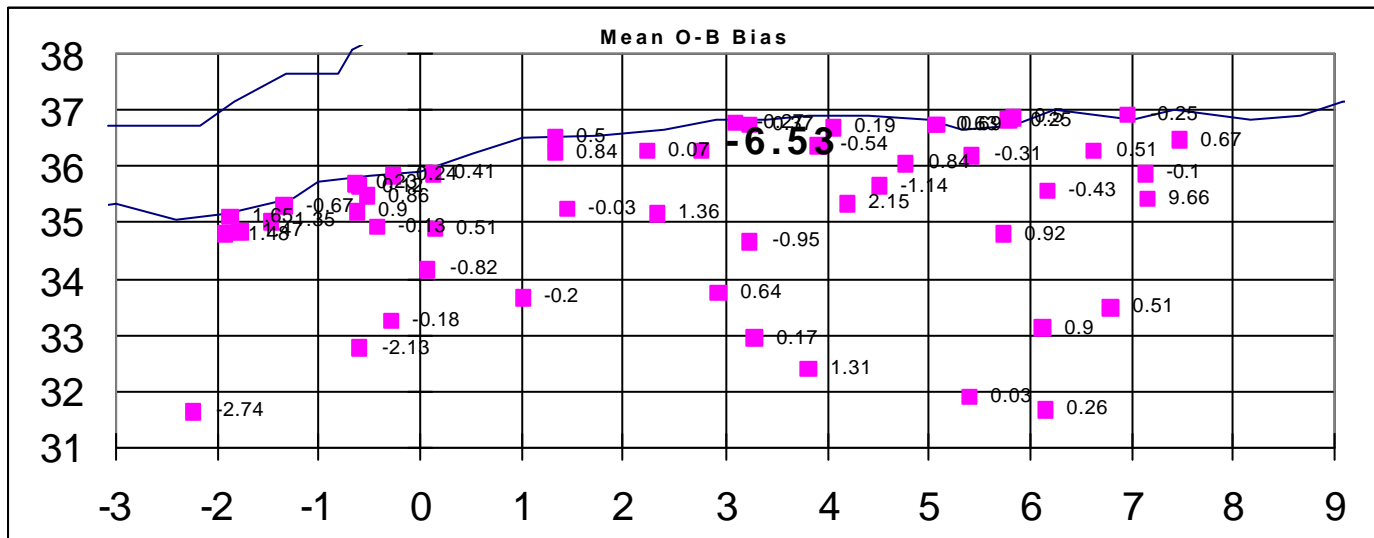


Local: Location of the suspect station (60437, shown in bold), as compared to the neighbouring stations.



A plot of the mean bias for respective stations, in the case below shows the mean of stn. no. 60437 having the highest magnitude (shown in bold). NB. The positions of these values are the same for the stations shown in the preceding map above.

SECTION II: DATA QUANTITY MONITORING



The amount of data from Regional Association I received at RTH Nairobi is monitored on monthly basis. This is to monitor the performance, in terms of the data volume as compared to the data quality of each station in RA I that sends data to Nairobi RTH both surface and upper air stations.

DECEMBER-2001

Country code	Country Name	NO. of Stns reported	Total No. of Stns
DAMM	ALGERIA	65	72
DBBB	BENIN	5	6
DFFD	BURKINA FASO	8	11
DIAP	COTE D'IVOIRE	9	14
DNMM	NIGERIA	3	33
DRRN	NIGER	12	16
DTTA	TUNISIA	7	25
DXXX	TOGO	4	9
EGRR	OCEAN ISLANDS	1	14
FAPR	SOUTH AFRICA	68	174
FBSK	BOTSWANA	14	18
FCBB	CONGO	9	16
FDMS	SWAZILAND	1	1
FEFF	CENRAL AFRICAN REPUBLIC	13	14
FIMP	MAURITIUS	5	5
FKKD	CAMEROON	9	19
FMCH	COMOROS	1	4
FMMG	MADAGASCAR	26	27
FOOL	GABON	13	13
FQMA	MOZAMBIQUE	12	23
FSIA	SEYCHELLES	1	6
FTTJ	TCHAD	15	16
FVHA	ZIMBABWE	12	43
FZAA	DEMOCRATIC REPUBLIC OF CONGO	16	57
GABS	MALI	19	20
GCLP	SPAIN/CANARY ISLANDS	4	9
GMMC	MOROCCO	23	35
GOOY	SENEGAL	12	12
GQNN	MAURITANIA	13	16
GVAC	CAPE VERDE	3	3
HAAB	ETHIOPIA	18	17
HCMM	SOMALIA	4	22
HECA	EGYPT	24	58
HKNC	KENYA	25	25
HLLT	LIBYAN ARAB JAMAHIRYA	22	24
HRYR	RWANDA	1	5
HSSS	SUDAN	28	40
HTDA	TANZANIA	14	21
HUEN	UGANDA	7	12
LPMG	MADEIRA	2	3