Short communication

Temperature data available on the Department of Water Affairs' Chemical Data Base.

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Abstract

The Chemical Data Base operated by the Department of Water Affairs contains information regarding the chemical components in South African rivers. This report examines the temperature data available on the data base and examines the long-term record for four sampling stations chosen at random. Errors were detected in the data base and these were broadly typographical errors and measurement errors. These potential problem areas are being investigated by the Directorate: Hydrology and so should occur less frequently from now on. Care should however be taken in using the historical data.

Introduction

The Chemical Data Base operated by the Department of Water Affairs contains information regarding the chemical components in South African rivers. At some sampling stations temperature measurements are made and this report outlines those stations which have a minimum of one measurement per month.

The objective of the report is to inform the scientific community on the availability of temperature data and the confidence which can be placed on this data.

The drainage regions in South Africa are designated by letters of the alphabet. The map (Fig. 1) shows the regions for the whole of South Africa. The other letter in the code corresponds to the type of sampling stations, i.e. M is for river stations and R for reservoir stations.

e.g: C1R0101 is the Vaal Dam wall station
C1M01 is a station on the Vaal River.

Table 1 shows the sampling stations which have a minimum of a monthly temperature record. The other sampling stations in the country can be regarded as having little or no temperature data.

For the purpose of this report it was decided to extract the temperature record for four sampling stations chosen at random. The data were then plotted as a time series plot in order to see the variations in these data. A number of conclusions can be drawn from these records.

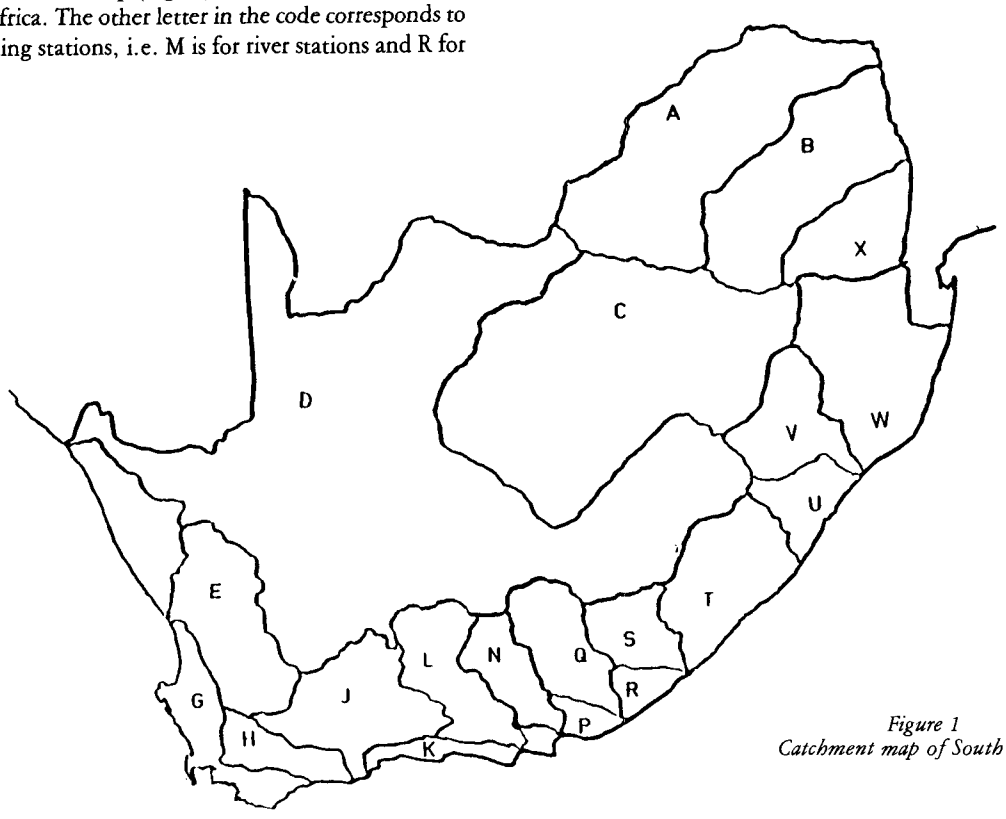

Figure 1
Catchment map of South Africa.

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TABLE 1
WATER QUALITY MONITORING STATIONS WITH A MINIMUM OF MONTHLY TEMPERATURE DATA

	A2M28 716	A2M55 240	G1M03 99	G1M40 116	G2M16 79	T3M04 138	T4M01 148	T5M04 155
	A2M29 366	A2M56 233	G1M04 92	G1M41 223	G2M18 78	T3M08 141	T5M03 146	T5M05 149
	A2M34 312	A2M57 231	G1M13 259	G1M42 144	G2M20 241		U2M13 316	
	A2M36 117	A2M60 78	G1M19 256	G1M43 109	G2M21 240	U2M01 212	U2M15 319	U6M02 176
	A2M40 266	A2M61 158	G1M20 263		G2M26 80	U2M05 183	U2M22 167	U6M03 249
A2M06 295	A2M42 276	A2M62 153	G1M31 256	G1M45 185	G2Q01 137	U3M06 196	U3M01 143	U7M07 152
A2M13 305	A2M45 281	A2R01 974	G1M35 145	G1M56 151	G4M05 161	U2M11 108	U4M07 128	
A2M14 335	A2M47 145	A2R02 215	G1M36 205	G1R03 220	G4M07 246			
A2M19 119	A2M48 297	A2R16 110	G1M37 263	G1M08 255	G4M14 211	V1M01 299	V1M41 144	V5M02 279
A2M21 219	A2M49 142	A4M02 72	G1M38 130	G2M12 108	G4R03 79	V1M09 94	V2M04 150	V6M02 293
A2M23 270	A2M50 143	A4M08 88	G1M39 120	G2M13 100	G4R04 79	V1M10 133	V2M05 93	V6M03 147
A2M24 137	A2M51 128	A6M09 102				V1M26 153	V2M06 92	V6M04 108
A2M25 164	A2M52 300	A6M11 74	H1M03 254	H3M11 211	H5M03 76	V1M31 129	V2M07 88	V6M06 101
A2M26 120	A2M53 155	A7M01 259	H1M06 216	H4M06 252	H5M04 262	V1M32 93	V3M02 165	V7M12 188
			H1M07 257	H4M12 74	H5M05 263	V1M33 96	V3M05 112	V7M16 154
			H1M13 85	H4M14 232				
			H1M15 85	H4M16 206	H5M06 217	V1M34 96	V3M07 138	V7M17 153
B4M07 204	B7M04 106	B8M08 132	H1M17 268	H4M17 241	H5M07 209	V1M35 170	V3M09 248	V7M18 147
					H6M05 76			
B4M10 105	B7M07 312	B8M09 90	H1M18 260	H4M18 232	H6M07 96	V1M38 177	V3M10 245	
B6M01 104	B7M09 99	B8M10 94	H2M01 30	H4M19 216	H6M08 97	V1M39 88	V3M11 99	
B6M03 108			H2M06 241	H4M20 184	H6M09 218			
			H2M07 144	H4M21 234	H7M04 77	W1M05 105		W3R02 98
C1M01 182	C2M08 130	C2M84 141	H2M08 162	H4M22 210	H7M06 154	W1M09 297	W2M09 133	W4M04 137
							W2M10 142	
C1M02 151	C2M15 122	C2Q03 116	H2M09 189	H4M24 213	H8M01 90	W1M10 138	W3M01 139	W4M06 201
C1M03F 86	C2M18 291	C4M04 111	H2M10 223	H5M02 229		W1M11 104	W3M08 235	W4M08 82
C1M04 274	C2M21 252	C5M20 79	H3M05 60			W1M11 157	W3M11 111	W4M09 137
C1M05 191	C2M23 288	C5M21 71	J1M17 139	J1R04 321		W2M05 208	W3M12 112	W5M23 114
C1M06 199	C2M24 90	C6M02 154	J1M19 150	J3M11 122		W2M06 305	W3M14 90	W7R01 72
C1M07 223	C2M28 207	C8M01 269				W2M07 132	W3M15 281	
C1M08 163	C2M44 292	C8M04 148	K2M02 81	K4M01 86	K4M03 71			Y2M33 R0
C1M09 76	C2M51 159	C8M10 100				X1M03 252	X2M15 262	X2M34 141
C1M10 72	C2M60 271	C8M11 181	L1M02 94			X1M14 103	X2M16 250	X2M36 86
C1M11 113	C2M61 253	C8M12 71				X2M05 104	X2M17 245	X3M01 90
C1M12 84	C2M62 137	C8M14 217	N2M02 77	N2M08 78	N2M03 308	X2M08 103	X2M22 257	X3M02 88
C1R01 75	C2M69 284	C8M26 82	N2M07 94	N2M09 288		X2M106	X2M23 106	X3M04 101
C2M01 280	C2M70 221	C8M27 102				X2M13 261	X2M31 105	X3M06 104
C2M04 116	C2M71 93	C9M10 174	P1M03 130	P3M01 108		X2M14 108	X2M32 247	X3M11 106
C2M05 147	C2M72 211	C9R02 1387						
C2N07 289			Q1M12 337	Q4M03 135	Q9M12 325			
			Q1M14 226	Q6M03 153	Q9M16 146			
			Q7M05 290					
D1M01 198	D3M13 286	D3R01 71	Q2M02 333	Q8M07 242	Q9M17 108			
D1M06 144	D3M15 131	D8M06 85	Q3M04 129	Q8M08 286	Q9M18 232			
D1M09 152			W3M05 326	Q9M02 100	Q9M19 144			
E2M07 77	E2M10 151		R1M01 119	R1M14 94	R2M11 165			
			R1M05 124	R1M15 301	R3M01 125			
			R1M13 142	R2M10 165				
			S3M02 81	S3M05 180	S6M02 157			
			S3M03 134	S3M06 226	S6M03 137			
			S3M04 205	S6M01 152				

Results

Station 1

This station provided the most trustworthy data in the group (Fig. 2). One temperature record in December 1982 could be an error. The value (31° C) is unlikely if one considers the whole record. The possible cause of the error is a typing error in the data entry phase but this sort of problem is at present being investigated by the Directorate: Hydrology in order to reduce this type of error.

Station 2

This time series plot (Fig. 3) shows that up to 1983 the station was sampled on a weekly basis but that after this a monthly sample was taken. It would be the responsibility of the user as to the accuracy of the maximum temperatures recorded in 1985 and 1986.

Station 3

This data series (Fig. 4) shows two interesting features. Firstly, the typographical error in June 1981 should be 9,0 °C and not 0,9 °C. Secondly, there is a gap in the record from the middle of 1985 to the middle of 1986. Only three samples were taken during this time. Cognisance of this type of situation should be taken.

Station 4

This station provided the worst series of data for the record (Fig. 5). Wild variations in the series are probably due to sampling error. This data would need to be screened thoroughly before use.

Discussion

The temperature data stored on the Chemical Data Base are collected by numerous people throughout the country. They are predominantly unskilled in terms of hydrological processes and extreme caution should be used in the use of the data. There are a number of volunteer samplers who sample on an *ad hoc* basis for the Department. Not all these samplers produce doubtful information but certainly there are those that do.

Problems encountered with the actual sampling of river water are numerous, e.g. it is possible that the thermometer has been lying in the sun inside a car and not enough equilibration time is allowed for the thermometer to record the actual water temperature; another problem is that the temperature of the

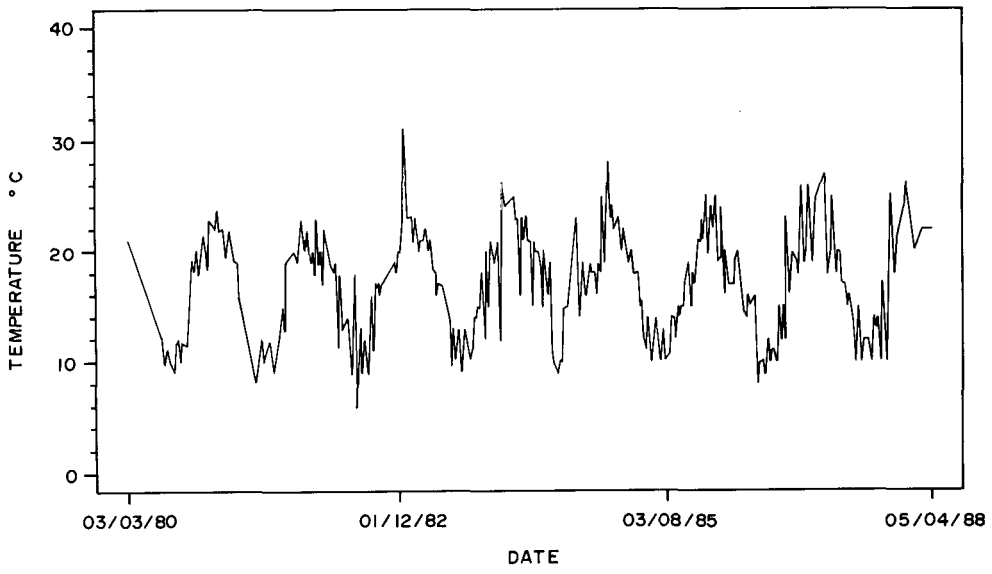

Figure 2
Time series for Station 1.

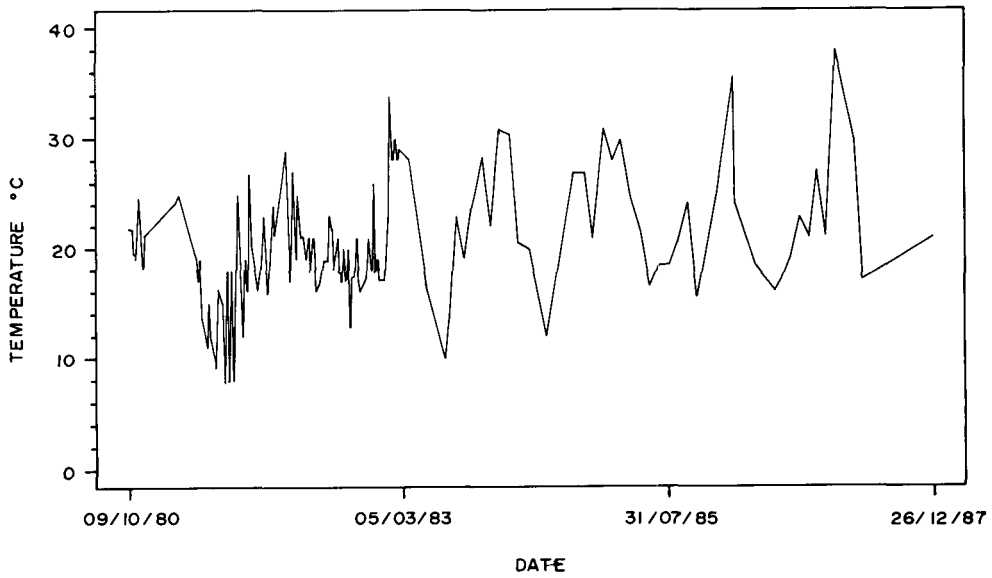

Figure 3
Time series for Station 2.

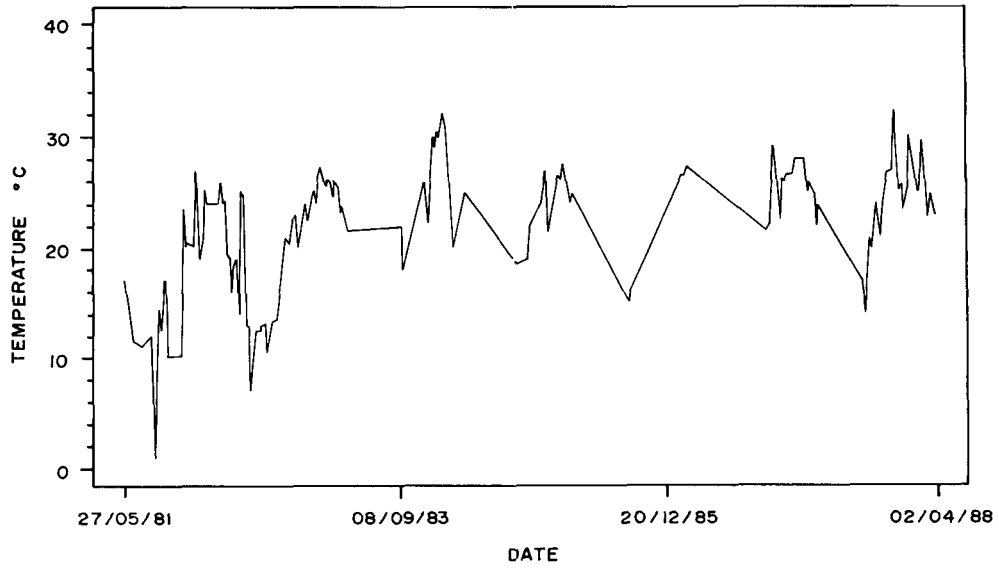

Figure 4
Time series for Station 3.

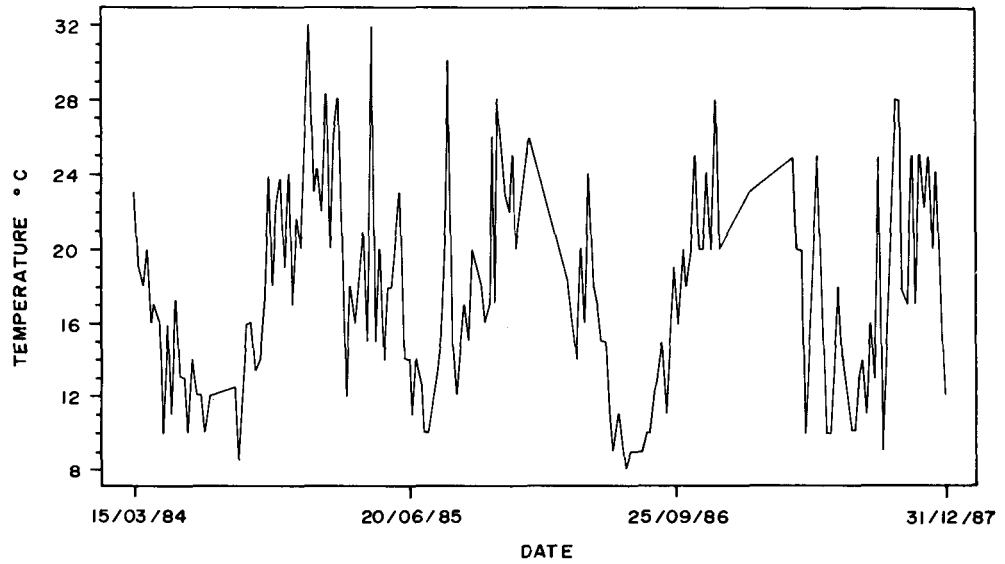

Figure 5
Time series for Station 4.

water may be measured once the water is in the bottle and already a few degrees higher than the flowing water; and problems with reading the exact temperature could also occur.

The Directorate: Hydrology is aware of such potential errors and is in the process of updating the data base and training those people involved in collecting the data.

Conclusions

Temperature data are available for a number of sampling stations throughout the country. The spread of stations is dependent on the hydrology and the accessibility of the river for a sampler.

Care should be taken in the use of these data and that all records be screened as best as possible before use.

Cognisance should be taken that errors could occur in the actual measurement of the sample, but it is hoped that further education and training of the samplers will reduce this probability.

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Grabow, WOK, Coubrough, P, Nupen, EM and Bateman, BW (1984) Evaluations of coliphages as indicators of the virological quality of sewage-polluted water. *Water SA* **10**(1) 7-14.

Wetzel, RG (1975) *Limnology*. WB Saunders Company, Philadelphia. 324.