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BAROMETRIC VARIABILITY AT KIMBERLEY AND ELSEWHERE.

BY J. R. SUTTON, Sc.D., F.R.S.S.A.

(Received October 14. Read October 15, 1913.)

The present discussion is a further contribution to the meteorology of the Table Land of South Africa. Previous papers have been published in the *Transactions* of the South African Philosophical Society, and of the Royal Society of South Africa. The main intention at this time is to give working constants of barometric variability for such few stations in Africa south of the equator as have been able to supply the necessary detailed observations. And, for purposes of comparison, the corresponding results for a number of stations outside the country have been computed. These latter are not by any means as numerous as might have been wished, but they represent all the series of observations of sufficient length which I have been able to buy, or borrow, or beg. Even then the discussion of what is available is far from complete, although it has been in hand for a very long time. Various accidents—the intermittent menaces to the existence of the Kenilworth Observatory—have conspired to delay it. Apart from that, when it comes to deciding whether it is better to publish a larger number of incomplete papers or a small number of more finished ones, the former has always seemed to be the better way. For the material is then, at any rate, put on record for the use of any one who cares to go further with it. That plan has therefore been followed in the present instance.

By “barometric variability” is meant the difference between the pressures of the air at the same hour on two consecutive days, regardless of sign. The average value of this variability from day to day for a month (or year) is called the monthly (or annual) mean variability. Work upon the oscillations of the barometer has been mainly confined to a discussion of the monthly ranges of pressure—*i.e.* of the differences between the greatest and least pressures occurring in a month—or of the ranges usually met with in passing from “highs” to “lows.” The present discussion is more general in outline, and includes these others as special

cases. Moreover, there is this important fact to be borne in mind: that whereas the monthly range, or the range of greatest disturbance, is almost independent of the number of atmospheric depressions and anticyclones which pass over any station, an abnormal number of such depressions or anticyclones must necessarily raise the value of the monthly and annual mean barometric variability accordingly. That is to say, the variability gives the better measure of cyclonic activity.

In Table 1 will be found the method of computation for a specimen month, showing—

1. The atmospheric pressure at 8 a.m. at Kenilworth (Kimberley) for each day of October, 1904;
2. The differences of pressure between one day and the next, with the average of them all, that is, the monthly mean variability, equal to $\cdot 102$ inch in this case;
3. The range from the greatest pressure to the least, equal to $\cdot 374$ inch; and
4. The average range from highs to lows reckoned on the two most conspicuous instances in the month, equal to $\cdot 312$ inch.

If it had been possible, it would have been well to have made 20 years the shortest period of observations which should entitle a station to have its constants of barometric variability determined and put on record here. For the monthly means of variability vary very much both from month to month, and for any one month from year to year. And so when the period is short the incidence of a month of exceptionally large or small variability may tend to distort the annual curve. To insist in every case, however, upon a long period would have shut out several stations whose geographical positions have a special importance. The results given, therefore, are to be regarded as provisional until better can be obtained for longer periods. Nevertheless it may be said that a comparison of all the annual curves shows that those derived from the shorter series of observations are probably very much better than might have been expected *a priori*.

Some stations of the first importance have had to be omitted. Not because their available records cover too short a period, but because they have been published in such a form as to be of little utility. Mauritius, for example, does not publish daily readings at a given hour, but only the average of the hourly readings for each day. Again, all the early results published in the Argentine *Anales de la Oficina Meteorológica* are shown in the same way. This circumstance unfortunately precludes their use for our special purpose. And for this reason, that the monthly mean barometric variability computed from the readings at a given hour differs considerably from the variability computed from daily means. Table 2 gives a comparison of the two sorts of variability at Córdoba. It

appears from this that readings at a given hour give a variability nearly always greater than that deduced from daily means.

The observations made use of here are :—

	Hour of Observation.*	Years of Record.
1. Cape Town, S. Africa.....	VIII	13
2. East London, S. Africa	VIII	20
3. Durban, S. Africa	IX	24
4. Kimberley, S. Africa	VIII	7 }
Kenilworth, S. Africa	VIII	16 }
5. Daressalam, G.E. Africa	VII	15
6. Perth, Australia	IX	12
7. Adelaide, Australia	IX	30
8. Alice Springs, Australia.....	IX	6
9. Port Darwin, Australia	IX	6
10. Sydney, Australia	IX	16
11. Wellington, New Zealand	IX	9
12. Staten Island, Argentina	VII	8
13. Córdoba, Argentina.....	IX	10
14. Hong Kong, China	IX	14

NOTES ON THE OBSERVATIONS.

1. CAPE TOWN. The readings of the barometer and attached thermometer at the Royal Observatory for the 13 years 1889–1911 were kindly supplied by Mr. Hough. These I have reduced to 32° F. before taking out the variability.

2. EAST LONDON. The readings of the barometer and attached thermometer at the Port Office for the 20 years 1885–1904, less half a month in January, 1885, were kindly supplied by the Harbour Board. These I have reduced to 32° F. before taking out the variability. The observations made in the first half of November, 1893, have had to be rejected as obviously erroneous.

3. DURBAN. The variability at the Natal Observatory has been computed from the pressures (at 32° F. and sea-level) published in the excellent Reports of the Natal Government Astronomer for the 24 years 1885–1908.

Meteorologically speaking, the Durban Observatory has been one of the bright spots in South Africa. Perhaps that is why it has been closed, and its fine series of observations brought to an end.

4. KIMBERLEY. Barometric observations were made twice a day

* The Hour of Observation is approximate in some cases; also the record is not in every case unbroken

(morning and evening) at Central Jones Street by the late Mr. G. J. Lee, F.R.Met.S., during the 8 years 1890–7. The variability for the morning hour, for the 7 years 1890–6, has been computed and combined with that for Kenilworth for the 16 years 1897–1912. The following observers were responsible for the Kenilworth readings: The late Mr. H. Neal, Mr. W. T. C. Braine, my wife, and myself. The reductions for temperature have been made by me.

5. DARESSALAM. The variability for the 15 years 1896–1910 has been computed from the pressures published in the excellent *Deutsche Uebersieische Meteorologische Beobachtungen*. These have been converted into inches for the sake of uniformity.

6. PERTH. The variability for the 12 years 1897–1908 has been computed from the Reports of the Government Astronomer for West Australia.

7, 8, 9. ADELAIDE. The variability for the 30 complete years 1878–1907 has been computed from the fine series of barometer observations published by the late Sir Charles Todd under the authority of the Government of South Australia.

ALICE SPRINGS and PORT DARWIN. The variability is, in each case, for 6 incomplete years 1880–5.*

10. SYDNEY. The variability for the 16 years 1878–1885, 1888–1895, has been computed from the results of meteorological observations made by the late Mr. H. C. Russell.

And here a word of praise may be expressed for the convenient and uniform manner in which the Australian results have been published, making reference and comparison so much easier.

11. WELLINGTON. The variability for the 9 years from March, 1904, to February, 1913, has been computed from the results published in the *New Zealand Gazette*, for copies of which I am indebted to the authorities of the meteorological service of that country. The observatory at Wellington has been moved occasionally from one site to another, the various altitudes quoted being 140, 104, 105, 110, 10, and 8 feet. The published pressures are probably good to the second decimal place, the third decimal being, it would seem, approximate.†

12. STATEN ISLAND. The variability is for the 8 incomplete years comprised within the period 1886–1896.

13. CÓRDOBA. The variability is for the 10 years 1889–1898 only. Previous to 1889 (as already stated) only mean daily values were pub-

* In March, 1882, according to the published results, the barometric pressure at Port Darwin stood at the same value for six consecutive mornings. This seems extraordinary.

† The majority of the published pressures for quite a considerable slice of the 9 years are in numbers the third decimal place of which end is 0 or 9.

lished. For the purposes of this inquiry the Argentine constants would be of great value; but the results of observations for that region in my possession end with Vol. XIV. (1901), carrying the record for Staten Island no farther than 1896, and for Córdoba only to 1898; so that only these two stations—and for a limited period at that—could be used. The *Anales* are, moreover, an expensive luxury.

14. HONG KONG. The variability for the 14 years 1884, 1886–7, 1902–12 has been computed for the sake of including one station in the Northern Hemisphere.

Table 3 gives the monthly mean constants of barometric variability, derived from differences such as those of Table 1, for 13 stations in the Southern Hemisphere as well as for Hong Kong. The average of all the Southern Hemisphere stations appears on the bottom line.

According to this Table the minimum variability for the Southern Hemisphere generally falls in February, and the maximum in August. There is besides a secondary minimum in July.

The South African stations show the February minimum, as do also Wellington and Córdoba. In Australia, however, the minimum is retarded into March and April, stations to the north and east feeling it later than do those to the south and west. It is worth notice in this connection, too, that the two easterly South African stations—*i.e.* East London and Durban—show a secondary minimum in April.

Cape Town has its maximum variability in August, whereas this is retarded into September at East London, and even into October at Durban. Kimberley conforms in a way to the rules of both East London and Durban in that the maximum is shown in October as well as August.

At Port Darwin and Perth the maximum variability falls in June. At Adelaide it comes in September, at Alice Springs between September and October, and at Sydney in October. Alice Springs and Sydney have besides a fairly strongly marked June maximum, and there is also a tendency to this maximum at Adelaide. Thus on the whole the rule that the more easterly of the south-coast stations have the later maximum variability holds good in Australia as it does in South Africa.

Wellington has the greater maximum variability in June and the lesser in August. Córdoba has one maximum, in July, and Staten Island probably one in August. Further, at quite one-half of the stations the December variability is greater than that of November.

Either the July minimum, or a tendency to it, is shown at most of the Southern Hemisphere stations.

One deduction to be drawn from Table 3, and particularly from the summary on the bottom line, is that the “equinoctial gales,” so far as barometric changes can indicate them, have no existence in fact.

Table 4 shows the maxima of barometric variability in each month,

i.e. the greatest change occurring, whether from higher to lower or lower to higher, in one day which has taken place in any assigned month of the period dealt with. For example, .409 inch is the greatest change of pressure which has taken place in one day in January at Cape Town. In this Table the various stations are not exactly comparable one with another. For, obviously, the longer the record at any place the greater is the chance of getting large values for the maximum variability. Taking the Table as it stands, however, East London, of the South African stations, has had the largest individual value of the variability, namely .735 inch in August; Cape Town coming next with .711 inch, also in August. Kimberley, and more especially Daressalam, happen far short of such a value. Of the Australian stations Adelaide and Sydney are comparable with the coast stations of South Africa; while Alice Springs, in the interior of Australia, is pretty much the same as Kimberley in the interior of South Africa.

Of the 13 stations in the Southern Hemisphere, Staten Island is easily first, in spite of its short record, in the matter of barometric oscillation.

Table 5, perhaps, gives more useful information than the previous Table. It gives the average values of the monthly maxima of variability for all the stations that have a record long enough to be worth consideration in this particular; *i.e.* it shows the average for each month of the maximum variability which has occurred in that month in each year. In other words, take any station N and any month M, and let the maximum variability in that month in the first year be a_1 , in the second year a_2 , . . . and in the n th year a_n . Then the mean value of all the maxima will be—

$$\frac{1}{n} (a_1 + a_2 + a_3 + \dots + a_n).$$

Thus at Cape Town, in January, the mean value of the maximum variability is .277 inch, the greatest value of all the individual maxima in that month being .409 inch (in 1903), while the least value of all the maxima is .189 inch (in 1904). It is curious that if we pick out the greatest variability in each month for some extended period, the average of them all is practically three times the constant. For example, the annual mean value of the maximum variability at Cape Town is (Table 5) .332 inch, while the constant is (Table 3) .108 inch. A point worth remark is that whereas the monthly constants are on the whole greater at East London than at Durban, yet Durban experiences the greater maxima, particularly in the summer months.

Tables 6 and 7 give the greatest and least values of the monthly and yearly mean variability. For example, in determining the monthly mean constant .089 inch at Cape Town for January we meet with .105 inch in

January, 1901, and .069 inch in January, 1905. And these values are shown in Tables 6 and 7 respectively.

Table 8 gives the deviation of the annual mean variability from the total mean. For example, the total mean variability at Cape Town, as shown in Table 3, is .108 inch, and the mean for 1905 is .100 inch. Hence the deviation for 1905 is —.008 inch.

The individual annual mean values of the monthly maxima of variability are given in Table 9. For example, the maximum variability for each month of 1905 at Cape Town was:—

	Inch.		Inch.
Jan.	.216	July	.333
Feb.	.255	Aug.	.315
Mar.	.212	Sept.	.542
April	.251	Oct.	.386
May	.324	Nov.	.254
June	.362	Dec.	.248

The average of these separate maxima is .308 inch, which is the value placed in the Table.

It is fashionable nowadays to compute the coefficients of correlation for all manner of presumably mutually dependent things. Calling the coefficient of correlation r , and the "probable error" $\pm E$, we have the following results for sundry pairs of the stations shown in Table 8:—

	r	E
Durban and East London.....	+.690	.075
Durban and Kimberley	+.525	.112
Durban and Perth	— .184	.188
Durban and Adelaide.....	+.359	.123
Cape Town and Kimberley	+.132	.183
Adelaide and Sydney	+.480	.130
Adelaide and Córdoba	+.165	.199

These results may, in some of the cases, be more curious than valuable. It is certainly remarkable that the coefficient for Durban and Adelaide should be so much greater than, and so much at variance with, the coefficient for Durban and Perth. And equally remarkable that the coefficient for Cape Town and Kimberley should be so small. This is a matter, however, that must stand over for the present, awaiting further elucidation later on. Particulars of barometric variability from a number of South American coast stations would probably help us.

However important barometric variability may be as a factor of weather, there is no present evidence forthcoming to show that it is

of any great importance as a factor at large in local climatic variations. In a rough-and-ready way, as between one station and another, it is perhaps correct to say that where the variability is greatest there will the force of the wind be the greatest and the storms most intense. But at any one station, say Kimberley, greater or less monthly mean variability does not, apparently, mean more or less wind during the month, nor higher or lower temperatures, nor greater or less range of temperature, nor more or less rain or clouds or sunshine. To a certain extent this result might have been anticipated. For as the barometer oscillates on one side or the other of the mean, so does the wind, and the cloud, and the temperature. A fall in the barometer means an increase in the velocity of the wind and a rise of temperature; while a higher barometer, to begin with, goes with light winds and low temperatures. These, however, are weather factors—factors, that is to say, of what Professor R. de C. Ward calls “cyclonic control,” and are not, strictly speaking, factors of climate.

TABLE 1.
SPECIMEN. COMPUTATION OF BAROMETRIC VARIABILITY.

1904.	VIII.	Diff.
	inch.	inch.
Sept. 30	26·163	·097
Oct. 1	·066	·064
2	·002	·142
3	·144	·095
4	·049	·025
5	·024	·088
6	·112	·052
7	·164	·032
8	·196	·044
9	·152	·096
10	·056	·058
11	25·998	·074
12	26·072	·166
13	·238	·115
14	·123	·091
15	·032	·213
16	·245	·053
17	·298	·136
18	·162	·095
19	·067	·130
20	25·937	·256
21	26·193	·112
22	·081	·152
23	25·929	·186
24	26·115	·008
25	·107	·100
26	·007	·109
27	·116	·030
28	·136	·109
29	·245	·058
30	·303	·186
31	·117	
Variability		·102
Range	·374	
H—L	·312	

TABLE 2.
BAROMETRIC VARIABILITY AT CÓRDOBA.

	1889.			1890.		
	At 9a.	Daily Means.	Diff.	At 9a.	Daily Means.	Diff.
	inch.	inch.	%.	inch.	inch.	%.
Jan.	·114	·094	21	·126	·110	14
Feb.	·102	·087	17	·087	·075	16
Mar.	·102	·094	9	·150	·122	23
April	·122	·091	34	·094	·075	25
May	·094	·087	8	·114	·091	26
June	·126	·106	19	·161	·130	24
July	·213	·173	23	·130	·114	14
Aug.	·157	·118	33	·146	·118	24
Sept.	·126	·106	19	·165	·138	20
Oct.	·106	·091	16	·126	·091	38
Nov.	·106	·110	— 4	·106	·091	16
Dec.	·102	·083	23	·091	·072	26
Year	·122	·102	20	·126	·102	24

TABLE 3.
MONTHLY MEAN CONSTANTS OF BAROMETRIC VARIABILITY.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year .
	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.
Cape Town	.089	.086	.090	.095	.103	.118	.123	.136	.132	.128	.102	.095	.108
East London	.141	.121	.132	.125	.130	.131	.137	.161	.171	.171	.143	.144	.142
Durban	.136	.117	.124	.117	.122	.126	.132	.160	.163	.175	.159	.149	.140
Kimberley	.049	.046	.047	.050	.059	.059	.062	.071	.069	.070	.058	.055	.058
Daressalam	.024	.024	.021	.020	.020	.020	.020	.019	.021	.023	.020	.023	.021
Perth	.089	.095	.088	.101	.111	.149	.139	.128	.125	.122	.100	.093	.112
Adelaide	.114	.103	.097	.105	.106	.131	.131	.143	.145	.144	.131	.128	.123
Alice Springs	.080	.064	.066	.065	.071	.080	.069	.086	.094	.095	.082	.080	.078
Port Darwin	.087	.093	.031	.024	.027	.029	.028	.027	.024	.024	.026	.028	.028
Sydney.....	.114	.114	.095	.093	.099	.119	.113	.125	.133	.145	.134	.122	.117
Wellington	.131	.130	.138	.152	.149	.195	.146	.165	.159	.150	.145	.149	.151
Staten I.	.186	.194	.211	.207	.202	.207	.206	.221	.208	.188	.181	.192	.200
Córdoba	.106	.096	.107	.114	.126	.133	.167	.153	.143	.135	.104	.112	.125
Hong Kong	.052	.059	.055	.049	.045	.038	.049	.046	.053	.043	.042	.047	.048
Southern Hemisphere	.100	.094	.096	.098	.102	.115	.113	.123	.122	.121	.107	.105	.108

TABLE 4.
MAXIMA OF BAROMETRIC VARIABILITY IN EACH MONTH.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Cape Town ...	inch. ·409	inch. ·350	inch. ·406	inch. ·535	inch. ·489	inch. ·513	inch. ·593	inch. ·711	inch. ·570	inch. ·500	inch. ·444	inch. ·366
East London...	·508	·407	·444	·526	·620	·577	·568	·735	·616	·642	·568	·577
Durban	·638	·481	·526	·580	·644	·502	·579	·687	·628	·646	·630	·580
Kimberley	·296	·236	·225	·336	·299	·381	·359	·338	·377	·290	·241	·264
Darassalam ...	·110	·110	·091	·087	·083	·083	·067	·079	·083	·102	·091	·087
Perth	·431	·378	·489	·369	·515	·588	·667	·525	·543	·512	·387	·405
Adelaide	·629	·429	·516	·686	·539	·598	·541	·558	·774	·619	·607	·601
Alice Springs...	·306	·261	·258	·346	·373	·335	·291	·486	·467	·368	·401	·330
Port Darwin ...	·193	·185	·151	·099	·150	·200	·167	·141	·120	·125	·096	·157
Sydney	·596	·629	·596	·447	·431	·517	·582	·581	·609	·559	·541	·498
Wellington ...	·662	·473	·590	·613	·571	·902	·539	·969	·678	·561	·540	·496
Staten I.	·685	·882	·906	1·106	·972	·720	·803	1·047	·740	·882	·689	·894
Córdoba.....	·488	·528	·516	·575	·531	·598	·646	·602	·520	·543	·457	·630
Hong Kong ...	·245	·292	·226	·227	·203	·233	·538	·274	·672	·428	·223	·240

TABLE 5.
MEAN VALUES OF THE MAXIMA OF BAROMETRIC VARIABILITY IN EACH MONTH.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.
Cape Town	.277	.249	.268	.308	.319	.374	.386	.434	.400	.367	.331	.268	.332
East London ..	.372	.320	.348	.359	.390	.375	.445	.461	.460	.468	.414	.423	.402
Durban.....	.392	.332	.367	.375	.371	.385	.404	.448	.459	.479	.456	.427	.408
Kimberley	.163	.146	.148	.161	.194	.193	.209	.218	.218	.218	.177	.173	.185
Daressalam	.076	.072	.064	.064	.062	.062	.058	.058	.063	.067	.060	.069	.065
Perth	.296	.268	.263	.305	.341	.413	.451	.405	.371	.371	.292	.252	.336
Adelaide	.360	.318	.295	.364	.330	.396	.402	.420	.446	.426	.383	.361	.375
Sydney	.339	.351	.336	.310	.321	.343	.374	.359	.407	.442	.371	.367	.360
Hong Kong	.170	.183	.167	.147	.138	.125	.176	.183	.194	.170	.151	.155	.163
Córdoba	.337	.359	.342	.362	.422	.404	.453	.443	.402	.414	.315	.402	.388

TABLE 6.
GREATEST VALUES OF THE MONTHLY AND YEARLY MEAN BAROMETRIC VARIABILITY.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.
Cape Town	.105	.107	.112	.137	.139	.163	.156	.186	.156	.145	.134	.125	.115
East London	.170	.160	.169	.164	.170	.165	.165	.208	.237	.243	.191	.184	.154
Durban.....	.175	.160	.150	.187	.168	.156	.191	.205	.196	.239	.215	.185	.152
Kimberley	.060	.068	.059	.084	.077	.074	.082	.099	.106	.102	.074	.078	.062
Daressalam	.029	.034	.027	.027	.028	.032	.027	.023	.028	.030	.030	.031	.023
Perth	.122	.123	.109	.138	.167	.180	.159	.161	.163	.143	.119	.135	.120
Adelaide	.151	.143	.135	.149	.158	.183	.172	.186	.195	.197	.170	.166	.136
Alice Springs	.102	.075	.086	.084	.090	.099	.087	.101	.108	.111	.110	.089	.087
Port Darwin	.048	.040	.040	.026	.041	.042	.043	.044	.041	.030	.032	.033	.034
Sydney	.186	.148	.130	.121	.128	.146	.146	.165	.167	.193	.183	.147	.127
Wellington	.181	.167	.215	.197	.194	.245	.175	.225	.234	.213	.179	.214	.159?
Staten L.	.209	.236	.283	.264	.244	.276	.260	.276	.283	.260	.244	.236	—
Córdoba	.126	.134	.161	.146	.157	.181	.213	.169	.185	.173	.130	.161	.138
Hong Kong	.064	.076	.067	.065	.058	.050	.075	.063	.139	.072	.056	.061	.057

TABLE 7.
LEAST VALUES OF THE MONTHLY AND YEARLY MEAN BAROMETRIC VARIABILITY.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.	inch.
Cape Town	·069	·072	·071	·058	·080	·083	·093	·108	·109	·089	·066	·071	·100
East London	·115	·091	·074	·086	·100	·096	·111	·122	·111	·135	·100?	·115	·128
Durban	·099	·088	·067	·081	·078	·107	·089	·110	·124	·121	·106	·125	·126
Kimberley	·030	·030	·031	·033	·037	·036	·044	·049	·049	·051	·044	·039	·062
Darassalam.....	·018	·019	·015	·015	·014	·016	·015	·015	·017	·017	·017	·019	·020
Perth	·075	·060	·060	·073	·073	·123	·114	·070	·088	·107	·082	·067	·103
Adelaide	·079	·072	·072	·069	·075	·087	·102	·090	·099	·104	·095	·098	·111
Alice Springs.....	·054	·058	·051	·043	·046	·054	·046	·069	·085	·078	·066	·060	·065
Port Darwin	·023	·028	·026	·018	·017	·019	·020	·018	·016	·018	·017	·024	·024
Sydney	·077	·085	·071	·063	·082	·088	·092	·098	·100	·109	·096	·098	·106
Wellington	·090	·100	·072	·109	·110	·153	·122	·107	·118	·139	·118	·121	·140
Staten I.....	·138	·134	·161	·142	·157	·157	·169	·157	·146	·157	·154	·150	·177
Córdoba	·087	·079	·051	·079	·094	·094	·118	·126	·118	·106	·067	·079	·114
Hong Kong.....	·040	·045	·043	·031	·031	·029	·031	·033	·028	·027	·032	·031	·043

TABLE 8.
DEVIATION OF THE ANNUAL MEAN BAROMETRIC VARIABILITY FROM THE TOTAL MEAN.

	Cape Town.	East London.	Durban.	Kimberley.	Daresalam.	Perth.	Adelaide.	Alice Springs.	Port Darwin.	Sydney.	Wellington.	Staten I.	Córdoba.	Hong Kong.	Southern Hemisphere.
1878							+·002			+·010					+·005
9							-·007			-·002					-·005
1880							+·004	+·009	+·006	+·007					+·006
1							+·005	+·005	+·005	·000					+·004
2							(+·002)			+·005					+·004
3							+·004	-·004	-·004	+·004					+·003
4							+·002	-·001	-·003	+·004					+·001
5		-·004	-·001				+·003	-·010	-·004	+·004				·000	+·007
6		-·001	-·003				-·009	-·013	-·004	-·011				-·003	-·004
7		+·008	+·008				+·004					-·003		+·001	+·007
8		+·003	+·004				+·007			+·001		-·023	-·003		-·002
9		+·012	+·008				+·008			-·001		+·001	+·001		·000
1890		+·008	·000	·000			-·009			-·007		+·001	+·001		-·001
1		·000	+·001	+·004			-·012			+·003		+·009	+·001		+·003
2		-·014	-·003	-·000			-·001			+·002		+·017	-·011		+·001
3		-·007	+·003	-·002			+·004			+·005					-·002
4		+·003	+·003	-·003			-·007			-·010		(+·019)	+·007		-·006
5		-·009	-·014	-·004			-·004			+·007		+·005	-·011		+·003
6		-·005	-·001	-·004	-·001		-·009			+·007			+·005		-·006
7		+·001	-·001	-·002	+·001		+·012			-·010			+·013		+·001
8		+·002	-·003	-·001	-·001		+·004			-·010					+·002
9	-·001	+·001	+·002	-·001	-·000	+·006	+·013			-·010					-·003
1900	-·002	+·011	+·008	+·001	+·002	+·008	+·004			+·004					+·004
1	+·002	+·012	+·012	+·000	+·002	+·003	+·005			-·007				-·003	+·004
2	+·002	-·003	+·001	-·003	+·001	-·001	+·007			(+·008)				+·002	+·001
3	+·002	+·001	+·001	-·000	-·000	-·005	+·004			-·009				+·004	+·001
4	-·002	+·003	+·002	-·000	-·000	-·004	+·003			+·000				+·002	-·002
5	-·008		+·001	-·001	-·001	-·004	+·008			+·002				+·009	+·003
6	+·005		+·008	+·001	+·001	-·000	+·004			+·002				-·006	-·000
7	-·002		-·003	-·001	-·001	-·001	+·004			-·001				·000	-·001
8	-·005		+·005	-·000	-·001	+·006				-·001				+·003	+·002
9	+·007			+·001	+·001					+·007				-·004	+·002
1910	+·003			+·002	-·000					-·010				-·003	+·002
1	-·003			+·003						+·007				-·011	-·004
2				+						+·007				+·002	+·004

TABLE 9.
ANNUAL MEAN VALUES OF THE MONTHLY MAXIMA OF
BAROMETRIC VARIABILITY.

	Cape Town.	East London.	Durban.	Kimberley.	Dares-salam.	Perth.	Ade-laide.	Sydney.	Cór-doba.	Hong Kong.
1878							·385	·389		
9							·369	·350		
1880							·359	·365		
1							·398	·362		
2							·386	·372		
3							·365	·375		
4							·400	·374		·166
5		·404	·425				·335	·333		
6		·362	·391				·361			·142
7		·431	·437				·380			·171
8		·395	·401				·383	·376		
9		·421	·427				·390	·348	·391	
1890		·393	·403	·183			·349	·338	·376	
1		·410	·408	·188			·383	·385	·420	
2		·420	·425	·190			·355	·350	·375	
3		·387	·414	·176			·385	·354	·339	
4		·402	·367	·180			·385	·345	·373	
5		·399	·386	·191			·376	·344	·389	
6		·389	·388	·167	·060		·361		·376	
7		·382	·387	·171	·061	·352	·409		·422	
8		·422	·429	·173	·066	·346	·403		·416	
9	·352	·403	·404	·199	·062	·317	·323			
1900	·325	·407	·393	·189	·064	·366	·401			
1	·354	·453	·449	·202	·070	·357	·376			
2	·322	·360	·441	·177	·067	·293	·349			·166
3	·348	·405	·401	·181	·068	·313	·383			·175
4	·304	·398	·381	·196	·062	·344	·378			·150
5	·308		·404	·194	·065	·327	·370			·167
6	·351		·428	·195	·067	·345	·389			·203
7	·304		·367	·161	·061	·328	·353			·143
8	·339		·433	·190	·067	·341				·156
9	·363			·194	·065					·165
1910	·333			·180	·065					·143
1	·311			·183						·196
2				·203						·143