

The removal of this difficulty involves the assumption that the diurnal variations have the same or a proportional value over regions of great extent, although the corresponding normals may differ very considerably. Hence by applying corrections for diurnal variation computed from those of a central station, results are obtained for all stations that are comparable in a great degree with those derived from hourly observations.

There is however, another difficulty occasioned by the fact that at most places the observations do not embrace a number of years sufficient for the elimination of the non-periodic variations of single years.

To supply the quantities needful for correcting the means derived from a few years so as to render them the same as if they had been derived from several years, it is necessary to draw up a table containing the abnormal deviations of monthly means for several years at a few stations of long standing, and then by examining the changes in the deviation on passing from place to place, to infer the probable deviation at all intermediate stations and the corrections for non-periodic variation applicable to the means obtained in those places for single years. Thus by applying to the monthly means of every year at a station where the series is short the corrections derived from the abnormal deviations or non-periodic variations in the same year at places where the series is long, and by taking the average of the means thus corrected, results are obtained which may be accepted as true monthly means, to be used for comparison between places, months, and seasons, and also to serve as a groundwork for computing the normals for every day and hour at the several stations.

It is seen then that one important service rendered by a central observatory in operation for many years, including a few years of hourly or bi-hourly observations, consists in its supplying corrections for diurnal and non-periodic variations, by aid of which irregular and scanty observations continued for a few years are made comparable in a great degree with those that are continued hourly for a long term of years.

It is not asserted that corrections observed from one or more centres will render the results at other stations absolutely the same as though they were found by independent observations at the several stations, and still less when the points of observation are scattered over a wide extent of country. The magnitude of the Diurnal variations are affected by a variety of local circumstances that are permanent, as well as by causes that undergo a progressive change, such as the clearing of forests, the drainage of land, &c., &c., and hence the application of corrections must be regarded to some extent as a compromise, the results being much nearer to the truth than if the corrections had not been applied, but not absolutely true.

In an extensive country such as British North America, where local circumstances differ so enormously, the observations of one central station are insufficient to give corrections which are applicable to the observations at remote points. Those for Diurnal variation if they may be the same in sign will probably differ greatly in extent, and non-periodic variations of single years are not only different in extent, but are often opposite in character at distant stations. It is only by the knowledge derived from protracted observations at a few well chosen points that the amount of abnormal deviation in particular years can be inferred for intermediate points. At least three good subordinate stations remote from Toronto and from each other are needed, where observations at equal intervals of one, two, or three hours may be made for five or six years, and at which a less onerous system may be pursued for many years. One of these should be at Red River, and while the others should be chosen chiefly on account of geographical fitness, those places at which good observations have been made during recent years have a strong claim for consideration, inasmuch as their results could sooner be made available in determining the non-periodic variations.

The establishment of these few normal stations need not be very expensive. Private enterprise now in operation might be supplemented by moderate annual subsidies sufficient to meet the necessities of extra attendance for five or six years, and as the reductions could be done at the central observatory at Toronto, no heavy outlay need be incurred on account of computation.

A few tables, derived chiefly from the Toronto observations, will now be given as a basis for some general remarks.

By subtracting the general annual means of each element from the special annual means proper to the several hours, table IV is obtained. The variations are derived from hourly observations at Toronto continued for six years, and to save space are here printed in double rows.

TABLE IV.

ANNUAL means of the Diurnal Variations of the principal Meteorological elements at Toronto from hourly observations:—

	hrs. 0	hrs. 1	hrs. 2	hrs. 3	hrs. 4	hrs. 5	hrs. 6	hrs. 7	hrs. 8	hrs. 9	hrs. 10	hrs. 11
	12	13	14	15	16	17	18	19	20	21	22	23
Temperature ...	+4.80 -3.42	+5.49 -4.03	+5.90 -4.51	+5.92 -4.97	+5.56 -5.31	+4.68 -5.48	+3.15 -4.56	+1.21 -3.07	-0.41 -1.21	-1.52 +0.80	-2.30 +2.50	-2.94 +3.82
Barometer.....	+008 -005	-003 -006	-013 -005	-016 -006	-018 -005	-017 -000	-013 +010	-010 +018	-005 +025	-001 +027	-001 +027	-001 +020
Pressure of Dry [Air	-019 +012	-031 +015	-040 +019	-042 +021	-041 +024	-038 +030	-029 +032	-016 +029	-003 +025	+005 +018	+011 +010	+015 +002
Pressure of Va- [pour	+027 -017	+028 -021	+028 -024	+026 -027	+024 -029	+022 -030	+022 -022	+015 -011	+006 -001	-001 +010	-006 +010	-012 +017
Relative Humi- [dity	-7 +5	-9 +6	-9 +6	-9 +7	-9 +7	-7 +7	-5 +7	-2 +5	0 +2	+3 0	+3 -3	+4 -5