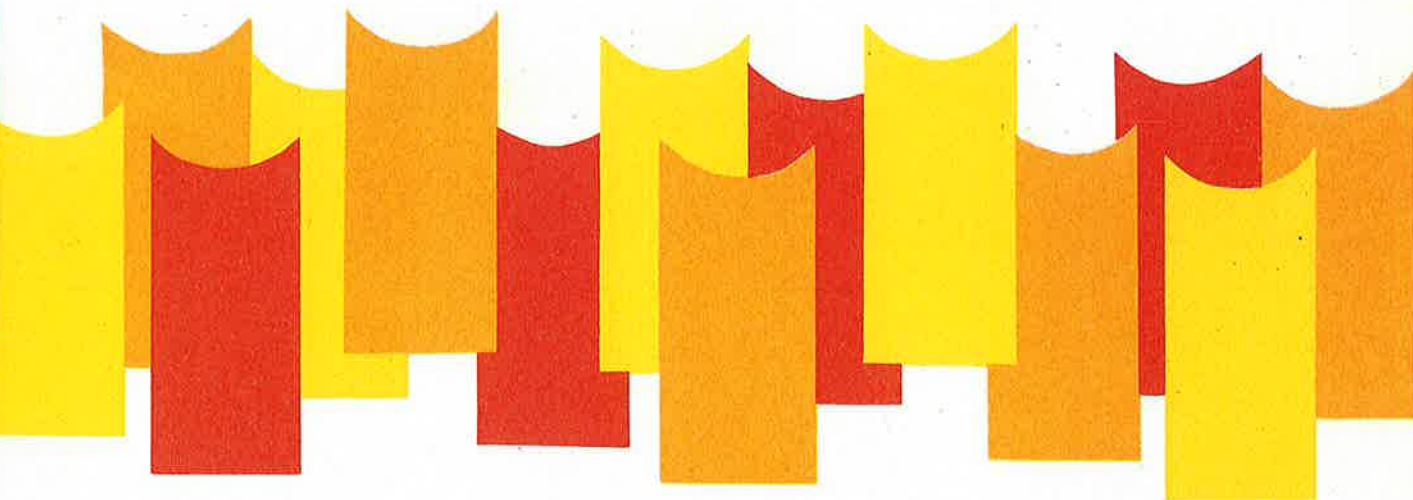


WATER & SOIL

MISCELLANEOUS PUBLICATION

No. 36

NEW ZEALAND RIVER TEMPERATURE REGIMES



**NATIONAL WATER AND SOIL
CONSERVATION ORGANISATION**

ISSN 0110-4705

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WATER & SOIL MISCELLANEOUS PUBLICATION NO. 36

**NEW ZEALAND
RIVER TEMPERATURE
REGIMES**

by

M. P. Mosley

**Water and Soil Science Centre
Ministry of Works and Development
Christchurch**

WELLINGTON 1982

New Zealand River Temperature Regimes

M. P. Mosley

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Ministry of Works and Development
Christchurch

Water & Soil Miscellaneous Publication No. 36, 1982. 86p. ISSN 0110-4705

Periodic water temperature data for 254 New Zealand flow recorder sites for which more than thirty measurements have been made are assembled. For each site, best-fit sine curves have been fitted to the observations, to show how mean daily temperature varies through the year. Plots of the temperature data and the best-fit curves for all 254 sites are presented, and the parameters of the curves, together with minimum and maximum recorded temperatures, are tabulated.

Easily measured catchment characteristics have been used in an effort to develop a simple statistical model which may be employed to predict the temperature regime at a site for which no data are available. Mean temperature is predictable from catchment latitude and mean elevation, and the phase shift coefficient of the sine curve has a remarkably constant value throughout the country. However, no simple model can predict either the amplitude of or the scatter of points around the sine curve; these must be estimated from inspection of the plots presented in the report.

National Library of New Zealand
Cataloguing-in-Publication data

MOSLEY, M. P. (Michael Paul), 1948-
New Zealand river temperature regimes /
by M.P. Mosley. - Wellington, N.Z. : Water
and Soil Division Ministry of Works and
Development for the National Water and
Soil Conservation Organisation, 1982. -
1 v. - (Water & soil miscellaneous publica-
tion, ISSN 0110-4705 ; no. 36)
551.483
1. Rivers--New Zealand--Temperature. I.
Title.

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**Published for the National Water and Soil Conservation Organisation by
the Water and Soil Division, Ministry of Works and Development,
P.O. Box 12-041, Wellington, New Zealand.**

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INTRODUCTION

Water temperature is an important aspect of physical water quality which may have a significant impact upon the suitability of a given river for such instream uses as water-based recreation, freshwater fisheries, or pollution abatement (Macan 1974; Bovee, 1978). Overseas work on the analysis and prediction of river water temperatures (Crisp 1977; Langford 1972; Morse 1972; Smith 1979) demonstrates that water resource development may significantly modify stream temperature regimes, and there is increasing concern that the impacts of such developments in New Zealand be fully evaluated. Man-induced changes cannot always be assumed to be adverse; for example, an expected temperature increase of 3°C due to addition of heated effluent from a power plant may increase the biological productivity of the river downstream and produce a significant improvement in a commercial fishery. Hence, only where the optimum requirements of the instream use, the present conditions, and the expected changes are all known, can impacts be properly evaluated.

Recent studies by Dymond & Henderson (1981) and Hockey *et al.* (1980) have considered the effect of flow reduction upon water temperatures, using an energy balance approach developed from the work of Brocard & Harleman (1976), Brown (1969), Morse (1972), and Raphael (1962). Where such a model is to be used, however, information is still required on the temperature regime of the waterway in its undisturbed condition. In New Zealand, little readily usable information on river temperature regimes is available for either unmodified streams or for streams affected by water resource development. Published work is limited to that of Grant (1977) on water temperatures at three stations in the Ngaruroro, and by Johnson (1971), in the

headwaters of Broken River, Craigieburn Range. Nevertheless, unpublished water temperature data are available for several hundred water-level recorder sites in New Zealand, because it is standard practice to measure water temperature after a discharge measurement (flow gauging) at each site. This body of data provides both a broad picture of temperature regimes for much of the country, and a basis for developing and testing models of water temperature that may be used to predict temperature regimes at sites for which no data are available.

A number of studies have demonstrated (Johnson 1971; Limerinos 1978; Shampine 1977; Walker & Lawson 1977; Ward 1963) that the annual cycle of river water temperatures may be fitted by a sine curve of the form.

$$T_i = \bar{T} + A \sin(2\pi t_i + \theta) \dots\dots\dots (1)$$

in which T_i is the temperature (°C) at time t_i ($0 < t_i \leq 1$, with 0 at 0000 h on 1 January and 1 at 2400 h on 31 December), \bar{T} is mean temperature (°C), A is amplitude of the sine curve (°C) and θ is phase shift of the curve (radians). Limerinos (1978) concluded that more than 80% of the annual variation in temperature could be explained by the sine functions calculated for 82 sites in California. At the same time, Johnson (1971), Shampine (1977) and Walker & Lawson (1977) have found that it may be possible to predict the parameters of equation 1 from catchment characteristics; in particular, \bar{T} seems to be readily predictable from catchment elevation and/or latitude.

The purpose of the present study was therefore to collate and synthesize water temperature data that are already available in New Zealand, and to develop an empirical model so that water temperature regimes may be predicted for sites at which no data are available.

DATA BASE

The Ministry of Works and Development (MWD) hydrological data system includes many thousands of temperature measurements made during flow gaugings at several hundred water-level recorder sites during the last 25 years. Because gaugings are carried out at more or less widely spaced intervals, the temperature measurements cannot provide a detailed record of temperature variations at a site for a specific period; indeed, many sites with stable stage-discharge rating curves may have less than 20 temperature measurements because more gaugings were unnecessary to establish the rating curve. Grant (1977) has discussed the inadequacies of periodic data, but Limerinos (1978) demonstrated that periodic measurements define the parameters in equation 1 as accurately as continuous data obtained from thermograph records. The measurements used herein were primarily made between the hours of 0900 and 1600; histograms for selected sites indicate that in general, observations are evenly spread

throughout the working day, with a tendency for most to be made between 1100 and 1300 hours. Data assembled by P. J. T. Smith, MWD, Dunedin (pers. comm.) for the Clutha River, Hockey *et al.* (1980) for the Hurunui River, and Brown (1969) for small streams in the USA, indicate that mean daily water temperature occurs in the early afternoon on large rivers, and between 1000 and 1200 hours in small streams. Hence, the periodic data used herein should provide a reasonable estimate of the trend of mean daily temperature in medium to large rivers, but of some temperature in excess of the mean in smaller rivers and streams.

Preliminary analysis indicated that at least 30 measurements were desirable for defining the annual temperature regime at a site. On this basis, a sample of 254 sites was selected for analysis (Figures 1 and 2). Plots of the temperature data for these sites are presented in Appendix 1, by MWD district.



Figure 2—Location of South Island sites used in the study.

ANALYSIS

A computer program written by R. P. Ibbitt (MWD, Christchurch) was used to compute, by an iterative least-squares procedure, the parameters \bar{T} , A and θ in equation 1 for each site. Values of these parameters, of maximum and minimum observed temperature (T_{\max} and T_{\min}) and of the standard error of estimate (se) of the best-fit curve are tabulated in Appendix 2.

For each site, the following readily measured physical variables were measured from NZMS1 maps: latitude (LAT, in decimal degrees); recorder elevation (RECEL, in m); maximum catchment elevation (MAXEL, in m); elevation at the point halfway between the recorder site and the highest point measured along the stream channel (MNEL, in m); catchment area (AREA, in km^2). Where available, figures for mean discharge, \bar{Q} , standard deviation of instantaneous flows, Q_{sd} , (both in m^3s^{-1}) and coefficient of variation of instantaneous flows, $Q_{cv} = Q_{sd}/\bar{Q}$, were obtained (Appendix 2). Shampine (1977) measured a number of additional physical variables (slope, length, and azimuth of

stream; percentage of area in lakes; mean monthly and annual air temperatures), but his analysis indicated that they were unimportant, so they were excluded from the present study. Although air temperatures have been shown by Johnson (1971) and Walker & Lawson (1977) to be closely correlated with water temperatures, no attempt was made to include air temperature in the analysis, because of the relatively small area of New Zealand for which reliable measurements are available and the lack of a ready source of appropriate data (A. I. Tomlinson, New Zealand Meteorological Service, pers. comm.). Similarly, other factors such as cloudiness which are known to influence temperature regimes could not be included because of the small amount of reliable information available. The relationships between the water temperature parameters and the physical catchment characteristics were examined with multiple correlation and stepwise regression analyses. Logarithmic transformation was used to normalise the distributions of some variables, and their logarithms used in the analyses.

RESULTS AND DISCUSSION

The plots of temperature data presented in Appendix 1 confirm that periodic temperature measurements can be fitted by a sine curve; although no other mathematical functions were tested, the sine curve appears to be perfectly acceptable.

The matrix of correlation coefficients between the sine curve parameters and the physical variables is presented in Table 1. Table 2 shows means, standard deviations, etc, of the parameters.

Table 1 Matrix of correlation coefficients between temperature parameters and catchment characteristics for 254 sites.

	T_{\max}	T_{\min}	\bar{T}	A	θ	se
T_{\max} ...	1.0					
T_{\min} ...	0.222	1.0				
\bar{T} ...	0.705	0.747	1.0			
A ...	0.669	-0.342	0.188	1.0		
θ ...	0.223	-0.176	0.034	0.255	1.0	
se ...	0.594	-0.438	0.038	0.686	0.292	1.0
latitude ...	-0.363	-0.669	-0.711	0.129	-0.077	0.111
area ...	-0.100				-0.254	-0.191
log (area) ...		-0.200	-0.130	-0.175		
recelev ...	-0.445	-0.451	-0.611	-0.111	0.034	-0.023
meanelev ...		-0.525	-0.694		0.048	0.029
Log (meanelev) ...	-0.483			-0.145		
maxelev ...	-0.444	-0.369	-0.535	-0.130	-0.210	-0.137

Note: Coefficients > 0.13 are significantly different from zero, $P \leq 0.05$.

Table 2 Selected Statistical Parameters for the Temperature Variables, 254 Sites.

	T_{\max}	T_{\min}	\bar{T}	A	θ	se
Mean ...	21.8	5.1	12.6	5.2	1.23	2.01
Standard Deviation ...	3.9	3.0	2.6	1.6	0.15	0.51
Standard Error of Mean ...	0.25	0.19	0.16	0.10	0.01	0.03
Minimum ...	12.5	0.0	2.95	0.55	0.74	0.58
Maximum ...	33.0	12.0	18.2	8.9	1.97	3.32
CV = SD/Mean ...	0.18	0.59	0.21	0.30	0.12	0.25

Sine Curve Parameters

Best-fit regression equations for the parameters were computed in which, firstly, only catchment variables and, secondly, both catchment and discharge variables could be entered by the stepwise computation procedure. Sample sizes were, respectively, 254 and 198 sites. Although statistically significant equations could be computed for all of the temperature parameters, only one, for mean temperature, \bar{T} , "explained" more than 30% of the variation in the parameter.

$$\bar{T} = 95.8 - 46.5 \log(\text{LAT}) - 3.46 \log(\text{MNEL}) \quad \dots (2)$$

(2.8)
(0.26)
(52%)
(21%)

The standard errors of the coefficients and percent of variance explained by the independent variables are shown beneath equation 2; the overall standard error of estimate is 1.38°C. The implication of equation 2 is that mean temperature may be reliably predicted in terms of the latitude of the measurement site and the catchment elevation parameter, MNEL; these two variables account for 73% of the variation in \bar{T} for the sample of 254 sites. This conforms closely to the findings of Johnson (1971) and Shampine (1977). Examination of the residuals from equation 2 provided no clues as to the factors that explain the remaining 27% of variance in \bar{T} ; neither geographic location (a surrogate for climatic zone), channel characteristics, nor hydrologic character (e.g., lake-fed, spring-fed) were noticeably related to the magnitude of the residuals. No doubt measurement error and lack of fit of equation 1 to the data are responsible for a significant portion of the unexplained variance.

Shampine (1977) was unable to develop a statistical model to predict amplitude, A, from physical catchment variables for streams in Indiana, and the data presented by Johnson (1971) similarly provide no evidence for any dependence of A upon catchment characteristics. The present study conforms to this; only 6% of the variance in A was accounted for by catchment variables included in the analysis (catchment area and maximum elevation). However, examination of the data indicated some dependence of A on hydrologic regime; a bivariate scatter plot of \bar{T} and A (Figure 3) suggests a number of groupings which show the influence of climatic or hydrologic factors. Most noticeable is a group of sites with values of A less than 2.5°C which are all located around Lake Rotorua and are spring fed; or are located on limestone outcrops (site 14604, Figure 4). Clearly, the annual range of water temperature in these streams is moderated by the predominantly subterranean source of stream flow. Another grouping of sites with low values of A includes many located on the West Coast of the South Island; it is considered that the equable climate and frequent cloud cover is here responsible for the low range in temperatures (site 84701, Figure 4). On the other hand, sites in inland Otago and Canterbury tend to have large values of A (although mean temperatures are low) (sites 62105, 71103, Figure 4). Generally clear skies promote rapid heating and cooling of the water both during the day and over the year, and many of these watercourses also tend to be wide and

braided, which again promotes rapid heating and cooling. Sites in the East Cape-Gisborne region also have a tendency for large values of A (site 19716, Figure 4). In most cases, this is perhaps less a function of climatic conditions than of the generally small size of the streams included in the sample from this area.

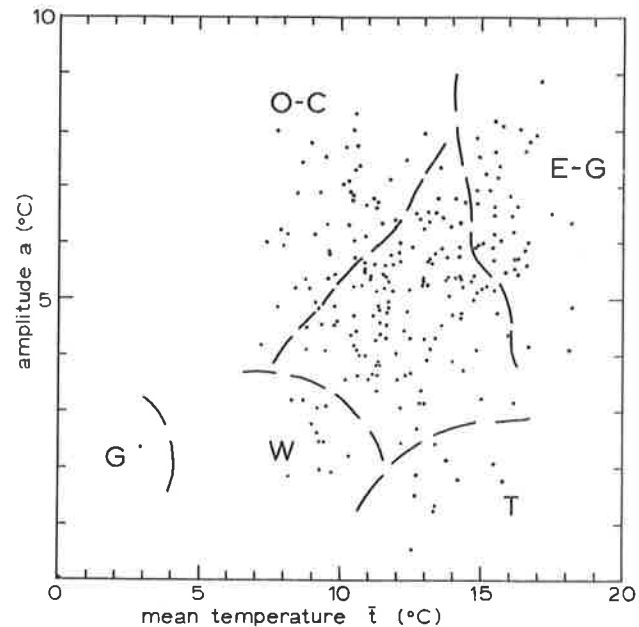


Figure 3 Bivariate plot of \bar{T} and A. The groupings around the main mass of points were identified with the help of cluster analysis, using computer program BMDP3M (Dixon 1975). The groupings are only tendencies, because many sites in those groups actually plot in the central body of points. Groups are: O-C: Otago and Canterbury; E-G: East Cape and Gisborne; W: West Coast, South Island; T: Taupo pumice/limestone; G: Glacial.

Nevertheless, an equation which included variables indicative of hydrologic regime explained less than 30% of the variance in A, and there is no justification for attempting to develop regional equations for A, because many sites in the four districts mentioned above are intermixed with sites from the rest of the country.

Amplitude appears, therefore, to be a function of a variety of factors, most of which are as yet unrecognised or unquantified. If synthesis of the annual temperature regime at a given site is required, the only method (apart from actually making measurements) appears to be to examine the data set presented in the appendices, identify those sites most similar (in terms of geographic location or climate, channel morphology, hydrologic regime, etc.) to the site of interest, and select the appropriate value of A.

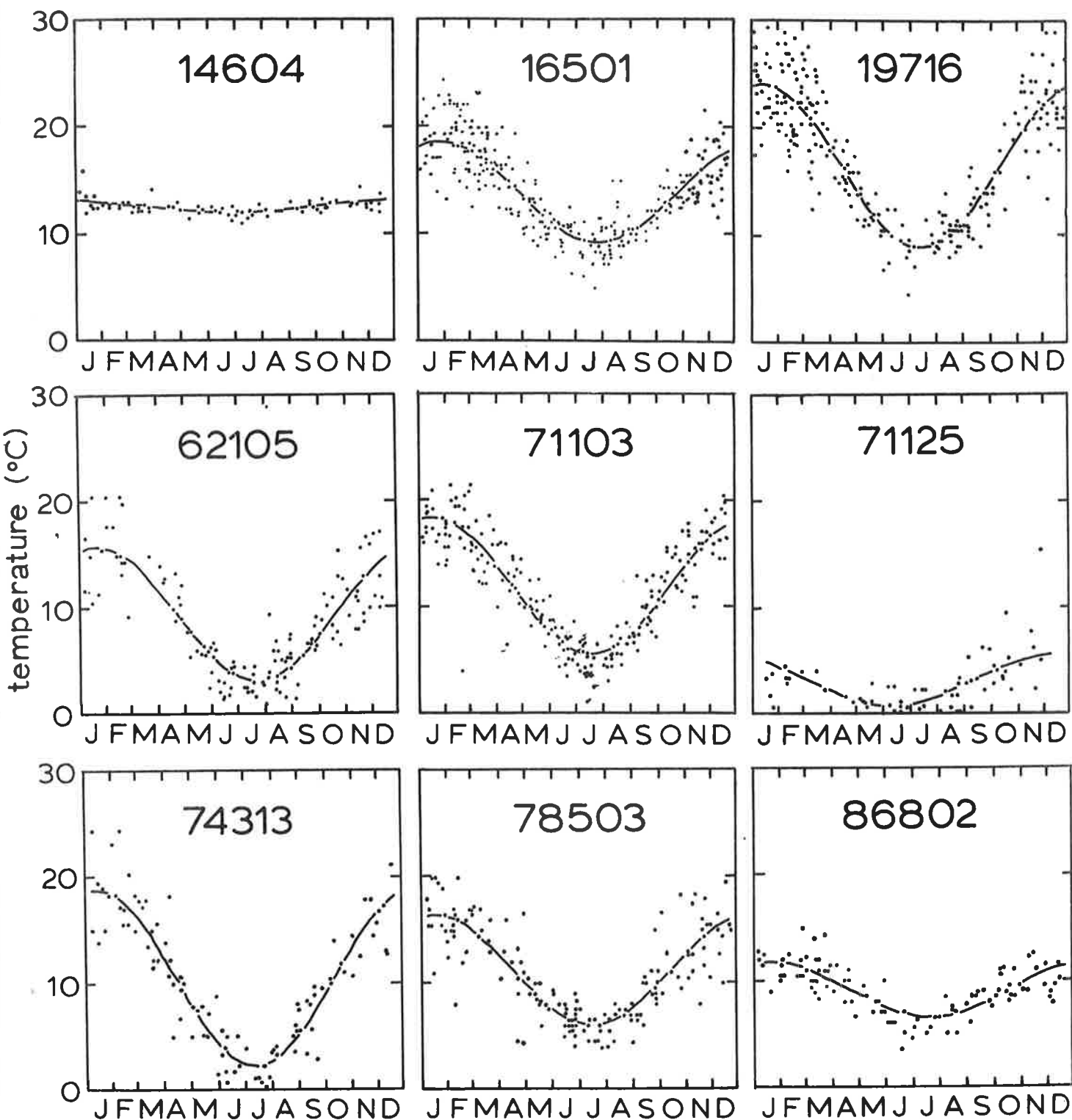


Figure 4 Representative temperature plots and best-fit sine curves. Pertinent details are:

Site	NZMS1 Grid Reference	\bar{T} (°C)	A(°C)	θ (radians)	se(°C)	Latitude	
14604 Awahou...	...	N76:685149	12.5	0.55	1.63	0.58	38.1
16501 Motu	N70:057358	13.9	4.72	1.13	2.18	37.86
19716 Waipaoa	N89:273614	16.5	7.60	1.35	2.87	38.47
62105 Clarence	S47:265862	9.5	6.31	1.20	2.39	42.46
71103 Hakataramea	S118:125112	12.0	6.40	1.29	2.14	46.72
71125 Hooker (glacial)	S79:787304	3.0	2.36	1.97	1.98	43.74
74313 Taieri	S135:843534	10.5	8.28	1.35	2.40	45.19
78503 Waihopai	S177:431045	11.3	5.16	1.33	2.30	46.39
84701 Cleddau	S113:908108	9.1	2.63	1.22	1.50	44.69

Most sites have rather similar values of phase shift, θ , which is an index of the timing of the maximum temperature during the year. The mean value of θ for the 254 sites is 1.23 radians, with a standard deviation of only 0.15 radians; this implies that the peak temperature occurs on average on January 26, and that temperature at about 67% of the sites peaks between January 19 and February 2. As catchment size increases, there is a weak tendency for θ to decrease—that is, the temperature peak occurs later in the year, as might be expected. However, for the purpose of synthesizing a temperature regime relationship, the mean value of 1.23 radians should be adequate.

Maximum Temperature and Temperature Variability

For the purpose of evaluating the suitability of a river for instream uses such as fish habitat, such aspects of the water temperature regime as maximum temperature, diurnal variability of temperature, and rates of change of temperature are of great importance. Indices of these aspects used herein are maximum recorded temperature, T_{\max} , and the standard error, se , of equation 1 for each site, the latter being an index of the amount of scatter of points about the best-fit sine curve. Unfortunately, neither of these parameters can be

satisfactorily predicted from simple catchment characteristics, although T_{\max} is to some extent ($R^2 = 29\%$) determined by latitude and the elevation parameter MNEL. This is perhaps not surprising because both parameters depend strongly on the precise conditions pertaining at the time temperature measurements are taken—that is, on time of day, on meteorological conditions such as degree of cloudiness, on depth, clarity, and volume of water, etc.—and on physical characteristics of the channel upstream such as amount of shading (either from overhanging vegetation or surrounding hills), the character of the stream bed, channel width, and so on. Physically based models to predict water temperatures require much detailed information on physical conditions, so that it is not surprising that a simple statistical model cannot be developed. As with sine curve amplitude, therefore, it appears that the only method available for predicting maximum temperature and variability of temperature at a given site is to examine the data set in the appendices and to select the site that is most similar to the site of interest. If the study warrants it, the alternative is to use a simulation model of the type developed by Hockey *et al.* (1980), or to make actual measurements at the critical period (most probably at the end of January), if annual maximum temperature is of specific concern.

CONCLUSION

Periodic measurements of water temperature at 254 sites in New Zealand may be fitted by sine curves, if measurements for different years are combined, as shown by Shampine (1977), Ward (1963) and others. Inspection suggests that the best-fit sine curves are unlikely to be improved upon by use of any other mathematical function. As few as thirty points randomly spaced through the year appear adequate to define the parameters of the curve, although fifty or more are desirable; periodic data have been shown by Limerinos (1978) to provide an estimate of the parameters as good as that given by continuously measured data. The measurements used herein provide an estimate of water temperature at about noon, which in medium to large rivers is the time when mean temperature tends to be passed in the diurnal temperature cycle.

Attempts to develop a model to predict, for a site at which no data are available, the annual temperature regime from easily measured catchment characteristics had a similar degree of success to that of Shampine (1977) in Indiana. The parameter \bar{T} of the sine curve (mean annual temperature) may be accurately predicted by an equation (equation 2) that includes latitude and catchment elevation. The parameter A (amplitude of the curve) cannot be

predicted to an acceptable level of accuracy and it is suggested that the only way in which the body of data available for the study may be used is by selecting those sites which are most similar (in respect of climatic zone, geographic location, channel character, etc.) to the site of interest and using their value of A . The third parameter, θ , of the sine curve has a remarkably stable value throughout New Zealand, and its mean value may be adopted.

It proved impossible to predict maximum temperature and the dispersion of temperatures about the trend line. If this information is required for a given location, inspection of the data set for a similar site may provide an estimate, but the only wholly acceptable solution seems to be to make field measurements or to use a simulation approach. In the latter case, the annual trend line obtained by the three step procedure outlined in the preceding paragraph may provide an acceptable basis. If measurements are to be made, the study indicates the most appropriate time of year for data collection (late January), and the number of periodic measurements likely to be required (a minimum of thirty, but preferably fifty, or one per week for a year).

ACKNOWLEDGMENTS

The data used herein were collected by many field hydrologists, and their work is here acknowledged. I am particularly grateful to the catchment authorities for making data available. I thank Richard Ibbitt for writing the sine curve program, Royd Cumming and Doug McMillan for assistance with the TIDEDA

and STATS/GRAPHIC packages, and John Dymond and Alastair McKerchar for reviewing the manuscript. This study was in its early stages a joint project with Horace Freestone, to whom I extend my thanks for his assistance, guidance, and many helpful suggestions.

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APPENDIX 1: Graphs of Temperature Measurements and Best-fit Sine Curves

INDEX: BY SITE NUMBER

Site	River	Station	Reference	District	Page
1316	Awanui	School Cut	N10:774686	AUCK	19
1909	Peria	Honeymoon Valley	N10:999686	AUCK	19
3503	Puketotara	Backblocks	N11:395544	AUCK	19
3506	Maungaparerua	Tyrees Ford	N11:391555	AUCK	19
3819	Waiharakeke	Willowbank	N15:529363	AUCK	19
4901	Ngunguru	Dugmores Rock	N20:942120	AUCK	19
7811	Oteha	Days Bridge	N38:213748	AUCK	20
9228	Waiorongomai	Old Quarry	N57:247746	HAM	22
13901	Mangawhai	Omokoroa	N58:503608	HAM	22
14601	Kaituna	L. Rotoiti Outlet	N76:811186	HAM	22
14603	Waiteti	Tauranga Direct Rd	N76:679122	HAM	22
14604	Awahou	Tauranga Direct Rd	N76:685149	HAM	22
14606	Waingaehe	SH 30 Br	N76:777059	HAM	22
14607	Waiohewa	SH 30 Br	N76:791111	HAM	23
14610	Utuhina	SH 5 Br	N76:710052	HAM	23
14614	Kaituna	Te Matai	N67:832459	HAM	23
14624	L. Rotorua	Mission Bay	N76:788154	HAM	23
14625	Puarenga	FRI Br	N76:732018	HAM	23
14627	Waiari	Muttons	N67:799430	HAM	23
14628	Mangorewa	Saunders Farm	N67:816348	HAM	24
15302	Tarawera	Awakaponga	N68:218278	HAM	24
15341	Tarawera	Lake Outlet	N77:966993	HAM	24
15350	Mangakino	County Br	N86:936824	HAM	24
15408	Rangitaiki	Murupara	N86:145648	HAM	25
15410	Whirinaki	Galatea	N86:191623	HAM	25
15412	Rangitaiki	Te Teko	N77:248155	HAM	25
15432	Rangitaiki	Kopuriki	N86:232822	HAM	25
15511	Waimana	Gorge	N78:478076	HAM	25
15514	Whakatane	Whakatane	N78:436194	HAM	25
15534	Wairere	Wainui Rd	N69:466250	HAM	26
15536	Waimana	Ogilvies Br	N87:551818	HAM	26
15901	Waioeke	Gorge	N78:737923	NAP	28
16002	Otara	Browns Br	N78:791094	NAP	28
16501	Motu	Houpoto	N70:057358	NAP	28
16502	Motu	Waitangirua	N79:032946	NAP	28
17601	Wharekahika	Hicks Bay Rd Br	N62:688692	NAP	28
17602	Mangatutu	SH 35	N62:666658	NAP	28
17603	Waitaukakarī	SH 35	N62:659667	NAP	29
17604	Waimate	SH 35	N62:670651	NAP	29
17606	Oweka	SH 35	N62:562670	NAP	29
17702	Nukutaharua	SH 35	N62:688661	NAP	29
17801	Karakatuwhero	SH 35	N63:737623	NAP	29
17802	Parinui	Forest Rd Br	N62:683587	NAP	29
17803	Pukeanaru	Forest Rd Br	N62:667566	NAP	30
17804	Tawaroa	Forest Rd Ford	N62:637571	NAP	30
17901	Awatere	SH 35	N63:748565	NAP	30
17902	Kopuapounamu	County Br	N62:657537	NAP	30
17904	Taurangakautuku	Tangihanga	N71:651495	NAP	30
18306	Poroporo	Rangitukia Rd Br	N72:820428	NAP	30
18308	Tapuaeroa	Pakihiroa Rd Br	N71:489356	NAP	31
18309	Wajapu	Rotokautuku Br	N71:689302	NAP	31
18310	Mata	Owetea	N80:450078	NAP	31
18312	Maraehara	Rangitukia Rd Br	N72:860450	NAP	31
18323	Raparapaririki	Tapuaeroa Rd	N71:495363	NAP	31
18325	Mangaraukokore	Gate Rd Br	N71:470360	NAP	31
18902	Hikuwai	Willow Flat	N89:650818	NAP	32
19602	Waimata	Goodwins Rd	N98:445402	NAP	32
19701	Waipaoa	Kanakanaia Br	N89:268623	NAP	32
19702	Waipaoa	Waipaoa Stn	N88:245835	NAP	32
19708	Waikohu	Mahaki	N88:123668	NAP	32
19709	Wharekopae	Killarney	N97:061529	NAP	32
19711	Waingaromia	Terrace	N89:326746	NAP	33
19712	Mangatu	Omapere	N88:192724	NAP	33
19716	Waipaoa	Kanakanaia C/W	N89:273614	NAP	33
19724	Waikohu	No. 2 Bridge	N88:166633	NAP	33
19725	Waikohu	No. 3 Bridge	N88:176633	NAP	33
19726	Waikohu	No. 4 Bridge	N88:163636	NAP	33
19728	Te Arai	Site 61	N97:212301	NAP	34
19734	Waikohu	No. 1 Bridge	N88:197130	NAP	34
19749	Te Arai	Reays Br	N106:213296	NAP	34
19765	Mangatu	Whatatutu	N88:221722	NAP	34
21401	Wairoa	Marumaru	N106:853108	NAP	34
21409	Waiiau	Otoi	N105:480048	NAP	34
21410	Waihi	Waihi	N105:564136	NAP	35
21601	Tahekenui	Glenstrae	N115:661925	NAP	35
21801	Mohaka	Raupunga	N115:542895	NAP	35
21803	Mohaka	Glenfalls	N114:072775	NAP	35
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23103	Ngaruroro	Whana Whana	N133:843320	NAP	36
23104	Ngaruroro	Kuripapango	N123:783533	NAP	36
23106	Taruarau	Taihape Rd	N123:679464	NAP	36
23201	Tukituki	Red Br	N134:338119	NAP	36
23203	Tukituki	Waipukurau	N146:988794	NAP	37
23209	Otane	Glendon	N141:015921	NAP	37
23211	Waipawa	Waipawa	N141:014843	NAP	37
23219	Waipawa	Fletchers Crossing	N140:753990	NAP	37
23221	Mangatewai	SH 50	N145:776795	NAP	37
23601	Waingongoro	Waimarama Rd	N142:384006	NAP	37
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29808	Hutt	Kaitoke	N161:716507	WGTN	44
29818	Hutt	Birchville	N161:624448	WGTN	44
30516	Mill Ck	Papanui	N160:334350	WGTN	44
31803	Otaki	Tuapaka	N157:719792	WGTN	44
32526	Mangahao	Ballance	N149:270254	WGTN	44
32529	Tiraumea	Ngaturi	N149:392215	WGTN	45
32531	Mangatainoka	Susp Br	N149:327261	WGTN	45
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32563	Oroua	Kawa Wool	N149:066488	WANG	38
32576	Pohangina	Mais Reach	N144:263511	WANG	38
32580	Manawatu	Ruahine St	N149:133348	WANG	38
32590	Koputaroa	Tavistock Rd	N152:849059	WANG	38
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32708	Rangitikei	Springvale	N123:507416	WANG	39
32726	Hautapu	Taihape	N132:286184	WANG	39
32732	Moawhango	Waiouru	N122:236489	WANG	39
32733	Moawhango	Moawhango	N132:339270	WANG	39
32734	Mangaio	Waiouru	N122:219608	WANG	39
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33111	Mangawhero	Ore Ore	N131:778308	WANG	40
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33115	Mangaetoroa	School	N121:743458	WANG	40
33116	Wahianoa	Karioi	N122:135523	WANG	40
33117	Makotuku	SH 49A	N121:834547	WANG	40
33301	Wanganui	Paetawa	N138:667055	WANG	41
33302	Wanganui	Te Maire	N101:705067	WANG	41
33307	Wanganui	Headwaters	N112:089990	WANG	41
33309	Manganui-a-te-Ao	Ashworth	N121:723621	WANG	41
33312	Retaruke	Kawautahi	N111:735911	WANG	41
33313	Ohura	Tokorima	N101:556097	WANG	41
33316	Ongarue	Taringamutu	N101:751165	WANG	42
33320	Whakapapa	Footbridge	N111:960859	WANG	42
33347	Wanganui	Te Porere	N112:087944	WANG	42
33356	Wanganui	Piriaka	N101:852116	WANG	42
36001	Punehu	Pihama	N128:507387	WANG	42
39504	Manganui	Tariki Rd	N109:843727	WANG	42
39508	Manganui	SH 3	N119:831649	WANG	43
39510	Ngatoro	SH 3	N109:786778	WANG	43
40703	Mangakowhai	Kaingapi	N83:563707	HAM	26
43472	Waiotapu	Reporoa	N85:801680	HAM	26
43810	Maketu	Rimu Stand	N47:508255	AUCK	20
45702	Waiwhiu	Dome Shadow	N34:147209	AUCK	20
46618	Mangakahia	Gorge	N19:366077	AUCK	20
46651	Manganui	Permanent Station	N23:632676	AUCK	20
47527	Opahi	Pond	N15:234344	AUCK	20
48015	Mangamuka	Gorge	N10:008591	AUCK	21
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57008	Motueka	Gorge	S26:288863	WGTN	45
57009	Motueka	Woodstock	S13:212320	WGTN	45
57014	Stanley Brook	Barkers	S19:208248	WGTN	45
57101	Moutere	Old House Rd	S14:377347	WGTN	46
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58301	Collins	Drop Structure	S15:866428	WGTN	46
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62105	Clarence	Jollies	S47:265862	CHCH	49
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68503	Harper	Coleridge	S65:962948	CHCH	50
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68513	Wilberforce	Oakden	S73:937843	CHCH	50
69506	Orari	Silverton	S91:730080	CHCH	51
71102	Otekaieke	Stockbridge	S127:153912	CHCH	51
71103	Hakataramea	Above MHB	S118:125112	CHCH	51
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71129	Forks	Balmoral	S89:034021	CHCH	52
71135	Jollie	Mt Cook Stn	S89:841164	CHCH	52
71167	Otekaieke	Gorge	S127:154912	CHCH	52
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74313	Taieri	Waipiata	S135:843534	DUN	56
74314	Taieri	Pat-Paerau	S145:675374	DUN	56
74315	Taieri	McAtamneys	S145:679277	DUN	56
74337	Kyeburn	MHB	S135:935593	DUN	57
74346	Loganburn	Paerau	S144:624217	DUN	57
74351	Deep Stream	Totara Rock	S153:632951	DUN	57
74352	Deep Stream	Rocklands	S154:671950	DUN	57
75207	Clutha	Balclutha	S179:522263	DUN	57
75213	Clutha	Clyde	S133:130517	DUN	58
75214	Clutha	Lowburn	S133:035744	DUN	58
75219	Lindis	Lindis Pk	S125:273080	DUN	58
75232	Pomahaka	Burkes Ford	S171:224472	DUN	58
75251	Manuherikia	D/S Forks	S125:619060	DUN	58
75253	Manuherikia	Ophir	S134:357629	DUN	59
75255	Dovedale Ck	Willows	S134:479527	DUN	59
75257	Dunstan Ck	Gorge	S125:503997	DUN	59
75259	Fraser	Old Man Range	S143:031485	DUN	59
75264	Nevis	Clegroy	S133:847530	DUN	59
75265	Nevis	Wentworth Stn	S133:872671	DUN	59
75273	Arrow	Tobins Track	S123:705817	DUN	60
75275	Shotover	16 Mile	S114:535143	DUN	60
75276	Shotover	Bowens Pk	S132:589786	DUN	60
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77504	Mataura	Gore Hwy Br	S170:843413	DUN	60
77505	Mataura	Parawa	S151:491058	DUN	60
77523	Waikaka	Willowbank Br	S170:915494	DUN	61
77525	Waimea	Mandeville Br	S169:713544	DUN	61
77526	Wyndham Stm	Glenham Br	S178:768103	DUN	61
78503	Waihopai	Kennington	S177:431045	DUN	61
78504	Waihopai	Above Scour	S177:441043	DUN	61
78602	Oreti	McKellars Flat	S141:178329	DUN	61
78625	Otapiri	McBrides Br	S169:422516	DUN	62
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93213	Gowan	L Rotoroa	S33:995673	WGTN	48
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1014644	Waiowhiro	Bonningtons Farm	N76:702078	HAM	24
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1043428	Tahunaatara	Ohakuri Rd	N85:548802	HAM	26
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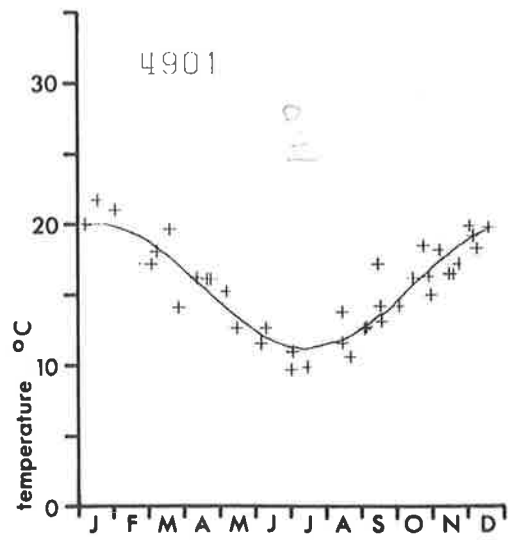
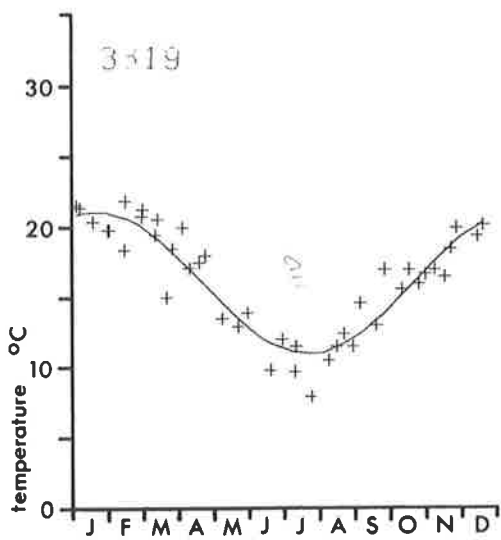
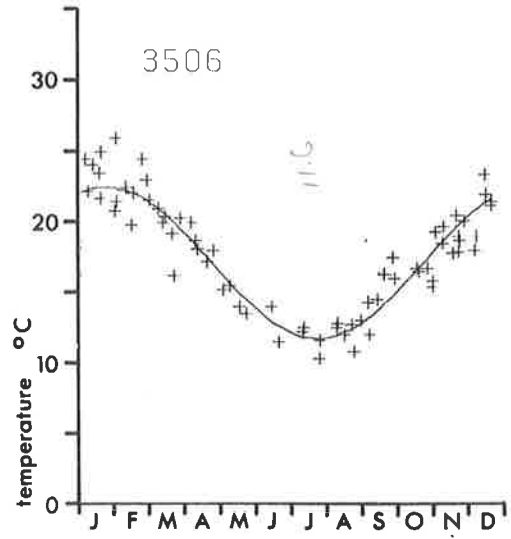
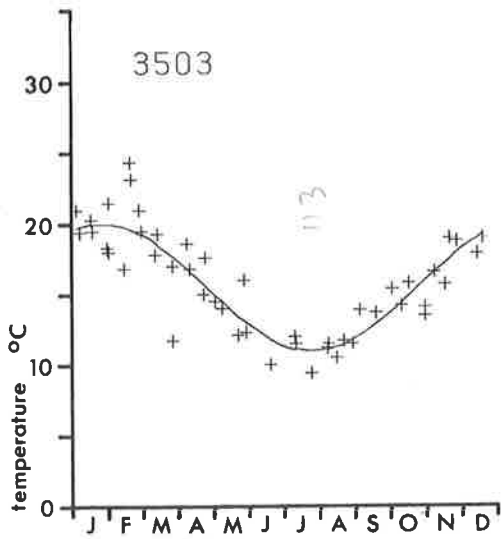
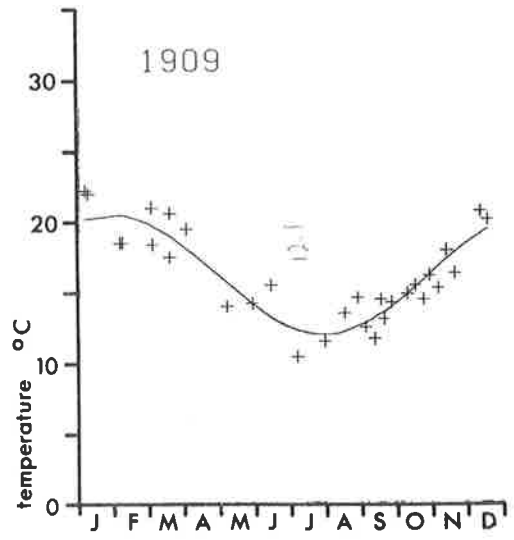
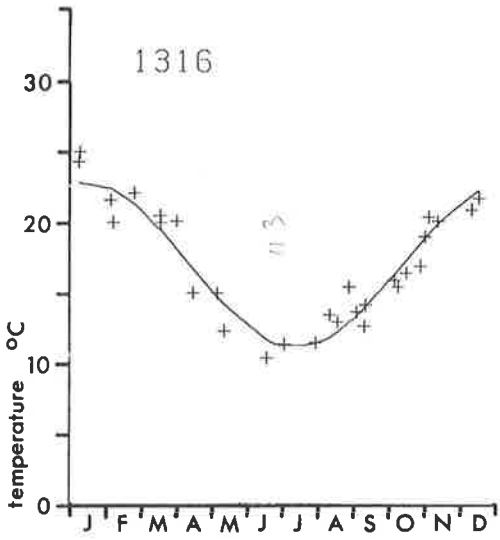
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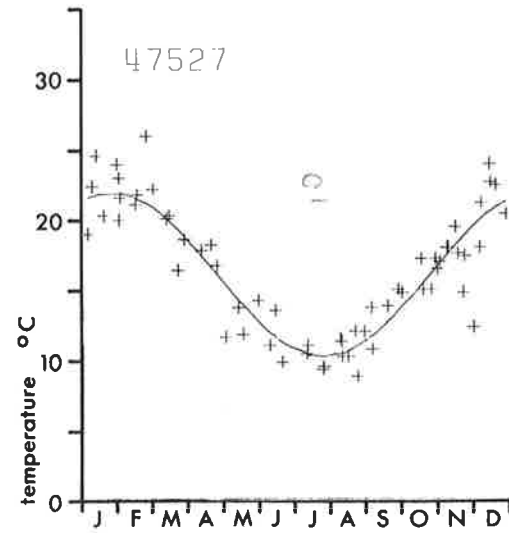
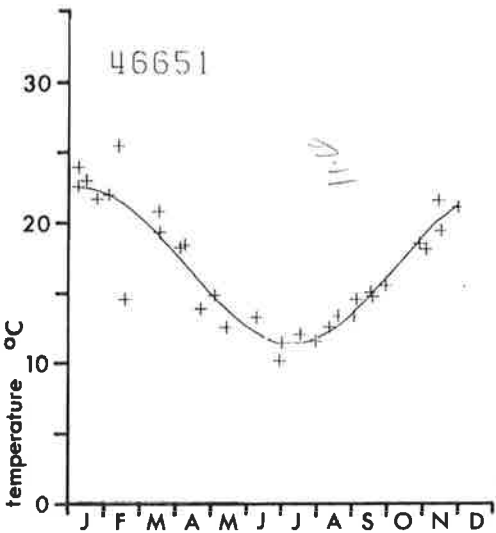
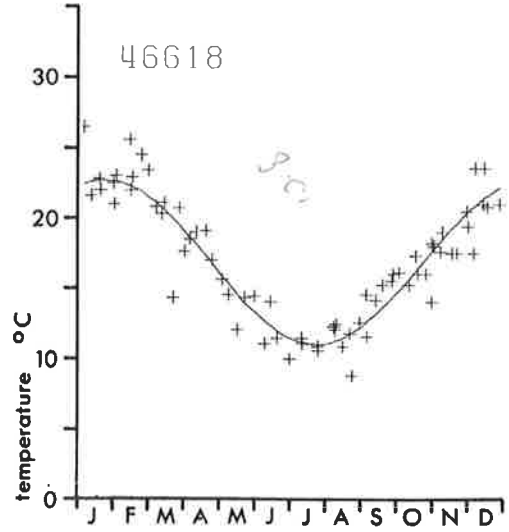
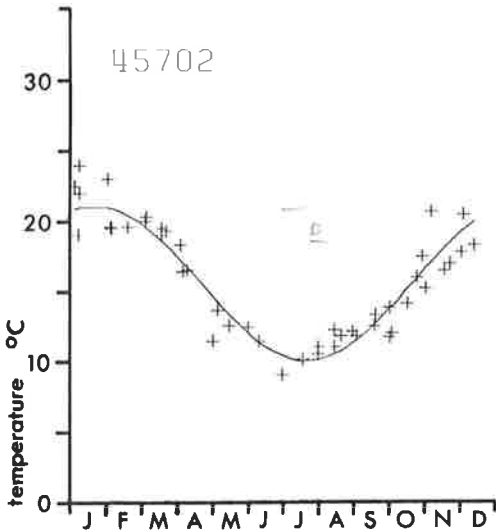
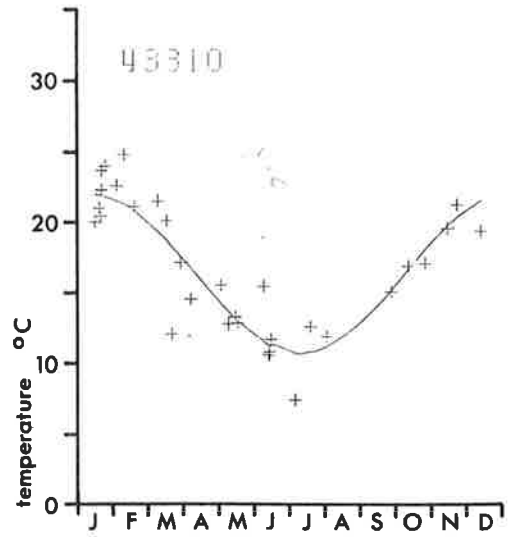
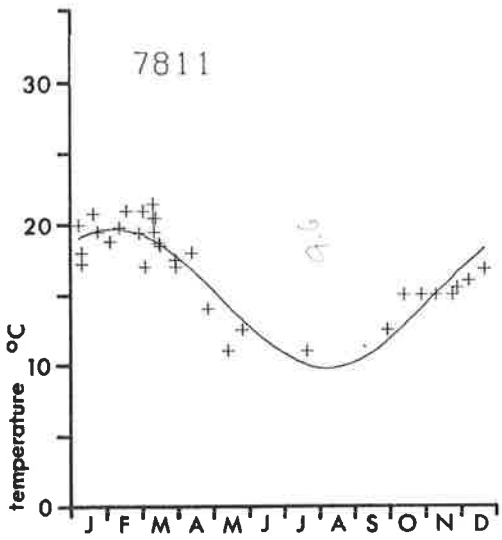
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Inangahua	Blacks Pt	93207	S38:342278	CHCH	54
Inangahua	Landing	93206	S31:357535	CHCH	54
Jollie	Mt Cook Stn	71135	S89:841164	CHCH	52
Kaituna	Okaramio	59003	S21:077124	WGTN	46
Kaituna	Rotoiti Outlet	14601	N76:811186	HAM	22
Kaituna	Te Matai	14614	N67:832459	HAM	23
Kakanui	Clifton Falls	71702	S136:353748	DUN	56
Karakatuwhero	SH 35	17801	N63:737623	NAP	29
Karamea	Arapito	95101	S12:614318	CHCH	55
Kiwitea	Spur Rd Extension	1032516	N144:105558	WANG	38
Kopuapounamu	County Br	17902	N62:657537	NAP	30
Koputaroa	Tavistock Rd	32590	N152:849059	WANG	38
Kyeburn	MHB	74337	S135:935593	DUN	57
L Rotorua	Mission Bay	14624	N76:788154	HAM	23
Lake Stm	Rouses	68509	S73:722674	CHCH	50
Lindis	Lindis Pk	75219	S125:273080	DUN	58
Loganburn	Paerau	74346	S144:624217	DUN	57
Maerewhenua	Kellys Gully	71106	S127:214845	CHCH	51
Maketu	Rimu Stand	43810	N47:508255	AUCK	20
Makotuku	SH 49A	33117	N121:834547	WANG	40
Manawatu	Ruahine St	32580	N149:133348	WANG	38
Mangaetoroa	School	33115	N121:743458	WANG	40
Mangahao	Balance	32526	N149:270254	WGTN	44
Mangaio	Waiouru	32734	N122:219608	WANG	39
Mangakahia	Gorge	46618	N19:366077	AUCK	20
Mangakara	Hirsts	1043434	N85:771661	HAM	26
Mangakino	County Br	15350	N86:936824	HAM	24
Mangakowhai	Kaingapipi	40703	N83:563707	HAM	26
Mangamuka	Gorge	48015	N10:008591	AUCK	21
Manganui	Permanent Station	46651	N23:632676	AUCK	20
Manganui	SH 3	39508	N119:831649	WANG	43
Manganui	Tariki Rd	39504	N109:843727	WANG	42
Manganui-a-te-Ao	Ashworth	33309	N121:723621	WANG	41
Mangaraukokore	Gate Rd Br	18325	N71:470360	NAP	31
Mangatainoka	Suspension Br	32531	N149:327261	WGTN	45
Mangatera	Dannevirke	32541	N145:561510	WANG	38
Mangatawai	SH 50	23221	N145:776795	NAP	37
Mangatu	Omapere	19712	N88:192724	NAP	33
Mangatu	Whatatutu	19765	N88:221722	NAP	34
Mangatutu	SH 35	17602	N62:666658	NAP	28
Mangawhai	Omokoroa	13901	N58:503608	HAM	22
Mangawhero	Ore Ore	33111	N131:778308	WANG	40
Mangles	Gorge	93212	S32:842647	WGTN	48
Mangorewa	Saunders Farm	14628	N67:816348	HAM	24
Manuherikia	D/S Forks	75251	S125:619060	DUN	58

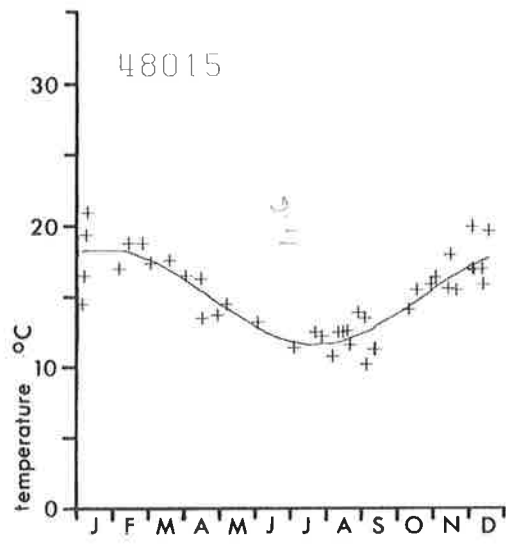
River	Station	Site	Reference	District	Page
Manuherikia ...	Ophir ...	75253	S134:357629	DUN	59
Marahara ...	Rangitukia Rd Br ...	18312	N72:860450	NAP	31
Mararoa ...	At Cliffs ...	79737	S149:759968	DUN	63
Maruia ...	Falls ...	93209	S32:682596	WGTN	47
Maryburn ...	Mt McDonald ...	71122	S100:933904	CHCH	52
Mata ...	Owetea ...	18310	N80:450078	NAP	31
Matakitaki ...	Mud L ...	93211	S32:741611	WGTN	47
Mataura ...	Gore Highway Br ...	77504	S170:843413	DUN	60
Mataura ...	Parawa ...	77505	S151:491058	DUN	60
Maungaparerua ...	Tyrees Ford ...	3506	N11:391555	AUCK	19
Middle Ck ...	Otahuti ...	78803	S176:192268	DUN	62
Mill Ck ...	Papanui ...	30516	N160:334350	WGTN	44
Moawhango ...	Moawhango ...	32733	N132:339270	WANG	39
Moawhango ...	Waiouru ...	32732	N122:236489	WANG	39
Mohaka ...	Glenfalls ...	21803	N114:072775	NAP	35
Mohaka ...	Raupunga ...	21801	N115:542895	NAP	35
Mokihinui ...	Burkes Ck ...	94302	S25:465962	CHCH	55
Motu ...	Houpoto ...	16501	N70:057358	NAP	28
Motu ...	Waitangirua ...	16502	N79:032946	NAP	28
Motueka ...	Gorge ...	57008	S26:288863	WGTN	45
Motueka ...	Woodstock ...	57009	S13:212320	WGTN	45
Moutere ...	Old House Rd ...	57101	S14:377347	WGTN	46
Nevis ...	Clegroy ...	75264	S133:847530	DUN	59
Nevis ...	Wentworth Stn ...	75265	S133:872671	DUN	59
Ngaruroro ...	Fernhill ...	23102	N134:185275	NAP	36
Ngaruroro ...	Kuripapango ...	23104	N123:783533	NAP	36
Ngaruroro ...	Whana Whana ...	23103	N133:843320	NAP	36
Ngatoro ...	SH 3 ...	39510	N109:786778	WANG	43
Ngongotaha ...	SH 5 ...	1014641	N76:682109	HAM	24
Ngunguru ...	Dugmores Rock ...	4901	N20:942120	AUCK	19
Nukutaharua ...	SH 35 ...	17702	N62:688661	NAP	29
Ohau ...	SH Br ...	71119	S109:768639	CHCH	53
Ohura ...	Tokorima ...	33313	N101:556097	WANG	41
Ongarue ...	Taringamutu ...	33316	N101:751165	WANG	42
Opahi ...	Pond ...	47527	N15:234344	AUCK	20
Orari ...	Silverton ...	69506	S91:730080	CHCH	51
Oreti ...	McKellars Flat ...	78602	S141:178329	DUN	61
Oroua ...	Kawa Wool ...	32563	N149:066488	WANG	38
Otaki ...	Tuapaka ...	31803	N157:719792	WGTN	44
Otane ...	Glendon ...	23209	N141:015921	NAP	37
Otapiri ...	McBrides Br ...	78625	S169:422516	DUN	62
Otara ...	Browns Br ...	16002	N78:791094	NAP	28
Oteha ...	Days Bridge ...	7811	N38:213748	AUCK	20
Otekaieke ...	Gorge ...	71167	S127:154912	CHCH	52
Otekaieke ...	Stockbridge ...	71102	S127:156912	CHCH	51
Oweka ...	SH 35 ...	17606	N62:562670	NAP	29
Parinui ...	Forest Rd Br ...	17802	N62:683587	NAP	29
Peria ...	Honeymoon Valley ...	1909	N10:999686	AUCK	19
Pohangina ...	Mais Reach ...	32576	N144:263511	WANG	38
Pomahaka ...	Burkes Ford ...	75232	S171:224472	DUN	58
Pomahaka ...	Hukarere ...	1075229	S161:984846	DUN	58
Poroporo ...	Rangitukia Rd Br ...	18306	N72:820428	NAP	30
Poutu ...	Dam Outlet ...	1443434	N112:258903	WANG	43
Poutu ...	Footbridge ...	1043464	N112:253907	WANG	43
Puarenga ...	FRI Br ...	14625	N76:732018	HAM	23
Pukeanaru ...	Forest Rd Br ...	17803	N62:667566	NAP	30
Puketotara ...	Backblocks ...	3503	N11:395544	AUCK	19
Punehu ...	Pihama ...	36001	N128:507387	WANG	42
Rangitaiki ...	Kopuriki ...	15432	N86:232822	HAM	25
Rangitaiki ...	Murupara ...	15408	N86:145648	HAM	25
Rangitaiki ...	Te Teko ...	15412	N77:248155	HAM	25
Rangitikei ...	Mangaweka ...	32702	N139:288015	WANG	39
Rangitikei ...	Springvale ...	32708	N123:507416	WANG	39
Raparapaririki ...	Tapuaeroa Rd ...	18323	N71:495363	NAP	31
Retaruke ...	Kawautahi ...	33312	N111:735911	WANG	41
Ribble ...	Airstrip ...	62104	S47:317930	CHCH	49
Riwaka Sth Branch ...	Moss Bush ...	56901	S13:307569	WGTN	45
Ruamahanga ...	Waihenga ...	29202	N161:944332	WGTN	44
Sandy Ck ...	SH 2 ...	22502	N114:317746	NAP	35
Selwyn ...	Whitecliffs ...	68001	S74:349649	CHCH	50
Shotover ...	16 Mile ...	75275	S114:535143	DUN	60
Shotover ...	Bowens Pk ...	75276	S132:598786	DUN	60
Stanley Brook ...	Barkers ...	57014	S19:208248	WGTN	45
Stanton ...	Cheddar Valley ...	64610	S55:472647	CHCH	49
Styx Ck ...	Paerau ...	1074345	S145:668258	DUN	57
Tahekenui ...	Glenstrae ...	21601	N115:661925	NAP	35
Tahunaatara ...	Ohakuri Rd ...	1043428	N85:548802	HAM	26
Taieri ...	McAtamneys ...	74315	S145:679277	DUN	56
Taieri ...	Pat-Paerau ...	74314	S145:675374	DUN	56
Taieri ...	Tiroiti ...	74311	S145:946463	DUN	56
Taieri ...	Waipiata ...	74313	S135:843534	DUN	56
Taipo ...	SH Br ...	91103	S51:914509	CHCH	53
Tapuaeroa ...	Pakihiroa Rd Br ...	18308	N71:489356	NAP	31
Taramakau ...	Gorge ...	91101	S51:763629	CHCH	53
Taramakau ...	Jacksons ...	91102	S51:999525	CHCH	53
Tarawera ...	Awakaponga ...	15302	N68:218278	HAM	24
Tarawera ...	Lake Outlet ...	15341	N77:966993	HAM	24
Taruarau ...	Taihape Rd ...	23106	N123:679464	NAP	36
Taurangakautuku ...	Tangihanga ...	17904	N71:651495	NAP	30
Tawaroa ...	Forest Rd Ford ...	17804	N62:637571	NAP	30

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Taylor	Weir	60104	S28:220888	WGTN	46
Te Arai	Reays Br	19749	N106:213296	NAP	34
Te Arai	Site 61	19728	N97:212301	NAP	34
Tiraumea	Ngaturi	32529	N149:392215	WGTN	45
Tongariro	Upper Dam	1043461	N112:256728	WANG	43
Tukituki	Red Br	23201	N134:338119	NAP	36
Tukituki	Waipukurau	23203	N146:988794	NAP	37
Tutaekuri	Puketapu	23001	N134:211367	NAP	36
Utuhina	SH 5	14610	N76:710052	HAM	23
Wahianoa	Karioi	33116	N122:135523	WANG	40
Waiapu	Rotokautuku Br	18309	N71:689302	NAP	31
Waiari	Muttons	14627	N67:799430	HAM	23
Waiarakarua	D/S Confluence	72004	S146:430466	DUN	56
Waiau	Excelsior Ck	79734	S149:748945	DUN	63
Waiau	L Manapouri	79703	S149:677012	DUN	62
Waiau	L Te Anau	79704	S149:763193	DUN	62
Waiau	Maling Pass	64606	S40:038154	CHCH	49
Waiau	Marble Pt	64602	S54:142642	CHCH	49
Waiau	Monowai	79730	S158:698762	DUN	63
Waiau	Otoi	21409	N105:480048	NAP	34
Waiau	Tautapere	79701	S167:776332	DUN	62
Waiharakeke	Willowbank	3819	N15:529363	AUCK	19
Waihi	Waihi	21410	N105:564136	NAP	35
Waihohonu	Desert Rd	1043466	N112:223735	WANG	43
Waihopai	Above Scour	78504	S177:441043	DUN	61
Waihopai	Kennington	78503	S177:431045	DUN	61
Waikaka	Willowbank Br	77523	S170:915494	DUN	61
Waikato	Reids Farm	1143444	N94:554405	HAM	27
Waikoau	Waikoau Road	22501	N114:288728	NAP	35
Waikohu	Mahaki	19708	N88:123668	NAP	32
Waikohu	No 1 Bridge	19734	N88:197130	NAP	34
Waikohu	No 2 Bridge	19724	N88:166633	NAP	33
Waikohu	No 3 Bridge	19725	N88:176633	NAP	33
Waikohu	No 4 Bridge	19726	N88:163636	NAP	33
Waimana	Gorge	15511	N78:478076	HAM	25
Waimana	Ogilvies Br	15536	N87:551818	HAM	26
Waimangaroa	Conns Flat	93601	S24:250766	CHCH	55
Waimangaroa	Smokestack	93602	S24:305733	CHCH	55
Waimata	Goodwins Road	19602	N98:445402	NAP	32
Waimate	SH 35	17604	N62:670651	NAP	29
Waimca	Mandeville Br	77525	S169:713544	DUN	61
Waingaehe	SH 30	14606	N76:777059	HAM	22
Waingaromia	Terrace	19711	N89:326746	NAP	33
Waingongoro	Waimarama Rd	23601	N142:384006	NAP	37
Waioka	Gorge	15901	N78:737923	NAP	28
Waiohewa	SH 30	14607	N76:791111	HAM	23
Waiorongomai	Old Quarry	9228	N57:247746	HAM	22
Waiotapu	Reporoa	43472	N85:801680	HAM	26
Waiowhiro	Bonningtons Farm	1014644	N76:702078	HAM	24
Waipaoa	Kanakanaia Br	19701	N89:268623	NAP	32
Waipaoa	Kanakanaia C/W	19716	N89:273614	NAP	33
Waipaoa	Waipaoa Stn	19702	N88:245835	NAP	32
Waipawa	Fletchers Crossing	23219	N140:753990	NAP	37
Waipawa	Waipawa	23211	N141:014843	NAP	37
Wairau	Dip Flat	60114	S33:290547	WGTN	47
Wairau	Hells Gate	60116	S40:265357	WGTN	47
Wairau	Tuamarina	60108	S22:253077	WGTN	46
Wairere	Wainui Rd	15534	N69:446250	HAM	26
Wairoa	Gorge	57502	S20:493149	WGTN	46
Wairoa	Marumaru	21401	N106:853108	NAP	34
Waitangi	Tangiwai	33114	N122:071417	WANG	40
Waitaukakari	SH 35	17603	N62:659667	NAP	29
Waiteti	Tauranga Direct Rd	14603	N76:679122	HAM	22
Waiwhiu	Dome Shadow	45702	N34:147209	AUCK	20
Wanganui	Headwaters	33307	N112:089990	WANG	41
Wanganui	Paetawa	33301	N138:667055	WANG	41
Wanganui	Piriaka	33356	N101:852116	WANG	42
Wanganui	Te Maire	33302	N101:705067	WANG	41
Wanganui	Te Porere	33347	N112:087944	WANG	42
Whakapapa	Footbridge	33320	N111:960859	WANG	42
Whakatane	Whakatane	15514	N78:436194	HAM	25
Whangaehu	Karioi	33107	N131:965389	WANG	40
Wharekahika	Hicks Bay Rd Br	17601	N62:688692	NAP	28
Wharekopae	Killarney	19709	N97:061529	NAP	32
Whirinaki	Galatea	15410	N86:191623	HAM	25
Wilberforce	Oakden	58513	S73:937843	CHCH	50
Wilberforce	Woolshed Hill	68511	S73:913860	CHCH	50
Wyndham Stm	Glenham Br	77526	S178:768103	DUN	61

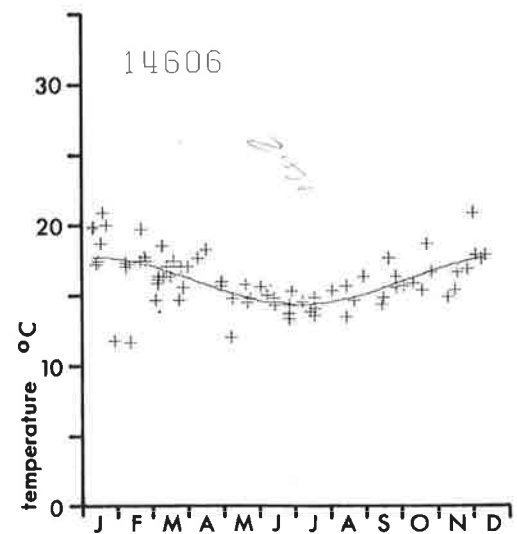
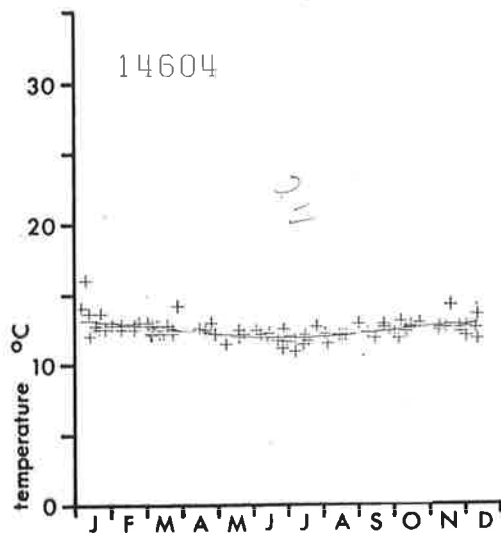
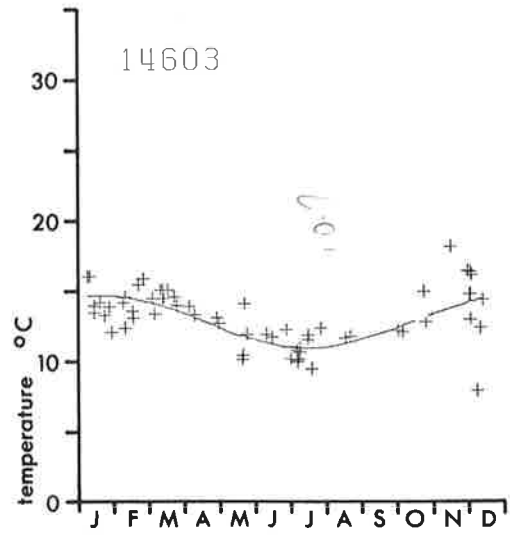
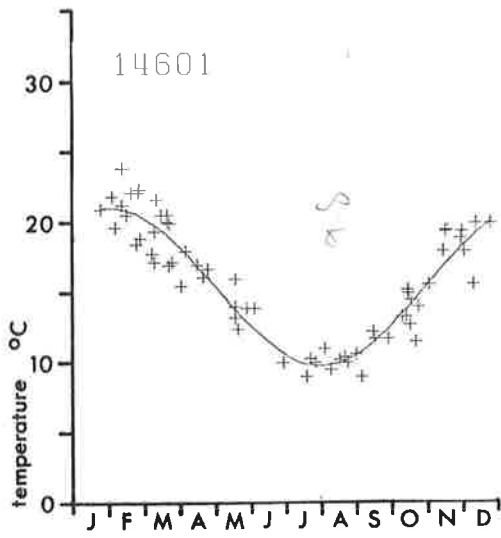
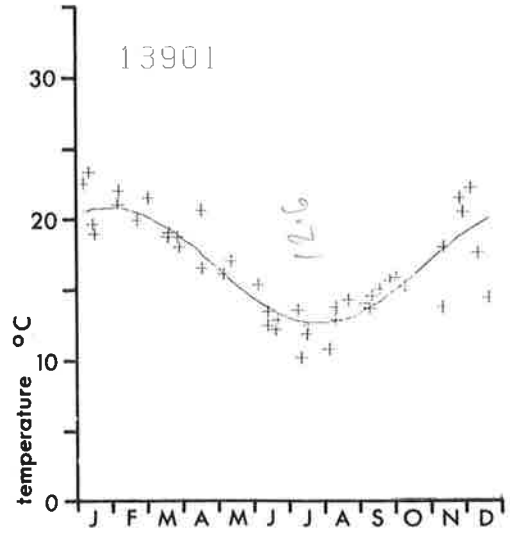
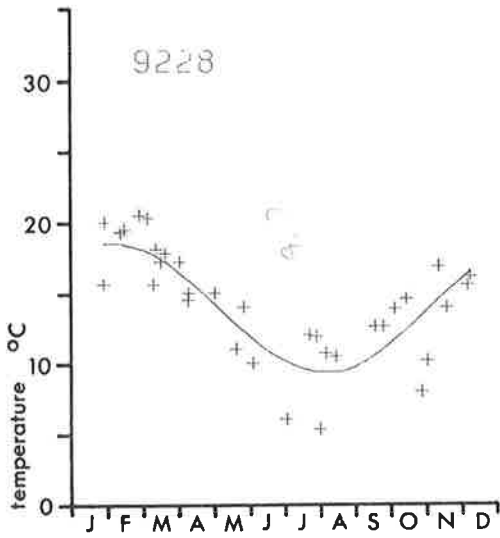
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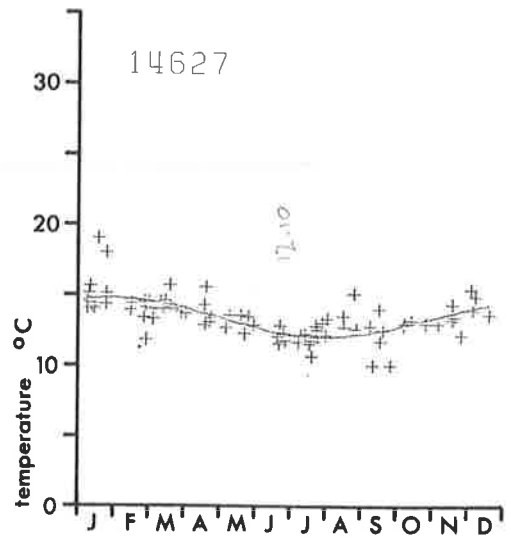
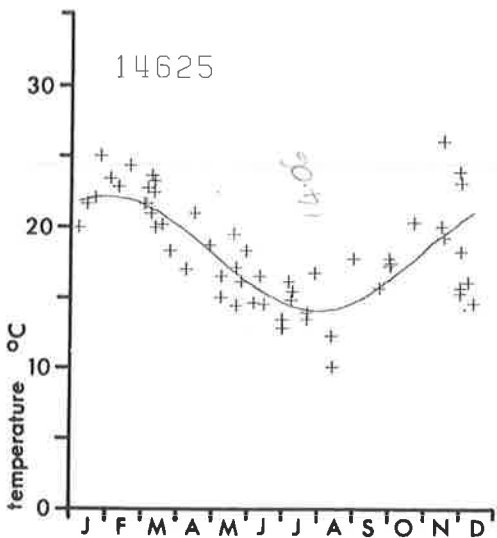
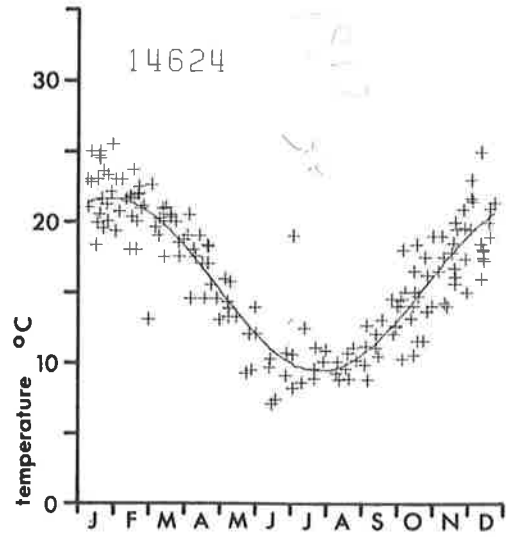
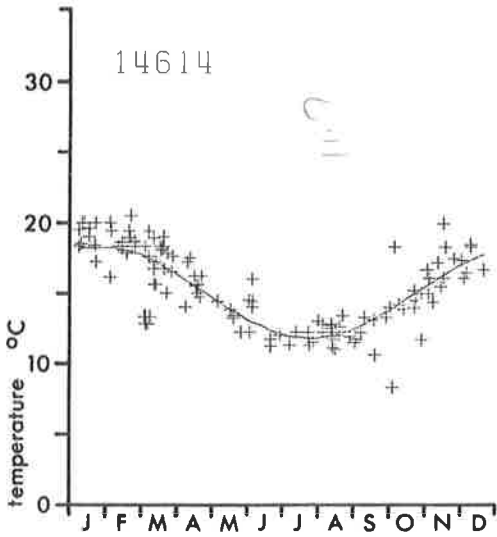
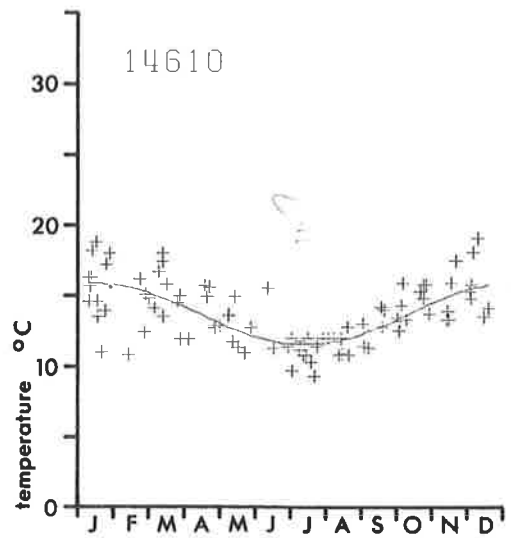
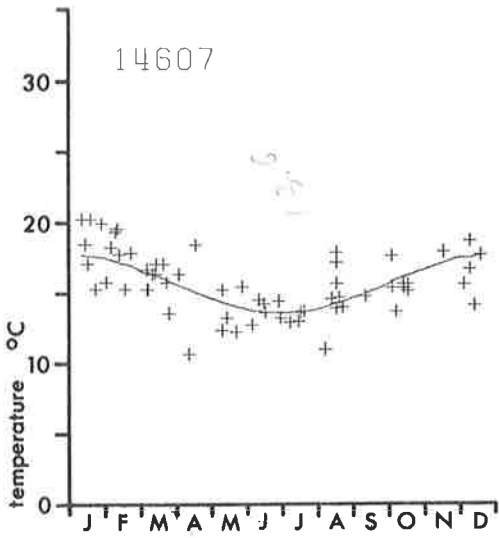


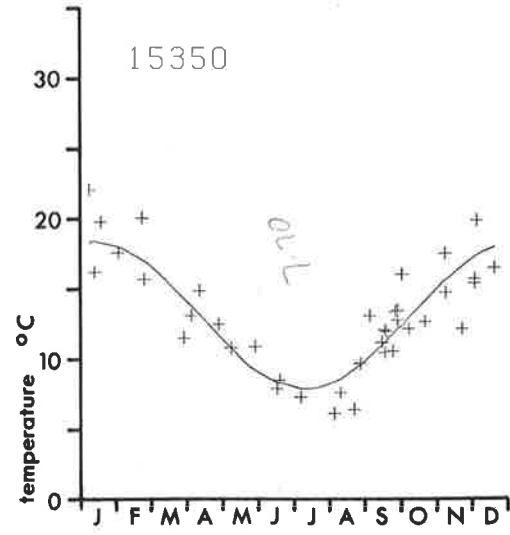
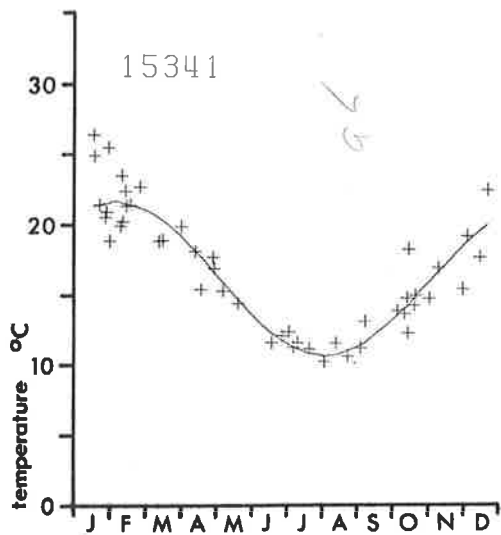
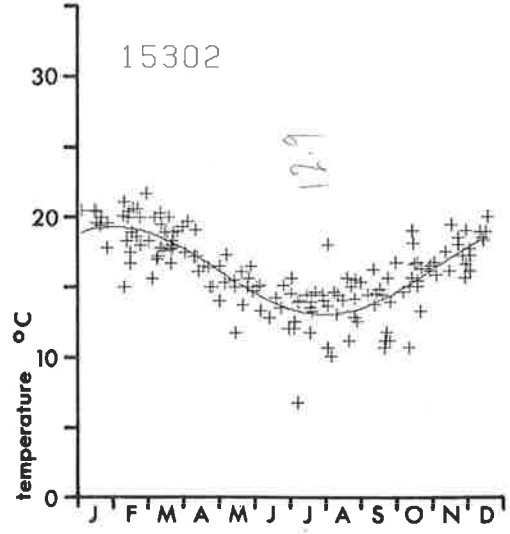
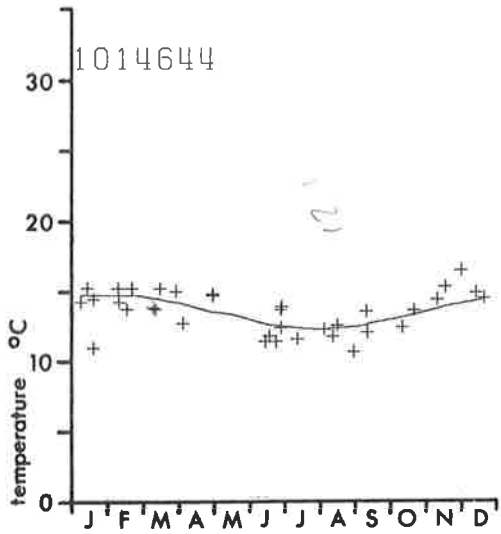
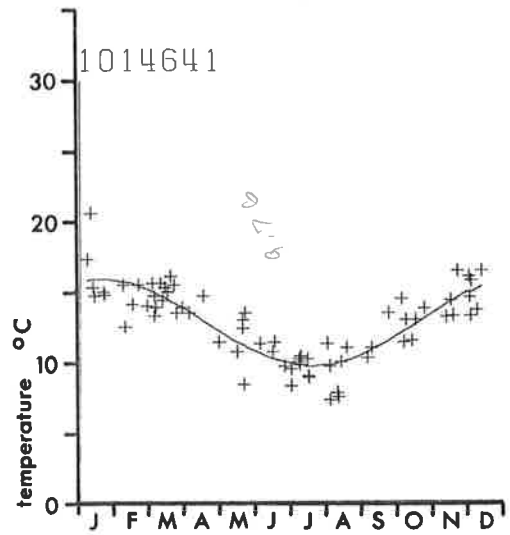
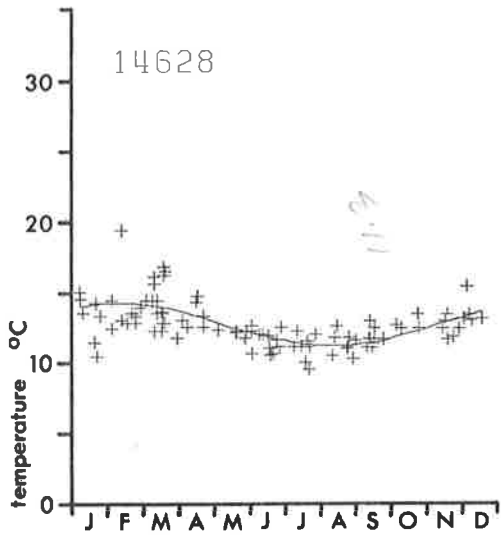


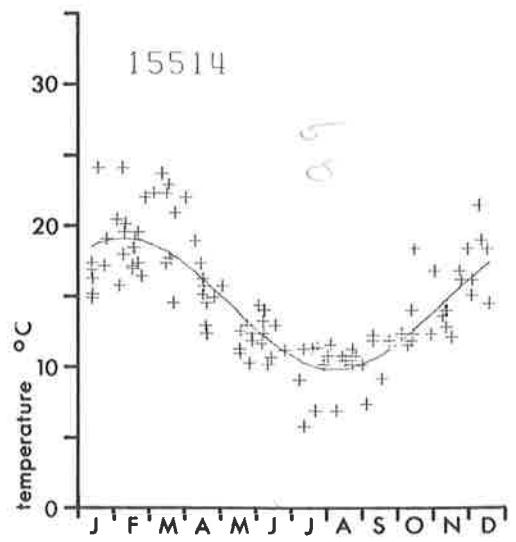
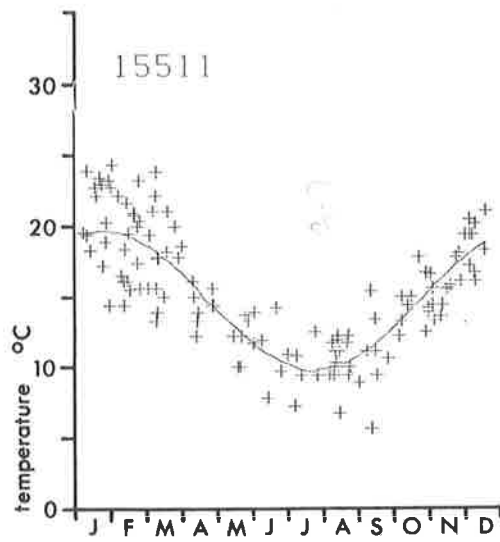
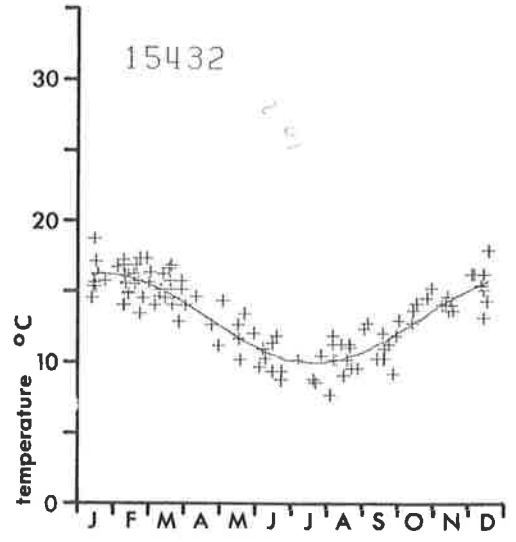
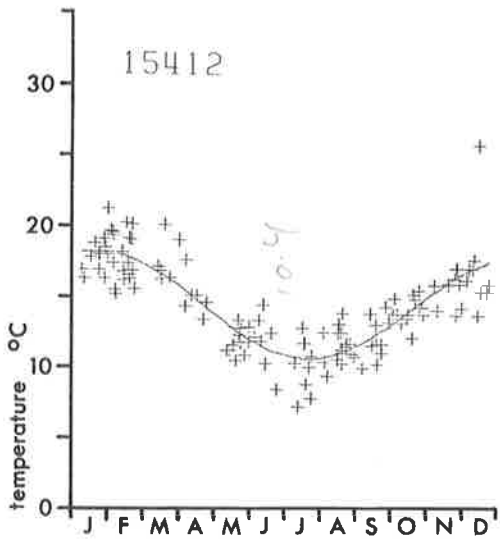
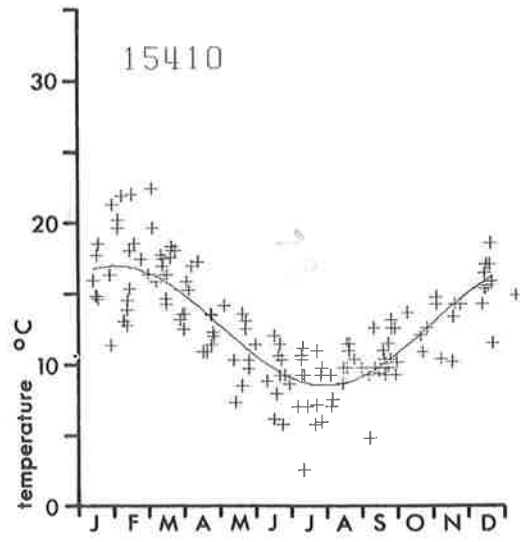
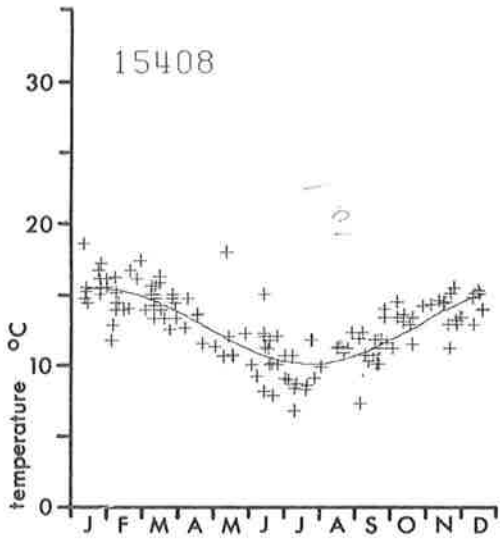


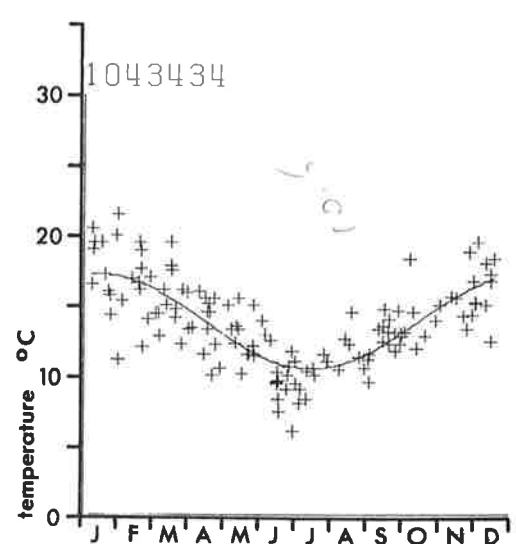
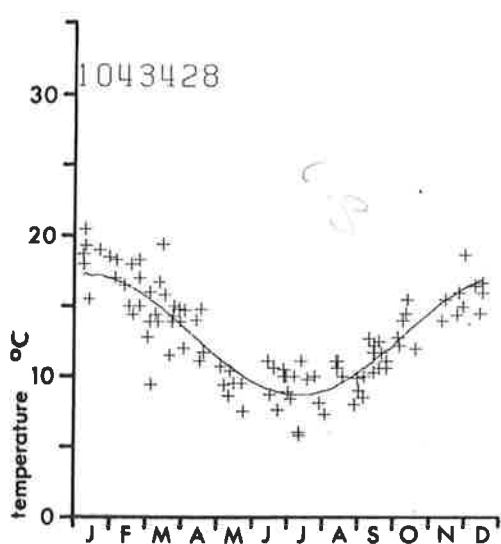
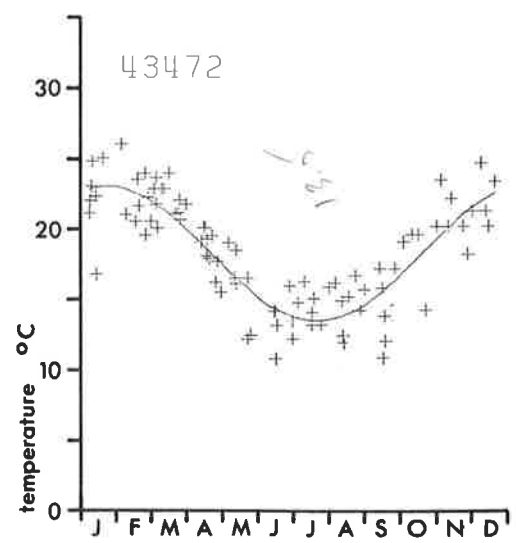
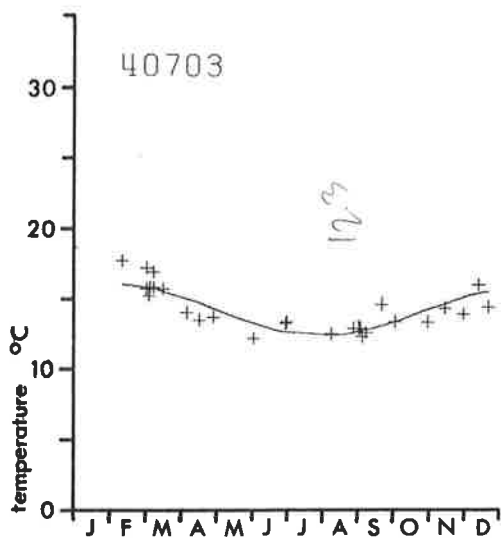
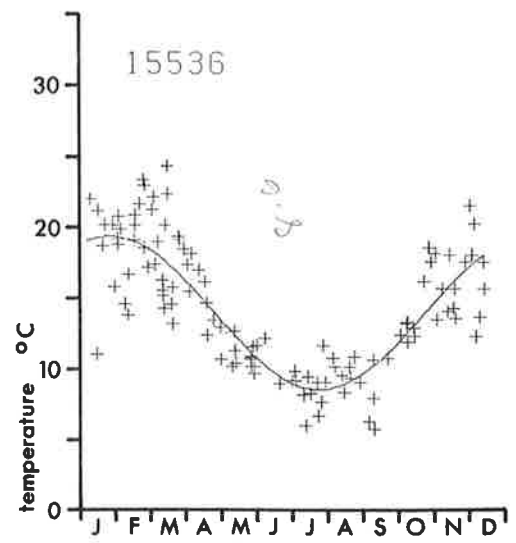
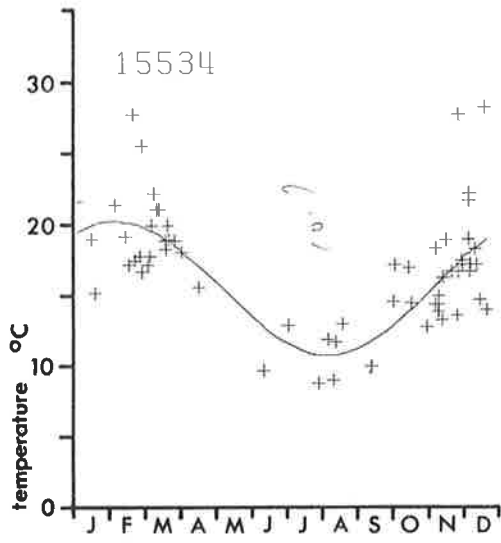
HAMILTON MWD DISTRICT

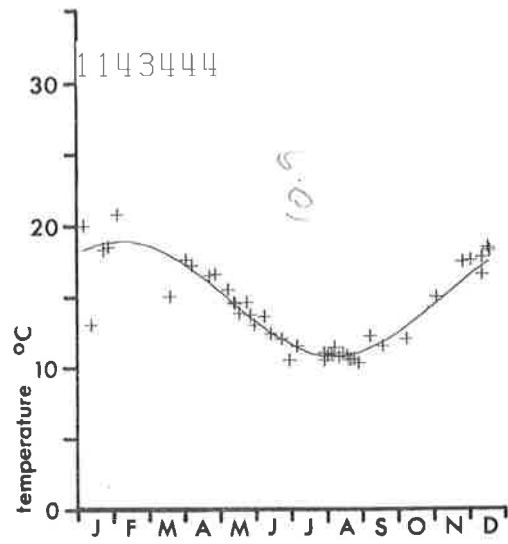




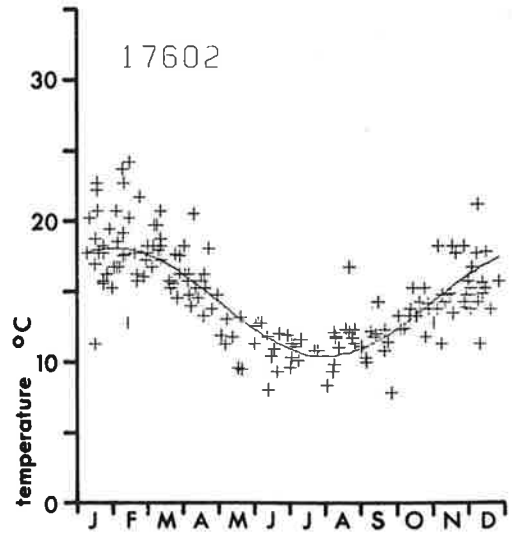
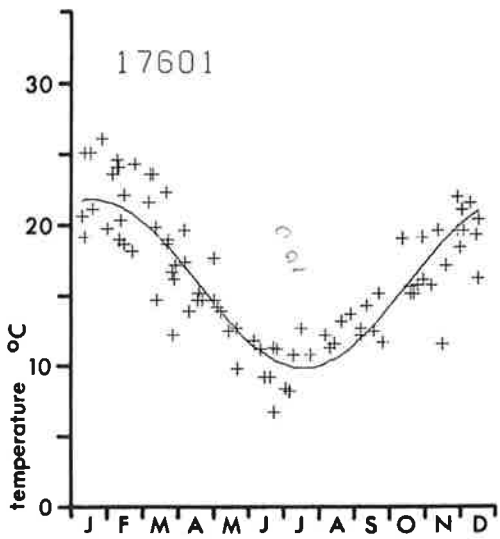
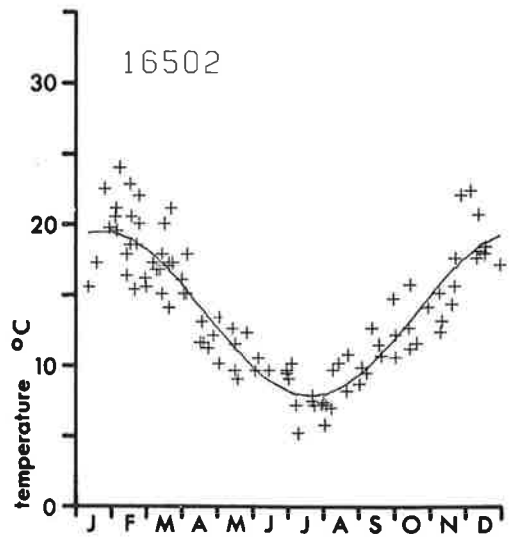
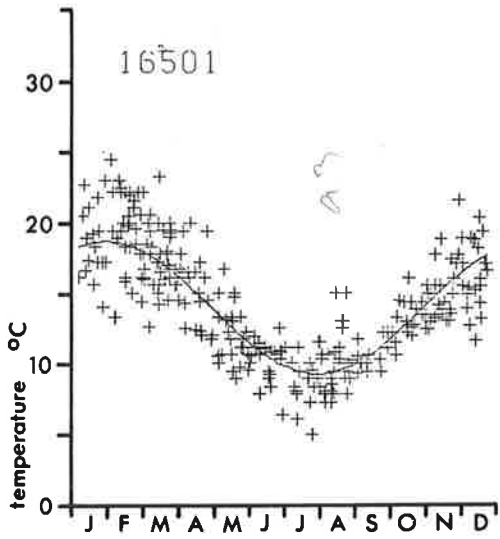
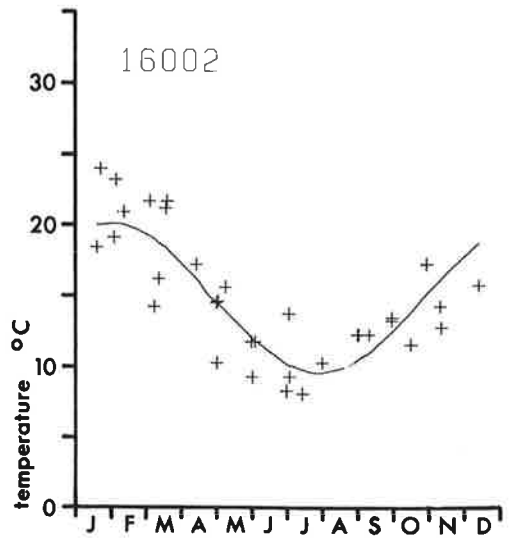
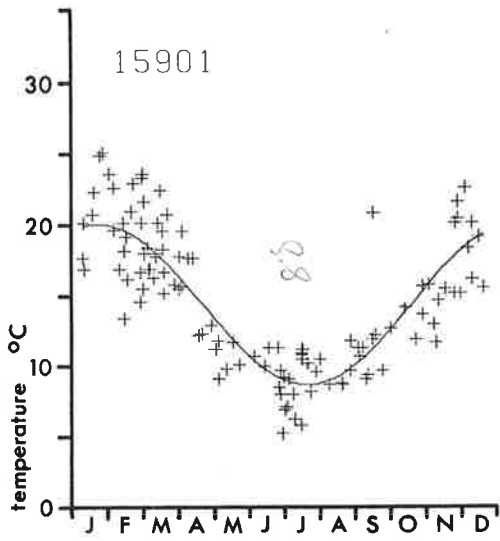


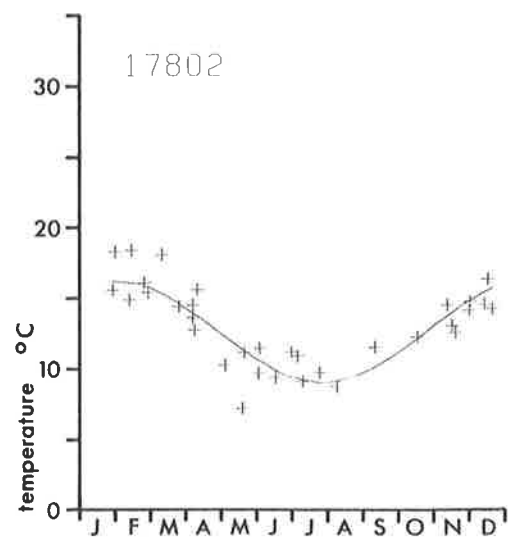
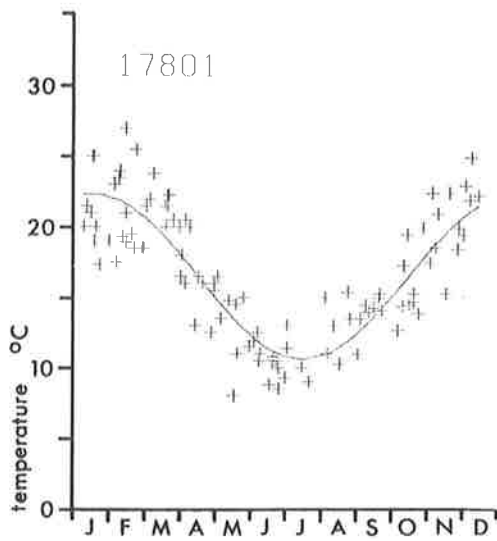
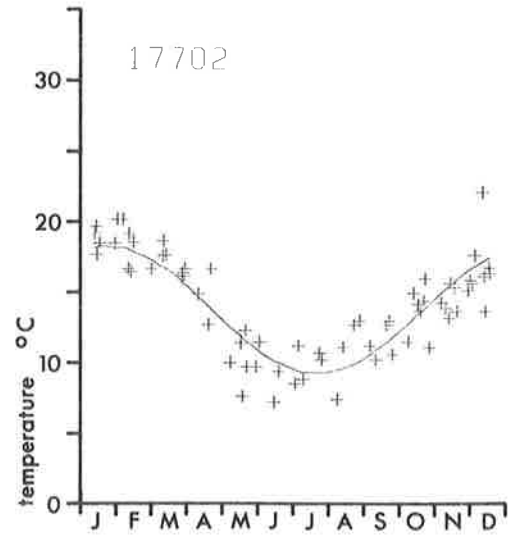
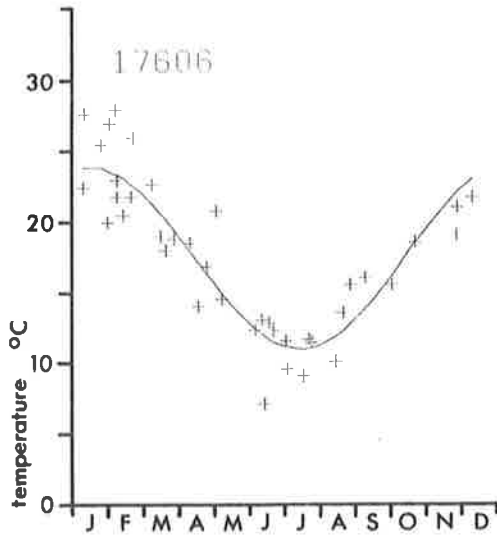
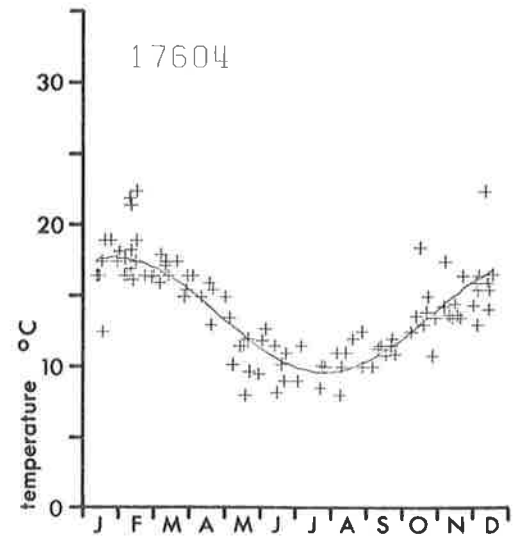
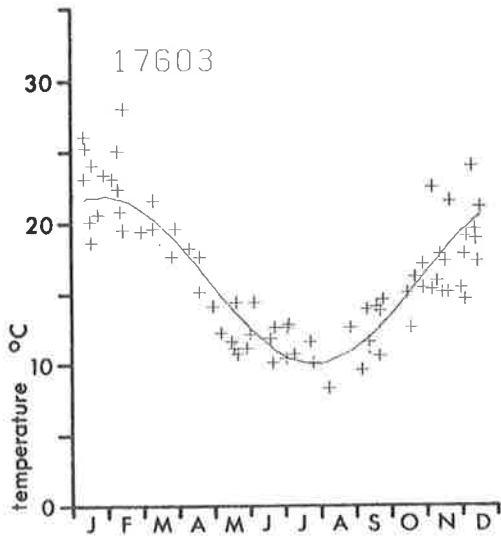


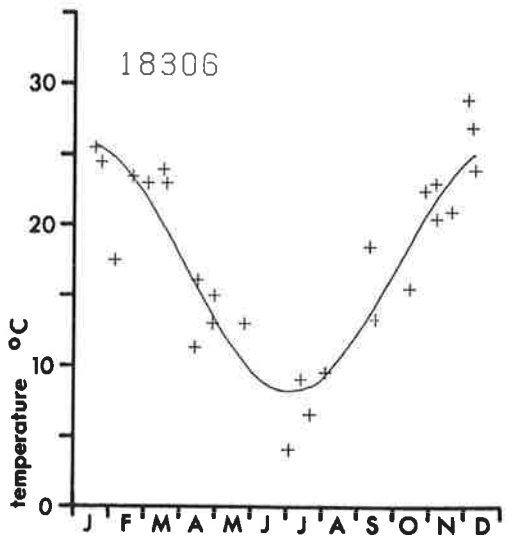
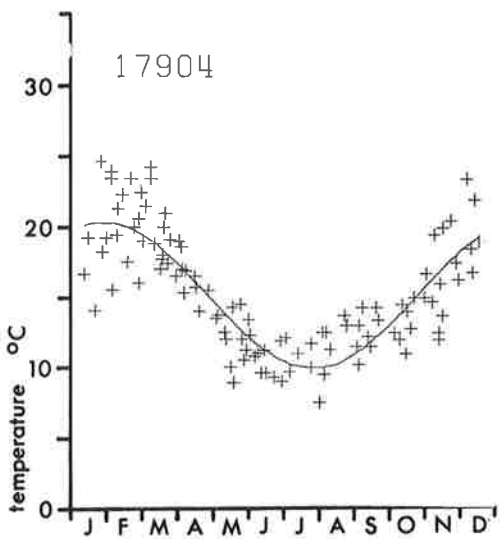
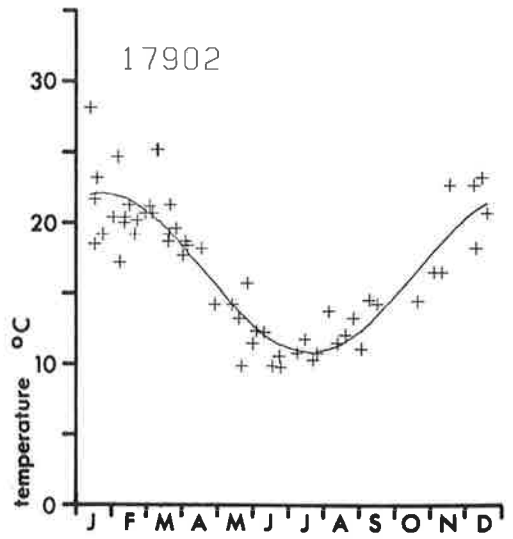
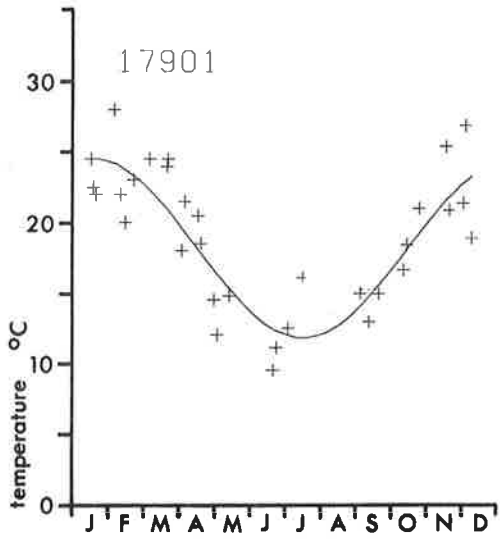
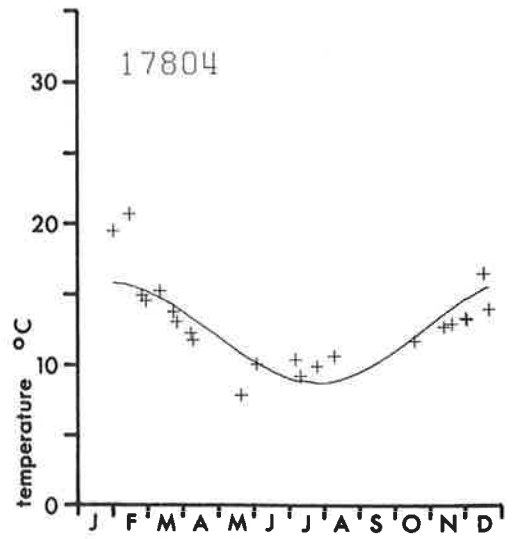
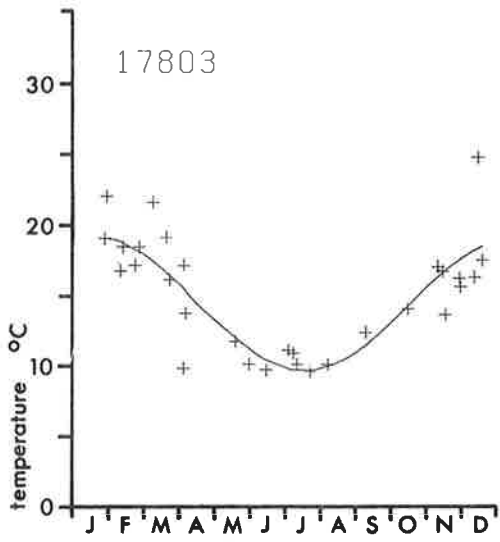


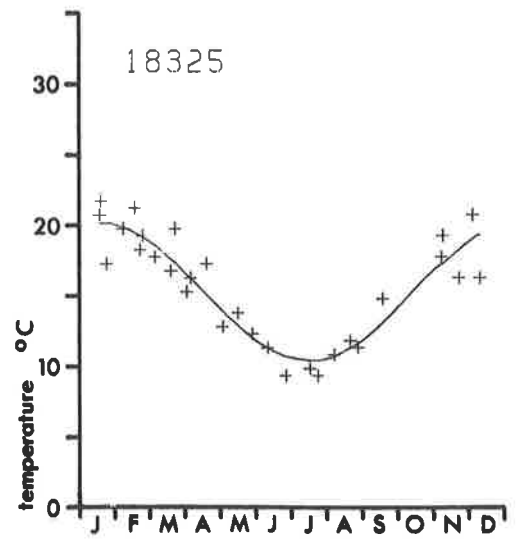
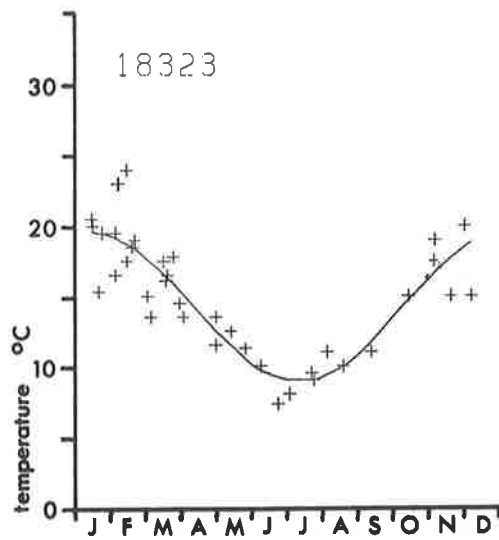
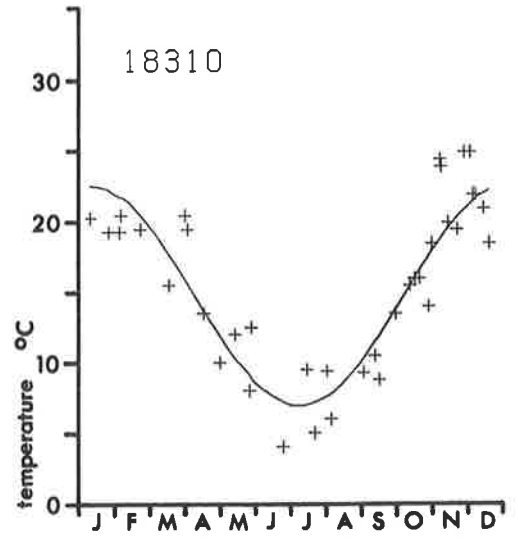
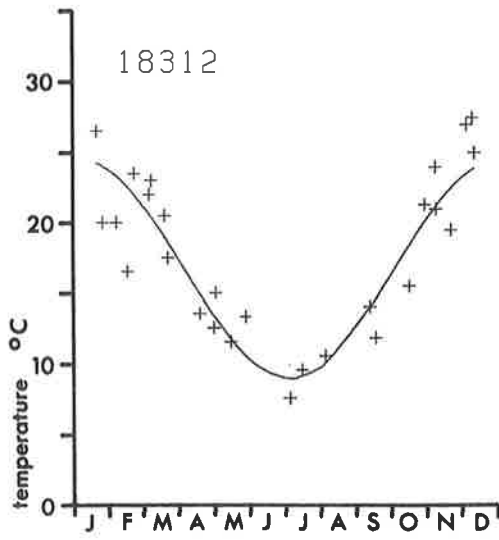
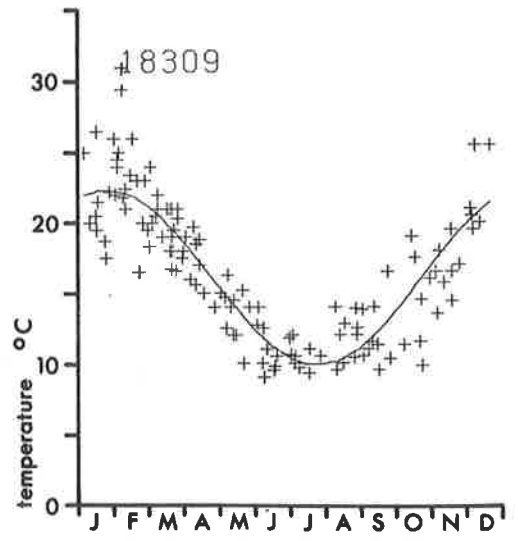
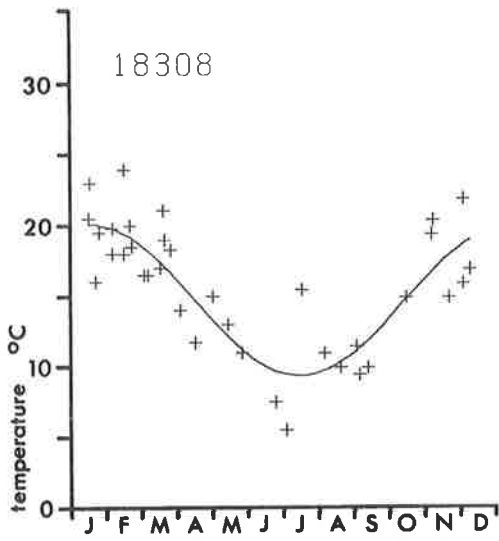


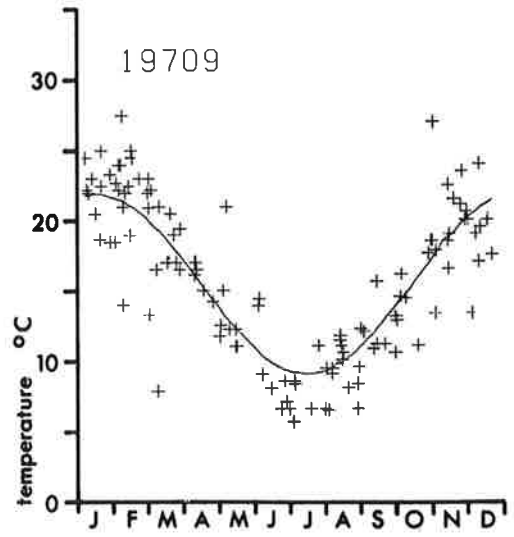
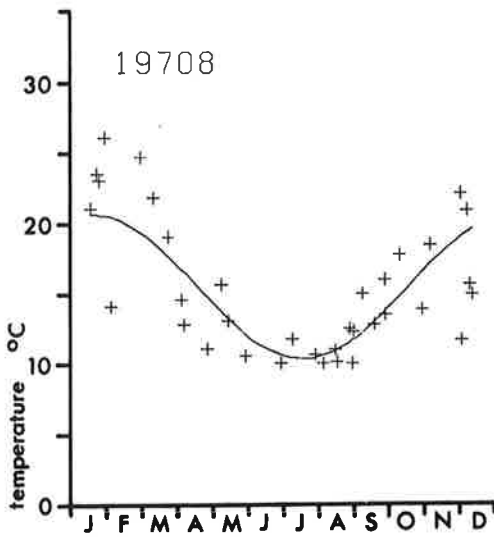
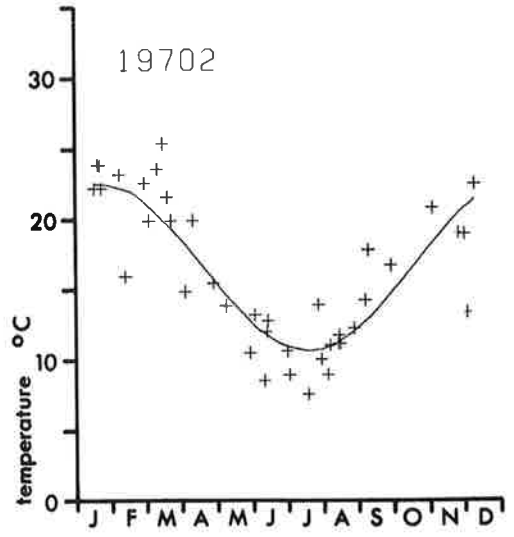
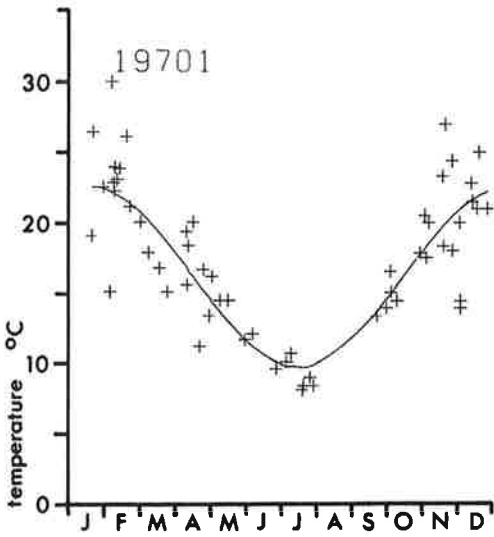
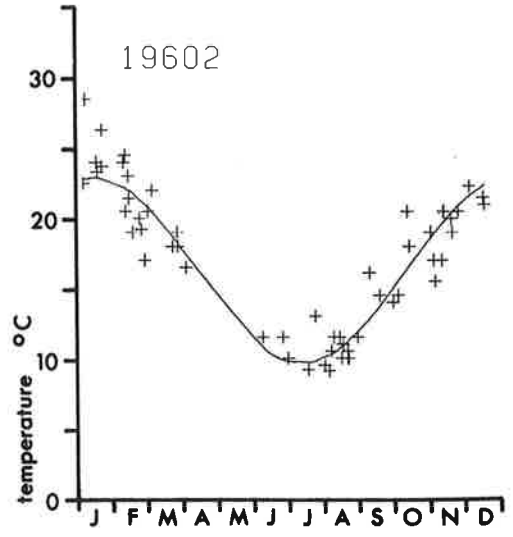
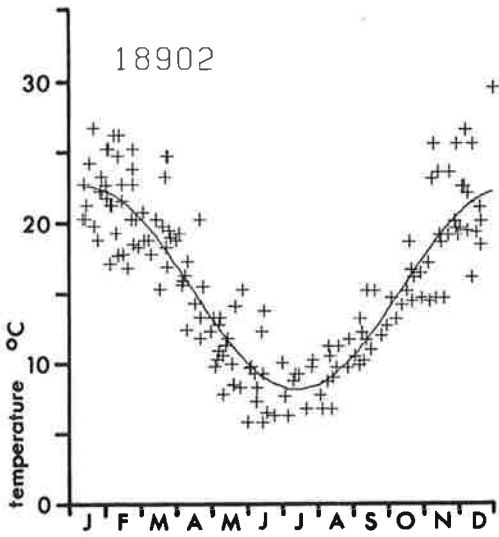
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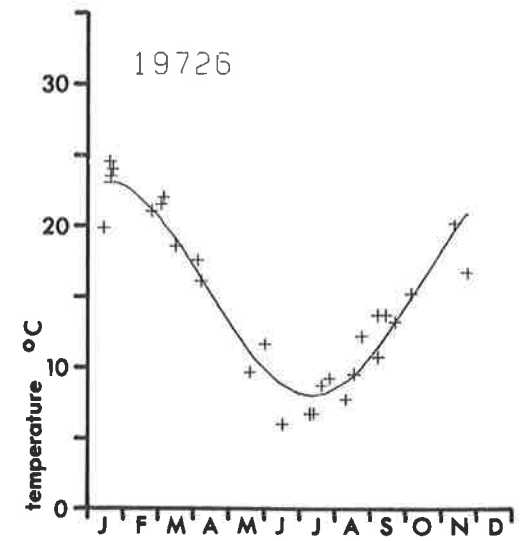
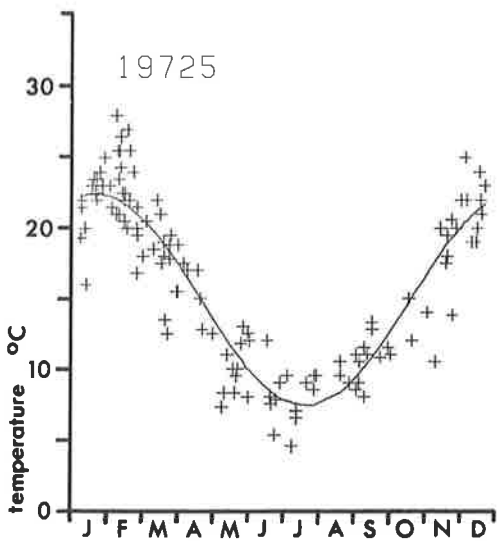
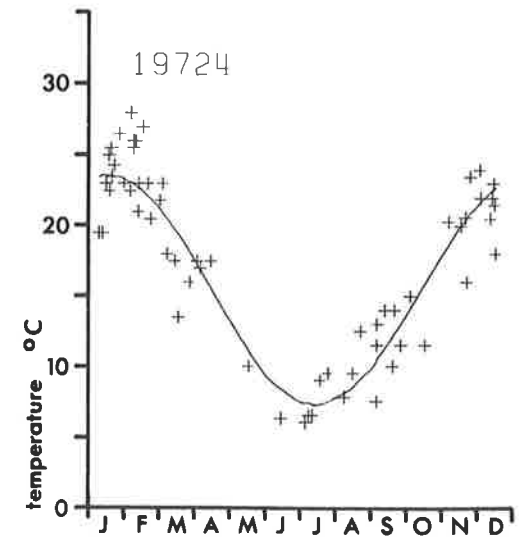
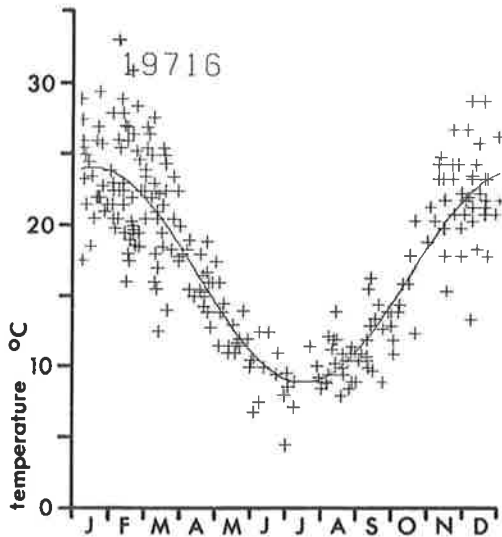
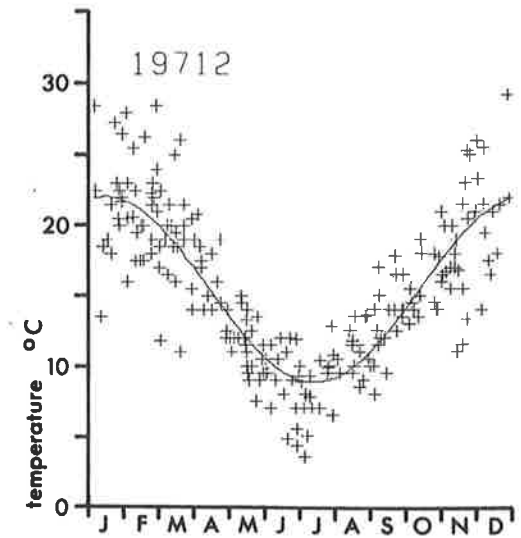
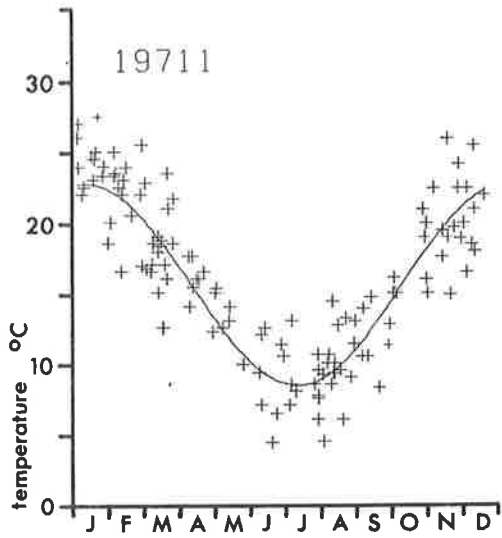


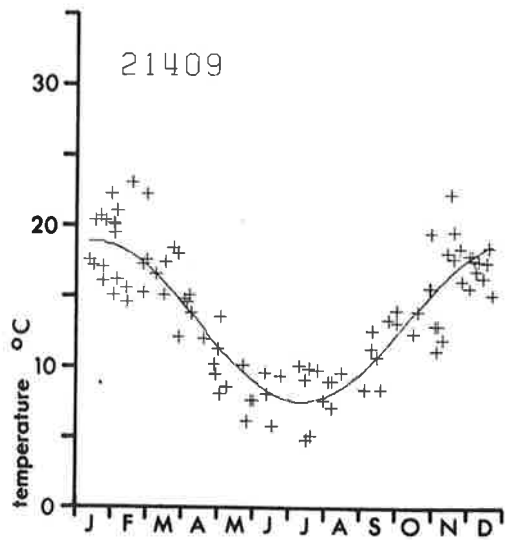
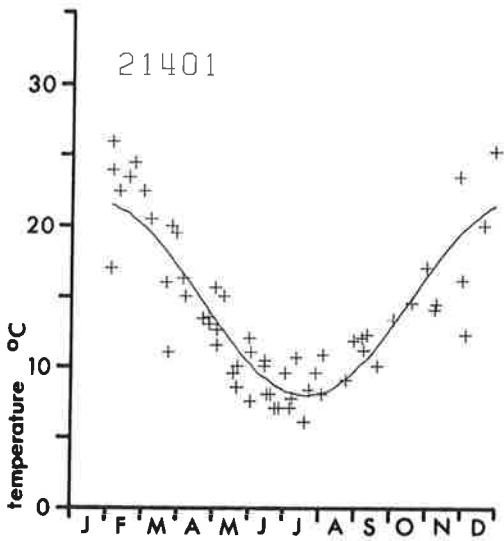
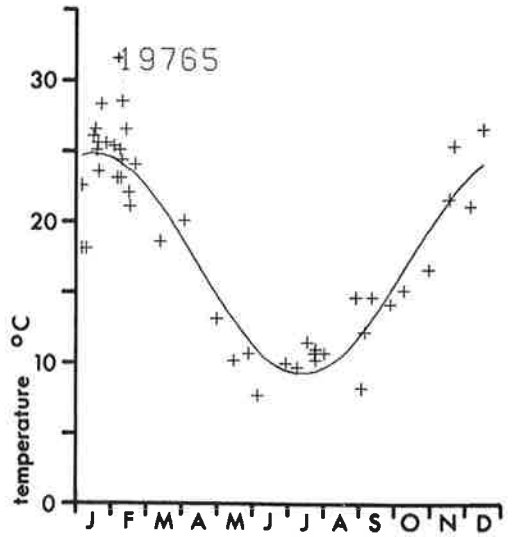
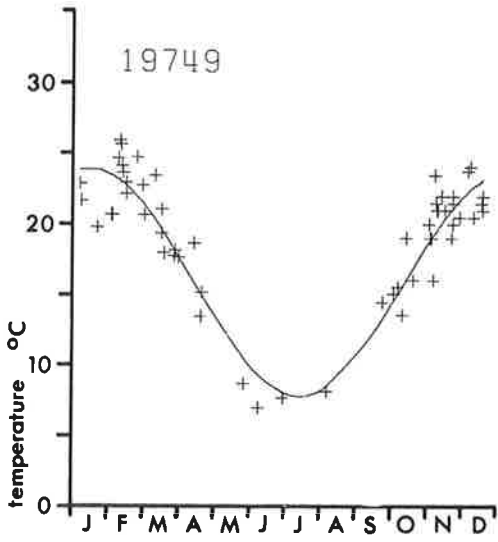
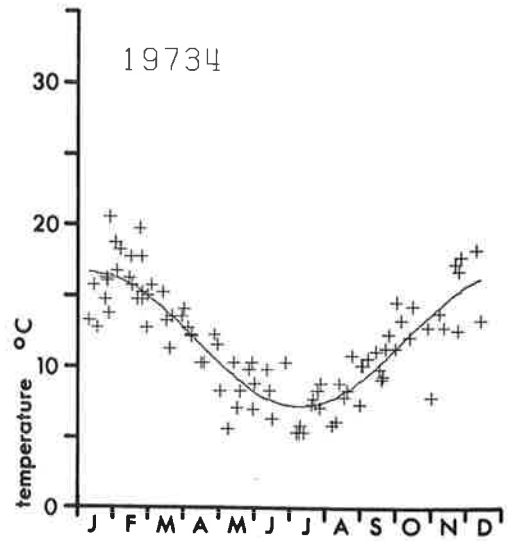
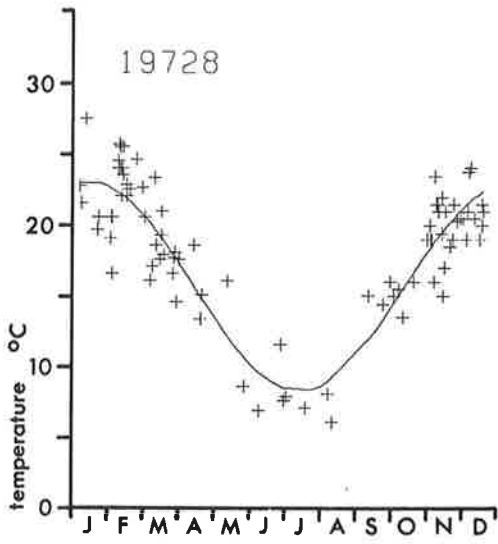


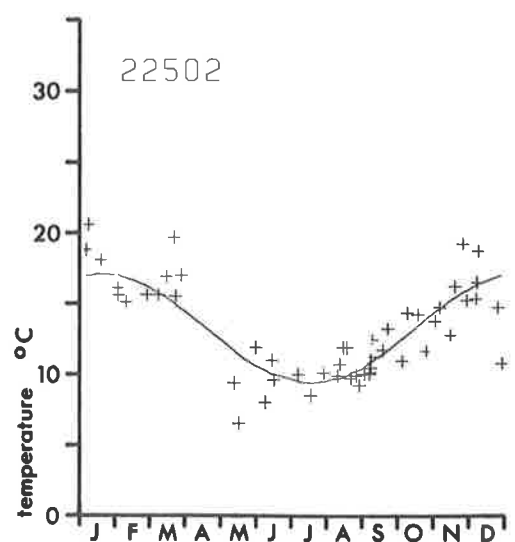
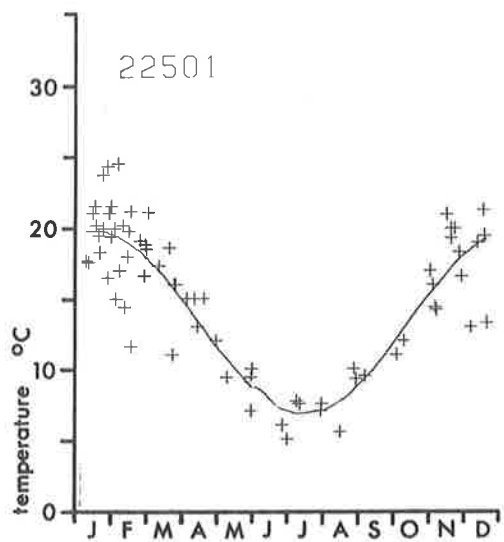
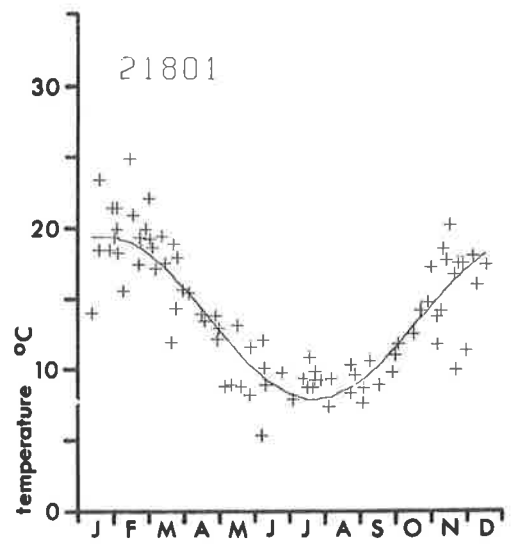
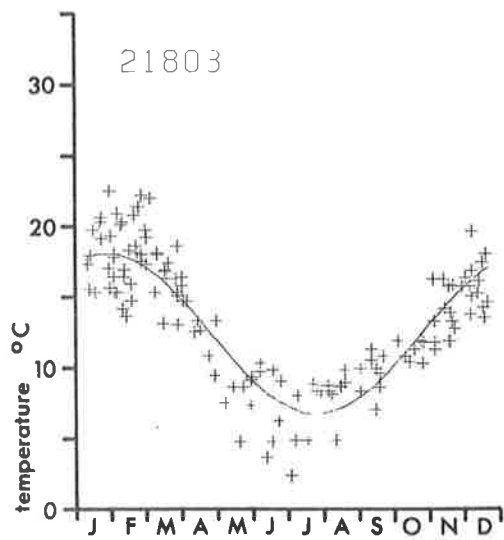
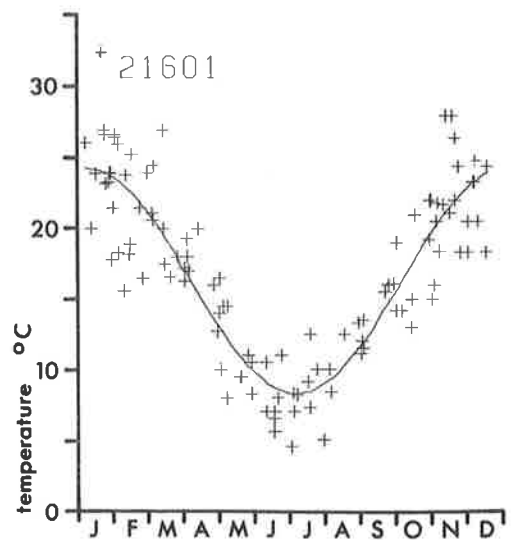
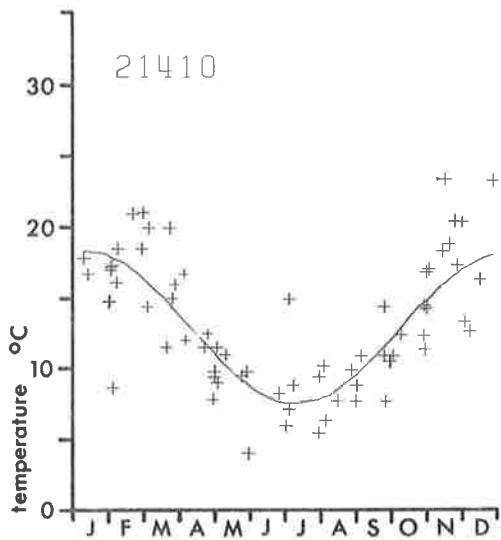


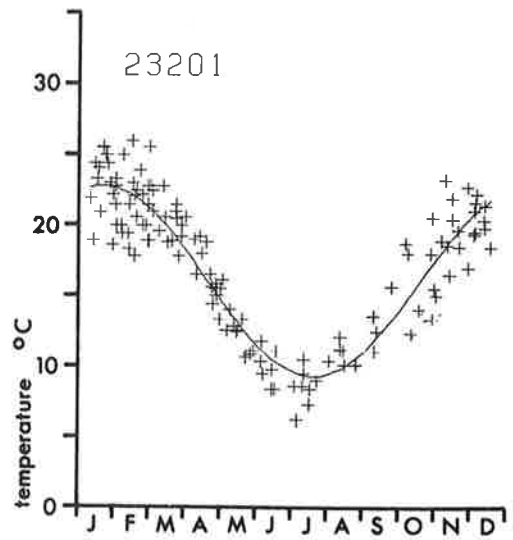
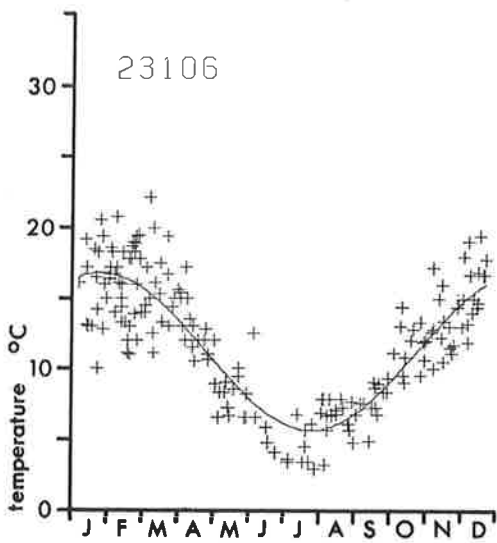
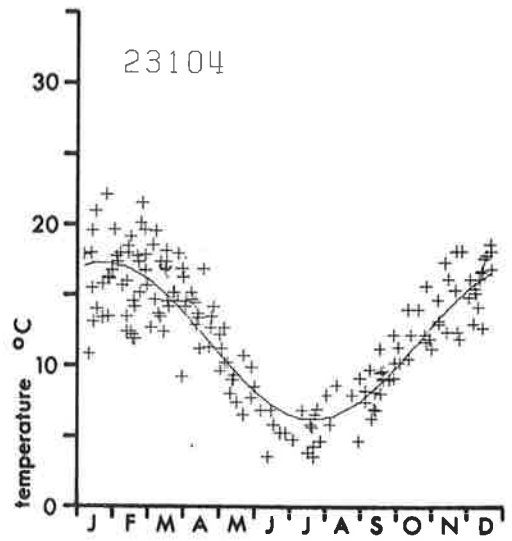
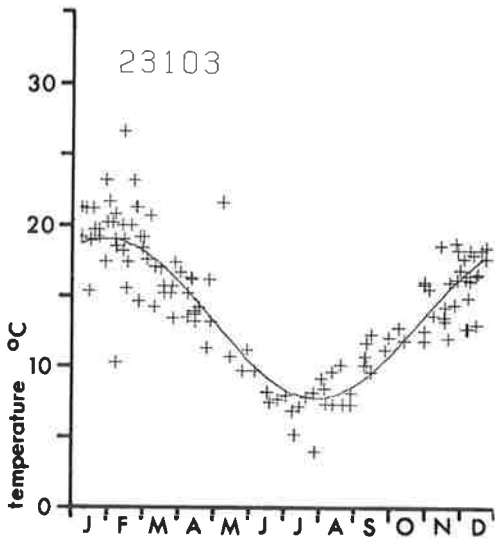
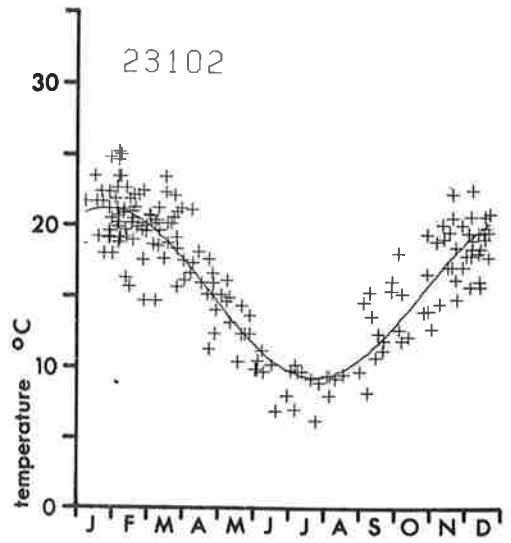
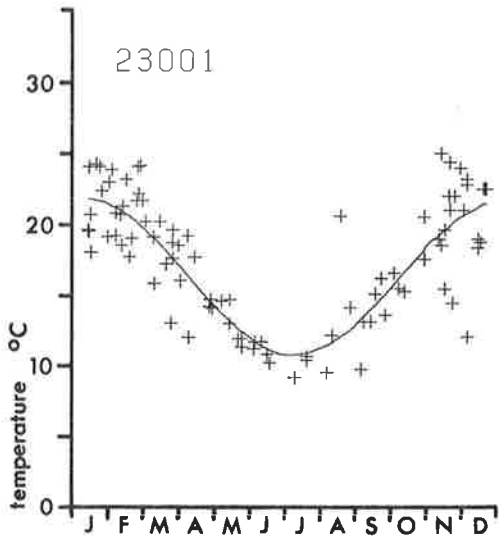


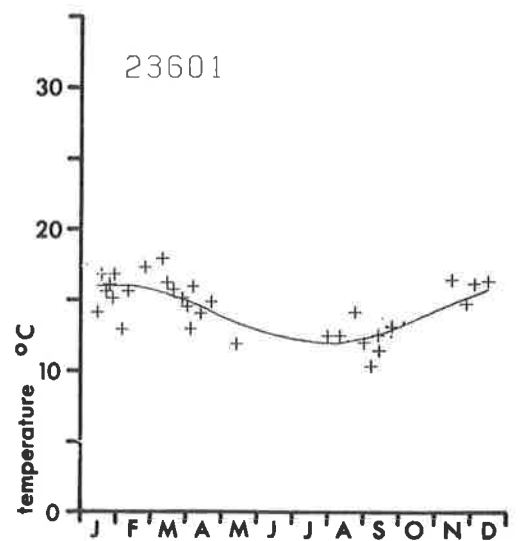
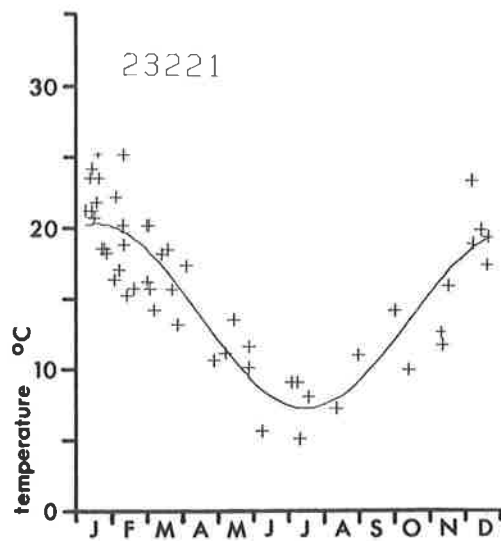
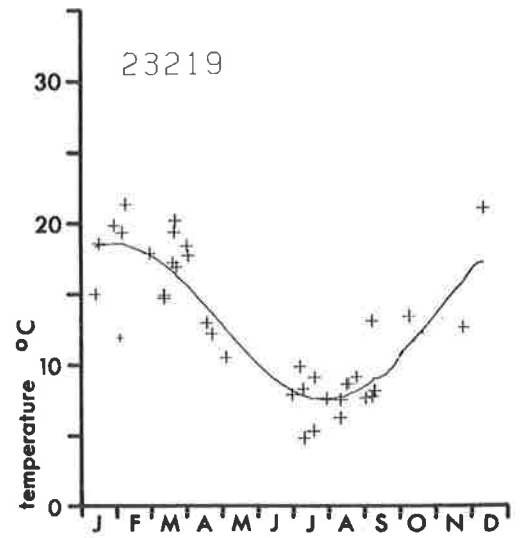
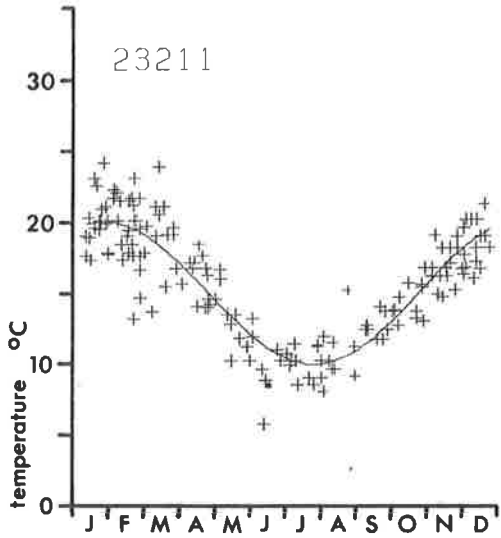
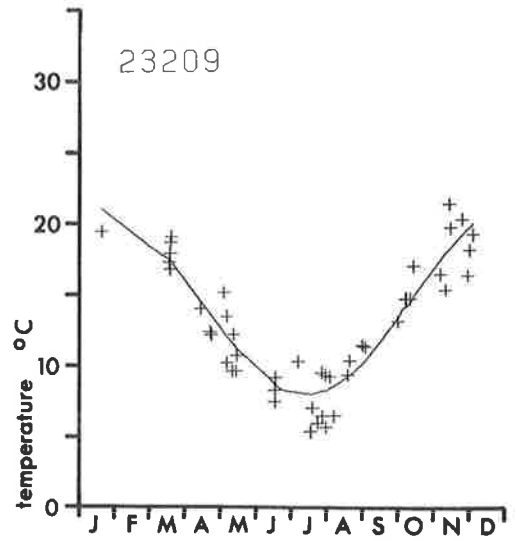
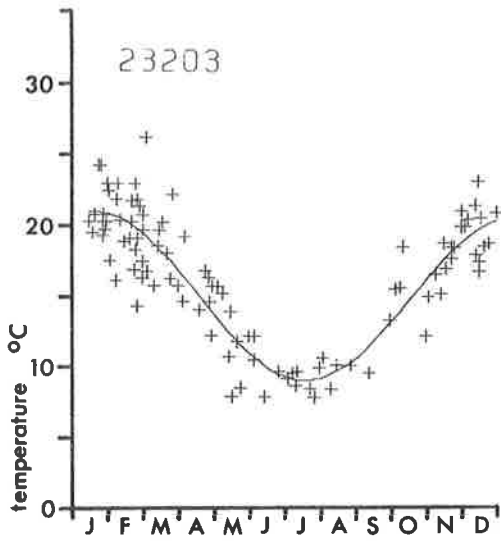




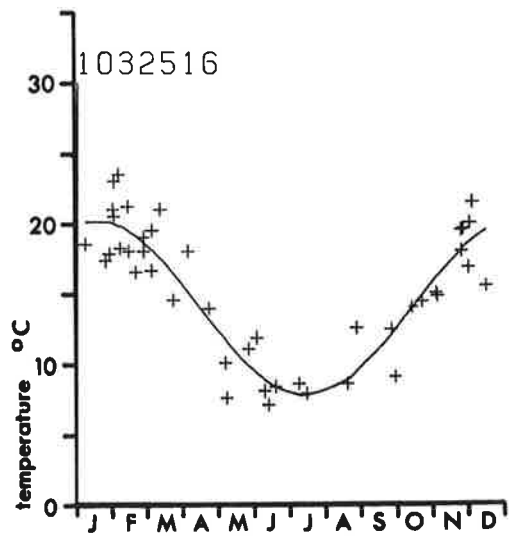
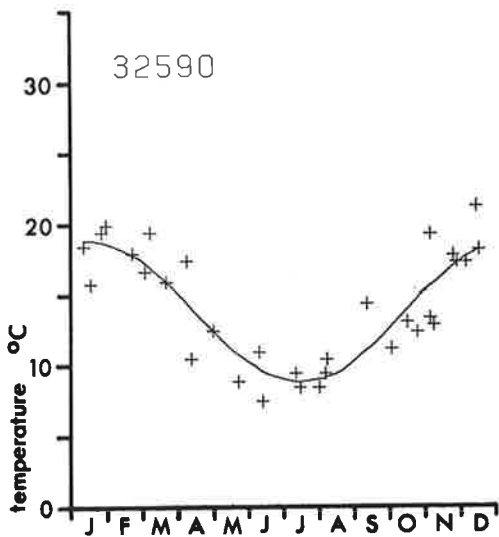
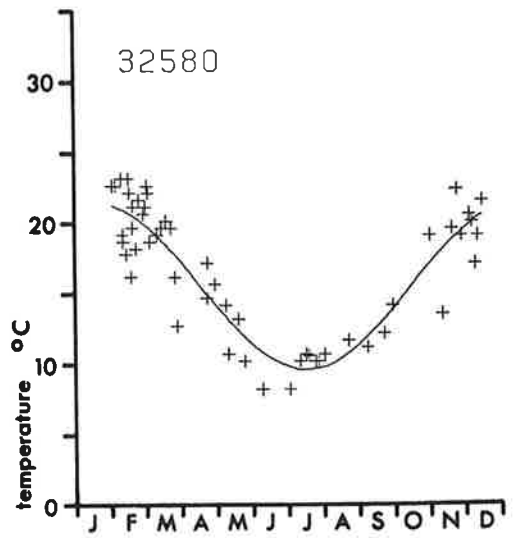
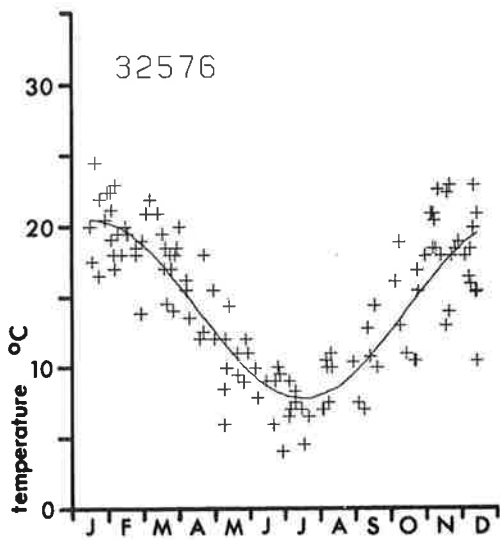
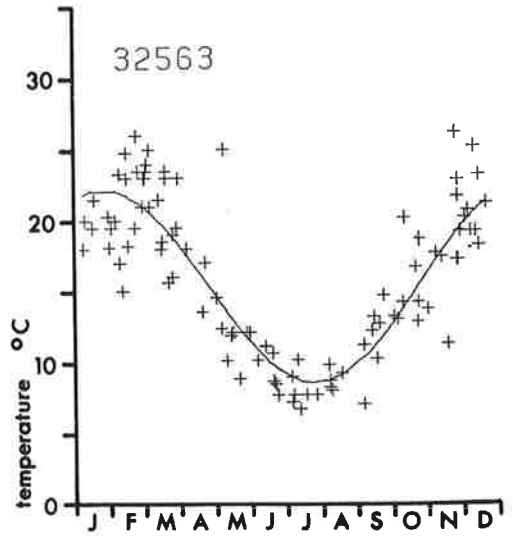
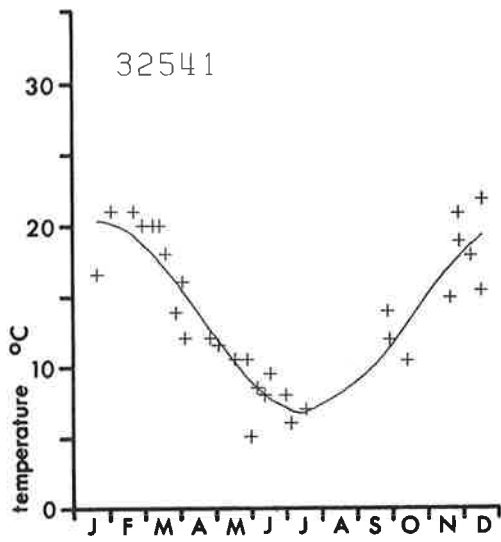


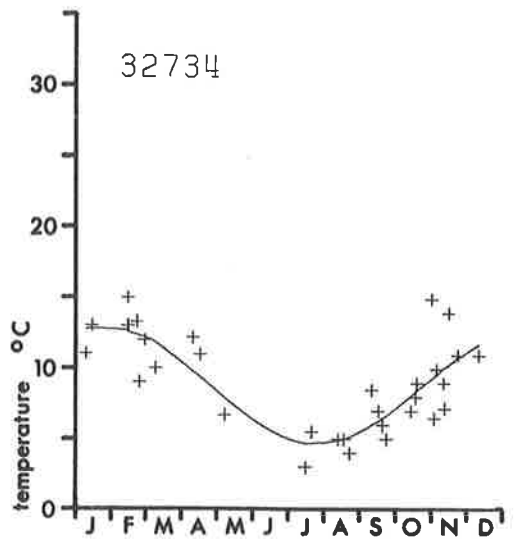
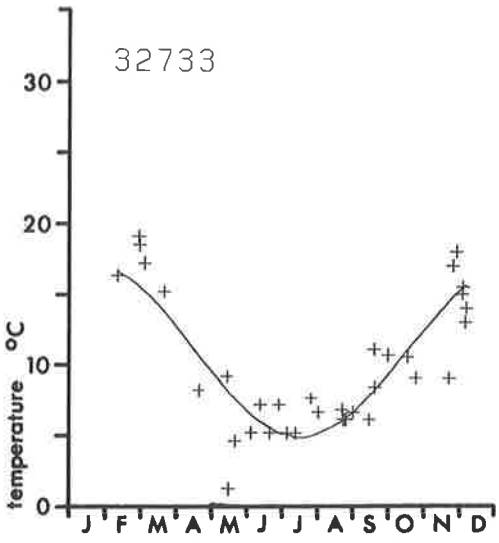
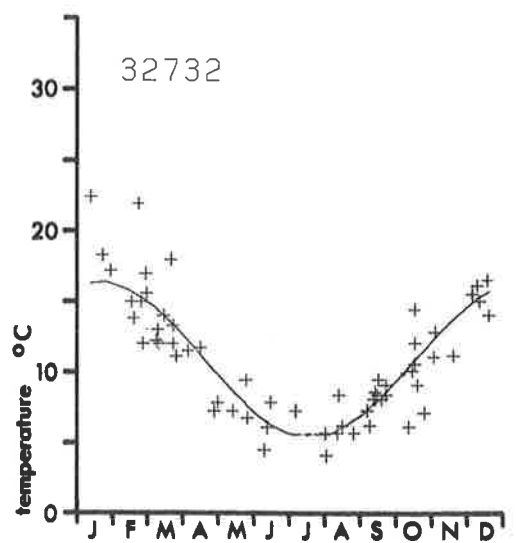
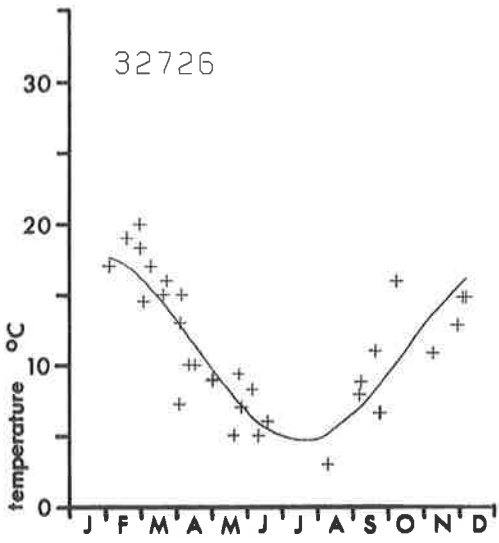
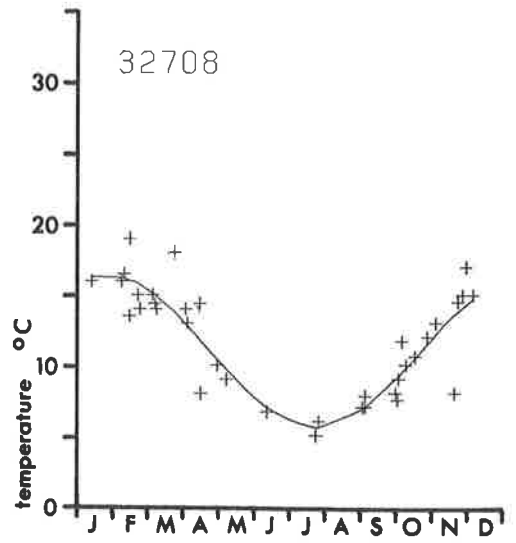
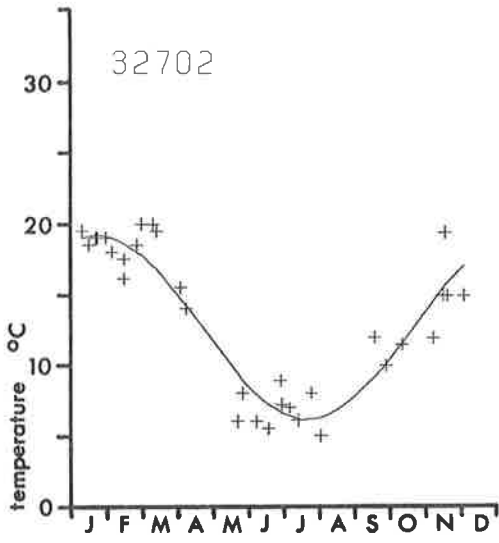


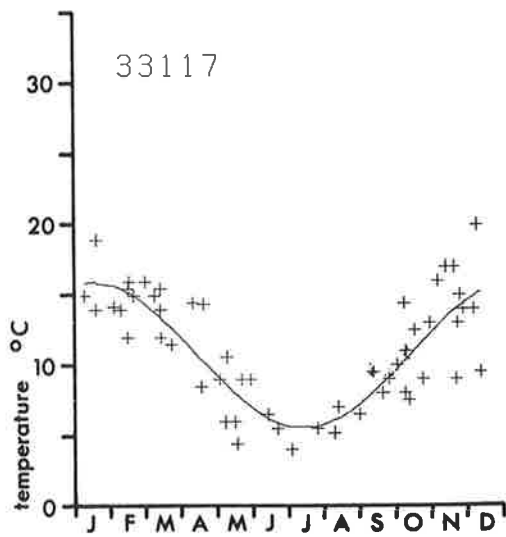
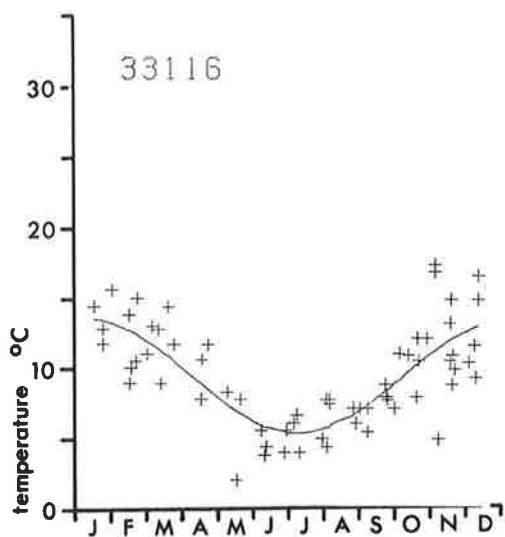
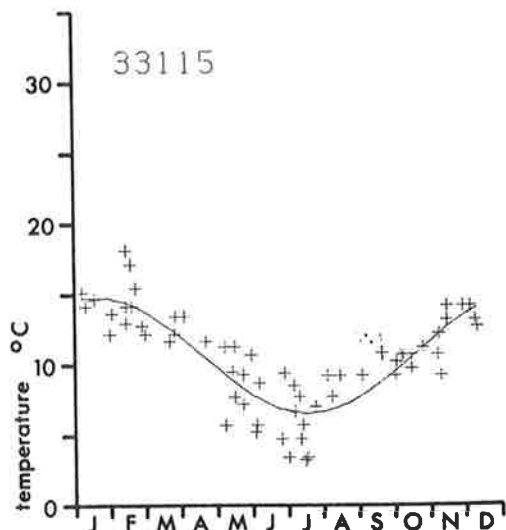
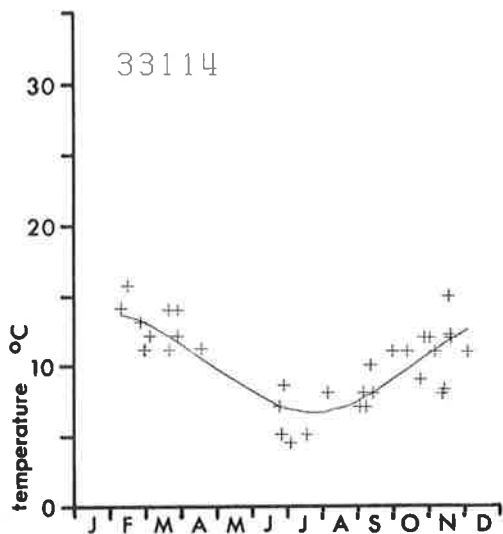
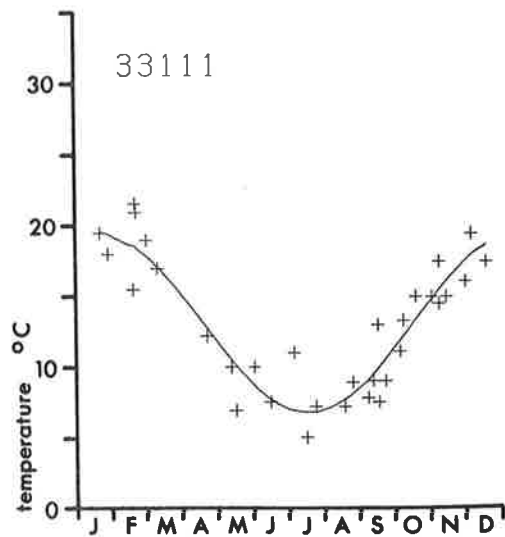
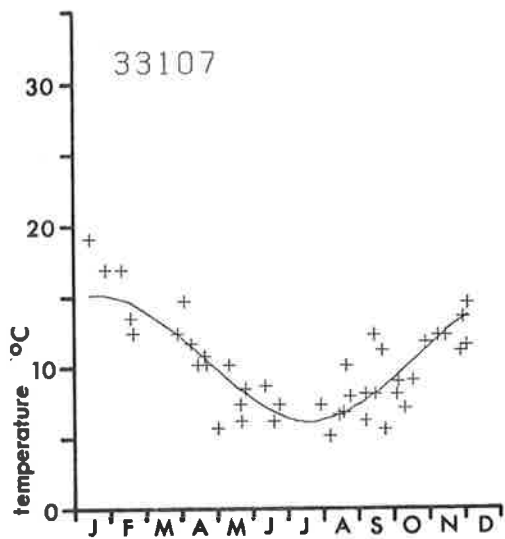


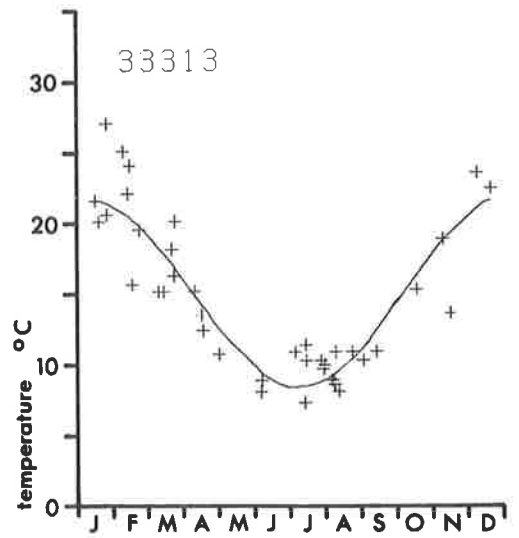
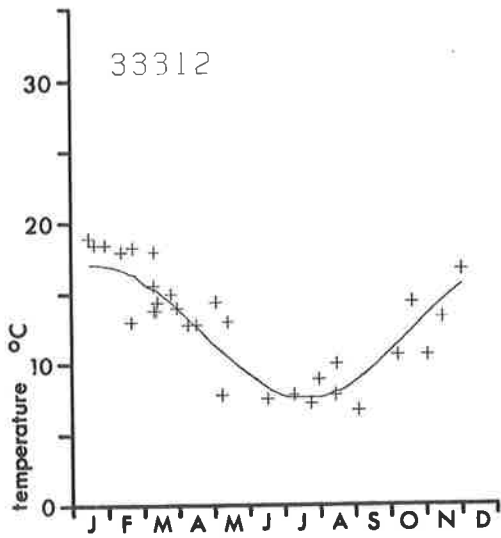
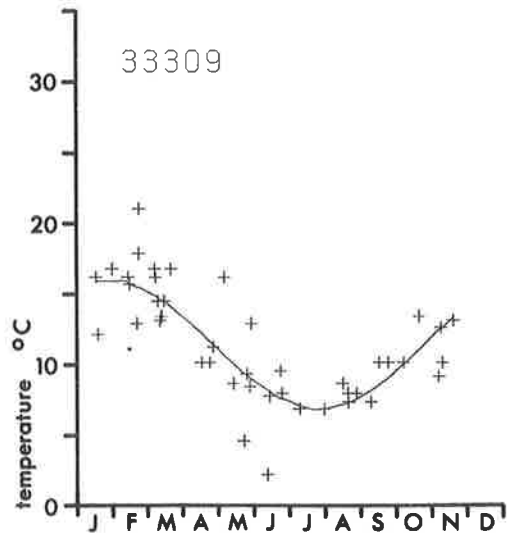
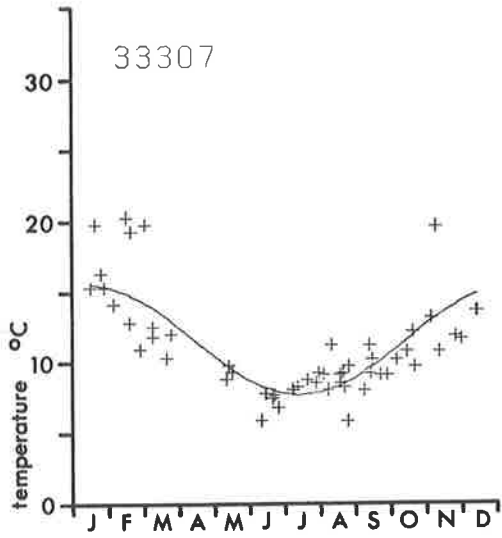
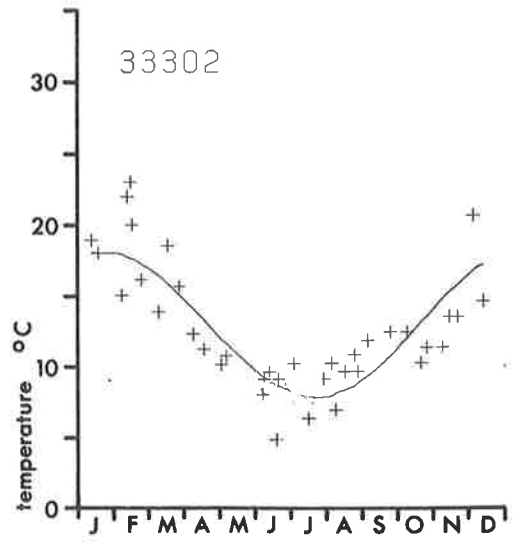
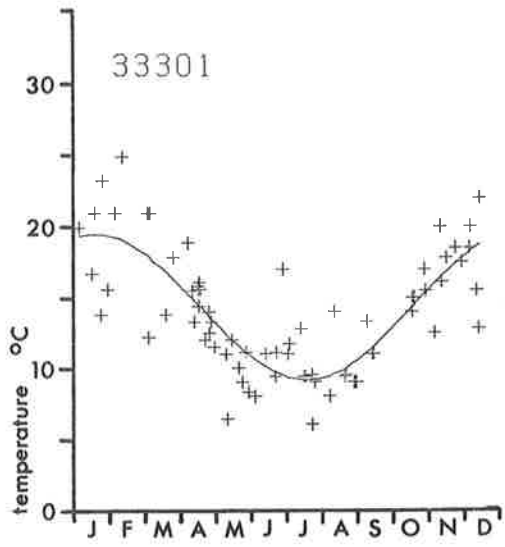


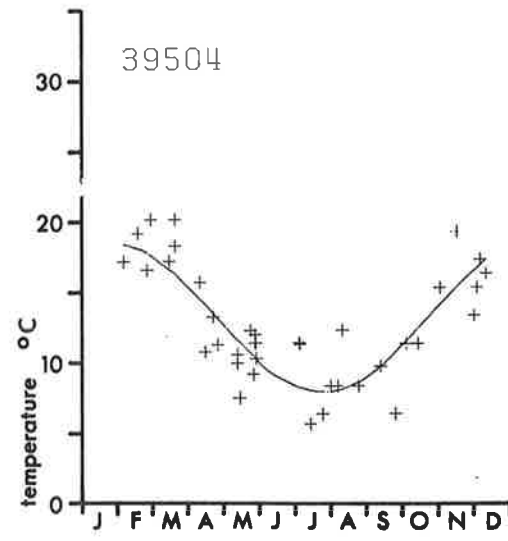
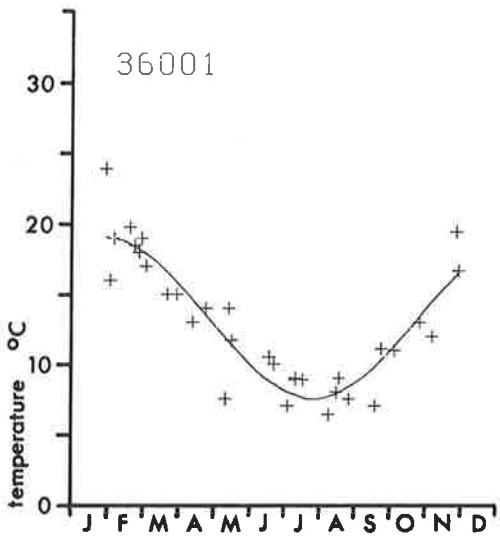
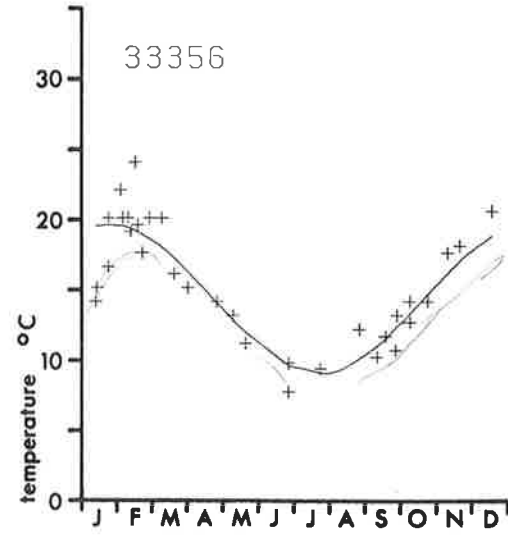
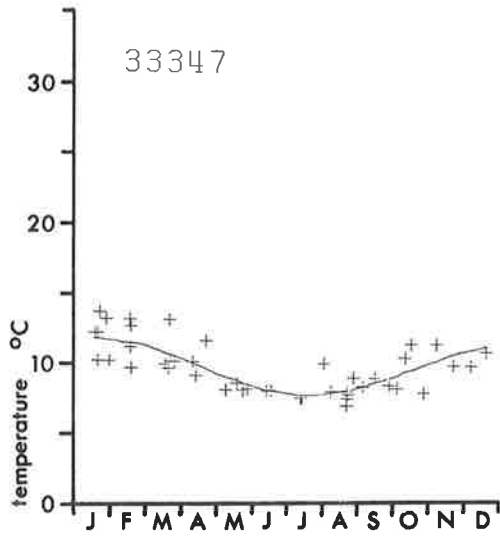
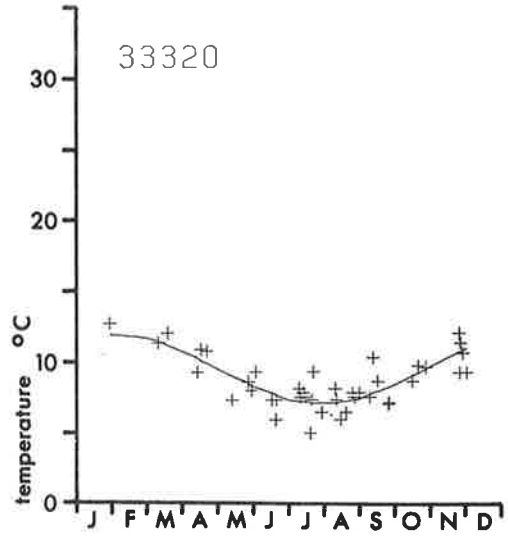
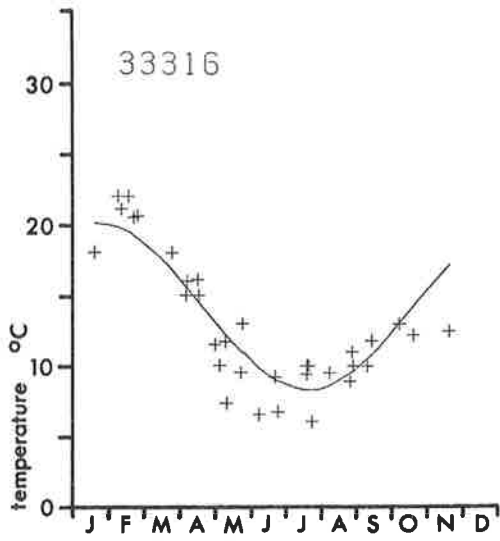
WANGANUI MWD DISTRICT

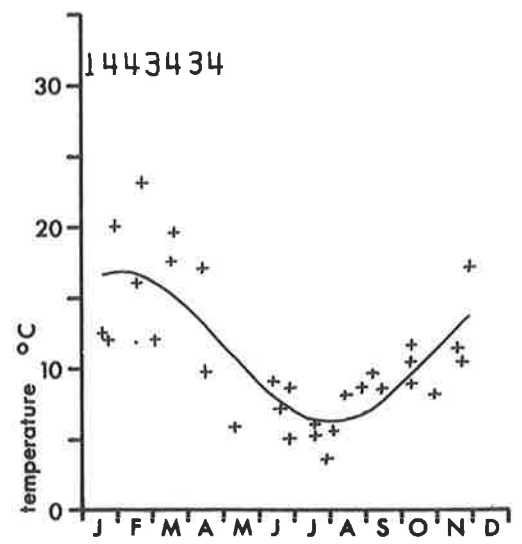
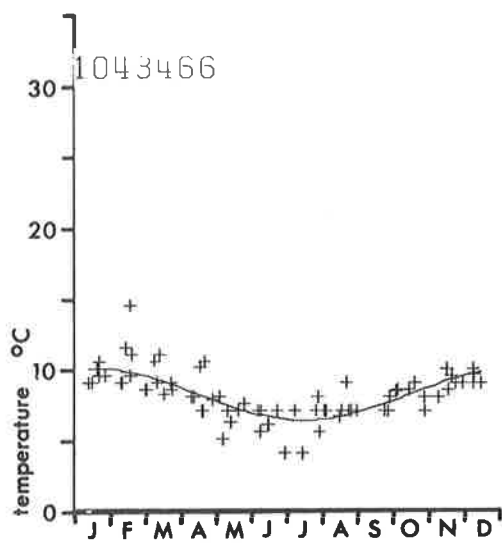
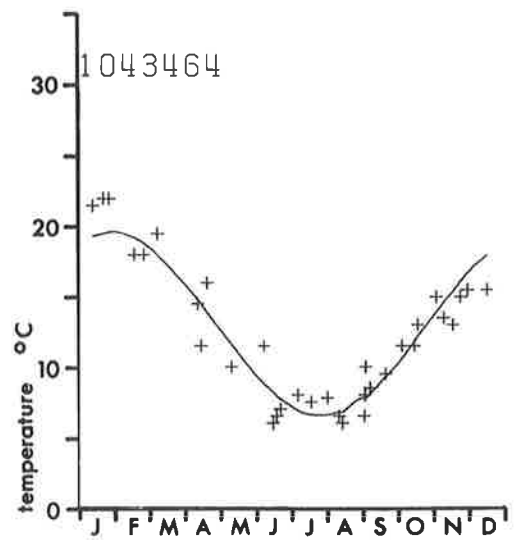
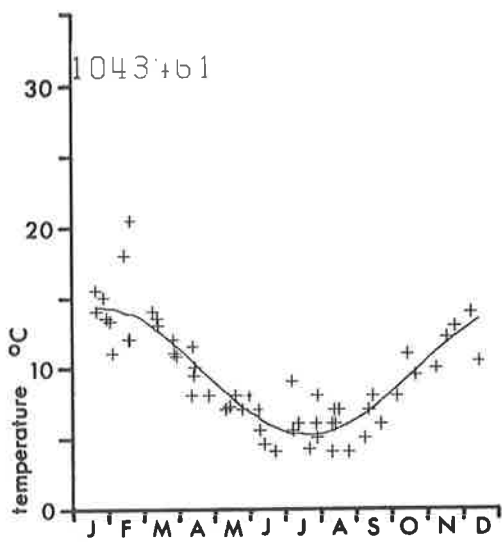
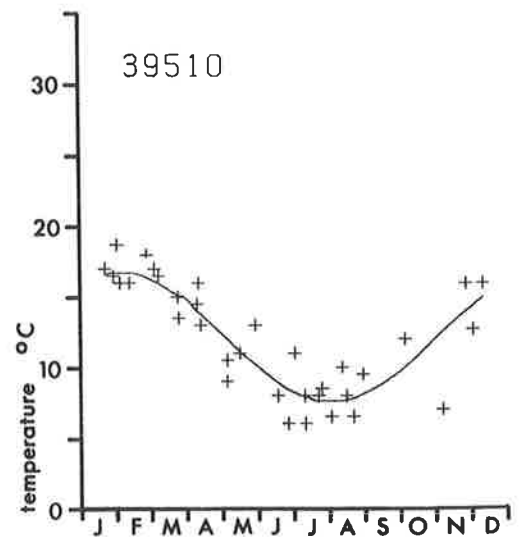
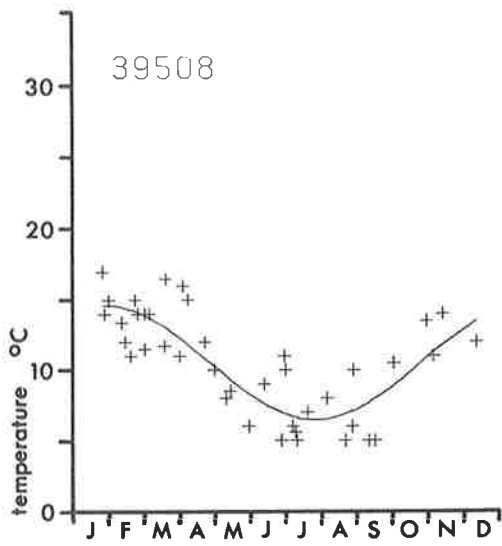




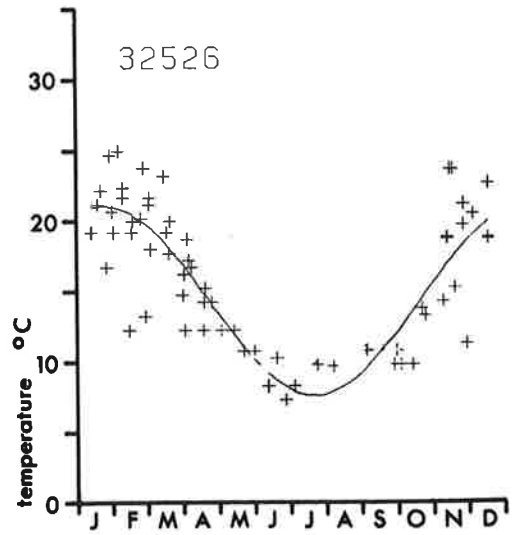
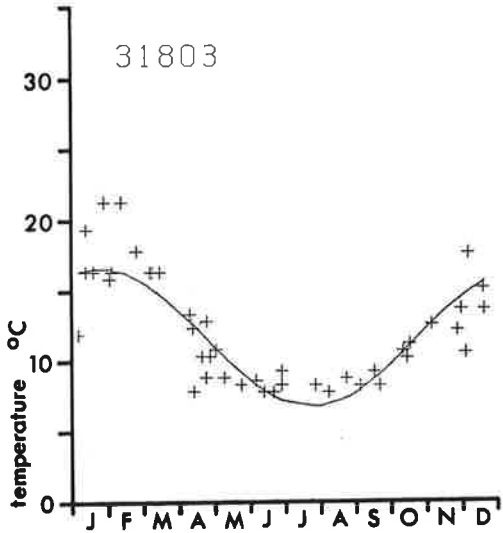
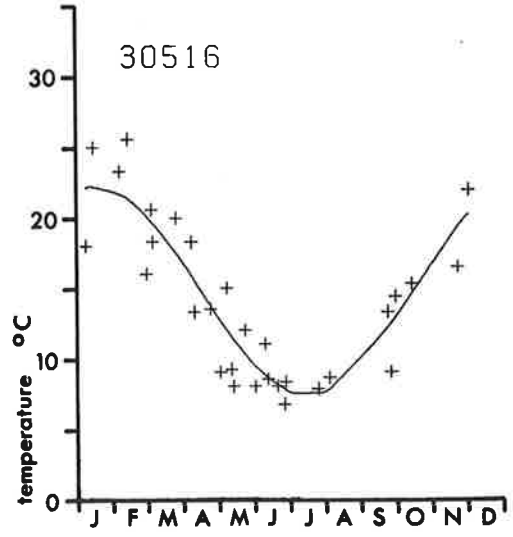
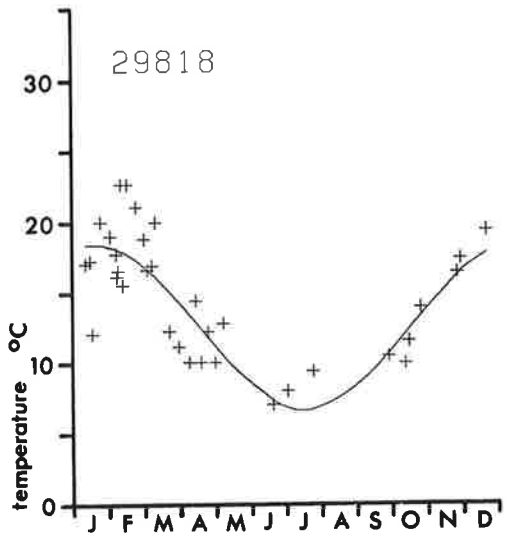
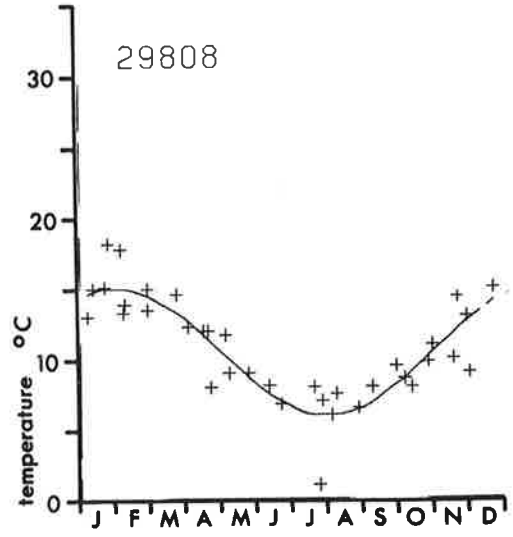
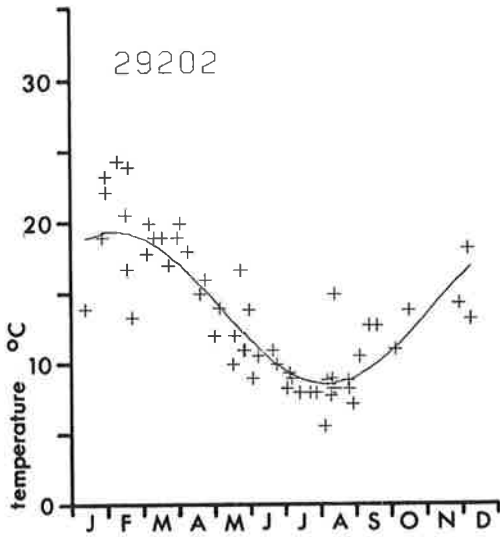


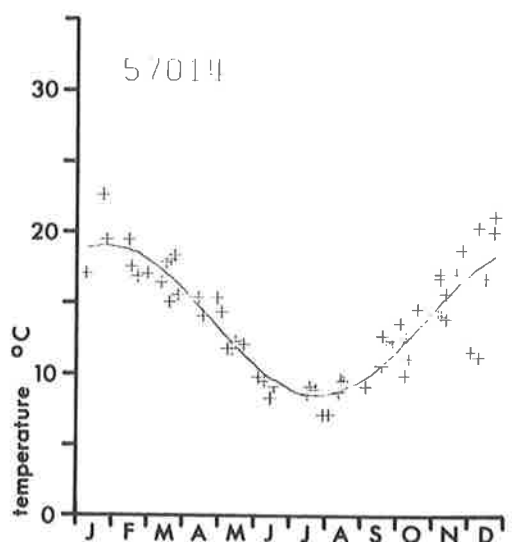
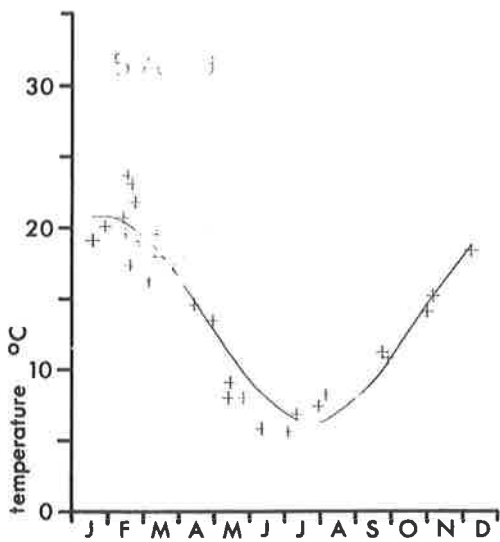
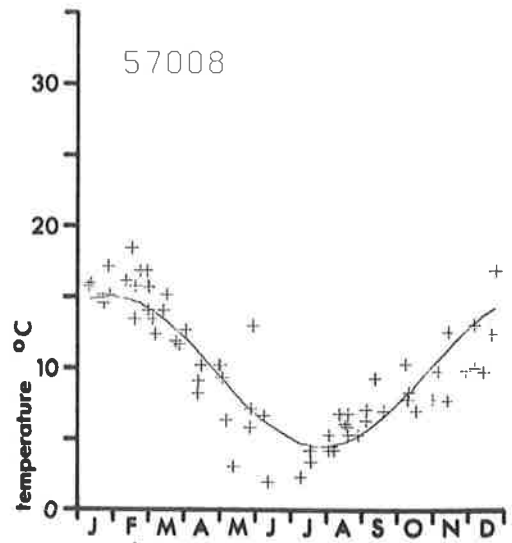
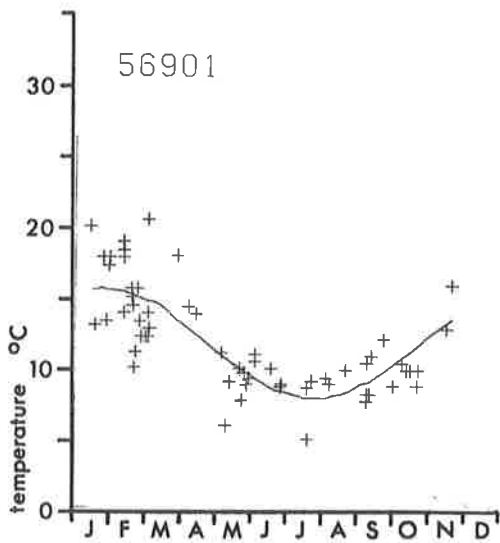
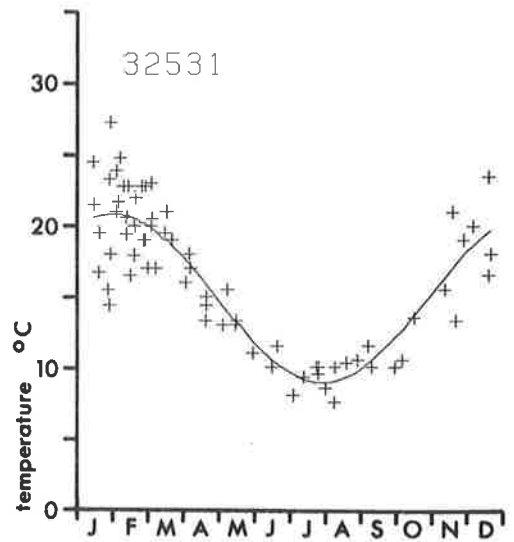
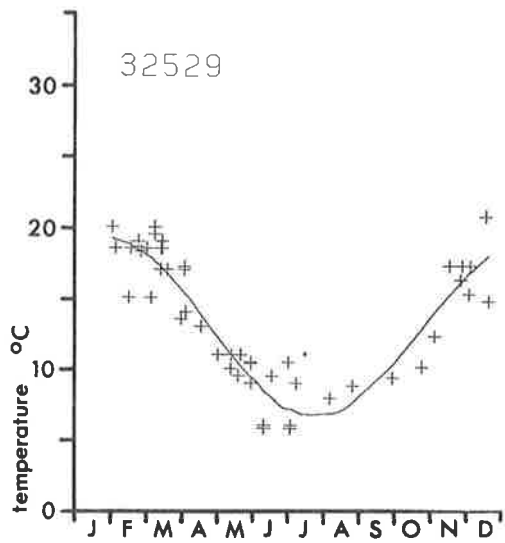


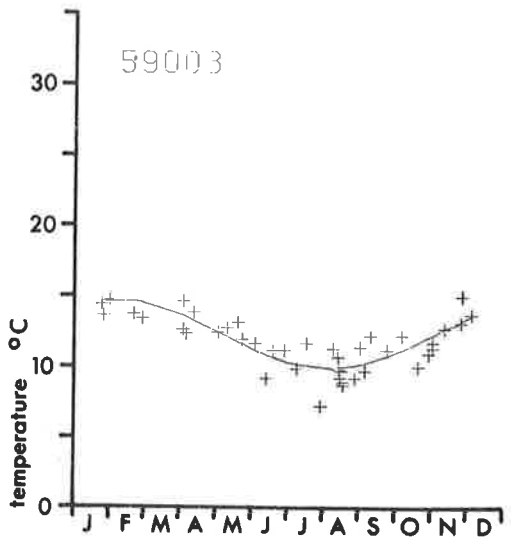
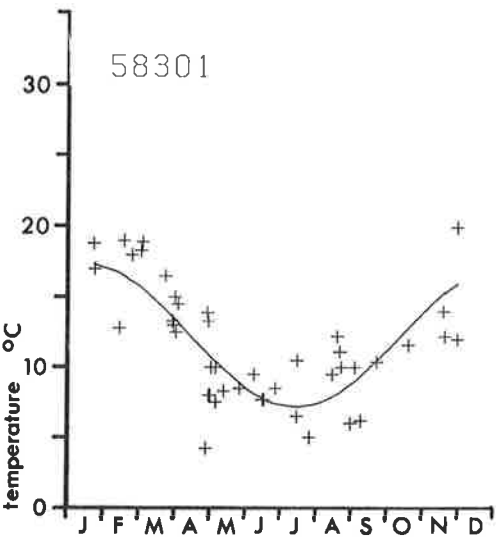
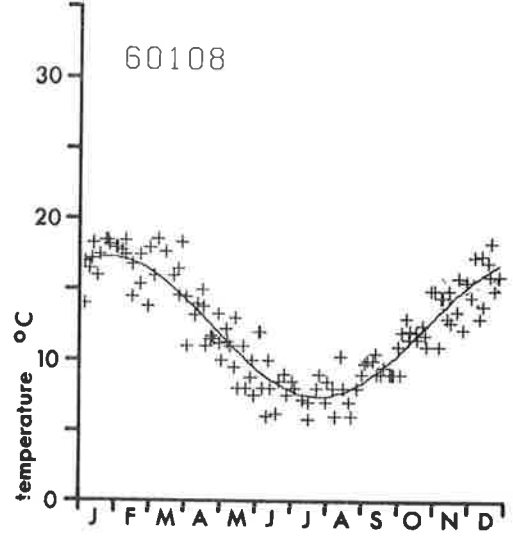
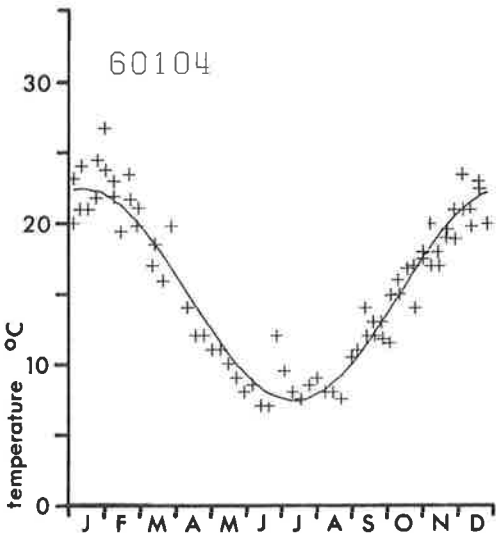
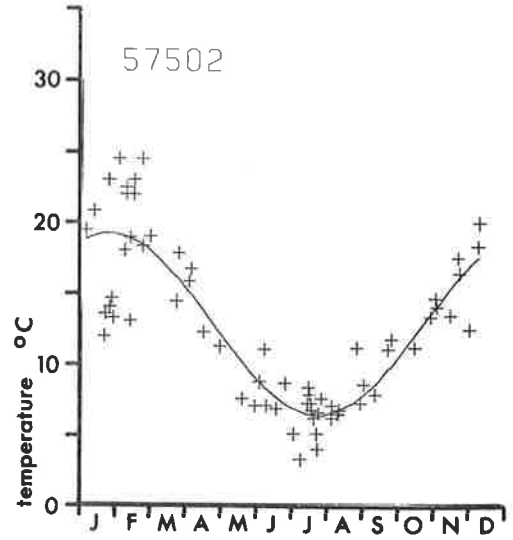
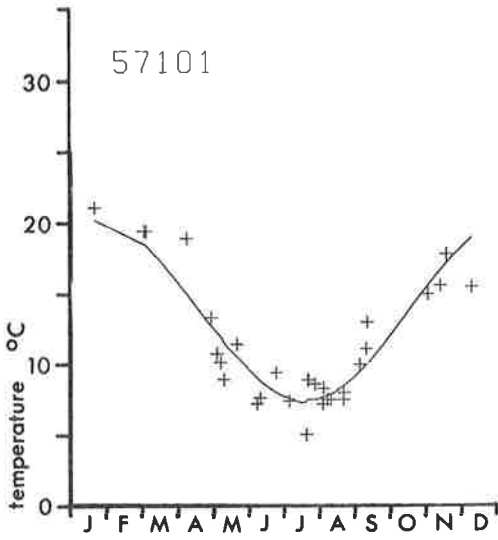


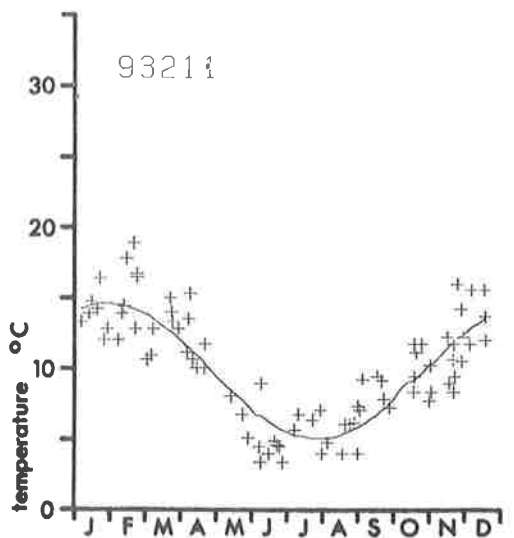
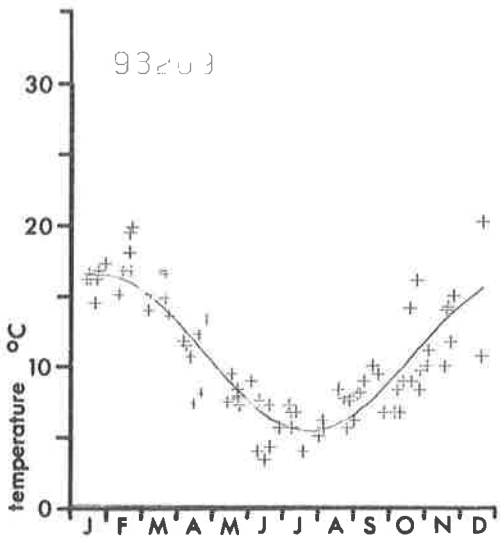
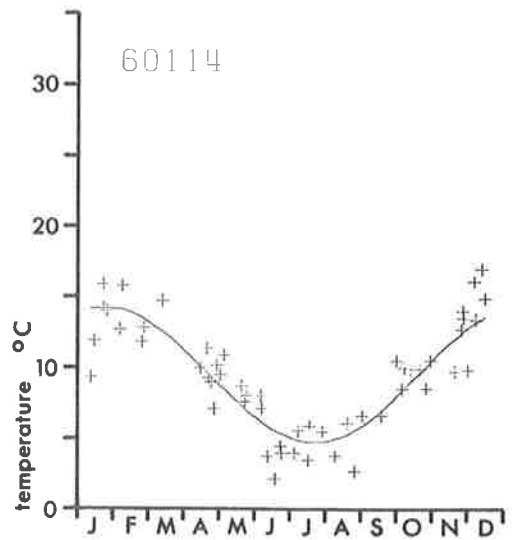
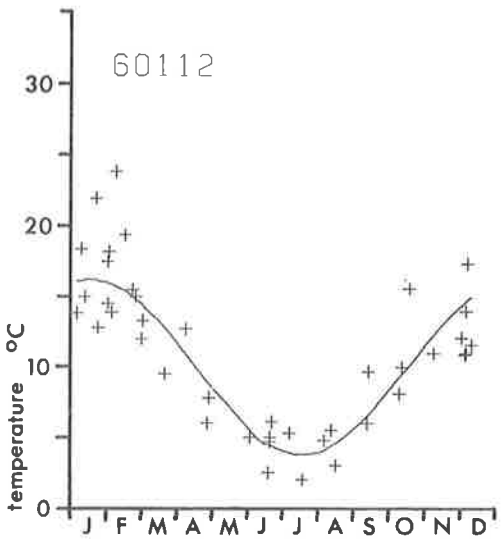
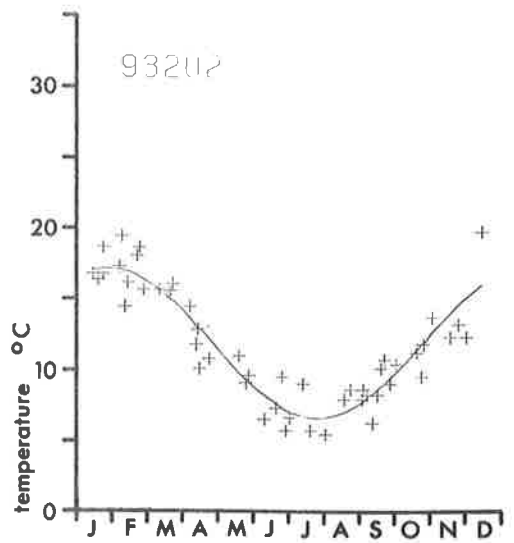
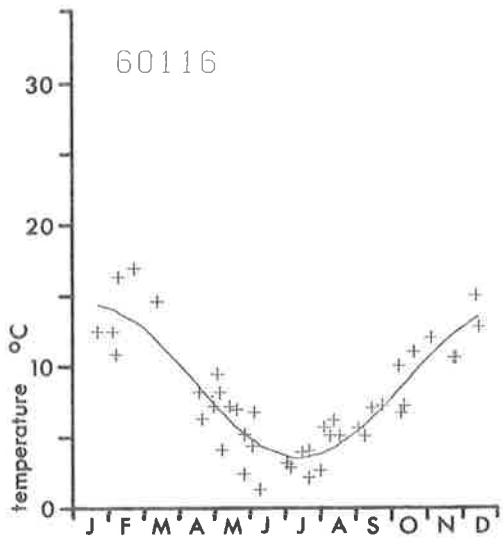


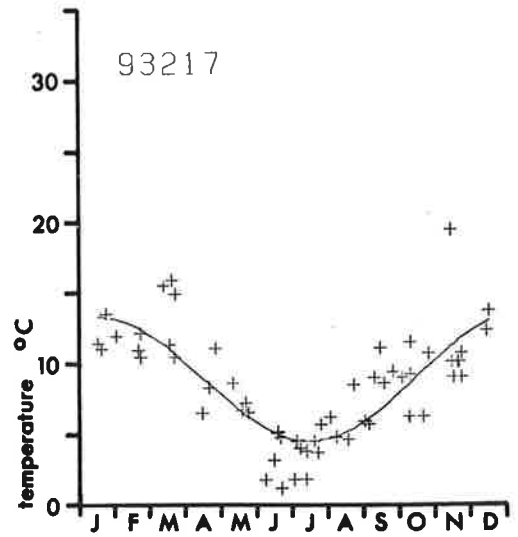
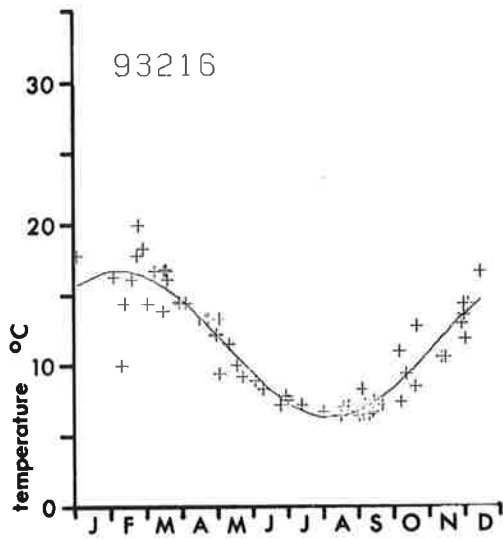
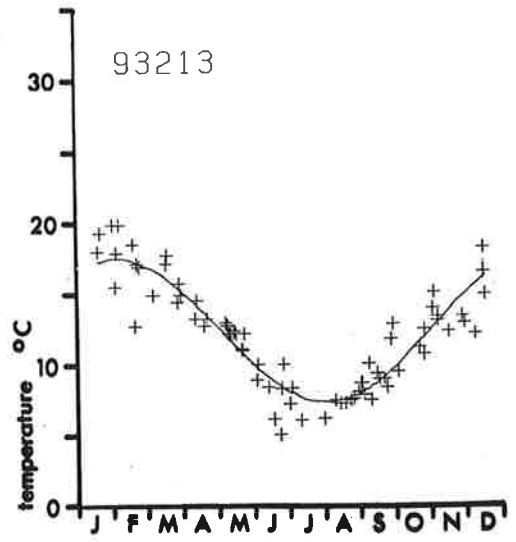
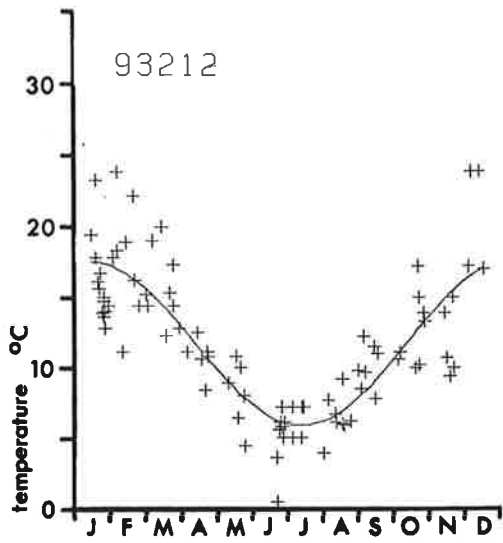
WELLINGTON MWD DISTRICT



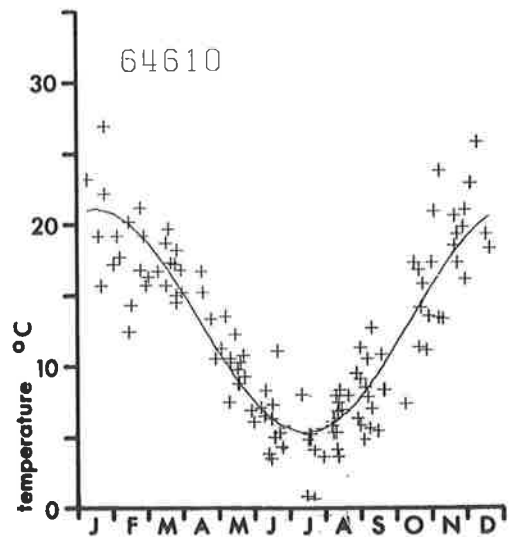
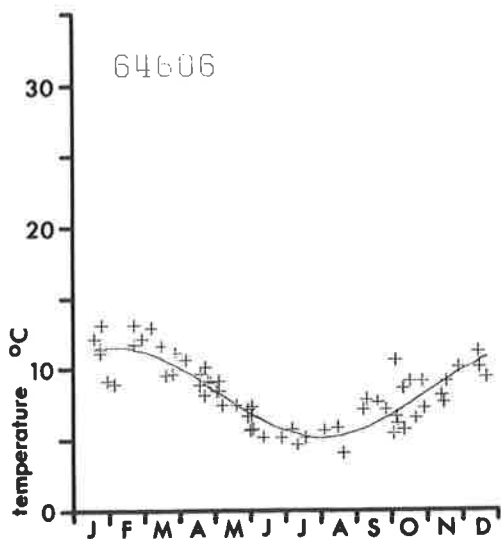
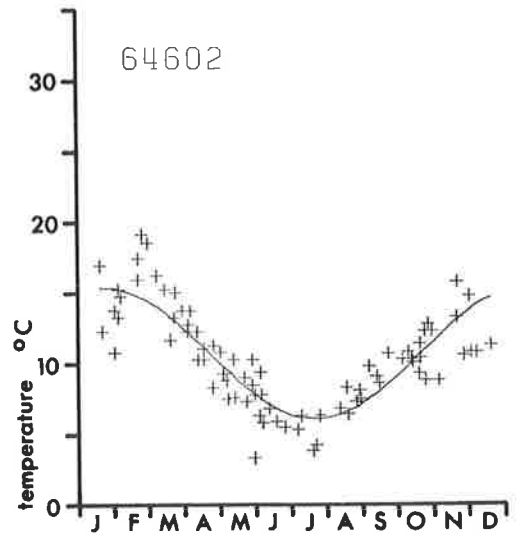
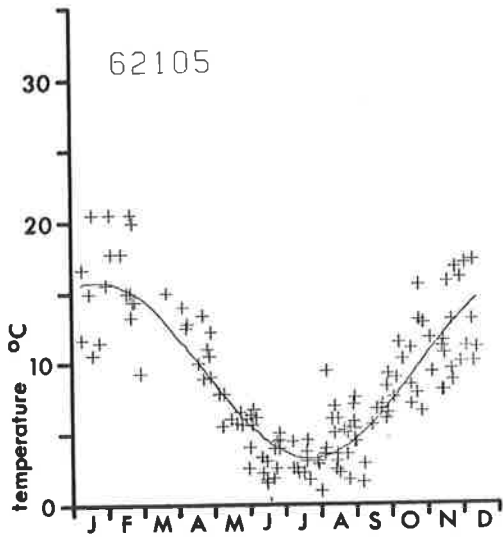
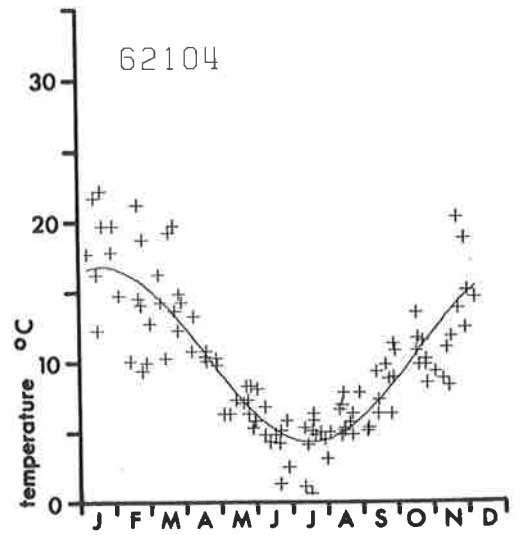
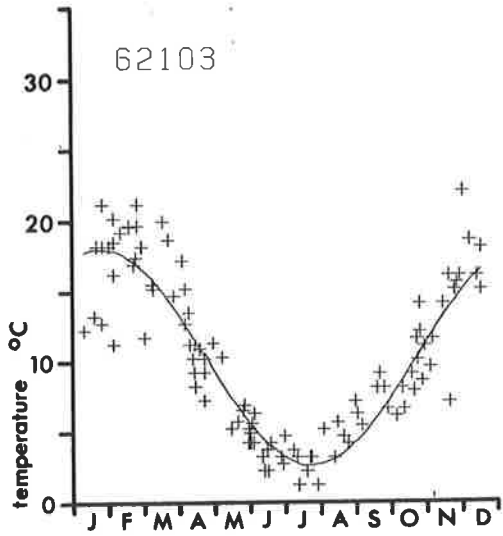


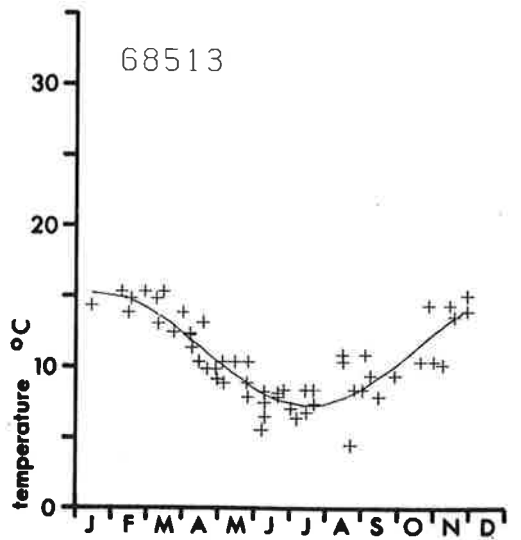
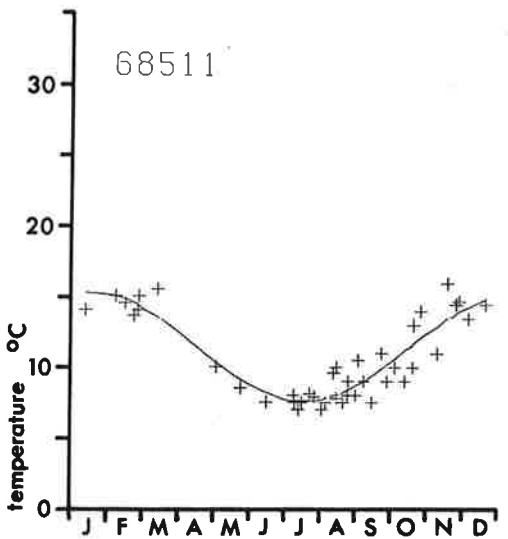
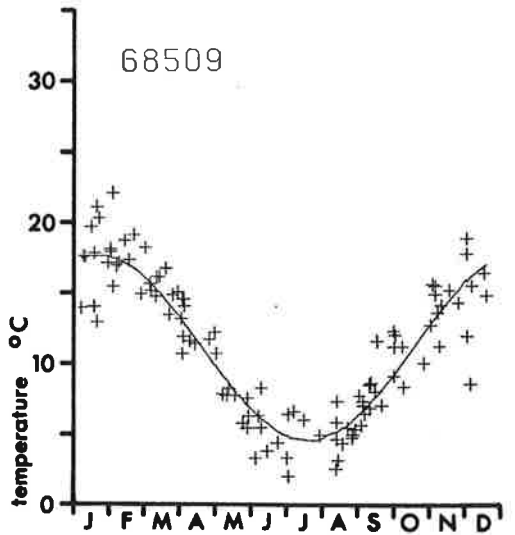
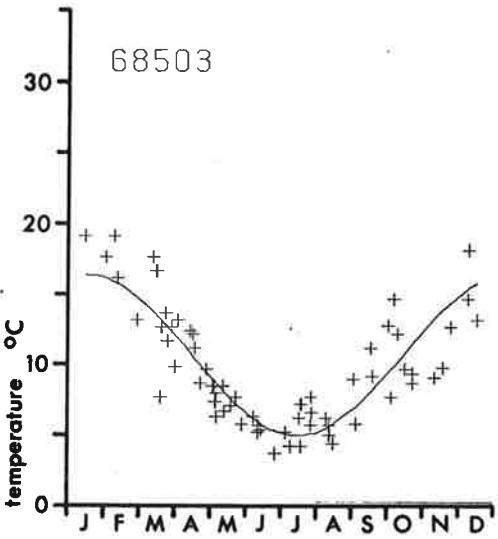
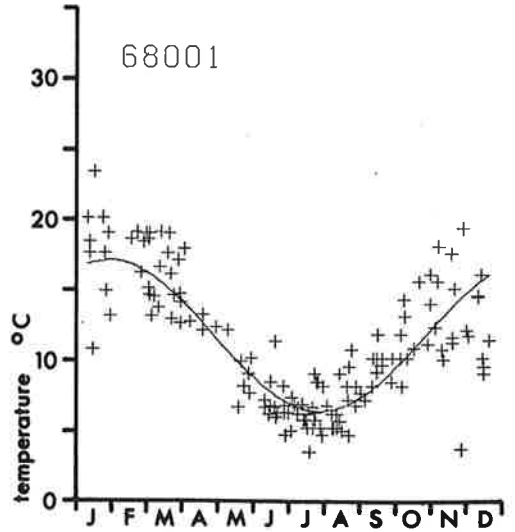
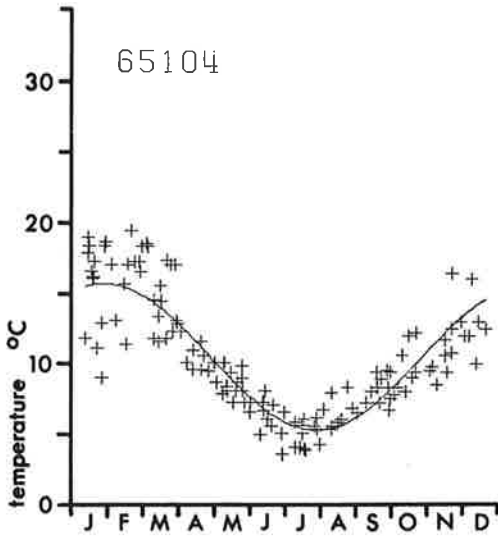


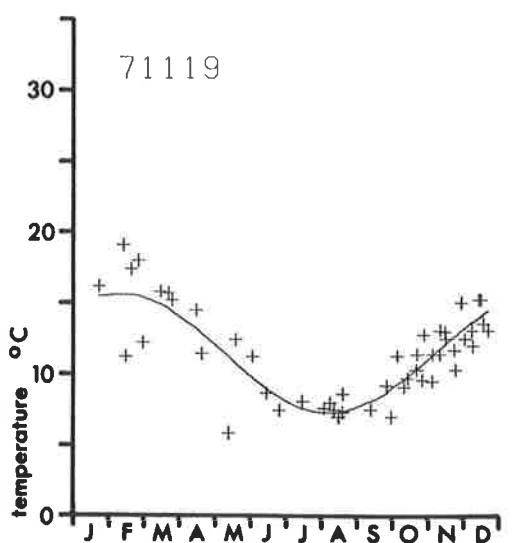
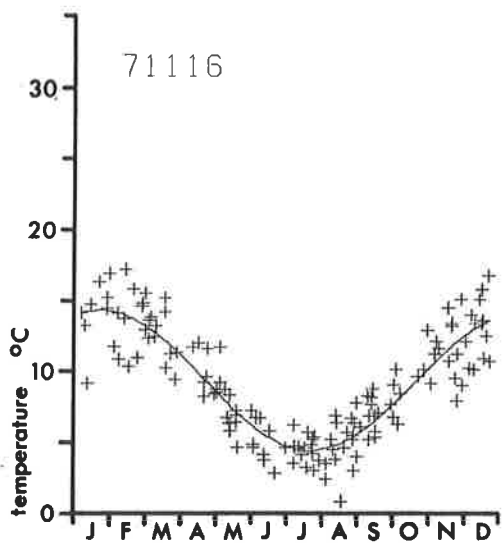
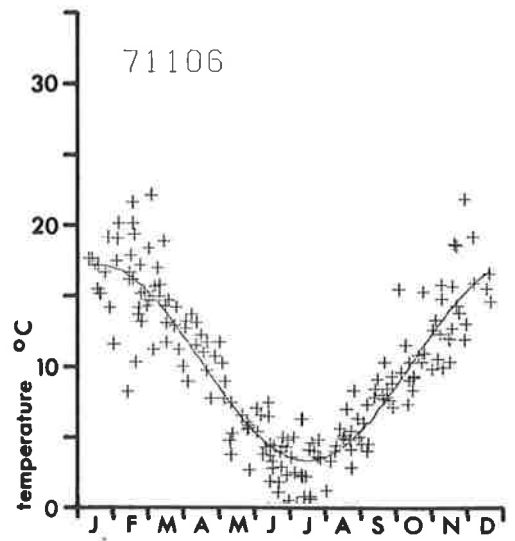
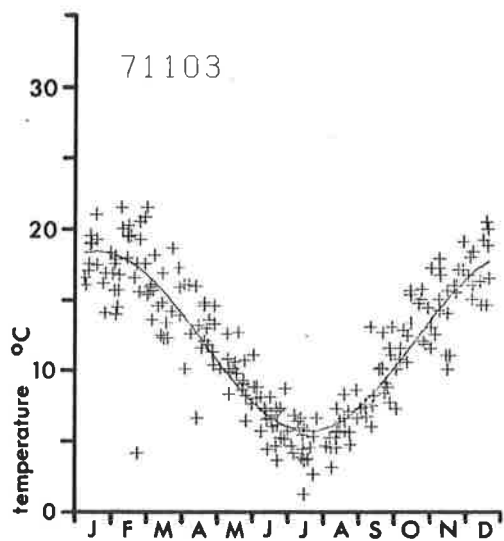
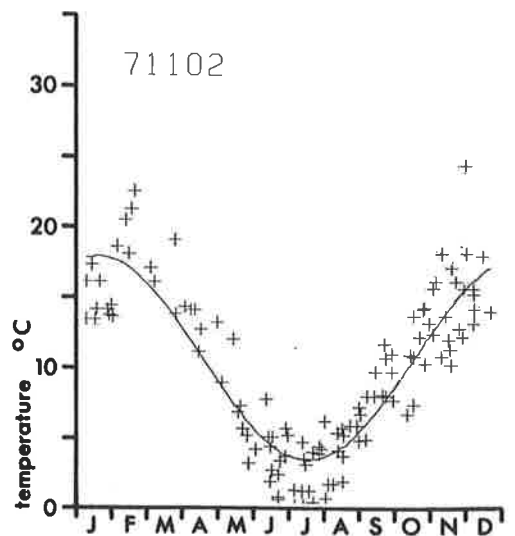
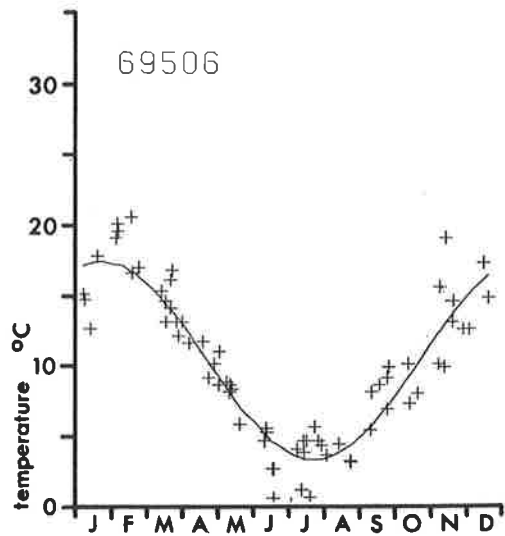


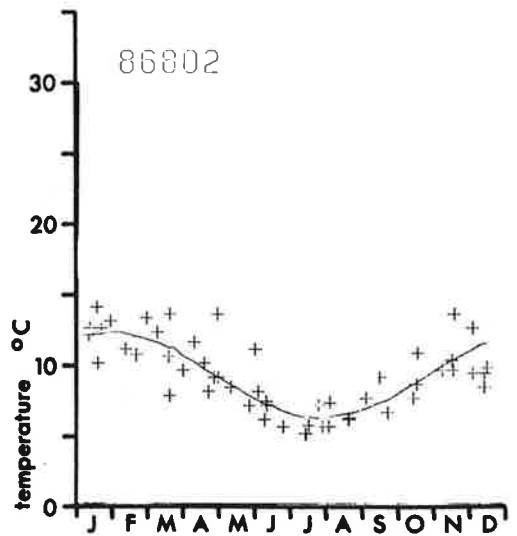
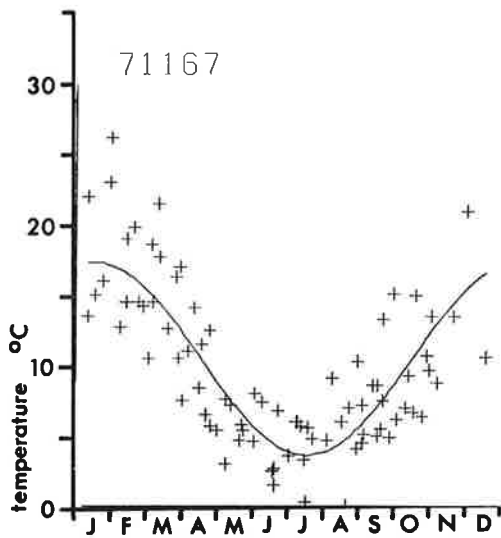
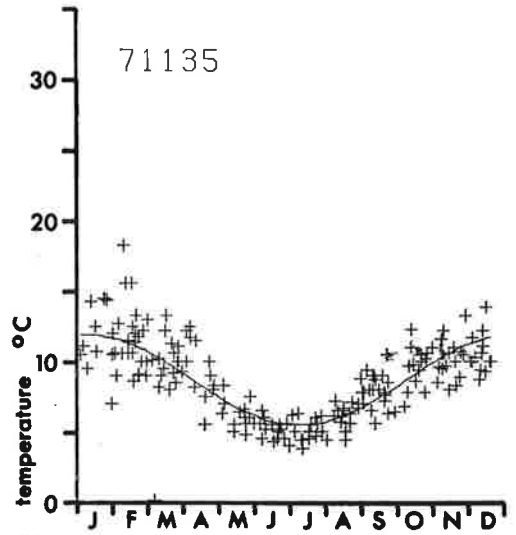
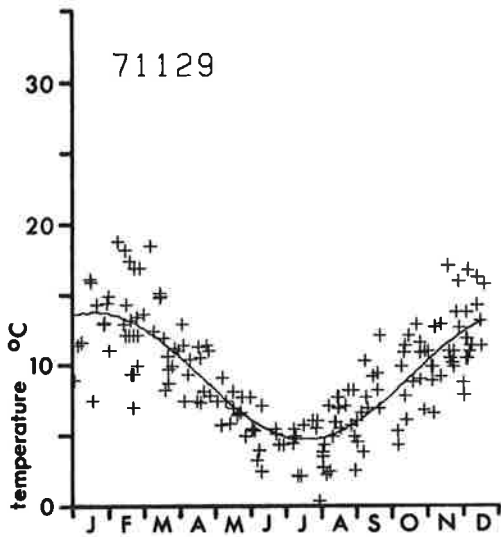
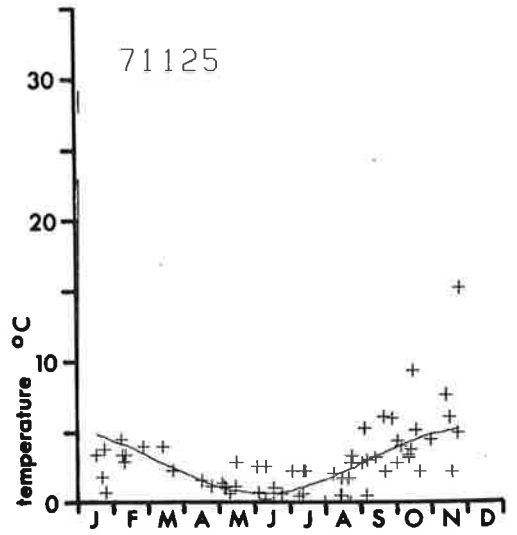
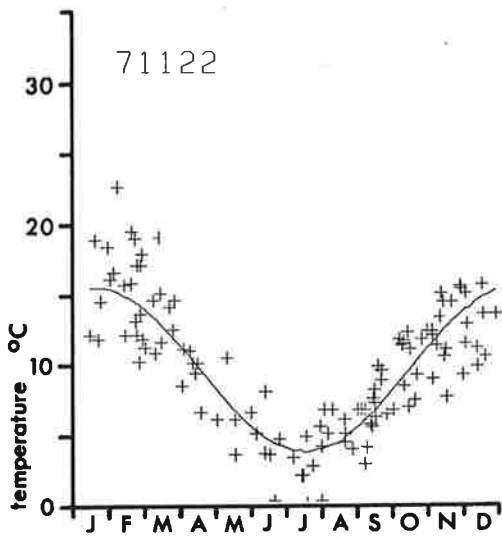


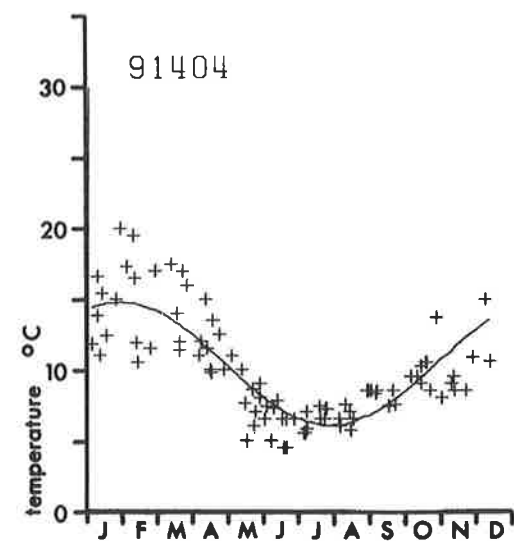
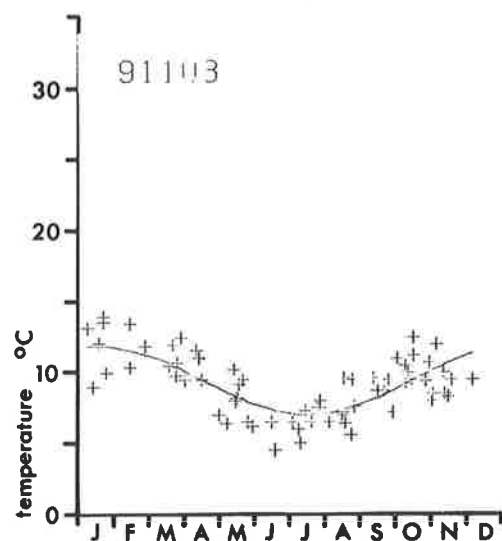
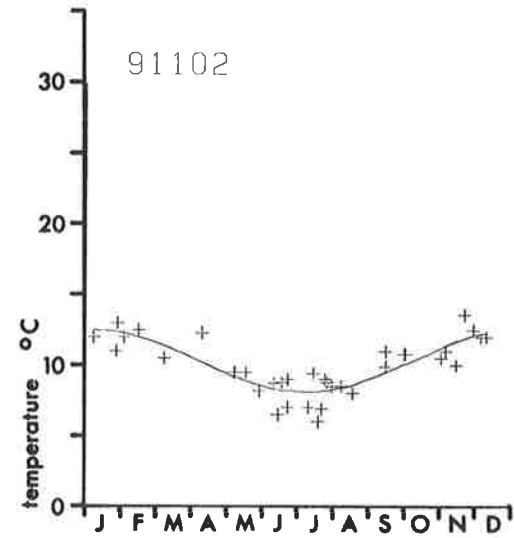
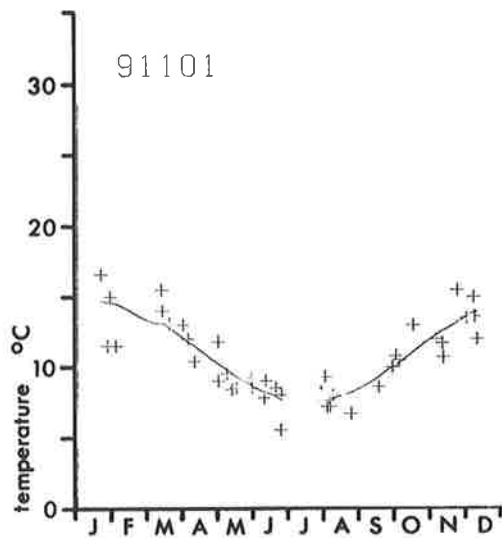
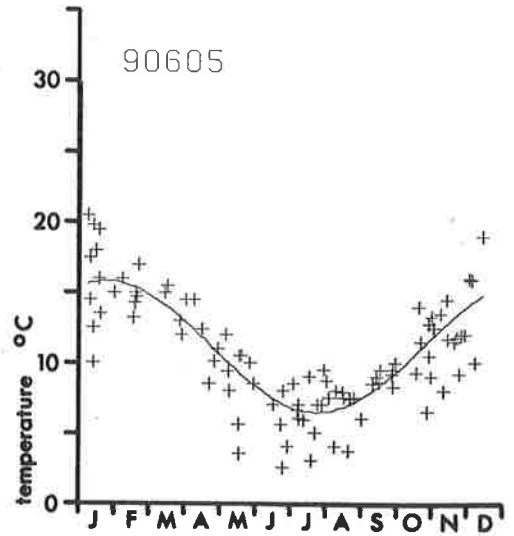
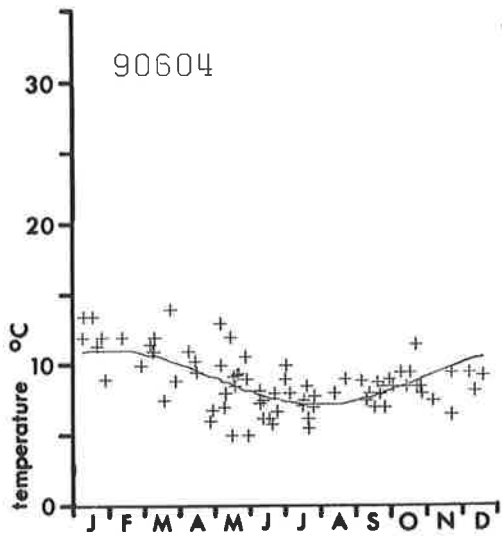
CHRISTCHURCH MWD DISTRICT

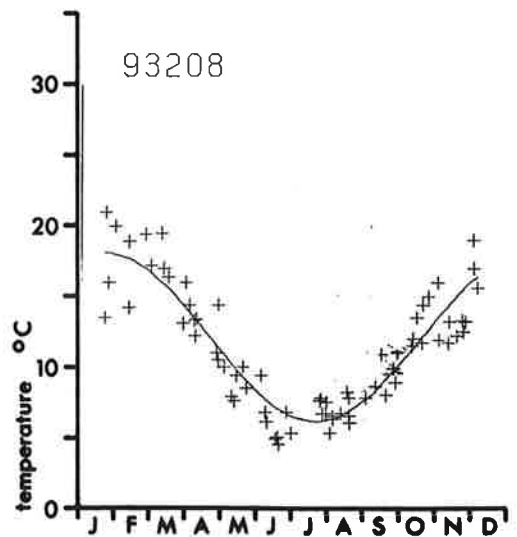
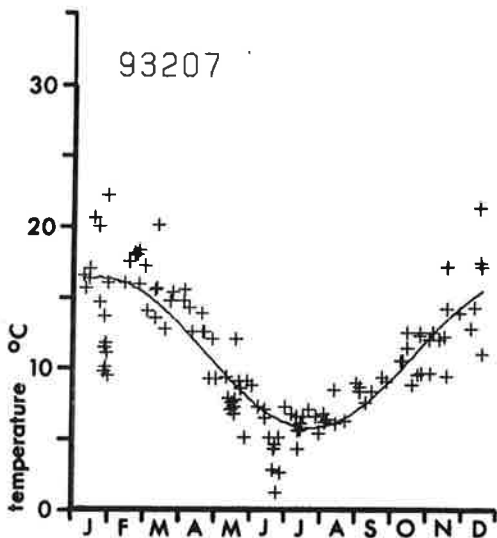
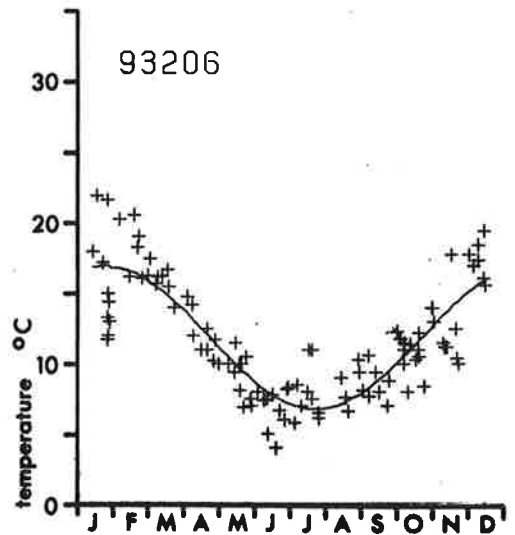
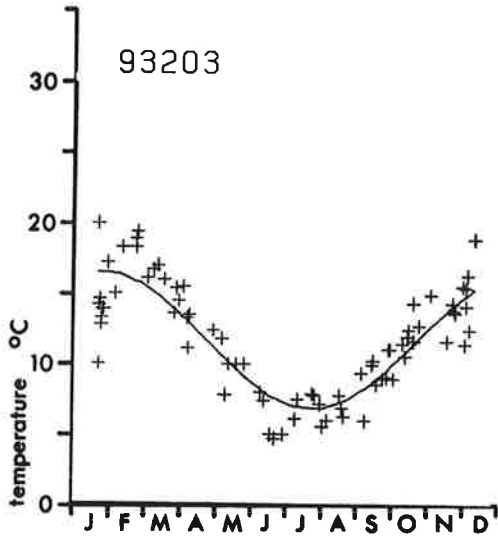
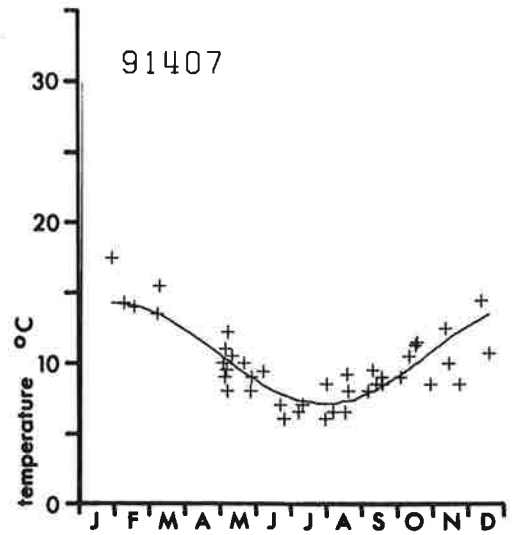
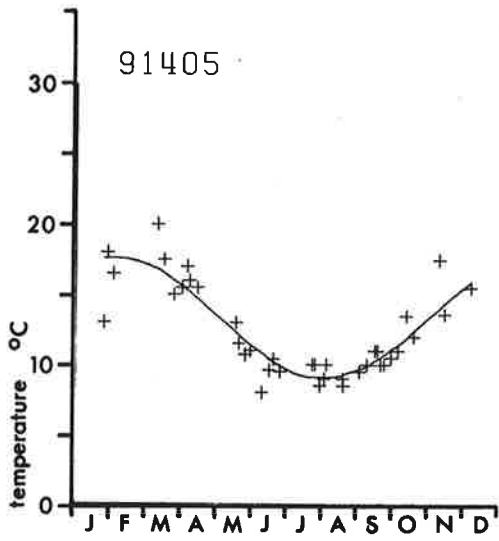


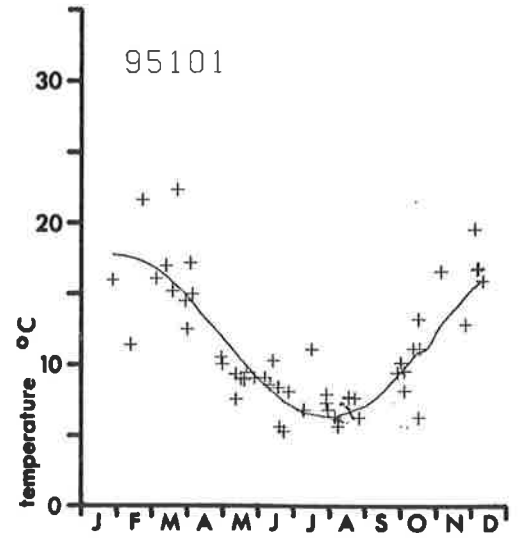
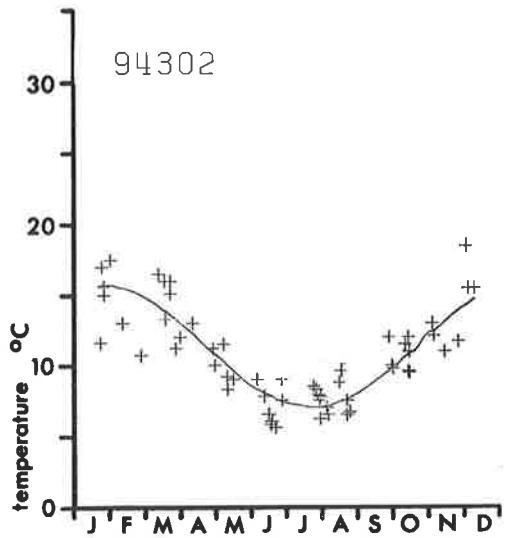
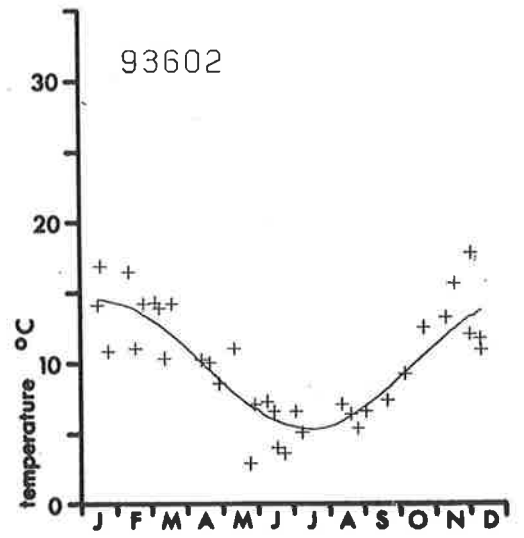
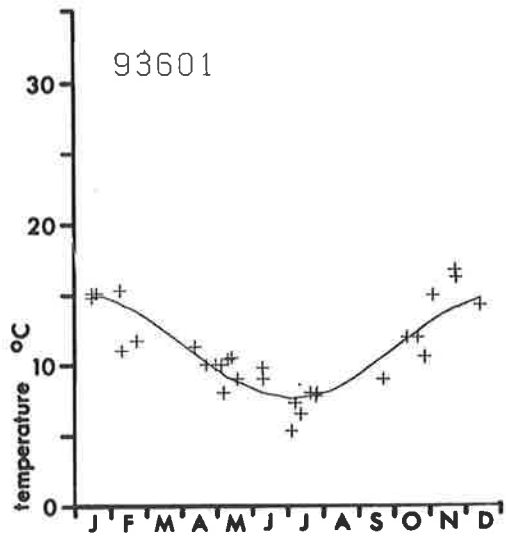




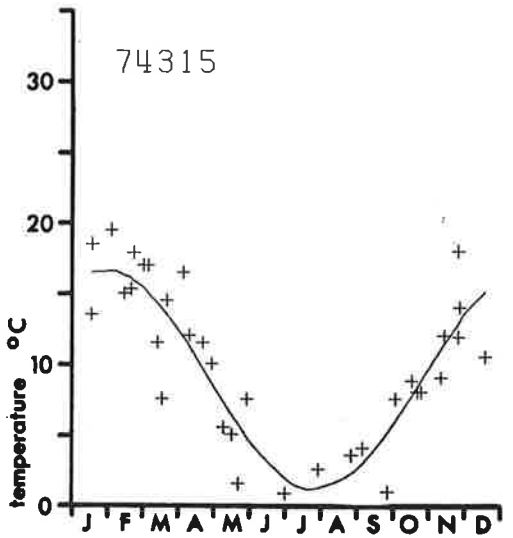
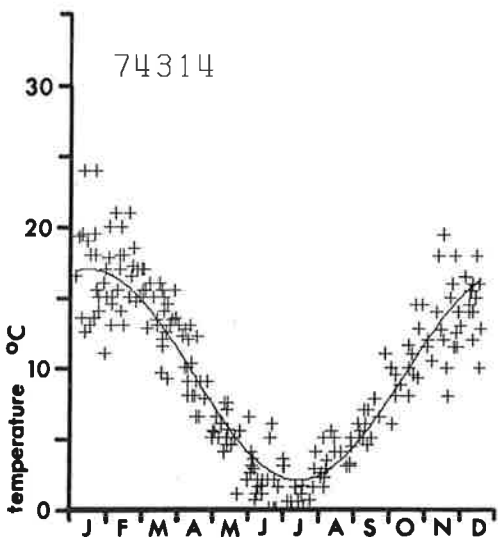
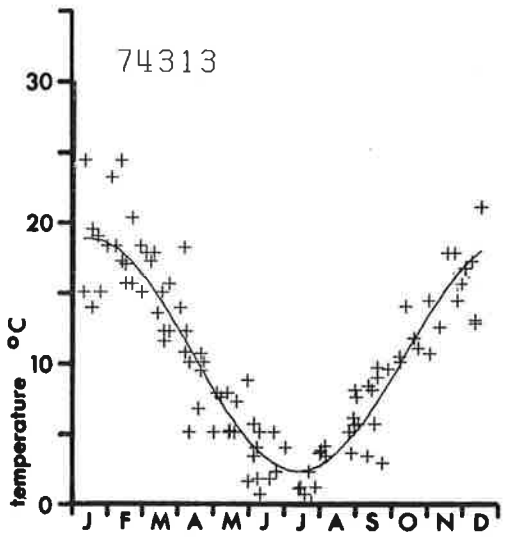
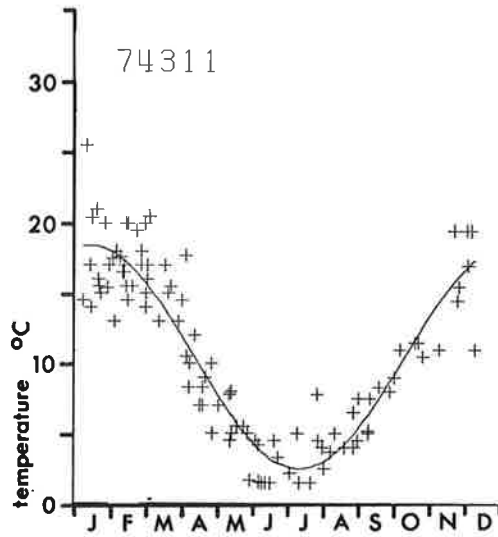
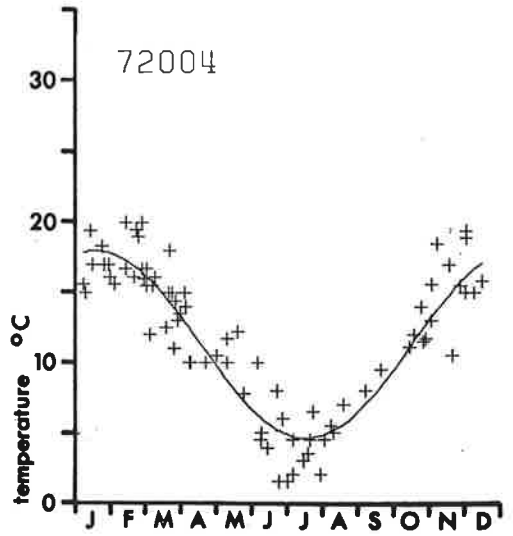
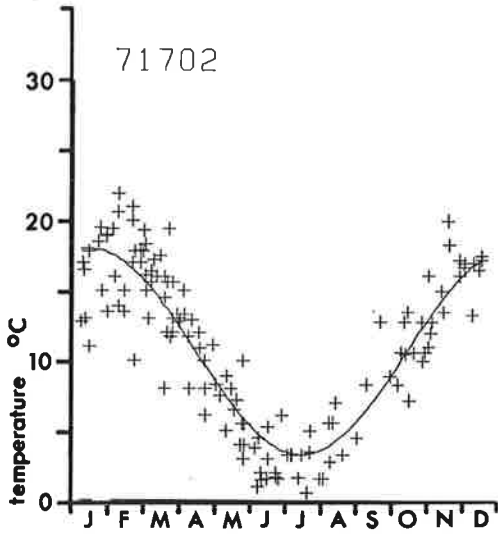


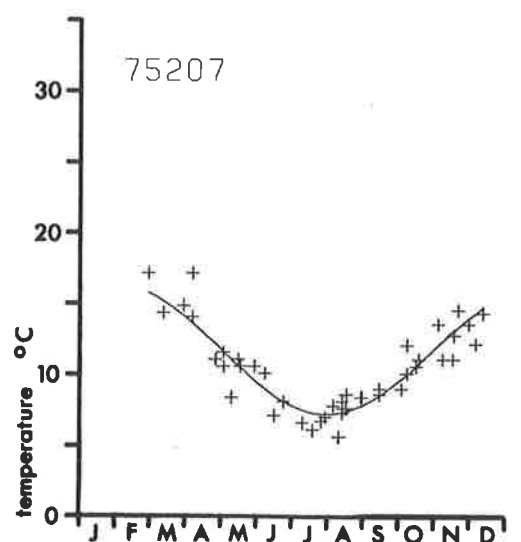
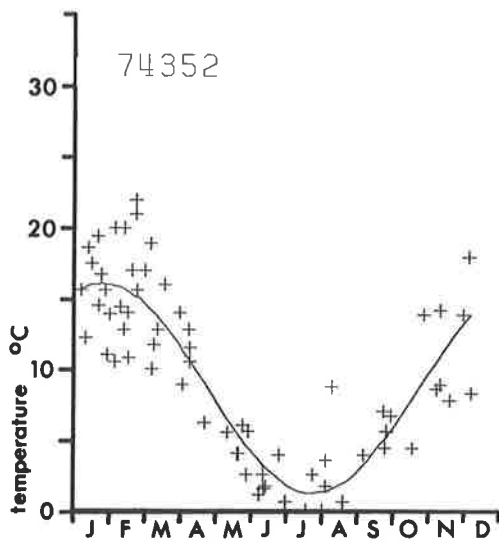
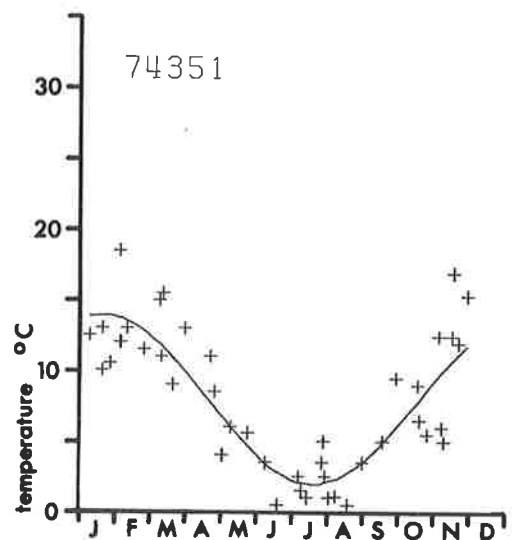
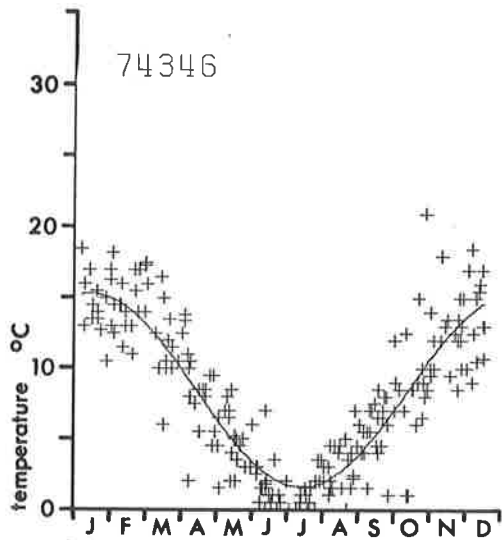
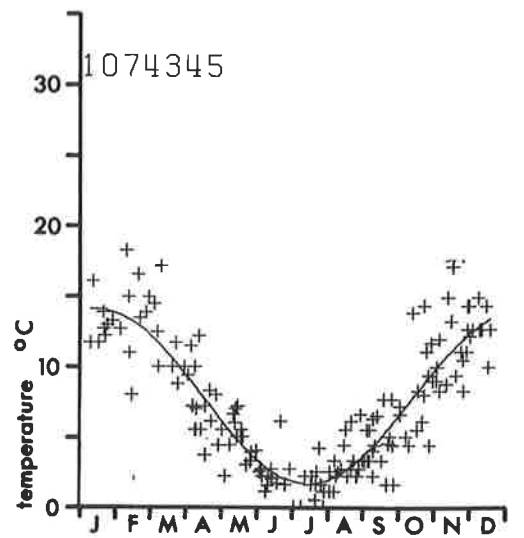
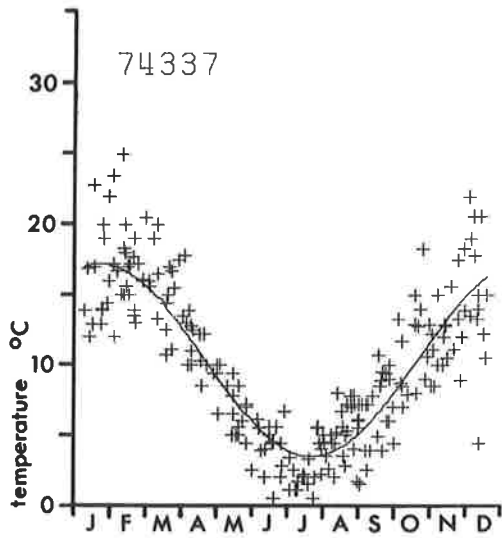


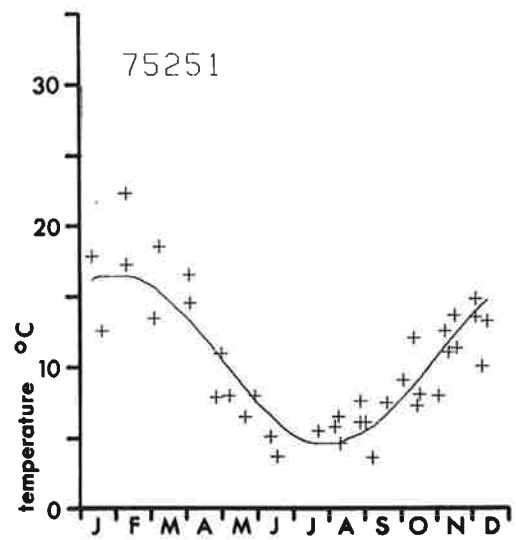
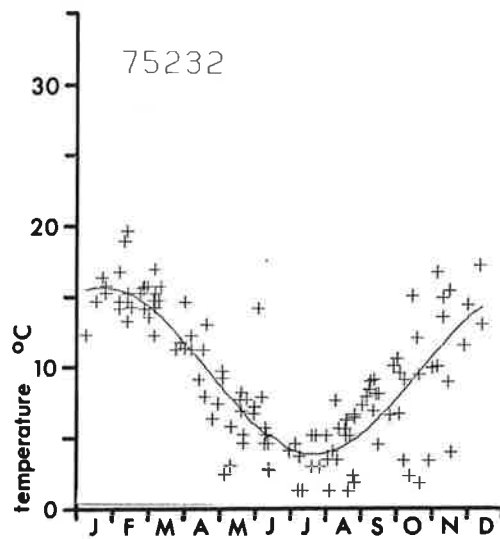
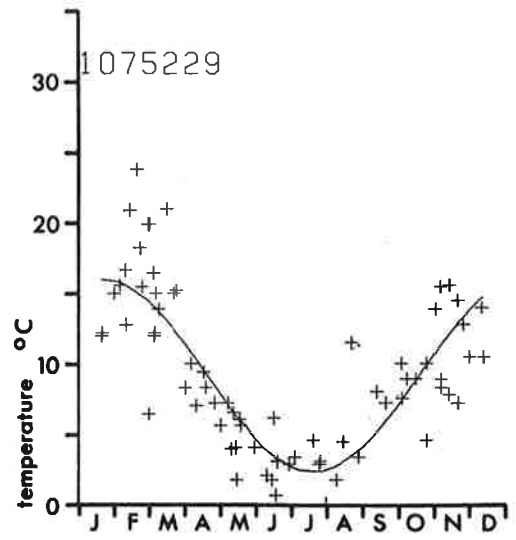
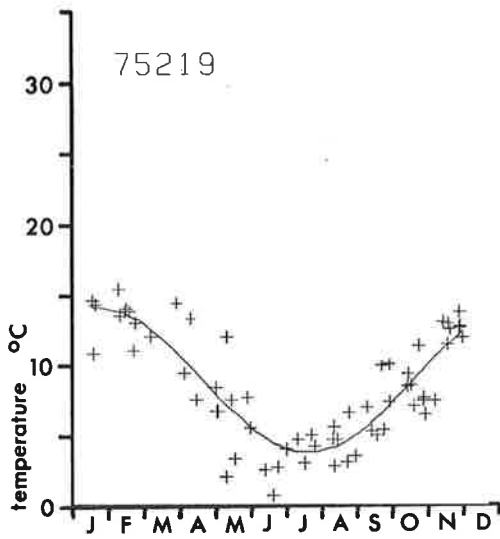
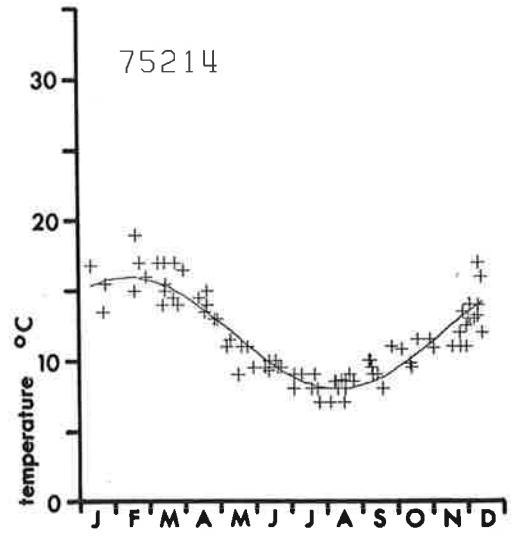
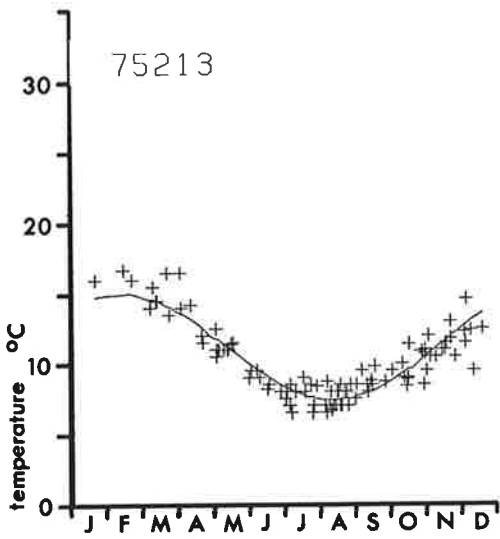


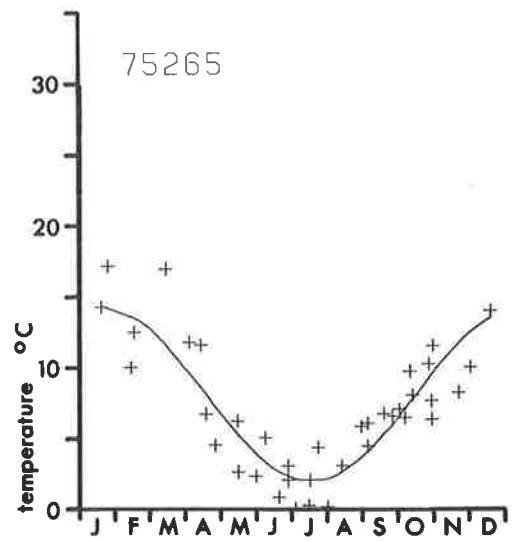
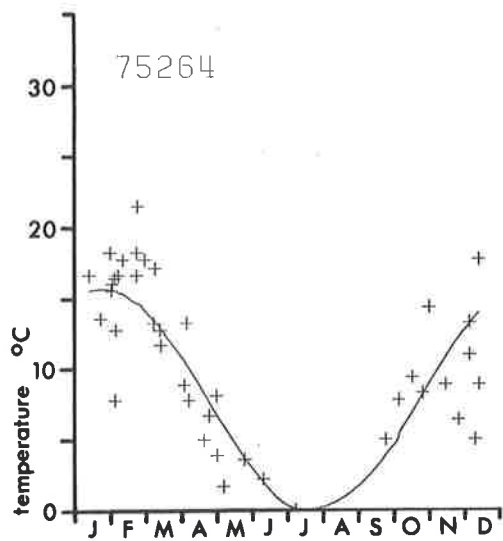
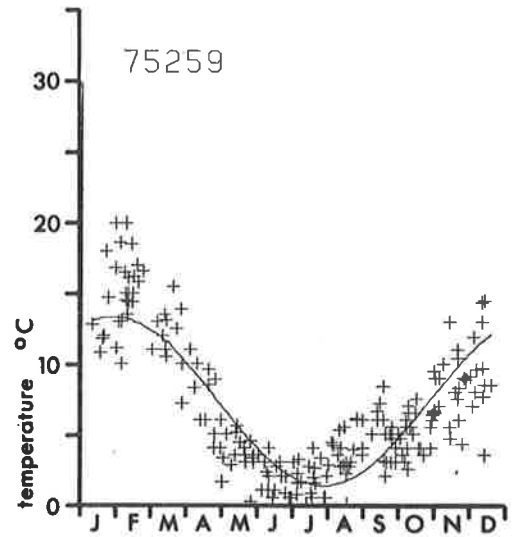
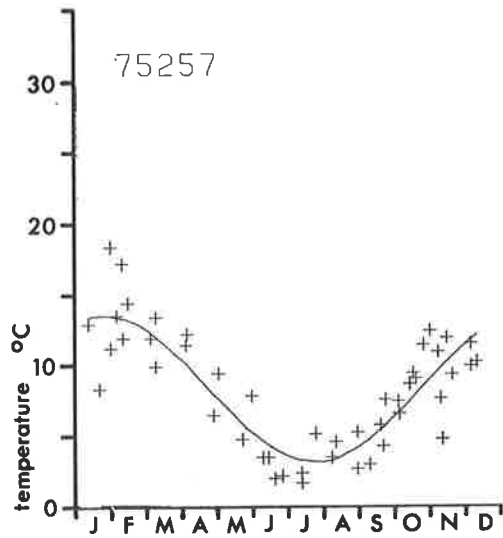
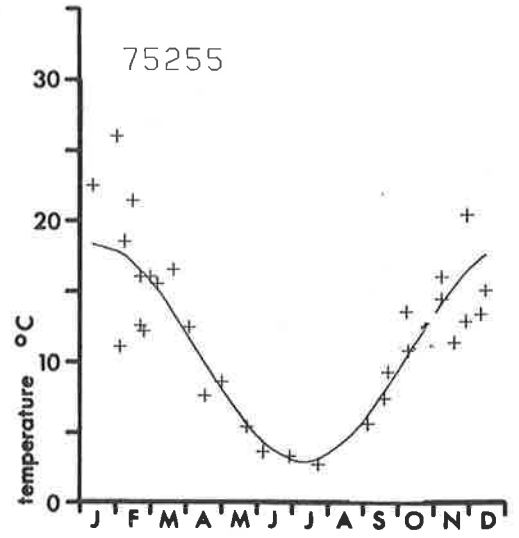
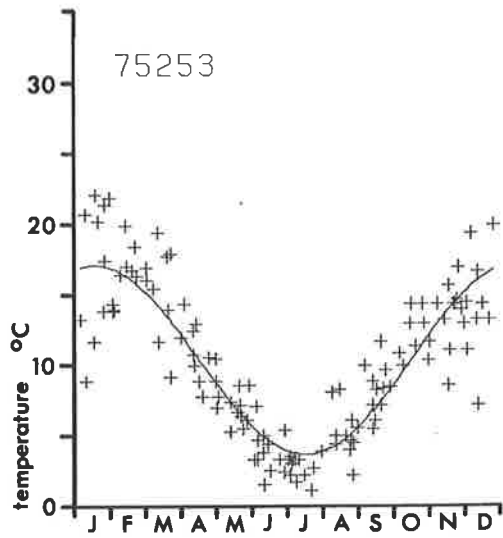


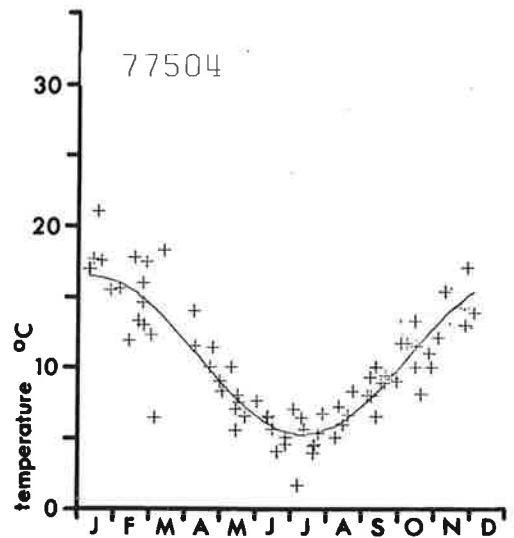
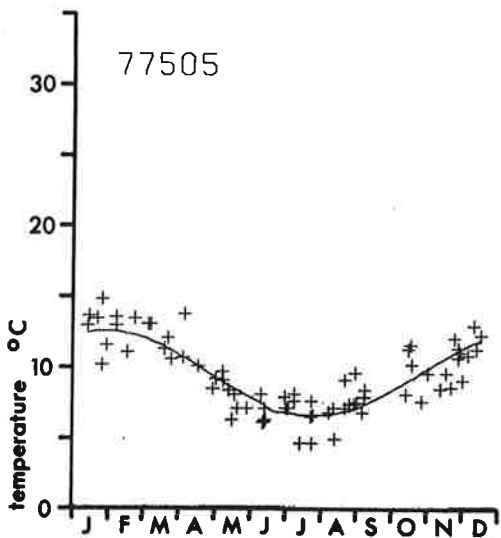
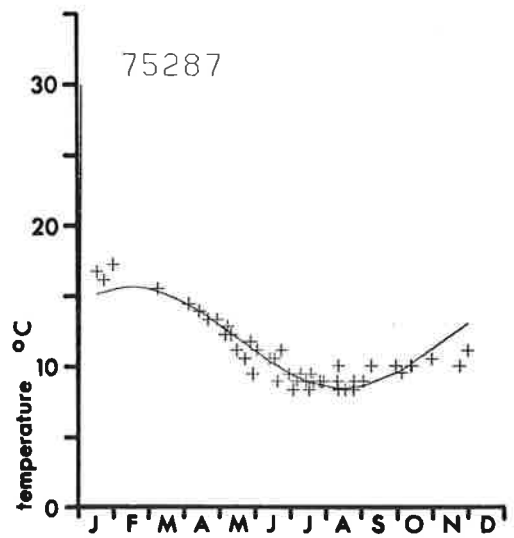
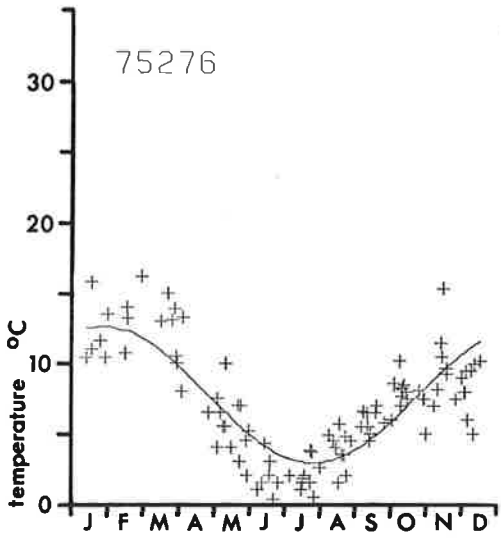
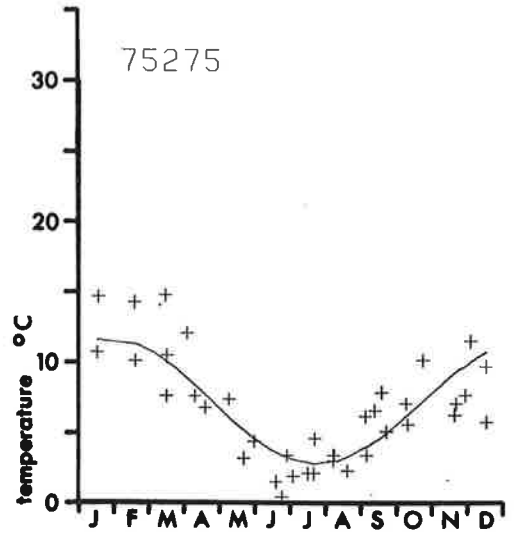
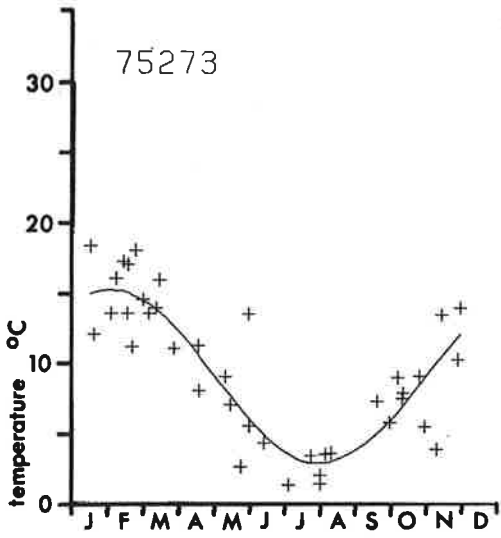
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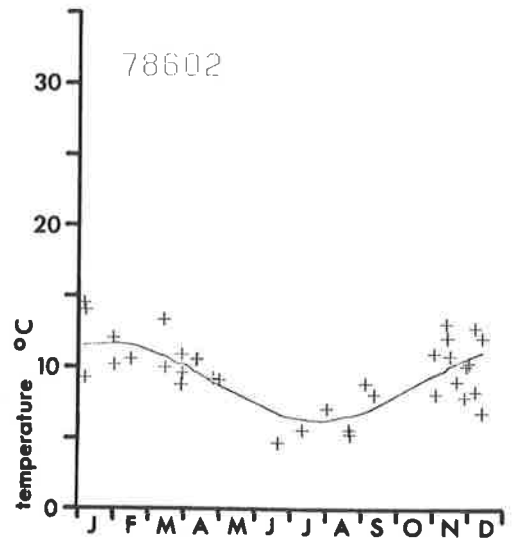
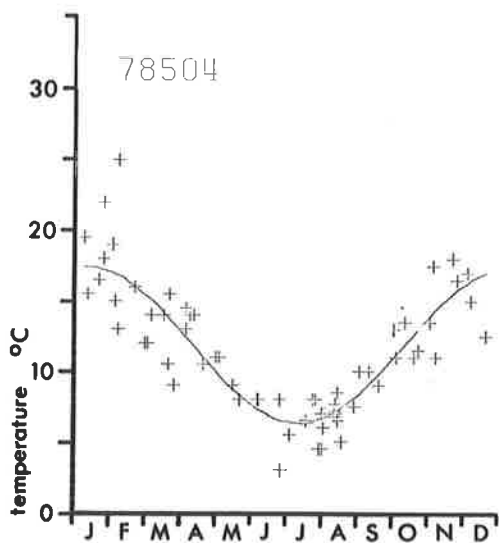
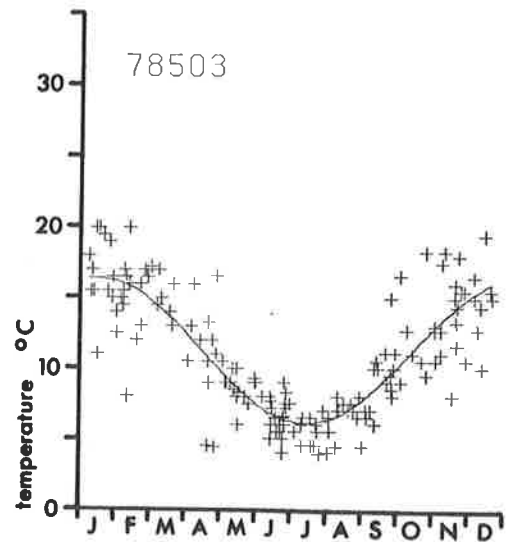
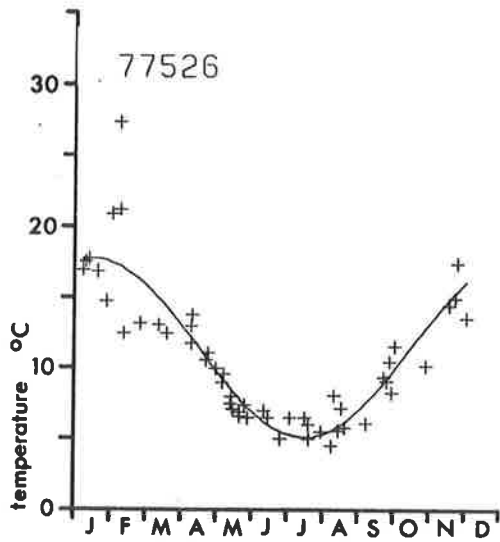
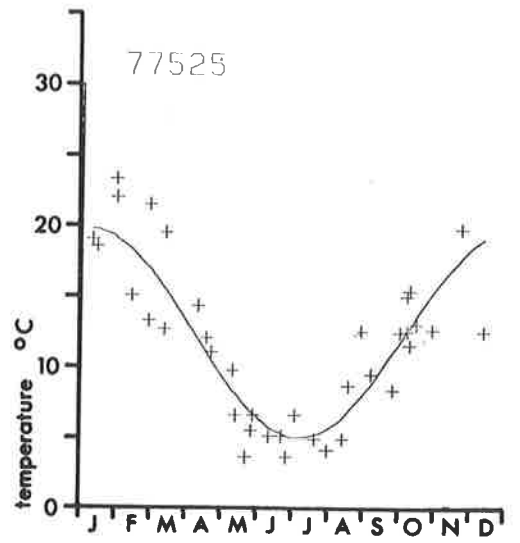
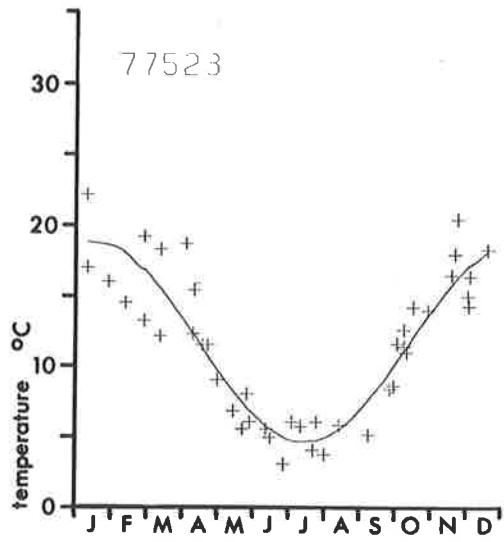


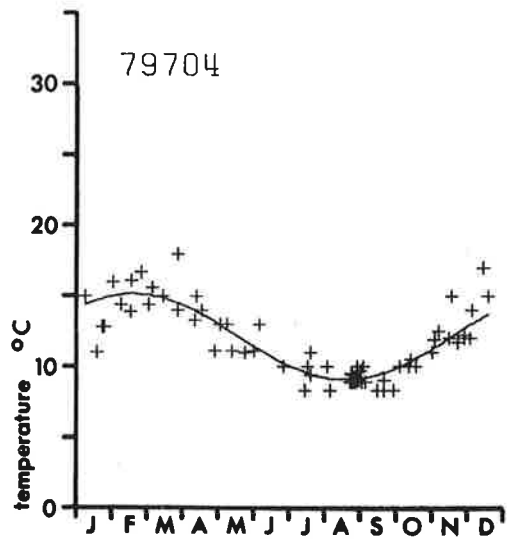
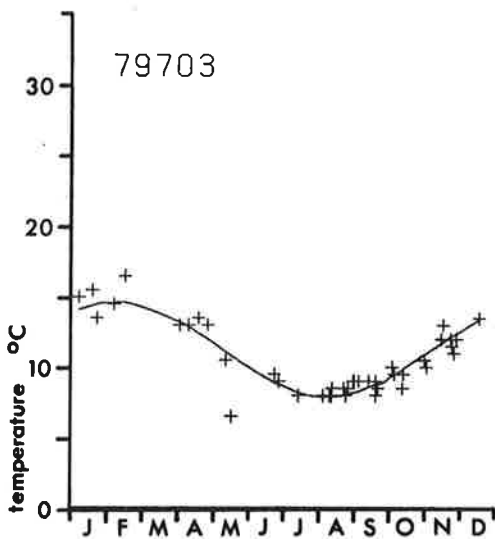
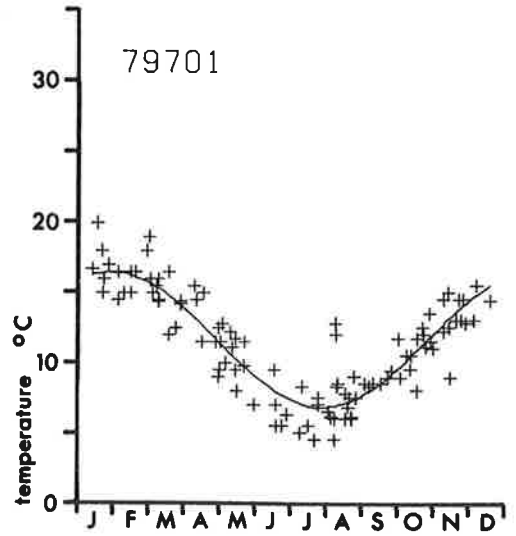
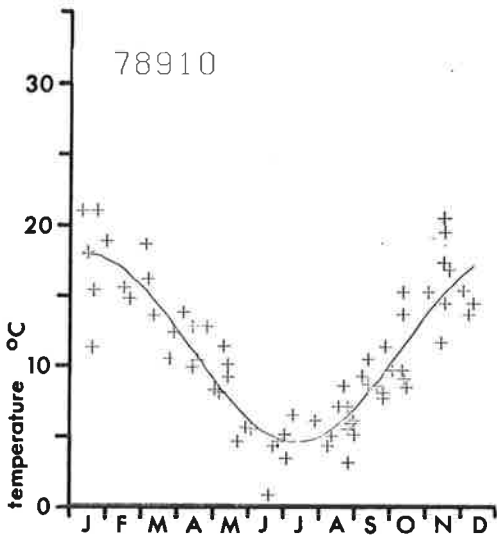
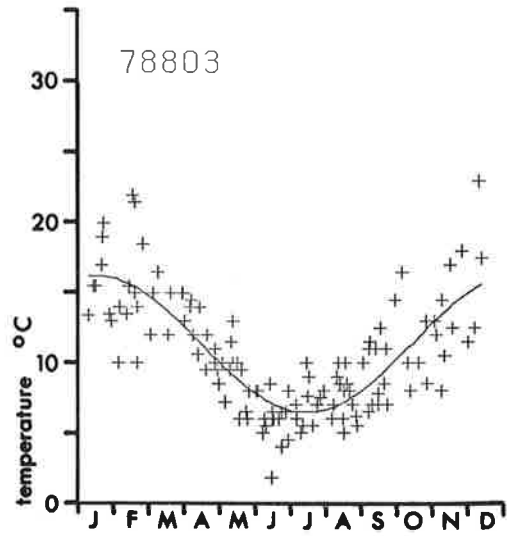
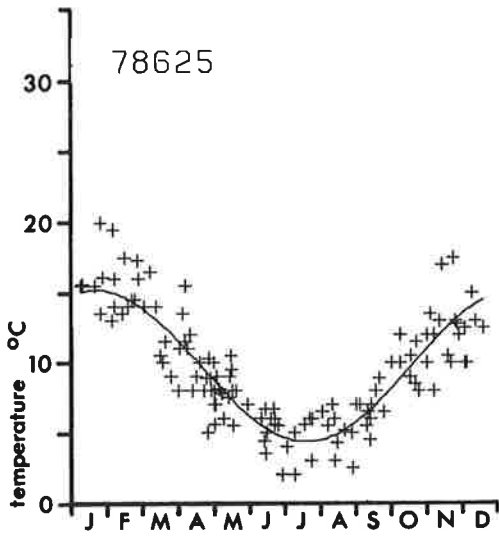


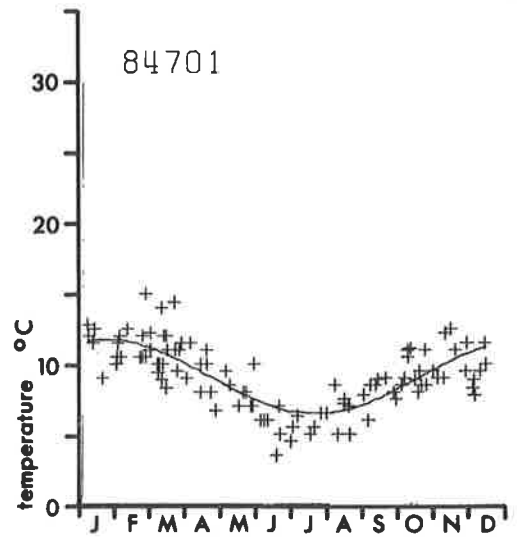
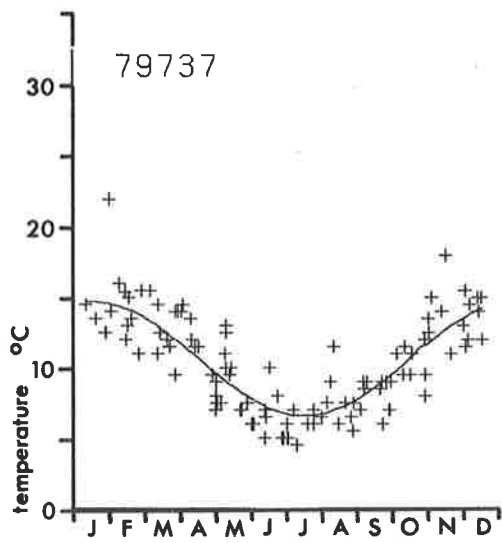
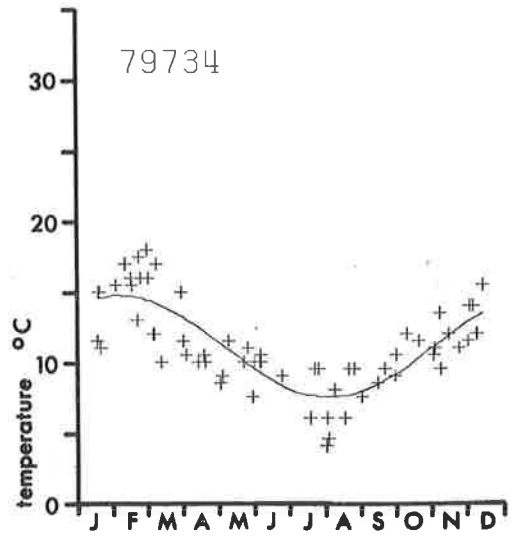
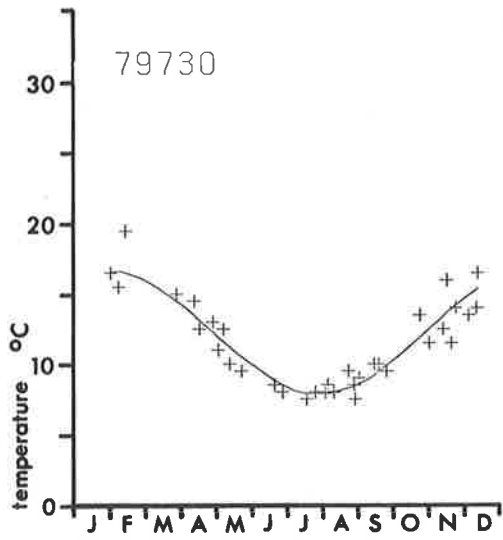












APPENDIX 2: Tabulation of Basic Temperature Data and Parameters of Best-fit Sine Curves

AUCKLAND MWD DISTRICT

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	Ø (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
1316	AWANUI, SCHOOL CUT N10.774686	222.0	6.28	12.18	35 7 0	25.0	10.4	17.0	5.8	1.36	1.3	26.	43.	610.	29
1909	PERIA, HONEYMOON VALLEY N10.999686	27.2	1.05	2.08	35 7 30	22.2	10.4	16.3	4.3	1.09	1.4	46.	82.	567.	30
3503 ^s	PUKETOTARA, BACKBLOCKS N11.395544	23.1	1.78	7.78	35 14 30	24.4	9.4	15.5	4.5	1.14	1.8	137.	244.	378.	47
3506	MAUNGAPARERUA, TYREES FORD N11.391555	11.1	0.49	1.74	35 14 0	26.0	10.3	17.1	5.4	1.19	1.4	158.	229.	311.	69
3819	WAIHARAKEKE, WILLOWBANK N15.529363	229.0	5.84	9.52	35 23 50	21.9	7.9	16.1	5.1	1.21	1.4	24.	52.	627.	42
4901	NGUNGURU, DUGMORES ROCK N20.942120	12.5	0.44	1.81	35 36 10	21.7	9.5	15.5	4.5	1.33	1.4	104.	137.	312.	38
7811	OTEHA, DAYS BRIDGE N38.213748	12.1			36 44 0	21.5	11.0	14.8	4.9	0.94	1.4	12.	24.	93.	32
43810	MAKETU, RIMU STAND N47.508255	9.6			37 8 30	24.8	7.3	16.3	5.7	1.45	2.0	70.	162.	267.	31
45702	WAIWHIU, DOME SHADOW N34.147209	8.0			36 21 10	24.0	9.0	15.5	5.5	1.23	1.4	128.	146.	386.	45
46618	MANGAKAHIA, GORGE N19.366077	246.0	10.23	20.47	35 37 30	26.5	8.7	16.8	5.9	1.18	1.6	58.	152.	722.	68
46651	MANGANUI, PERMANENT STATION N23.632676	411.0	9.02	15.57	35 57 50	25.5	10.1	16.9	5.6	1.41	1.7	15.	27.	415.	31
47527	OPAHI, POND N15.234344	10.6	0.30	1.28	35 24 30	26.0	8.8	16.1	5.9	1.16	1.9	187.	198.	326.	61
48015	MANGAMUKA, GORGE N10.008591	23.3			35 11 40	21.0	10.2	15.0	3.4	1.20	1.4	49.	128.	725.	41

HAMILTON MWD DISTRICT

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
9228	WAIORONGOMAI, OLD QUARRY N57.247746	7.9			37 33 40	20.5	5.3	13.9	4.6	0.99	2.3	61.	152.	952.	33
13901	MANGAWHAI, OMOKOROA N58.503608	2.9	0.07	0.14	37 40 30	23.3	10.1	16.7	4.1	1.11	1.7	15.	61.	184.	46
14601	KAITUNA, ROTOITI OUTLET N76.811186	632.0			38 1 10	23.9	9.0	15.5	5.7	1.03	1.4	274.	279.	817.	64
14603	WAITETI, TAURANGA DIRECT RD N76.679122	71.0	1.34	0.63	38 4 20	18.0	7.7	12.7	1.9	1.28	1.5	300.	457.	591.	66
14604	AWAHOU, TAURANGA DIRECT RD N76.685149	21.5	1.75	0.30	38 3 0	16.0	11.0	12.5	0.5	1.63	0.6	303.	442.	546.	86
14606	WAINGAHAE, SH30 N76.777059	9.6	0.25	0.07	38 7 30	20.7	11.4	15.8	1.7	1.46	1.6	303.	335.	686.	77
14607	WAIOHEWA, SH30 N76.791111	11.1	0.34	0.23	38 4 50	20.0	10.4	15.4	2.1	1.64	1.6	299.	396.	759.	66
14610	UTUHINA, SH5 N76.710052	59.6	2.15	1.06	38 7 50	18.8	1.0	13.4	2.4	1.40	1.9	299.	303.	757.	91
14614	KAITUNA, TE MATAI N67.832459	948.0	38.56	9.82	37 47 40	20.5	3.3	15.0	3.2	1.16	1.6	15.	259.	817.	132
14624	L. ROTORUA, MISSION BAY N76.788154	500.0			38 2 40	25.5	7.0	15.5	6.1	1.16	2.1	283.	299.	759.	167
14625	PUARENGA, FRI BR N76.732018	74.8	1.92	0.96	38 9 30	26.1	10.0	18.1	4.1	1.05	2.4	302.	328.	744.	57

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
14627	WAIARI, MUTTONS N67.799430	69.9	4.36	1.65	37 49 0	18.9	10.0	13.3	1.3	1.09	1.1	26.	244.	518.	90
14628	MANGOREWA, SAUNDERS FARM N67.816348	179.0	6.76	5.88	37 53 10	19.4	9.5	12.7	1.5	0.89	1.2	61.	325.	559.	106
1014641	NGONGOTOHA, SH5 N76.682109	73.3	1.82	1.15	38 5 0	20.6	7.3	12.8	3.1	1.27	1.4	283.	450.	648.	72
1014644	WAIOWHIRO, BONNINGTONS FARM N76.702078	4.4	0.37	0.17	38 3 60	16.4	10.5	13.3	1.2	1.09	1.2	293.	305.	757.	38
15302	TARAWERA, AWAKAPONGA N68.218278	906.0	33.53	7.78	37 56 20	21.7	6.7	16.1	3.2	1.05	1.6	6.	47.	1111.	165

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
15341	TARAWERA, LAKE OUTLET N77.966993	413.0	7.42	1.36	38 10 40	26.5	10.4	16.3	5.4	1.01	1.7	285.	305.	1111.	53
15350	MANGAKIND, COUNTY BR N86.936824	544.0	0.17	1.96	38 19 0	22.0	6.0	13.0	5.2	1.44	1.9	448.	457.	533.	40
15408	RANGITAIKI, MURUPARA N86.145648	1184.0	22.28	6.43	38 27 30	18.6	6.7	12.7	2.7	1.17	1.5	201.	597.	1091.	136
15410	WHIRINAKI, GALATEA N86.191623	534.0	14.97	12.20	38 28 40	22.2	2.2	12.5	4.3	1.10	2.2	184.	354.	1221.	142
15412	RANGITAIKI, TE TEKO N77.248155	2893.0	72.68	31.81	38 2 20	26.0	7.2	14.3	3.7	1.26	1.6	21.	218.	1221.	148
15432	RANGITAIKI, KOPURIKI N86.232822	2318.0	57.11	24.70	38 18 50	18.6	7.5	12.9	3.1	1.25	1.2	130.	283.	1221.	111
15511	WAIMANA, GORGE N78.478076	440.0	19.70	27.72	38 6 20	24.4	5.6	14.7	5.0	1.13	2.3	24.	229.	1341.	135
15514	WHAKATANE, WHAKATANE N78.436194	1557.0	56.58	78.58	38 0 30	24.0	5.6	14.3	4.6	0.98	2.2	12.	81.	1393.	111
15534	WAIRERE, WAINUI RD N69.446250	2.6	0.06	0.82	37 57 40	28.3	8.8	15.5	4.7	0.98	2.7	52.	110.	177.	80
15536	WAIMANA, OGILVIES BR N87.551818	207.0			38 19 0	24.2	5.6	13.8	5.4	1.17	2.4	122.	294.	1300.	124
40703	MANGAKOWHAI, KAINGAPIPI N83.563707	16.2	0.62	0.64	38 25 0	17.5	12.0	14.1	1.8	1.13	0.8	149.	203.	410.	27
43472	WAIOTAPU, REPOROA N85.801680	228.0	4.18	2.06	38 26 10	26.0	10.6	18.1	4.8	1.20	2.0	299.	346.	978.	93
1043428	TAHUNAATARA, DHAKURI RD N85.548802	210.0	4.97	3.13	38 20 20	20.5	5.8	13.0	4.3	1.41	1.6	270.	300.	884.	101
1043434	MANGAKARA, HIRSTS N85.771661	22.0	0.42	0.21	38 27 10	21.5	6.0	13.8	3.4	1.34	1.9	296.	396.	713.	136
1143444	WAIKATO, REIDS FM N94.554405	3305.0	137.40	75.90	38 39 50	20.8	10.3	14.8	4.1	0.91	1.2	349.	390.	2797.	46

NAPIER MWD DISTRICT

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
15901	WAIOEKA, GORGE N78.737923	640.0	11.18	35.51	38 13 20	25.0	5.0	14.2	5.7	1.24	2.5	67.	319.	1341.	116
16002	OTARA, BROWNS BR N78.791094	254.0			38 5 0	23.8	7.8	14.6	5.3	1.10	2.4	30.	88.	1006.	33
16501	MOTU, HOUPOTO N70.057358	1393.0	93.78	131.46	37 51 30	24.5	4.9	13.9	4.7	1.13	2.2	11.	157.	1463.	306
16502	MOTU, WAITANGIRUA N79.032946	295.0	13.80	22.27	38 12 20	24.0	5.0	13.6	5.9	1.25	2.0	425.	462.	1039.	96
17601	WHAREKAHIKA, HICKS BAY RD BR N62.688692	142.0			37 34 20	26.0	6.5	15.7	6.0	1.30	2.3	5.	43.	914.	86
17602	MANGATUTU, SH35 N62.666658	14.0	0.95	2.52	37 36 0	24.0	7.5	14.0	3.9	1.03	2.1	27.	213.	914.	170
17603	WAITAUKAKARI, SH 35 N62.659667	6.7			37 35 30	28.0	8.2	15.8	5.9	1.14	2.3	24.	259.	640.	72
89 17604	WAIMATE, SH35 N62.670651	3.3			37 36 20	22.0	7.5	13.2	4.1	1.15	1.8	30.	396.	792.	99
17606	OWEKA, SH35 N62.562670	39.6			37 35 30	28.0	7.0	17.4	6.5	1.32	2.3	59.	102.	869.	39
17702	NUKUTAHARUA, SH35 N62.688661	3.7			37 36 0	22.0	7.0	13.6	4.5	1.23	1.7	20.	305.	762.	70
17801	KARAKATUWHERO, SH 35 N63.737623	77.2			37 37 40	27.0	8.0	16.5	5.8	1.30	2.3	6.	61.	992.	102
17802	PARINUI, FOREST RD BR N62.683587	6.7			37 39 30	18.3	7.0	12.5	3.7	1.11	1.4	61.	457.	992.	33
17803	PUKEANARU, FOREST RD BR N62.667566	1.4			37 40 30	24.8	9.5	14.3	4.7	1.27	2.3	91.	457.	992.	30
17804	TAWAROA, FOREST RD FORD N62.637571	2.1			37 40 20	20.8	7.8	12.3	3.6	1.17	1.9	198.	457.	992.	22
17901	AWATERE, SH35 N63.748565	132.0			37 40 40	28.0	9.5	18.2	6.3	1.31	2.6	37.	172.	1414.	32

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMED)	QSD (CUMED)	LATITUDE (DMS)	TMAX (DEG)	THIN (DEG)	TBAR (DEG)	A (DEG)	Ø (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
17902	KOPUAPOUNAMU, COUNTY BR N62.657537	52.6			37 42 0	28.0	9.5	16.2	5.7	1.24	2.1	117.	232.	1414.	56
17904	TAURANGAKAUTUKU, TANGIHANGA N71.651495	24.0			37 44 10	24.7	7.5	15.1	5.2	1.11	2.2	157.	274.	1158.	105
18306	POROPORO, RANGITUKIA RD BR N72.820428	66.8			37 47 30	29.0	4.0	17.0	8.9	1.48	2.9	18.	59.	640.	26
18308	TAPUAERDA, PAKIHIROA RD BR N71.489356	120.0			37 51 0	24.0	5.5	14.8	5.3	1.32	2.5	192.	343.	1754.	36
18309	WAIAPU, ROTOKAUTUKU BR N71.689302	1378.0			37 53 40	31.0	9.0	16.1	6.2	1.18	2.4	58.	131.	1754.	131
18310	MATA, OWETEA N80.450078	286.0			38 5 20	25.0	4.0	14.8	7.8	1.46	2.6	308.	386.	1440.	37
18312	MARAEHARA, RANGITUKUA RD BR N72.860450	73.0			37 46 20	27.5	7.5	16.7	7.8	1.53	2.5	6.	52.	539.	27
18323	RAPARAPARIRIKI, TAPUAERDA RD N71.495363	33.8			37 50 40	24.0	7.3	14.2	5.3	1.38	2.1	195.	408.	500.	38
18325	MANGARAUOKOKORE, GATE RD BR N71.470360	28.6			37 50 40	21.5	9.0	15.0	4.9	1.33	1.4	219.	366.	1173.	30
18902	HIKUWAI, WILLOW FLAT N89.650818	307.0	8.85	31.77	38 17 30	29.5	5.5	15.1	7.2	1.37	2.6	18.	30.	675.	168
19602	WAIMATA, GOODWINS RD N98.445402	198.0			38 38 10	28.5	9.1	16.3	6.6	1.38	1.8	12.	47.	610.	59
19701	WAIPADA, KANAKANAIÁ BR N89.268623	1580.0	52.05	85.23	38 27 50	30.0	8.0	16.1	6.4	1.32	3.1	38.	76.	1213.	58
19702	WAIPADA, WAIPADA STN N88.245835	183.0			38 17 20	25.5	7.5	16.6	6.0	1.25	2.6	139.	216.	1081.	40
19708	WAIKOHU, MAHAKI N88.123668	144.0			38 25 30	26.1	10.0	15.4	5.1	1.28	3.1	67.	244.	1065.	35
19709	WHAREKOPAE, KILLARNEY N97.061529	181.0	3.89	8.40	38 32 20	27.5	5.6	15.4	6.5	1.33	2.8	90.	203.	995.	131

SITE NUMBER	GRID REFERENCE	AREA (SQ. KM)	TBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE RECORDED ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N	
19711	WAINGAROMIA, TERRACE N89.326746	175.0	7.25	17.15	38 21 50	27.5	4.3	15.6	7.2	1.39	2.6	88.	163.	998.	138
19712	MANGATU, OMAPERE N88.192724	155.0	6.61	9.81	38 22 40	29.3	3.5	15.4	6.6	1.35	2.9	104.	251.	1213.	219
19716	WAIPADA, KANAKANAIA C/W N89.273614	1582.0	40.85	69.74	38 28 20	33.0	4.5	16.5	7.6	1.35	2.9	34.	76.	1213.	256
19724	WAIKOHU, NO 2 BRIDGE N88.166633	274.0			38 27 20	28.0	6.0	15.4	8.1	1.31	2.4	55.	158.	1065.	62
19725	WAIKOHU, NO 3 BRIDGE N88.176633	597.0			38 27 20	28.0	4.5	14.9	7.5	1.27	2.4	53.	152.	1065.	124
19726	WAIKOHU, NO 4 BRIDGE N88.163636	116.0			38 27 20	24.5	5.8	15.4	7.6	1.38	1.7	58.	142.	925.	27
19728	TE ARAI, SITE 61 N97.212301	149.0			38 43 40	27.5	6.0	15.6	7.3	1.40	2.3	29.	79.	719.	85
19734	WAIKOHU, NO 1 BRIDGE N88.197130	26.4			38 25 10	20.3	5.0	11.6	4.7	1.42	1.8	457.	532.	1065.	89
19749	TE ARAI, REAYS BR N106.21329	98.5			38 44 0	25.8	6.8	15.7	8.0	1.40	1.9	32.	79.	719.	57
19765	MANGATU, WHATATUTU N88.221722	222.0			38 22 50	31.5	7.5	16.9	7.9	1.33	2.7	85.	218.	1213.	45
21401	WAIROA, MARUMARU N106.853108	1806.0			38 53 50	26.0	6.0	14.8	6.9	1.29	2.5	15.	216.	1393.	60
21409	WAIU, OTOI N105.480048	513.0	21.86	26.04	38 57 10	23.0	4.7	13.1	5.7	1.37	2.2	94.	171.	1369.	91
21410	WAIHI, WAIHI N105.564136	49.7	2.29	3.53	38 52 0	23.6	4.0	12.9	5.3	1.41	2.9	168.	453.	1181.	70
21601	TAHEKENUI, GLENSTRAE N115.661925	20.6	0.71	3.22	39 2 40	32.5	4.5	16.3	8.0	1.45	2.9	24.	70.	343.	109
21801	MOHAKA, RAUPUNGA N115.542895	2370.0	82.41	76.52	39 4 30	25.0	5.4	13.8	5.7	1.18	2.3	15.	236.	1714.	83
21803	MOHAKA, GLENFALLS N114.072775	997.0	35.24	36.01	39 10 50	22.2	2.0	12.1	5.7	1.18	2.1	311.	401.	1724.	134

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
22501	WAIKOAU, WAIKOAU RD N114.288728	72.5			39 12 50	24.6	5.0	13.3	6.5	1.37	2.4	96.	171.	393.	70
22502	SANDY CK, SH2 N114.317746	18.3	0.40	0.61	39 12 0	20.5	6.3	13.1	3.9	1.27	2.0	168.	198.	485.	52
23001	TUTAEKURI, PUKETAPU N134.211367	793.0	16.35	29.46	39 30 40	25.0	9.0	16.1	5.5	1.45	2.5	30.	145.	1724.	98
23102	NGARURORO, FERNHILL N134.185275	1930.0	45.47	69.10	39 35 20	25.1	6.0	15.0	6.0	1.17	2.1	27.	197.	1724.	181
23103	NGARURORO, WHANA WHANA N133.843320	1093.0	36.96	37.13	39 33 20	26.5	3.8	13.2	5.6	1.13	2.3	180.	427.	1724.	123
23104	NGARURORO, KURIPAPANGO N123.783533	370.0	17.18	17.37	39 22 50	22.0	3.3	11.5	5.6	1.25	2.2	494.	655.	1724.	171
23106	TARUARAU, TAIHAPE RD N123.679464	259.0	6.18	7.01	39 26 20	22.2	2.8	11.2	5.6	1.20	2.2	582.	779.	1585.	186
23201	TUKITUKI, RED BR N134.338119	2380.0	50.60	98.51	39 43 0	26.0	6.1	16.0	6.8	1.25	1.9	26.	136.	1722.	131
23203	TUKITUKI, WAIPUKURAU N146.988794	751.0			39 59 10	26.0	7.7	14.8	5.9	1.31	2.1	131.	265.	1686.	101
23209	OTANE, GLENDON N141.015921	24.3	0.18	0.61	39 53 0	21.1	5.0	14.4	6.7	1.34	1.7	134.	165.	399.	55
23211	WAIPAWA, WAIPAWA N141.014843	673.0	25.71	32.23	39 57 0	24.1	5.5	14.8	5.1	1.14	1.8	136.	261.	1722.	158
23219	WAIPAWA, FLETCHERS XING N140.753990	125.0	5.65	0.0	39 49 40	21.5	4.7	13.1	5.7	1.11	2.3	302.	518.	1722.	45
23221	MANGATEWAI, SH50 N145.776795	44.6	1.50	2.75	39 59 20	25.0	5.0	13.6	6.4	1.35	2.6	221.	323.	930.	51
23601	WAINGONGORO, WAIMARAMA RD N142.384006	22.5			39 48 10	17.8	10.0	13.8	2.1	1.10	1.3	24.	251.	477.	31
32541	MANGATERA, DANNEVIRKE N145.561510	77.8			40 13 30	22.0	5.0	13.5	6.8	1.28	2.1	163.	229.	739.	31

WANGANUI MWD DISTRICT

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
33302	WANGANUI, TE MAIRE N101.705067	2212.0	82.81	78.33	38 56 40	23.0	4.6	12.8	5.2	1.22	2.4	131.	355.	2751.	37
33307	WANGANUI, HEADWATERS N112.089990	81.3	2.87	2.84	39 0 30	20.0	5.6	11.3	3.9	1.36	2.1	718.	762.	1969.	56
33309	MANGANUI-O-TE-AO, ASHWORTH N121.723621	332.0	18.07	22.37	39 18 40	21.0	2.0	11.3	4.6	1.15	2.3	300.	373.	2797.	46
33312	RETARUKE, KAWAUTAHI N111.735911	256.0	8.46	15.16	39 4 20	19.0	6.7	12.3	4.8	1.24	1.8	163.	247.	884.	33
33313	OHURA, TOKORIMA N101.556097	668.0	23.57	32.94	38 55 50	27.0	7.0	14.8	6.7	1.44	2.3	134.	151.	600.	42
33316	ONGARUE, TARINGAMUTU N101.751165	1075.0	34.72	33.13	38 51 40	22.0	6.0	14.2	5.9	1.29	2.0	180.	215.	1050.	37
33320	WHAKAPAPA, FOOTBRIDGE N111.960859	184.0	11.76	16.51	39 7 0	12.5	4.6	9.3	2.5	1.10	1.1	663.	960.	2751.	41
33347	WANGANUI, TE PORERE N112.087944	28.2	1.28	1.06	39 2 50	13.5	7.0	9.6	1.9	1.33	1.1	664.	914.	1969.	45
33356	WANGANUI, PIRIAKA N101.852116	834.0	27.28	29.68	38 54 20	24.0	7.5	14.2	5.3	1.21	2.0	203.	552.	2751.	32
36001	PUNEHU, PIHAMA N128.507387	29.5	1.18	2.00	39 29 40	24.0	6.4	13.3	5.8	1.16	1.9	20.	315.	2519.	32
39504	MANGANUI, TARIKI RD N109.843727	80.0	6.49	11.08	39 13 0	20.0	5.3	12.9	5.4	1.15	2.2	215.	457.	2518.	41
39508	MANGANUI, SH3 N119.831649	11.3	1.47	2.93	39 16 50	17.0	5.0	10.5	4.1	1.12	2.1	331.	556.	2518.	41
39510	NGATORO, SH3 N109.786778	11.6	1.24	3.17	39 10 30	18.7	6.0	12.1	4.6	1.01	1.8	216.	416.	1606.	35
1043461	TONGARIRO, UPPER DAM N112.256728	174.0	11.59	13.10	39 13 20	20.5	4.0	9.8	4.5	1.21	1.7	846.	902.	1695.	56

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
1043464	POUTU, FOOTBRIDGE N122.253907	145.0	7.27	2.12	39 4 30	22.0	6.0	13.1	6.5	1.10	1.6	550.	602.	1856.	33
1043466	WAIHOHONU, DESERT RD N112.223735	88.0	5.92	2.40	39 13 0	14.5	4.0	8.2	1.8	1.30	1.1	914.	1219.	2682.	74
1443434	POUTU, DAM OUTLET N112.258903	146.0	3.31	4.54	39 4 30	23.0	3.5	11.4	5.3	1.04	3.0	549.	602.	1856.	30
32563	OROUA, KAWA WOOL N149.066488	570.0	11.29	14.33	40 14 40	26.0	6.5	15.3	6.9	1.17	2.8	62.	288.	671.	100
32576	POHANGINA, MAIS REACH N144.263511	471.0	22.20	32.82	40 13 30	24.6	4.0	14.1	6.3	1.32	2.7	82.	229.	1568.	122
32580	MANAWATU, RUAHINE ST N149.133348	3900.0	107.51	146.98	40 21 40	23.0	8.0	15.3	5.9	1.30	1.9	37.	137.	1568.	53
32590	KOPUTAROA, TAVISTOCK RD N152.849059	21.4			40 36 0	21.5	7.5	13.9	5.0	1.32	1.9	27.	50.	396.	32
1032516	KIWITEA, SPUR RD EXTENSION N144.105558	246.0	4.57	7.27	40 11 20	23.5	7.0	13.9	6.3	1.31	2.0	116.	312.	671.	45
32702	RANGITIKEI, MANGAWEKA N139.288015	2787.0	667.71	62.78	39 48 40	20.0	5.0	12.7	6.5	1.19	1.8	250.	539.	1727.	32
32708	RANGITIKEI, SPRINGVALE N123.507416	583.0	19.49	21.87	39 28 50	19.0	5.0	11.0	5.4	1.15	1.8	561.	753.	1727.	36
32726	HAUTAPU, TAIHAPE N132.286184	303.0	5.04	5.23	39 40 20	20.0	3.0	11.3	6.6	1.29	2.4	401.	710.	1148.	32
32732	MOAWHANGO, WAIOURU N122.236489	285.0	8.72	8.22	39 25 10	22.5	4.0	10.8	5.5	1.27	2.1	780.	960.	1559.	63
32733	MOAWHANGO, MOAWHANGO N132.339270	602.0	13.87	11.84	39 36 0	18.9	1.0	10.8	6.1	1.31	2.4	456.	782.	1559.	35
32734	MANGAIO, WAIOURU N122.219608	14.8	0.45	0.50	39 19 20	15.0	3.0	8.8	4.1	1.13	2.0	1070.	1143.	1460.	32

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
33107	WHANGAEHU, KARIKI N131.965389	492.0	16.87	6.14	39 30 10	18.9	5.0	10.5	4.4	1.23	1.9	568.	722.	2797.	42
33111	MANGAWHERO, ORE ORE N131.778308	506.0	13.56	17.30	39 34 10	21.6	5.0	13.1	6.4	1.27	1.8	239.	535.	2699.	32
33114	WAITANGI, TANGIWAI N122.071417	63.5	1.06	0.54	39 28 40	15.6	4.4	10.2	3.5	1.23	1.7	700.	725.	960.	34
33115	MANGAETOROA, SCHOOL N121.743459	33.2	0.86	1.27	39 26 40	18.0	3.0	10.5	4.2	1.26	1.8	460.	466.	730.	61
33116	WAHIANDA, KARIKI N122.135523	20.0	0.64	0.77	39 23 30	17.5	2.0	9.5	4.1	1.45	2.3	899.	1189.	2797.	64
33117	MAKOTUKU, SH49A N121.834547	20.8	0.87	1.52	39 22 20	20.0	4.0	10.7	5.2	1.36	2.3	610.	914.	1829.	54
33301	WANGANUI, PAETAWA N138.667055	6643.0	817.47	253.98	39 46 40	25.0	6.0	14.3	5.2	1.25	2.6	18.	102.	2797.	78

WELLINGTON MWD DISTRICT

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
29202	RUAMAHANGA, WAIHENG N161.944332	2340.0	80.39	106.59	41 12 0	24.4	5.6	14.0	5.4	1.00	1.9	17.	69.	1571.	74
29808	HUTT, KAITOKE N161.716507	88.8	7.81	12.35	41 3 20	18.2	1.0	10.5	4.5	1.03	1.7	186.	305.	1362.	36
29818	HUTT, BIRCHVILLE N161.624448	427.0	22.02	36.12	41 6 10	22.7	7.0	12.5	5.9	1.28	2.5	70.	183.	1361.	36
30516	MILL CK, PAPANUI N160.334350	9.4	0.17	0.42	41 10 50	25.6	6.7	14.8	7.4	1.33	2.3	116.	137.	468.	31
31803	OTAKI, TUAPAKA N157.719792	309.0	27.43	65.12	40 49 0	21.0	7.5	11.3	4.9	1.21	1.8	59.	142.	1530.	44
32526	MANGAHAD, BALLANCE N149.270254	266.0			40 26 10	24.8	7.0	14.1	6.8	1.21	2.8	90.	204.	1516.	68
75 32529	TIRAUMEA, NGATURI N149.392215	734.0			40 28 10	21.0	5.8	13.0	6.2	1.15	1.7	101.	139.	780.	55
32531	MANGATAINDKA, SUSP. BR. N149.327261	452.0	17.18	29.44	40 25 50	27.3	7.5	14.9	6.0	1.12	2.3	99.	194.	1279.	72
56901	RIWAKA S BR, MOSS.BUSH S13.307589	46.2	2.45	4.58	41 2 10	20.5	5.0	11.8	3.8	1.16	2.3	50.	244.	1330.	59
57008	MOTUEKA, GORGE S26.288863	163.0	6.82	12.18	41 38 0	18.3	1.7	9.5	5.3	1.14	2.0	376.	610.	1791.	70
57009	MOTUEKA, WOODSTOCK S13.212320	1750.0	55.29	79.78	41 15 30	23.6	5.4	13.4	7.3	1.18	2.1	70.	203.	1875.	32
57014	STANLEY BROOK, BARKERS S19.208248	81.6	1.58	9.79	41 19 0	22.6	7.0	13.7	5.3	1.18	1.8	107.	207.	582.	56
57101	MOUTERE, OLD HOUSE RD S14.377347	464.0	16.07	35.66	41 24 0	21.1	5.0	13.8	6.4	1.26	1.6	41.	203.	1791.	30
57502	WAIROA, GORGE S20.493149	17.6	0.57	1.69	49 9 40	24.5	3.2	12.8	6.4	1.17	2.7	30.	183.	860.	68
58301	COLLINS, DROP STRUCTURE S15.866428	68.7			41 35 50	20.0	4.2	12.3	5.1	1.33	2.5	82.	335.	963.	43

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	Ø (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
59003	KAITUNA, OKARAMIO S21.077124	16.1	0.66	3.09	41 24 10	14.8	7.0	12.1	2.4	0.98	1.1	61.	81.	1311.	52
60104	TAYLOR, WEIR S28.220888	3430.0	124.00	171.60	41 26 30	26.8	7.0	14.9	7.5	1.38	1.6	2.	305.	2298.	72
60108	WAIRAU, TUAMARINA S22.253077	550.0	20.47	32.11	41 42 40	18.6	5.8	12.4	5.0	1.16	1.4	381.	610.	2140.	122
60112	BRANCH, RECORDER S27.532773	60.7	0.58	2.35	41 14 10	27.7	2.0	10.0	6.2	1.29	2.8	41.	91.	367.	41
60114	WAIRAU, DIP FLAT S33.290547	3430.0	25.69	22.28	41 53 50	16.5	1.7	9.1	4.8	1.23	1.8	663.	815.	511.	54
60116	WAIRAU, HELLS GATE S40.265357	192.0	8.27	7.41	42 3 10	16.7	1.1	8.8	5.3	1.37	1.8	841.	1055.	2202.	42
93202	BULLER, LONGFORD S25.806711	1410.0	73.32	64.86	41 45 50	19.7	5.3	11.8	5.3	1.16	1.5	183.	430.	2339.	49
93209	HARUIA, FALLS S32.682596	980.0	61.39	61.45	41 51 50	20.3	3.3	10.9	5.5	1.17	2.0	152.	335.	2042.	78
93211	MATAKITAKI, MUD LK S32.741611	857.0	50.35	53.28	41 50 50	18.9	3.3	9.8	4.8	1.10	1.9	189.	376.	2301.	85
93212	MANGLES, GORGE S32.842647	284.0	8.36	11.83	41 49 10	23.9	0.4	11.7	5.8	1.37	2.7	239.	366.	1401.	88
93213	GOWAN, L ROTOROA S33.995673	368.0			41 47 50	20.0	5.0	12.4	5.1	0.99	1.4	431.	488.	2339.	76
93216	BULLER, L ROTOITI S33.201659	195.0	12.63	10.01	41 48 0	20.0	6.4	11.5	5.1	0.91	1.5	610.	664.	2339.	64
93217	GLENROY, BLICKS S39.753354	198.0	10.73	10.20	42 3 30	19.4	1.1	8.9	4.5	1.30	2.4	366.	549.	2126.	59

CHRISTCHURCH MWD DISTRICT

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
62103	ACHERON, CLARENCE S47.319961	997.0	25.80	44.98	42 22 30	22.0	0.0	10.1	7.7	1.21	2.5	698.	838.	2201.	113
62104	RIBBLE, AIRSTRIP S47.317930	20.0	0.76	1.00	42 24 0	22.0	0.3	10.3	6.3	1.29	2.5	713.	797.	1699.	106
62105	CLARENCE, JOLLIES S47.265862	440.0	13.83	14.55	42 27 30	20.6	0.0	9.5	6.3	1.20	2.4	750.	914.	2103.	139
64602	WAIAM, MARBLE PT S54.142642	1980.0	96.65	95.66	42 38 40	18.9	3.0	10.4	4.7	1.24	1.8	261.	541.	2301.	88
64606	WAIAM, MALINGS PASS S40.038154	74.6	6.35	0.73	42 13 20	13.0	3.9	8.2	3.2	1.03	1.2	803.	876.	2301.	64
64610	STANTON, CHEDDAR VALLEY S55.472647	41.6	0.63	0.21	42 38 0	26.8	0.3	12.9	7.9	1.37	2.5	111.	168.	354.	132
71 65104	HURUNUI, MANDAMUS S61.932462	1070.0	50.35	44.71	42 47 30	19.4	3.5	10.4	5.2	1.15	1.9	296.	366.	1987.	141
68001	SELWYN, WHITECLIFFS S74.349649	164.0	3.46	5.83	43 28 0	23.3	3.3	11.6	5.4	1.14	2.4	274.	390.	1494.	154
68503	HARPER, COLERIDGE S65.962948	329.0	11.05	7.18	43 13 10	19.0	3.5	10.5	5.7	1.32	1.9	527.	658.	2097.	75
68509	LAKE STN, ROUSES S73.722674	114.0	2.74	1.14	43 26 30	22.0	1.7	10.9	6.6	1.25	1.9	690.	777.	2720.	106
68511	WILBERFORCE, WOOLSHED HILL S73.913860	457.0	117.92	87.11	43 17 30	16.0	7.0	11.4	3.8	1.28	1.1	431.	587.	2400.	43
68513	WILBERFORCE, OAKDEN S73.937843	466.0	79.94	60.89	43 18 20	15.0	4.1	10.9	4.0	1.30	1.4	418.	573.	2400.	54
69506	ORARI, SILVERTON S91.730080	520.0	11.85	18.75	43 56 0	20.5	0.0	10.2	7.1	1.20	2.0	261.	518.	2003.	72
71102	OTEKAIEKE, STOCKBRIDGE S127.153912	78.7	1.10	1.61	44 53 30	24.3	0.0	10.5	7.3	1.32	2.5	297.	506.	1920.	118
71103	HAKATARAMEA, ABOVE MHB S118.125112	899.0	6.06	10.40	46 43 30	21.5	1.1	12.0	6.4	1.29	2.1	204.	591.	1864.	233

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	Ø (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
71106	MAEREWHENUA, KELLYS GULLY S127.214845	187.0	2.98	7.36	44 56 40	22.0	0.0	10.0	7.0	1.35	2.2	229.	488.	1478.	190
71116	AHURIRI, S DIADEM S108.458406	556.0	22.27	19.32	44 28 10	17.0	0.6	9.1	4.9	1.26	1.7	610.	738.	2499.	143
71119	OHAU, SHB S109.768639	1250.0	82.13	50.01	44 17 10	18.9	5.6	11.2	4.2	0.94	1.7	428.	530.	2682.	50
71122	MARYBURN, MT MCDONALD S100.939899	52.2	0.52	0.52	44 4 40	22.6	0.0	9.6	5.8	1.31	2.4	622.	762.	1158.	119
71125	HOOKER, BALL HUT RD S79.787304	103.0	16.59	25.64	43 44 20	15.3	0.0	2.9	2.4	1.97	2.0	677.	975.	3764.	67
71129	FORKS, BALMORAL S89.034021	98.0	3.06	2.53	43 58 40	18.9	0.4	9.3	4.5	1.24	2.3	797.	1021.	2408.	170
71135	JOLLIE, MT COOK STN S89.841164	139.0	14.31	35.74	43 51 20	18.3	0.1	8.7	3.2	1.41	1.7	579.	808.	2621.	191
71167	OTEKAIIEKE, GORGE S127.154912	78.7	1.48	3.10	44 53 30	26.2	0.0	10.5	6.8	1.28	3.3	297.	506.	1920.	83
86802	HAAST, ROARING BILLY S87.066042	1020.0	192.15	269.80	43 56 50	14.0	5.0	9.1	3.0	1.09	1.5	53.	166.	2644.	61
90604	HOKITIKA, COLLIERS CK S57.549228	352.0	119.80	171.43	42 59 20	14.0	5.0	9.1	2.0	1.07	1.6	88.	335.	2492.	80
90605	BUTCHERS CK, L KANIERE RD S58.630487	4.0	0.35	1.05	42 36 40	20.5	2.5	11.1	4.7	1.18	2.1	98.	122.	610.	110
91101	TARAMAKAU, GORGE S51.763629	850.0	112.75	110.89	42 39 30	16.6	5.5	11.1	3.6	1.28	1.3	27.	172.	2271.	47
91102	TARAMAKAU, JACKSONS S51.999525	474.0			42 44 40	13.6	6.0	10.3	2.2	1.44	1.0	162.	287.	2271.	36
91103	TAIPO, SHB S51.914509	181.0	33.98	34.10	42 45 30	14.0	4.5	9.5	2.5	1.29	1.5	149.	358.	2195.	69
91404	GREY, WAIPUNA S45.258999	642.0	49.18	62.91	42 21 20	20.0	4.5	10.4	4.4	1.09	2.0	171.	302.	1806.	93

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
91405	ARNOLD, L BRUNNER S51.973727	440.0	56.42	31.43	42 34 40	20.0	8.0	13.4	4.3	1.01	1.4	84.	120.	1958.	40
91407	AHAURA, GORGE S45.207904	790.0	87.82	94.62	42 26 0	17.5	6.0	10.7	3.6	1.09	1.4	111.	201.	1745.	41
93203	BULLER, TE KUHA S31.181629	6350.0	416.12	466.75	41 50 10	20.0	4.7	11.7	4.8	1.17	2.1	15.	175.	2339.	80
93206	INANGAHUA, LANDING S31.357535	1000.0	72.98	121.44	41 54 40	22.0	4.0	11.9	5.1	1.18	2.1	67.	244.	1590.	107
93207	INANGAHUA, BLACKS PT S38.342278	234.0	15.24	27.27	42 7 20	22.2	1.1	11.0	5.3	1.21	2.5	200.	314.	1590.	128
93208	BULLER, WOOLFS S31.445627	4560.0	246.51	243.06	41 50 10	21.0	4.5	12.1	6.0	1.22	1.7	49.	235.	2339.	78
93601	WAIMANGAROA, CONNS FLAT S24.250766	45.8	6.87	13.46	41 16 10	16.8	5.3	11.3	3.7	1.49	1.4	30.	396.	1106.	30
93602	WAIMANGAROA, SMOKESTACK S24.305733	19.6	3.67	12.42	41 45 0	17.8	2.8	9.9	4.6	1.34	1.9	335.	567.	1105.	43
94302	MOKIHINUI, BURKES CK S25.465962	685.0	80.78	107.13	41 33 40	18.5	5.6	11.4	4.4	1.20	1.6	29.	317.	1547.	74
95101	KARAMEA, ARAPITO S12.614318	1200.0	107.38	148.12	41 16 10	22.4	5.2	12.0	5.8	1.10	2.2	14.	201.	1826.	67

DUNEDIN MWD DISTRICT

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	θ (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
71702	KAKANUI, CLIFTON FALLS S136.353748	223.0	3.81	12.84	45 1 40	21.9	0.6	10.7	7.3	1.33	2.6	90.	293.	1643.	135
72004	WAIARAKARUA, D/S CONFLUENCE S146.430465	155.0	4.15	16.43	44 40 30	20.0	1.5	11.3	6.7	1.27	2.0	9.	230.	2537.	79
74311	TAIERI, TIRIITI S145.946463	2468.0	15.04	17.56	45 15 40	25.5	1.5	10.5	8.0	1.36	2.4	338.	543.	1637.	103
74313	TAIERI, WAIFIATA S135.843534	1865.0	10.63	11.56	45 11 40	24.4	0.0	10.5	8.3	1.35	2.4	349.	594.	1554.	98
74314	TAIERI, PAT-PAERAU S145.675374	738.0	8.24	8.34	45 19 40	24.0	0.0	9.5	7.5	1.32	2.4	393.	792.	1449.	218
74315	TAIERI, MCATAMNEYS S145.679277	666.0	8.29	15.79	45 24 30	19.5	0.8	8.9	7.8	1.10	2.6	546.	578.	1372.	34
74337	KYEBURN, MHB S135.935593	376.0	3.04	6.02	45 8 50	25.0	0.5	10.3	6.9	1.22	2.7	384.	492.	1637.	220
1074345	STYX CK, PAERAU S145.668258	39.3			45 25 20	18.3	0.0	7.9	6.2	1.32	2.1	571.	991.	1381.	157
74346	LOGANBURN, PAERAU S144.624217	150.0	1.66	2.66	45 27 20	21.0	0.0	8.4	6.9	1.32	2.4	578.	823.	1311.	214
74351	DEEP STM, TOTARA ROCK S153.632951	105.0	2.66	4.11	45 40 30	18.5	0.5	7.9	6.0	1.23	2.6	436.	792.	1158.	44
74352	DEEP STM, ROCKLANDS S154.671950	190.0	4.02	5.63	45 40 30	22.0	0.0	8.6	7.4	1.17	2.9	387.	823.	1158.	68
75207	CLUTHA, BALCLUTHA S179.522263,20306.0	20306.0	540.01	267.13	46 14 40	17.1	5.5	11.6	4.5	1.03	1.2	9.	155.	2819.	43
75213	CLUTHA, CLYDE S133.130517,12018.0	12018.0	484.33	188.18	45 12 10	16.7	6.5	11.2	3.8	0.87	1.0	139.	267.	2819.	97
75214	CLUTHA, LOWBURN S133.035744	6211.0	284.58	111.30	45 0 50	19.0	7.0	12.0	4.0	0.85	1.1	174.	279.	2691.	82
75219	LINDIS, LINDIS PK S125.273080	542.0	6.57	12.97	44 44 20	15.4	0.7	8.9	5.2	1.23	2.0	370.	518.	1890.	65

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	0 (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
1075229	POMAHAKA, HUKARERE S161.984846	361.0			45 45 10	23.9	0.0	9.1	6.9	1.23	3.3	244.	506.	506.	71
75232	POMAHAKA, BURKES FORD S171.224472	1924.0	26.45	41.18	46 3 40	19.4	1.1	9.5	5.9	1.22	2.6	52.	215.	1463.	123
75251	MANUHERIKIA, D/S FORKS S125.619060	174.0	3.45	2.90	44 45 40	22.3	3.5	10.5	6.0	1.04	2.2	701.	914.	2134.	37
75253	MANUHERIKIA, OPHIR S134.357629	2036.0	15.46	16.87	45 6 40	22.2	1.1	10.4	6.7	1.29	2.5	288.	440.	2134.	125
75255	DOVEDALE CK, WILLOWS S134.479527	39.0	0.14	0.42	45 12 10	26.0	2.6	10.6	7.7	1.39	3.2	457.	762.	1003.	30
75257	DUNSTAN CK, GORGE S125.503997	157.0	2.71	2.34	44 48 50	18.5	1.7	8.4	5.2	1.18	2.1	625.	751.	2134.	47
75259	FRASER, OLD MAN RA S143.031485	122.0	4.92	34.52	45 13 40	20.0	0.0	7.3	6.0	1.10	2.4	561.	1189.	1707.	195
75264	NEVIS, CLEGROY S133.847530	451.0			45 10 40	21.6	0.0	7.8	8.0	1.18	3.3	654.	1158.	2225.	43
75265	NEVIS, WENTWORTH STN S133.872671	689.0	15.72	19.27	45 3 50	17.2	0.0	8.1	6.1	1.28	2.1	267.	655.	2225.	38
75273	ARROW, TOBINS TRACK S123.705817	199.0	2.41	3.54	44 56 30	18.3	1.3	9.0	6.1	1.04	2.5	384.	661.	2042.	39
75275	SHOTOVER, 16 MILE S114.535143	112.0			44 39 40	14.7	0.3	7.1	4.4	1.15	2.1	549.	949.	2518.	39
75276	SHOTOVER, BOWENS PK S132.589786	1088.0	37.46	36.63	44 59 40	16.2	0.3	7.8	4.8	1.14	2.2	335.	480.	2518.	103
75287	HAWEA, CAMPHILL BR S115.045180	1428.0	66.08	77.36	44 39 20	17.2	8.3	12.0	3.6	0.80	0.9	311.	354.	2518.	45
77504	MATAURA, GORE HWY BR S170.843413	3465.0	82.49	95.67	46 5 50	21.1	1.6	10.8	5.6	1.38	1.9	70.	209.	2035.	75
77505	MATAURA, PARAWA S151.491058	766.0			45 33 10	14.8	4.5	9.5	3.0	1.13	1.3	264.	396.	2035.	74
77523	WAIKAKA, WILLOWBANK BR S170.915494	288.0	3.42	9.55	46 1 50	22.2	3.0	11.7	7.1	1.33	2.1	91.	171.	1036.	43

SITE NUMBER	GRID REFERENCE	AREA (SQ KM)	QBAR (CUMEC)	QSD (CUMEC)	LATITUDE (DMS)	TMAX (DEG)	TMIN (DEG)	TBAR (DEG)	A (DEG)	Ø (RAD)	SE (DEG)	RECORDER ELEV (M)	MEAN ELEV (M)	MAXIMUM ELEV (M)	N
77525	WAIMEA, MANDEVILLE BR S169.713544	671.0	3.26	8.09	45 59 30	23.3	3.5	12.3	7.4	1.44	2.6	102.	130.	668.	37
77526	WYNDHAM STM, GLENHAM BR S178.768103	370.0	8.69	13.77	46 21 10	27.5	4.5	11.5	6.3	1.30	2.2	26.	62.	718.	51
78503	WAIHOPAI, KENNINGTON S177.431045	152.0	1.96	3.48	46 23 10	20.0	3.9	11.3	5.2	1.33	2.3	14.	40.	91.	163
78504	WAIHOPAI, ABOVE SCOUR S177.441043	157.0	2.02	3.05	46 23 10	25.0	3.0	11.8	5.5	1.39	2.2	15.	43.	91.	67
78602	ORETI, MCKELLARS FLAT S141.178329	138.0	5.62	9.99	45 20 0	14.6	4.6	8.9	2.8	1.13	1.8	594.	661.	2035.	35
78625	OTAPIRI, MCBRIDES BR S169.422516	108.0	2.56	5.30	46 0 0	20.0	2.0	9.8	5.4	1.24	1.9	149.	250.	753.	129
78803	MIDDLE CK, OTAHUTI S176.192268	27.4	0.38	0.53	46 12 10	23.0	1.8	11.3	4.9	1.31	2.4	43.	58.	91.	123
78910	HAMILTONBURN, MATUKU BR S159.181847	188.0	3.77	8.34	45 43 40	21.0	0.7	11.2	6.7	1.37	2.3	277.	352.	1494.	66
79701	WAIAM, TUATAPERE S167.776332	8134.0			46 8 0	20.0	4.5	11.6	4.8	1.10	1.6	14.	183.	2292.	104
79703	WAIAM, L MANAPOURI S149.677012	4483.0	366.33	163.36	45 34 40	16.5	6.5	11.3	3.3	0.90	1.0	171.	213.	2292.	42
79704	WAIAM, L TE ANAU S149.763193	3124.0	239.94	141.34	45 25 40	18.0	8.3	12.1	3.1	0.74	1.3	213.	213.	2292.	62
79730	WAIAM, MONOWAI S158.698762	660.0	494.00	186.26	45 47 0	19.5	7.5	12.3	4.4	1.07	1.1	134.	213.	2292.	36
79734	WAIAM, EXCELSIOR CK S149.748945	5798.0	59.32	126.13	45 37 50	18.0	4.0	11.1	3.6	0.99	1.8	158.	213.	2292.	81
79737	MARAROA, AT CLIFFS S149.759968	1219.0	33.96	39.78	45 36 40	22.0	4.5	10.6	4.1	1.29	1.9	183.	440.	2097.	116
84701	CLEDDAU, MILFORD S113.908108	155.0	31.02	71.50	44 41 30	15.0	3.5	9.1	2.6	1.23	1.5	9.	230.	2537.	114

APPENDIX 3: Tabulation of Catchment Parameters

AUCKLAND MWD DISTRICT

SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)	SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)
						1014641	283.	450.	648.	1.82	1.15
1316	26.	43.	610.	6.28	12.18	1014644	293.	305.	757.	0.37	0.17
1909	46.	82.	567.	1.05	2.08	15302	6.	47.	1111.	33.53	7.78
3503	137.	244.	378.	1.78	7.78	15341	285.	305.	1111.	7.42	1.36
3506	158.	229.	311.	0.49	1.74	15350	448.	457.	533.	0.17	1.96
3819	24.	52.	627.	5.84	9.52	15408	201.	597.	1091.	22.28	6.43
4901	104.	137.	312.	0.44	1.81	15410	184.	354.	1221.	14.97	12.20
7811	12.	24.	93.	0.0	0.0	15412	21.	218.	1221.	72.68	31.81
43810	70.	162.	267.	0.0	0.0	15432	130.	283.	1221.	57.11	24.70
45702	128.	146.	386.	0.0	0.0	15511	24.	229.	1341.	19.70	27.72
46618	58.	152.	722.	10.23	20.47	15514	12.	81.	1393.	56.58	78.58
46651	15.	27.	415.	9.02	15.57	15534	52.	110.	177.	0.06	0.82
47527	187.	198.	326.	0.30	1.28	15536	122.	294.	1300.	0.0	0.0
48015	49.	128.	725.	0.0	0.0	40703	149.	203.	410.	0.62	0.64

HAMILTON MWD DISTRICT

9228	61.	152.	952.	0.0	0.0	43472	299.	346.	978.	4.18	2.06
13901	15.	61.	184.	0.07	0.14	1043428	270.	300.	884.	4.97	3.13
14601	274.	279.	817.	0.0	0.0	1043434	296.	396.	713.	0.42	0.21
14603	300.	457.	591.	1.34	0.63	1143444	349.	390.	2797.	137.40	75.90

NAPIER MWD DISTRICT

14604	303.	442.	546.	1.75	0.30	15901	67.	319.	1341.	11.18	35.51
14606	303.	335.	686.	0.25	0.07	16002	30.	88.	1006.	0.0	0.0
14607	299.	396.	759.	0.34	0.23	16501	11.	157.	1463.	93.78	131.46
14610	299.	303.	757.	2.15	1.06	16502	425.	462.	1039.	13.80	22.27
14614	15.	259.	817.	38.56	9.82	17601	5.	43.	914.	0.0	0.0
14624	283.	299.	759.	0.0	0.0	17602	27.	213.	914.	0.95	2.52
14625	302.	328.	744.	1.92	0.96	17603	24.	259.	640.	0.0	0.0
14627	26.	244.	518.	4.36	1.65	17604	30.	396.	792.	0.0	0.0
14628	61.	325.	559.	6.76	5.88						

SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)	SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)
17606	59.	102.	869.	0.0	0.0	19734	457.	532.	1065.	0.0	0.0
17702	20.	305.	762.	0.0	0.0	19749	32.	79.	719.	0.0	0.0
17801	6.	61.	992.	0.0	0.0	19765	85.	218.	1213.	0.0	0.0
17802	61.	457.	992.	0.0	0.0	21401	15.	216.	1393.	0.0	0.0
17803	91.	457.	992.	0.0	0.0	21409	94.	171.	1369.	21.86	26.04
17804	198.	457.	992.	0.0	0.0	21410	168.	453.	1181.	2.29	3.53
17901	37.	172.	1414.	0.0	0.0	21601	24.	70.	343.	0.71	3.22
17902	117.	232.	1414.	0.0	0.0	21801	15.	236.	1714.	82.41	76.52
17904	157.	274.	1158.	0.0	0.0	21803	311.	401.	1724.	35.24	36.01
18306	18.	59.	640.	0.0	0.0	22501	96.	171.	393.	0.0	0.0
18308	192.	343.	1754.	0.0	0.0	22502	168.	198.	485.	0.40	0.61
18309	58.	131.	1754.	0.0	0.0	23001	30.	145.	1724.	16.35	29.46
18310	308.	386.	1440.	0.0	0.0	23102	27.	197.	1724.	45.47	69.10
18312	6.	52.	539.	0.0	0.0	23103	180.	427.	1724.	36.96	37.13
18323	195.	408.	500.	0.0	0.0	23104	494.	655.	1724.	17.18	17.37
18325	219.	366.	1173.	0.0	0.0	23106	582.	779.	1585.	6.18	7.01
18902	18.	30.	675.	8.85	31.77	23201	26.	134.	1722.	50.60	98.51
19602	12.	47.	610.	0.0	0.0	23203	131.	265.	1686.	0.0	0.0
19701	38.	76.	1213.	52.05	85.23	23209	134.	165.	399.	0.18	0.61
19702	139.	216.	1081.	0.0	0.0	23211	136.	261.	1722.	25.71	32.23
19708	67.	244.	1065.	0.0	0.0	23219	302.	518.	1722.	5.65	0.0
19709	90.	203.	995.	3.89	8.40	23221	221.	323.	930.	1.50	2.75
19711	88.	163.	998.	7.25	17.15	3601	24.	251.	477.	0.0	0.0
19712	104.	251.	1213.	6.61	9.81	WANGANUI MWD DISTRICT					
19716	34.	76.	1213.	40.85	69.74	32541	163.	229.	739.	0.0	0.0
19724	55.	158.	1065.	0.0	0.0	32563	62.	288.	671.	11.29	14.33
19725	53.	152.	1065.	0.0	0.0	32576	82.	229.	1568.	22.20	32.82
19726	58.	142.	925.	0.0	0.0	32580	37.	137.	1568.	107.51	146.98
19728	29.	79.	719.	0.0	0.0	32590	27.	50.	396.	0.0	0.0

SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)	SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)
1032516	116.	312.	671.	4.57	7.27	1043466	914.	1219.	2682.	5.92	2.40
32702	250.	539.	1727.	667.71	62.78	1443434	549.	602.	1856.	3.31	4.54
32708	561.	753.	1727.	19.49	21.87	WELLINGTON MWD DISTRICT					
32726	401.	710.	1148.	5.04	5.23	29202	17.	69.	1571.	80.39	106.59
32732	780.	960.	1559.	8.72	8.22	29808	186.	305.	1362.	7.81	12.35
32733	456.	782.	1559.	13.87	11.84	29818	70.	183.	1361.	22.02	36.12
32734	1070.	1143.	1460.	0.45	0.50	30516	116.	137.	468.	0.17	0.42
33107	568.	722.	2797.	16.87	6.14	31803	59.	142.	1530.	27.43	65.12
33111	239.	535.	2699.	13.56	17.30	32526	90.	204.	1516.	0.0	0.0
33114	700.	725.	960.	1.06	0.54	32529	101.	139.	780.	0.0	0.0
33115	460.	466.	730.	0.86	1.27	32531	99.	194.	1279.	17.18	29.44
33116	899.	1189.	2797.	0.64	0.77	56901	50.	244.	1330.	2.45	4.58
33117	610.	914.	1829.	0.87	1.52	57008	376.	610.	1791.	6.82	12.18
33301	18.	102.	2797.	817.47	253.98	57009	70.	203.	1875.	55.29	79.78
33302	131.	355.	2751.	82.81	78.33	57014	107.	207.	582.	1.58	9.79
33307	718.	762.	1969.	2.87	2.84	57101	41.	203.	1791.	16.07	35.66
33309	300.	373.	2797.	18.07	22.37	57502	30.	183.	860.	0.57	1.69
33312	163.	247.	884.	8.46	15.16	58301	82.	335.	963.	0.0	0.0
33313	134.	151.	600.	23.57	32.94	59003	61.	81.	1311.	0.66	3.09
33316	180.	215.	1050.	34.72	33.13	60104	2.	305.	2298.	124.00	171.60
33320	663.	960.	2751.	11.76	16.51	60108	381.	610.	2140.	20.47	32.11
33347	664.	914.	1969.	1.28	1.06	60112	41.	91.	367.	0.58	2.35
33356	203.	552.	2751.	27.28	29.68	60114	663.	815.	511.	25.69	22.28
36001	20.	315.	2519.	1.18	2.00	60116	841.	1055.	2202.	8.27	7.41
39504	215.	457.	2518.	6.49	11.08	93202	183.	430.	2339.	73.32	64.86
39508	331.	556.	2518.	1.47	2.93	93209	152.	335.	2042.	61.39	61.45
39510	216.	416.	1606.	1.24	3.17	93211	189.	376.	2301.	50.35	53.28
1043461	846.	902.	1695.	11.59	13.10	93212	239.	366.	1401.	8.36	11.83
1043464	550.	602.	1856.	7.27	2.12	93213	431.	488.	2339.	0.0	0.0

SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)
93216	610.	664.	2339.	12.63	10.01
93217	366.	549.	2126.	10.73	10.20

SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)
91101	27.	172.	2271.	112.75	110.89
91102	162.	287.	2271.	0.0	0.0

CHRISTCHURCH MWD DISTRICT

62103	698.	838.	2201.	25.80	44.98
62104	713.	797.	1699.	0.76	1.00
62105	750.	914.	2103.	13.83	14.55
64602	261.	541.	2301.	96.65	95.66
64606	803.	876.	2301.	6.35	0.73
64610	111.	168.	354.	0.63	0.21
65104	296.	366.	1987.	50.35	44.71
68001	274.	390.	1494.	3.46	5.83
68503	527.	658.	2097.	11.05	7.18
68509	690.	777.	2720.	2.74	1.14
68511	431.	587.	2400.	117.92	87.11
68513	418.	573.	2400.	79.94	60.89
69506	261.	518.	2003.	11.85	18.75
71102	297.	506.	1920.	1.10	1.61
71103	204.	591.	1864.	6.06	10.40
71106	229.	488.	1478.	2.98	7.36
71116	610.	738.	2499.	22.27	19.32
71119	428.	530.	2682.	82.13	50.01
71122	622.	762.	1158.	0.52	0.52
71125	677.	975.	3764.	16.59	25.64
71129	797.	1021.	2408.	3.06	2.53
71135	579.	808.	2621.	14.31	35.74
71167	297.	506.	1920.	1.48	3.10
86802	53.	164.	2644.	192.15	269.80
90604	88.	335.	2492.	119.80	171.43
90605	98.	122.	610.	0.35	1.05

91103	149.	358.	2195.	33.98	34.10
91404	171.	302.	1806.	49.18	62.91
91405	84.	120.	1958.	56.42	31.43
91407	111.	201.	1745.	87.82	94.62
93203	15.	175.	2339.	416.12	466.75
93206	67.	244.	1590.	72.98	121.44
93207	200.	314.	1590.	15.24	27.27
93208	49.	235.	2339.	246.51	243.06
93601	30.	396.	1106.	6.87	13.46
93602	335.	567.	1105.	3.67	12.42
94302	29.	317.	1547.	80.78	107.13
95101	14.	201.	1826.	107.38	148.12

DUNEDIN MWD DISTRICT

71702	90.	293.	1643.	3.81	12.84
72004	9.	230.	2537.	4.15	16.43
74311	338.	543.	1637.	15.04	17.56
74313	349.	594.	1554.	10.63	11.56
74314	393.	792.	1449.	8.24	8.34
74315	546.	578.	1372.	8.29	15.79
74337	384.	492.	1637.	3.04	6.02
1074345	571.	991.	1381.	0.0	0.0
74346	578.	823.	1311.	1.66	2.66
74351	436.	792.	1158.	2.66	4.11
74352	387.	823.	1158.	4.02	5.63
75207	9.	155.	2819.	540.01	267.13
75213	139.	267.	2819.	484.33	188.18
75214	174.	279.	2691.	284.58	111.30

SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)	SITE NUMBER	RECORDER HT (M)	MEAN HT (M)	MAXIMUM HT (M)	QBAR (CUMEC)	QSD (CUMEC)
75219	370.	518.	1890.	6.57	12.97	77523	91.	171.	1036.	3.42	9.55
1075229	244.	506.	506.	0.0	0.0	77525	102.	130.	668.	3.26	8.09
75232	52.	215.	1463.	26.45	41.18	77526	26.	62.	718.	8.69	13.77
75251	701.	914.	2134.	3.45	2.90	78503	14.	40.	91.	1.96	3.48
75253	288.	440.	2134.	15.46	16.87	78504	15.	43.	91.	2.02	3.05
75255	457.	762.	1003.	0.14	0.42	78602	594.	661.	2035.	5.62	9.99
75257	625.	751.	2134.	2.71	2.34	78625	149.	250.	753.	2.56	5.30
75259	561.	1189.	1707.	4.92	34.52	78803	43.	58.	91.	0.38	0.53
75264	654.	1158.	2225.	0.0	0.0	78910	277.	352.	1494.	3.77	8.34
75265	267.	655.	2225.	15.72	19.27	79701	14.	183.	2292.	0.0	0.0
75273	384.	661.	2042.	2.41	3.54	79703	171.	213.	2292.	366.33	163.36
75275	549.	949.	2518.	0.0	0.0	79704	213.	213.	2292.	239.94	141.34
75276	335.	480.	2518.	37.46	36.63	79730	134.	213.	2292.	494.00	186.26
75287	311.	354.	2518.	66.08	77.36	79734	158.	213.	2292.	59.32	126.13
77504	70.	209.	2035.	82.49	95.67	79737	183.	440.	2097.	33.96	39.78
77505	264.	396.	2035.	0.0	0.0	84701	9.	230.	2537.	31.02	71.50

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