THE VARIATION OF GROUND SNOW LOADS WITH ELEVATION IN SOUTHERN BRITISH COLUMBIA

by

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Abstract

Measurements conducted at 20 locations in Southern British Columbia were used to investigate the relationship between maximum water equivalent (ground snow load) and elevation. It was found that the relative increase of water equivalent with elevation (ie. the slope of the water equivalent plotted against elevation) could be defined very well for larger regions with similar climatic conditions. For a given mountain, ground snow loads could therefore be predicted by extrapolating from water equivalent values at one elevation to another elevation.

Plots of the absolute values of water equivalents against elevation for regions of similar climatic conditions could give only approximate values of ground snow loads for any particular site. Plots of the mean water equivalent and of the 30 year maximum water equivalent plotted against elevation for the measurement locations and for the regions of similar snow conditions are presented.

The density of snow at the time of maximum water equivalent was briefly investigated. No correlation of density with elevation was found.

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Acknowledgements

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Chapter 1.

Introduction and survey of other work

1.1 Introduction

Ground snow loads in Canada are based on observations of snow depths on the ground taken at more than 200 stations across the country for periods ranging from 10 to 18 years. Since most of the observations have been taken near populated areas, few records are available in remoter parts of the country, particularly in the mountain regions of British Columbia. Where measurements do exist in the mountain regions, they are usually at valley stations resulting in little information on how the snow load changes with elevation.

In 1965 the National Research Council initiated a programme of measuring the annual snow water equivalents at different elevations for several mountains in Southern British Columbia. (see Figure 1.1) The goal of this thesis is to use these measurements to examine and quantify the relationship between annual maximum water equivalent (ground snow load) with elevation in Southern B. C. It is desired to be able to predict approximate values of the maximum ground snow loads at a given elevation when few or no measurements are available at the site concerned.

Several statistical parameters were calculated at each

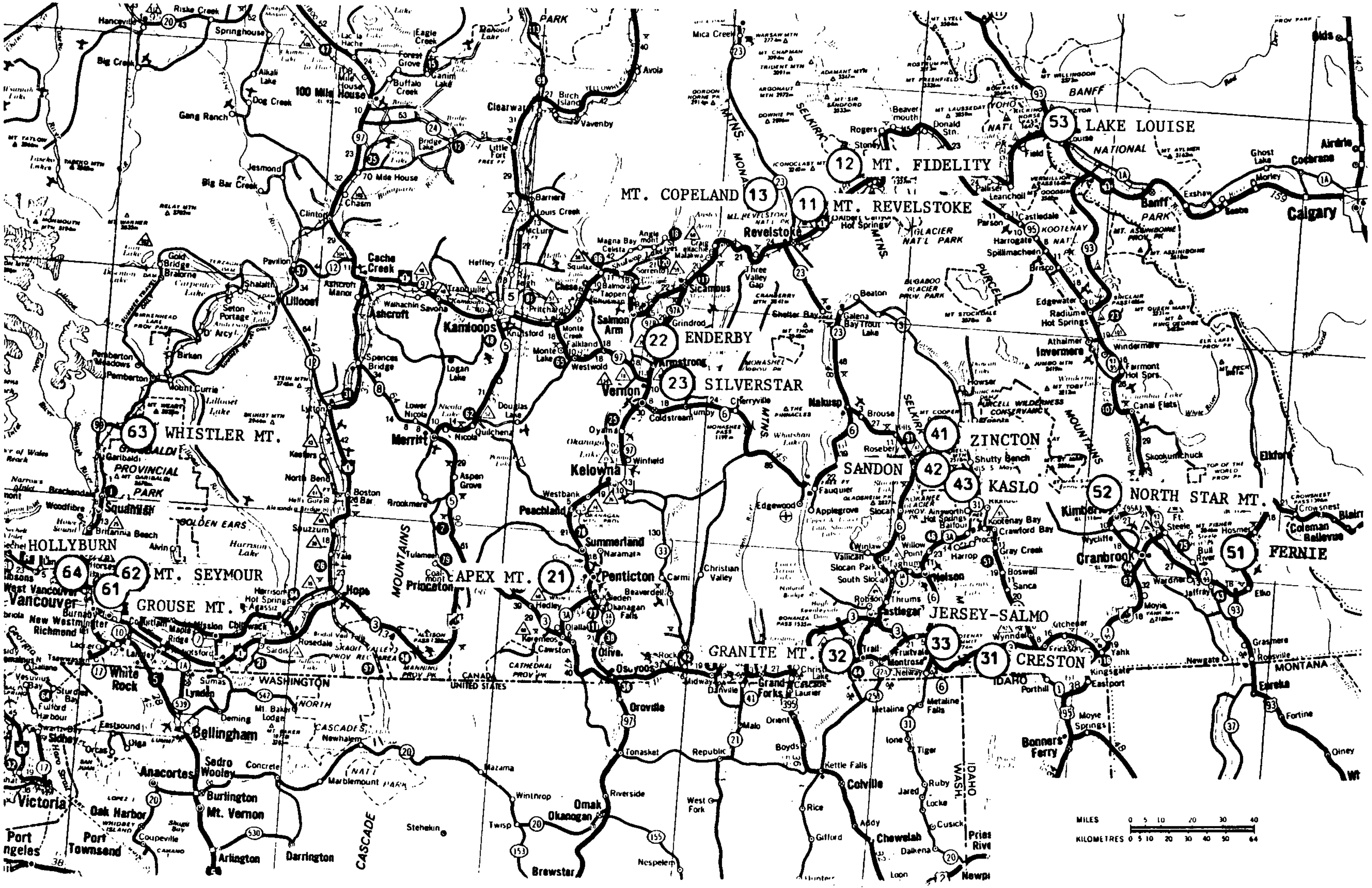


Figure 1.1 Map of Southern British Columbia showing measurment locations

measurement station in an attempt to find trends in the values of water equivalents either vertically with elevation or spatially by region. Extreme value probability distributions were used to calculate the maximum design snow loads. In Canada these are taken as those loads which on the average are exceeded every thirty years.

Both the absolute value of the water equivalents and the relative differences of water equivalents with elevation were investigated in some detail. Statistics for snow depth are tabulated, but are only discussed in general terms. Snow density was briefly investigated as to its variation with elevation.

1.2 Survey Of Work Done On Snow Loads

The determination of roof snow loads is generally divided into two parts. First the maximum ground snow load is determined. This is dependent on the return period used, the elevation, and the climatic region (International Organization for Standardization(1974) in [24]). Secondly the ground snow load is multiplied by various coefficients to take into account different roof shapes, exposure and other loading conditions.

1.2.1 Ground Snow Loads

Before the 1951 edition of the National Building Code snow loads were calculated by using the average snowfall and average rainfall in the months January, February and March. The maximum load was limited to 40 lb/sq ft. (1.9 kPa)[17].

Subsequently Thomas ?27? Took the maximum snow depths recorded for a number of stations across Canada and converted these to snow loads by assuming a density for the snow of 0.2 gm/cc. To this he added the maximum daily expected rainfall in late winter or early spring and plotted the values on a map of Canada. This map was published in the National Building Code in 1953.

As more years of data became available Boyd used a statistical analysis of the annual maximum depths of snow. He fitted the Gumbel extreme value distribution to the measured maximum annual snow depths and the maximum snow depth for a 30 year return period was then calculated. The maximum snow depths were converted to snow loads by using a snow density of 0.2 gm/cc. Since maximum roof loads often occur when rain water is retained in the snow, the maximum one-day rainfall expected to occur during the months of maximum snow depth was added to the snow loads. These values were then plotted to produce an updated version of the map done by Thomas. This map became part of the 1960 National Building Code. In 1977 this map was replaced by a table of ground loads for different towns [19].

1.2.2 Roof Loads

Before 1960, no distinction was made between ground snow loads and roof snow loads. Design roof loads were usually specified as a uniformly distributed load equal to the maximum snow load with reduction permitted only for sloped roofs and a few other conditions [17].

However, roof loads can differ significantly from ground loads and only rarely are uniform snow loads on roofs observed. Usually the wind, influenced by the shape of the roof and by adjacent structures, will distribute the snow in a non-uniform pattern. Over-design may occur where the wind regularly blows the snow away, and under design may occur where the wind velocity is decreased, for example near penthouses, and the snow accumulates.

In 1956 the Division of Building Research of the National Research Council started a study comparing ground loads to roof loads for various types of roofs shapes, exposure, and climatic conditions. The results of the studies [22] were incorporated into the 1960 and 1965 revisions of the National Building Code. Taylor [27] discusses the 1977 Commentary [20] on the 1975 National Building Code.

1.2.3 Variation Of Ground Loads With Elevation

Little work has been done investigating the effect of elevation on ground snow loads. Usually when measurements are taken in mountainous regions, they are taken in valley bottoms where the centers of population are. Snow courses at higher elevations done for hydrological studies are generally too far apart to be readily compared with each other if one wants to consider the effects of elevation.

Meiman [16] has done a literature survey of snow accumulation related to elevation, aspect and forest canopy. Although elevation was generally a major factor affecting snow accumulation, many workers had substantially improved their correlations by including other land surface factors. The studies surveyed showed that aspect was an important effect, but it was considerably less than that of elevation. Aspect did not have an effect on maximum snowpack under natural forest conditions where melt opportunity is minimal during the accumulation period,[16] however there were strong indications that accumulation, irrespective of melt is related to aspect. It was found that forest canopy affects accumulation patterns in terms of a few meters while elevation effects occur over 100's of meters. The effect of forest canopy would most likely have very little effect on loads of structures, but could change the values of snow course measurements.

Generally Meiman found that the "effects of elevation, aspect, and forest canopy on maximum snowpack water equivalent exhibit tremendous variability between and within given physiographic-climatic boundary conditions."

Packer [21] also investigated the effect of elevation, aspect, and cover on the maximum snowpack water content in a western white pine forest in a watershed in northern Idaho. He found that the distribution of maximum snow water content can be described by an equation containing the first three power functions of elevation, the first three power functions of aspect, a linear function of forest canopy density, and a linear interaction between the magnitude of snow fall from year to year and elevation.

Hendrick et al.[11] found that seasonal precipitation increases linearly with elevation in a study for a mountain in Vermont. However a very large variation in this rate of individual events makes prediction for higher elevations difficult.

The results of Dingman et al [6] in a study on the variation of snow properties with elevation in New Hampshire and Vermont showed a strong dependence of snow water equivalents and depths on elevation. The dependence were due to two elevation related climatic factors: 1) more precipitation occurs a higher elevations, and 2) vertical temperature gradients.

Rhea and Grant [23] consider the total snowfall in a mountainous area to be the resultant of orographic lifting, large scale vertical motion, convection, and upstream barrier interception. It was found that the long term average winter precipitation was strongly correlated to topographic slope computed over the first 20km upwind of the station. The correlation was increased by including an exponential formula for the partial depletion of downstream condensate due to precipitation. However, they also found that long term average winter precipitation was not well correlated to station elevation except for points on the same ridge. Snow course local setting appeared to make a fairly systematic difference in observed water equivalent values ranging in the mean between +5cm and -10cm. [23]

However, few studies have concerned themselves directly with the effects of elevation of the ground snow loads as applied to roof loadings. Results have to be general enough for use over wide areas and useful for design specification such as provided in codes. Zingg [29] discusses ground snow loads in Switzerland where the loads are given as a quadratic function of elevation. In British Columbia the only studies have been by Schaerer [26]. This thesis represents a continuation of his work.

Chapter 2.

Climate and measurements

2.1 Major Climatic Regions Of Southern British Columbia

The climate of Southern British Columbia varies considerably as one travels from west to east across the province. On a regional scale, climates associated with major regions are determined by large scale topography, wind systems and air masses. On a smaller scale, conditions are very much modified by local physiographic factors such as slope, aspect and elevation.

The proximity of the Pacific Ocean plays a major role in determining the climate of British Columbia. Mountain ranges trending northwest-southeast present a barrier to moisture rich westerly prevailing winds and are a major factor in determining the "distribution of precipitation and the degree of dominance of Pacific air masses in relation to continental air masses". [25] The rising air on the western sides of mountain ranges releases much precipitation, whereas on the lee side, conditions are much drier. As the maritime air moves east, the air becomes progressively drier inland. The relation between altitude and precipitation is given in Figure 2.1. Maps of precipitation, approximate snowfall and water equivalents are given in Figures 2.2, 2.3, 2.4.

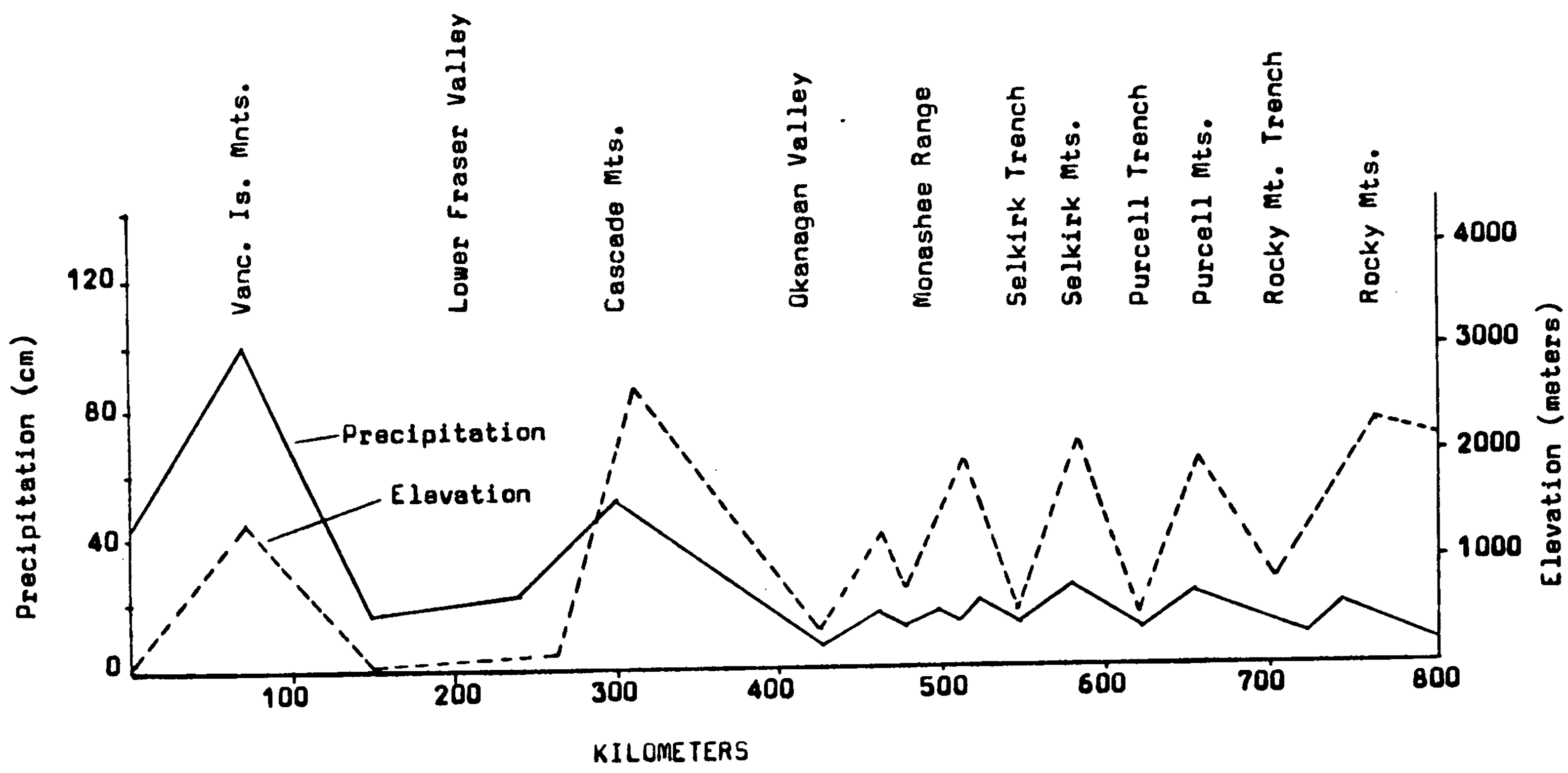


Figure 2.1 Relation of altitude and precipitation in Southern British Columbia (Modified from Kerr in Chapman [4])

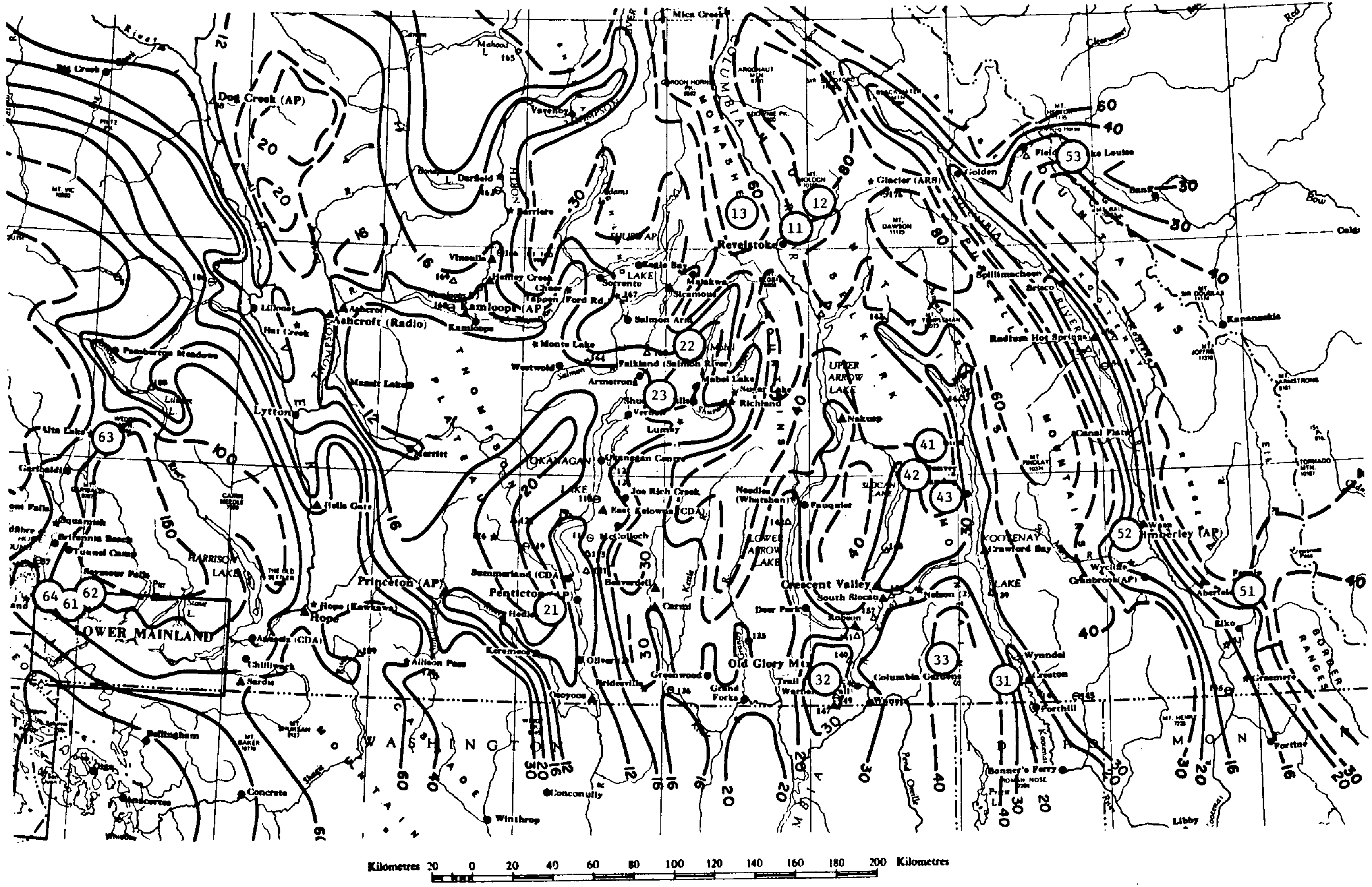


Figure 2.2 Annual precipitation in Southern British Columbia (inches)
Circles indicate snow measurement locations (from Farley [9])

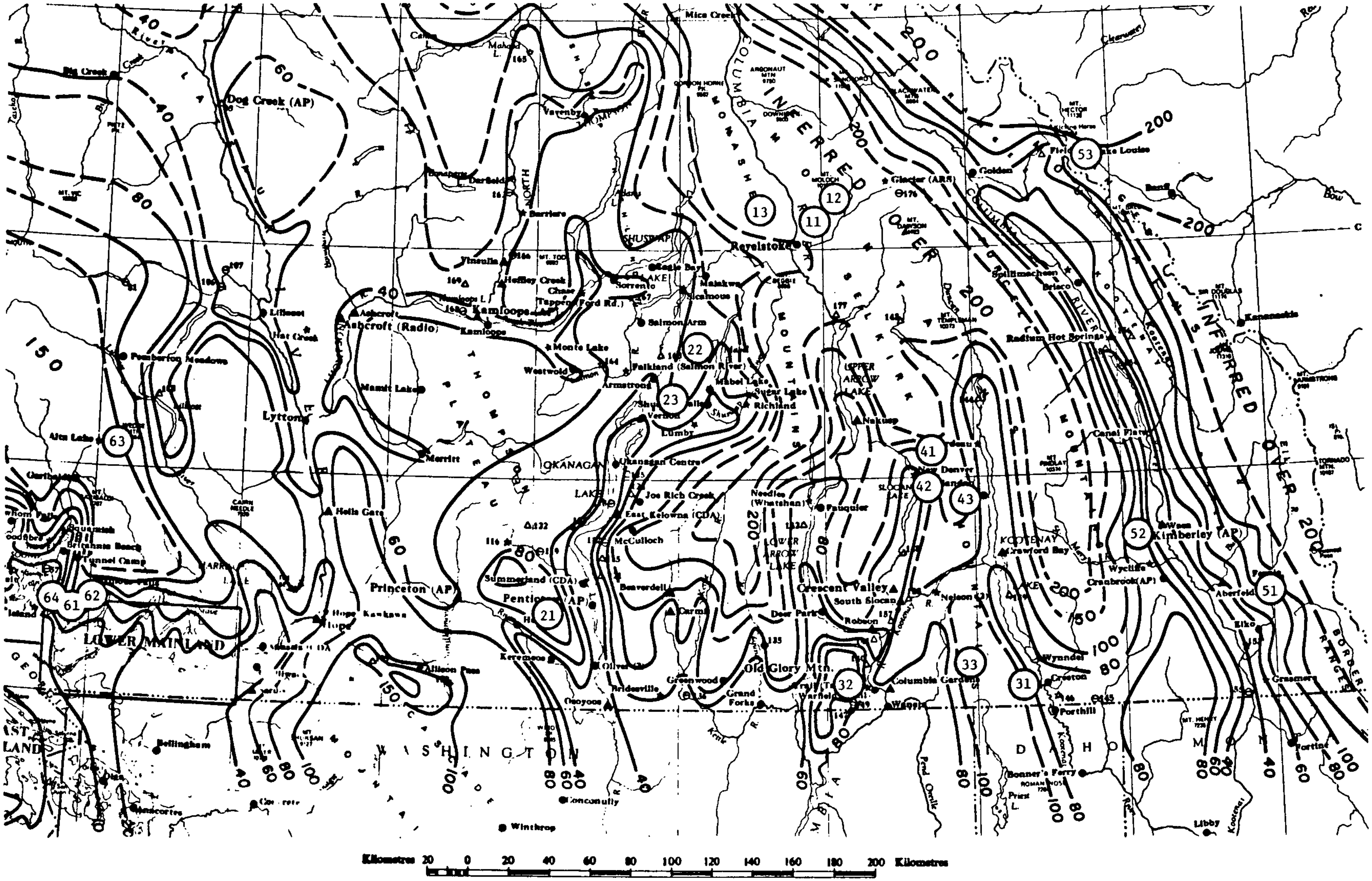


Figure 2.3 Mean annual snowfall in Southern British Columbia (inches)
Circles indicate snow measurement locations. (from Farley [9])

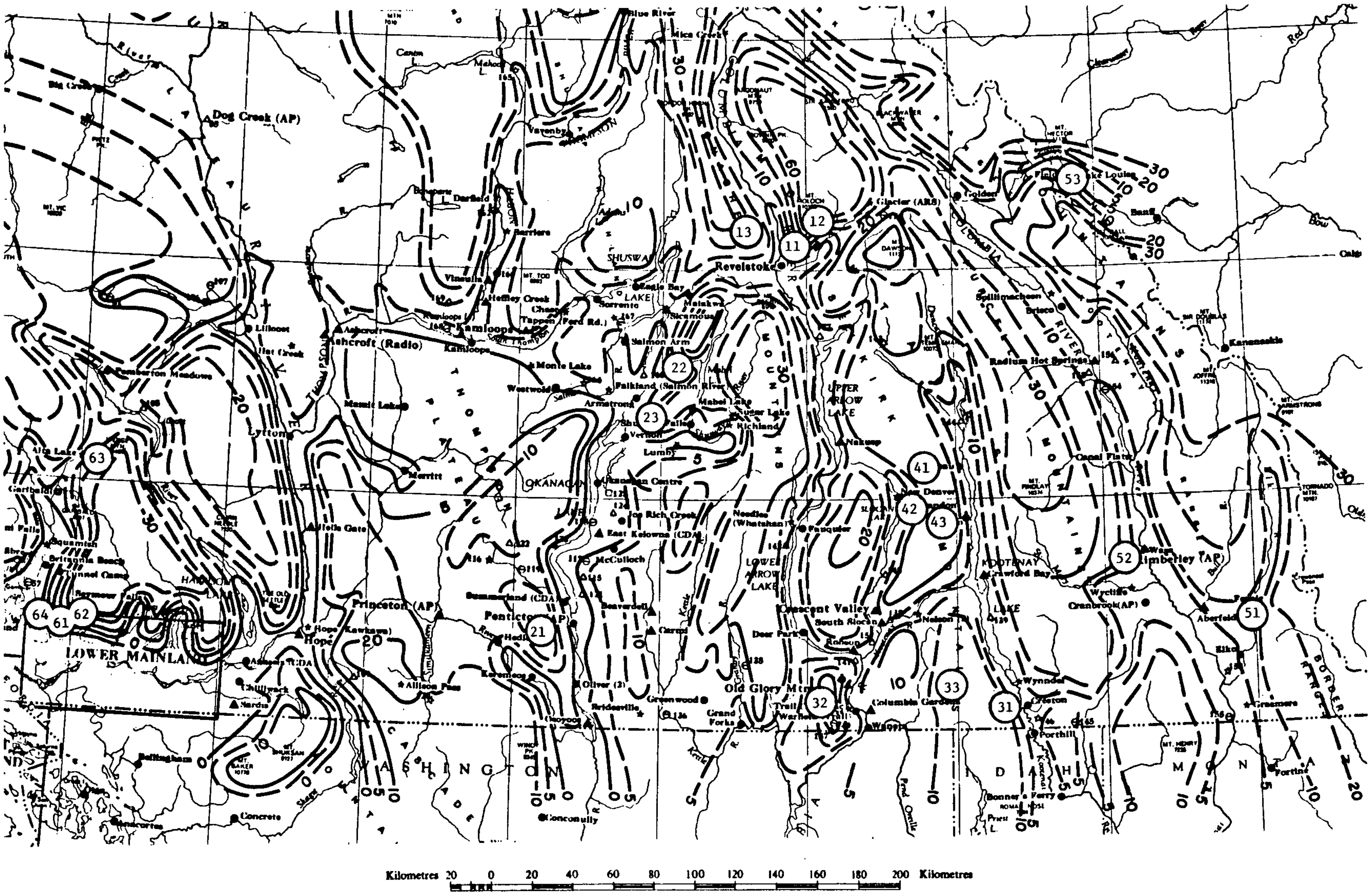


Figure 2.4 Water equevalent on 1 April in Southern British Columbia
Circles indicate snow measurement locations. (from Farley [9])

The major climatic regions of Southern British Columbia are as follows: [4][13]

2.1.1 Coast Mountains

The climate of the coast mountains of British Columbia is characterized by its mildness, humidity and extremely heavy precipitation especially in the mountains. Snow fall is generally limited to higher elevations and usually is quite wet.

2.1.2 Southwest Interior

This region of continental climate is between the Coast Range to the west and the Columbia Mountains to the east. It is in the rain-shadow of the Coast range resulting in arid characteristics.

2.1.3 Southeast Interior And Southern Rockies

This region is very mountainous, and as such has higher precipitation than the dry interior, especially on the west facing slopes, although the valleys are semiarid. Because of higher elevations, temperatures are lower and about one half of the precipitation falls as snow.

2.2 Definitions

To distinguish between the mountains which were included in the study, the individual stations measured and the sites where snow loads are required some terms used in this thesis will be defined.

A location is an area (usually a single mountain) comprising several stations each at a different elevation where the snow measurements which were used in this study were taken. A station is one elevation on a mountain where the snow observations were taken. A region is a larger area comprising several locations with similar ground snow load conditions. A site is a place where maximum snow load information is required.

2.3 Selection Of Locations

Locations were selected on a number of mountains throughout Southern British Columbia, preferably near centers of population where there is a need for snow load information.[26] Of prime importance was accessiblity in the winter, either by truck or snowmobile. Measurements at a few of the original locations were discontinued because of inaccessiblity due to road closures or because the location was not considered representative of the area. The locations, the number of stations at each location and the approximate number of years of observation are given in Table I. Figure 1.1 shows the locations where observations were made.

Table I
Snow Load Measurement Locations

location code	Plot symbol	location	number of stations	approx number of years
11	R	Revelstoke	12	12
12	F	Fidelity	10	12
13	C	Copeland	10	4-6
21	A	Apex	9	9
22	E	Enderby	15	12
23	V	Silverstar-Vernon	12	11-12
31	P	Creston	10	9
32	T	Granite-Rossland	11	6-11
33	J	Jersey-Salmo	8	11
41	Z	Zincton	6	11
42	D	Sandon	11	11
43	K	Kaslo	7	8
51	I	Fernie	7	10
52	N	North Star-Kimberley	8	12
53	L	Lake Louise	8	12
61	G	Grouse	10	5-11
62	S	Seymour	10	8-11
63	W	Whistler	0	0
64	H	Hollyburn	10	3-4

2.4 Selection Of Stations

Each location (or mountain) has from six to fifteen stations where measurements are taken. A typical station would be a small clearing of approximately two tree heights in width on the downslope side of a mountain road. An attempt was made to find stations with similar aspect and vegetation and also to be representative of the area. Since maximum snow loads are of concern in this study, stations were selected to be as wind free as possible to maximize the snow accumulation. After a few years as measurements became available, some of the stations were changed to improve their location.

2.5 Measurement

Collection of data was started by the National Research Council in 1968, with the number of locations increasing in subsequent years. Most of the measurements were taken by N.R.C. staff. The data was provided to the author by the National Research Council, Division of Building Research in Vancouver, B.C.

2.5.1 Method

Snow depth and water equivalents were measured at each station. The water equivalent measurements were made with a Federal snow sampler with approximately three measurements made per station. Although more measurements at each station would have been desirable, it was felt that three carefully done measurements would be adequate and that a large number stations with acceptable accuracy were preferable to a smaller number with a slight increase in accuracy. The spread between measurements proved to be small. [26]

Since only the annual maximum water equivalents were of interest, measurements were taken at approximately two week intervals during the period when the maximum values were expected. Although the maximum snow depth may be missed because of snow settlement, water equivalents generally do not decrease much until spring melting occurs and and the values measured could be expected to be close to the maximum values. Only in the Vancouver area, where temperatures are much warmer and melting begins immediately did the water equivalent measurements have to be taken right after a snowfall. Generally maximum values occurred in the valleys in January or February and but at higher elevations maximum values are recorded later, generally April or May.

2.5.2 Accuracy And Reliability

Most of the measurements were done by National Research Council staff with the exception of Whistler Mountain where the ski-lift company did them and the Vancouver Mountains where, for a few years students did the measurements. Because the measurements were generally done carefully and the stations well chosen one can have a a high degree of confidence in them. A few measurements done when weather conditions were extremely poor were deleted if the values seemed unusual. Unfortunately the accuracy of the values obtained at Whistler Mountain was uncertain and it was decided not use them in the analysis.

2.5.3 Units Used

Most of the snow measurements were recorded in British units and it is only recently that S.I. units are being used. For purposes of this study all measurements were converted to their metric values. Because of the intrinsic definition of water equivalent and because comparision can more readily be made to snow depths, water equivalents are expressed in centimeters, rather than kilopascals which would be more suitable when considering roof loads. Table II gives conversion factors between various units.

Table II
Conversion Factors For Snow Measurements

1 cm water	=	0.0981	kPa
1 cm water	=	2.048	lb/sq.ft.
1 in water	=	2.540	cm water
1 in water	=	5.202	lb/sq.ft.
1 in water	=	0.2491	kPa
1 kPa	=	20.88	lb/sq.ft.

Chapter 3.

Analysis and results at the locations

3.1 Calculation Of Statistics At Each Station

At each station the mean, standard deviation, coefficient of variation, the minimum and the maximum values for the annual maximum snow water equivalents were calculated. These statistics are tabulated in Appendix I. The plots showing an overview for all the stations of the standard deviation and the coefficient of variation are given in Figures 3.1 and 3.2 Figure 4.14 gives an overview for all stations of the mean water equivalent. Plots of the mean water equivalents and of maximum water equivalent for each station are given later in this chapter.

In these plots the locations for the data plotted is identified by a letter symbol. The legend of the letters used as plot symbols is given in Table I.

Statistics for the snowdepth and density of the snow at the time the maximum water equivalents were measured are also tabulated (appendix I and II) but no analysis was done on these values.

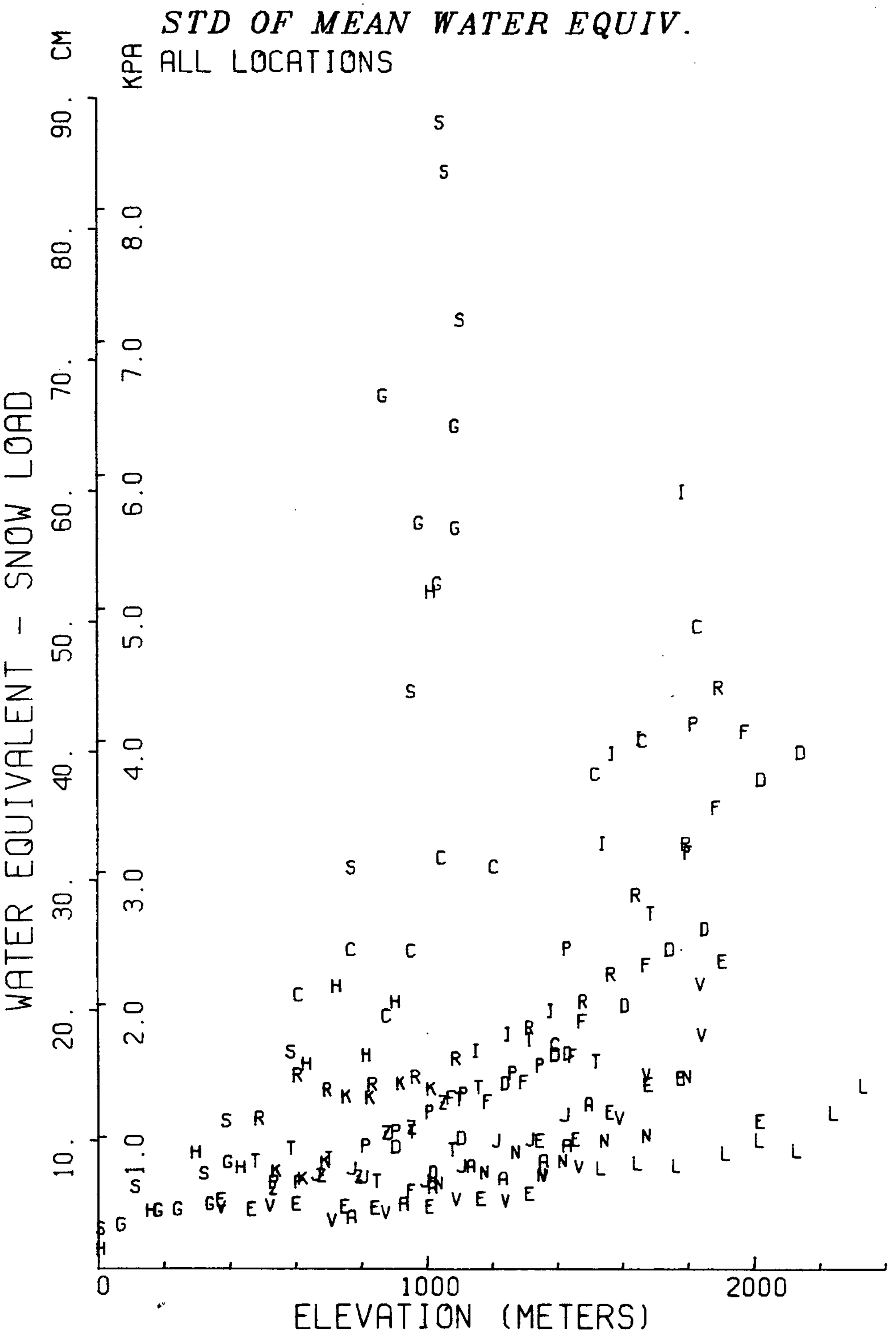


Figure 3.1 Standard deviation of water equivalent
All locations plotted. For legend see Table I.

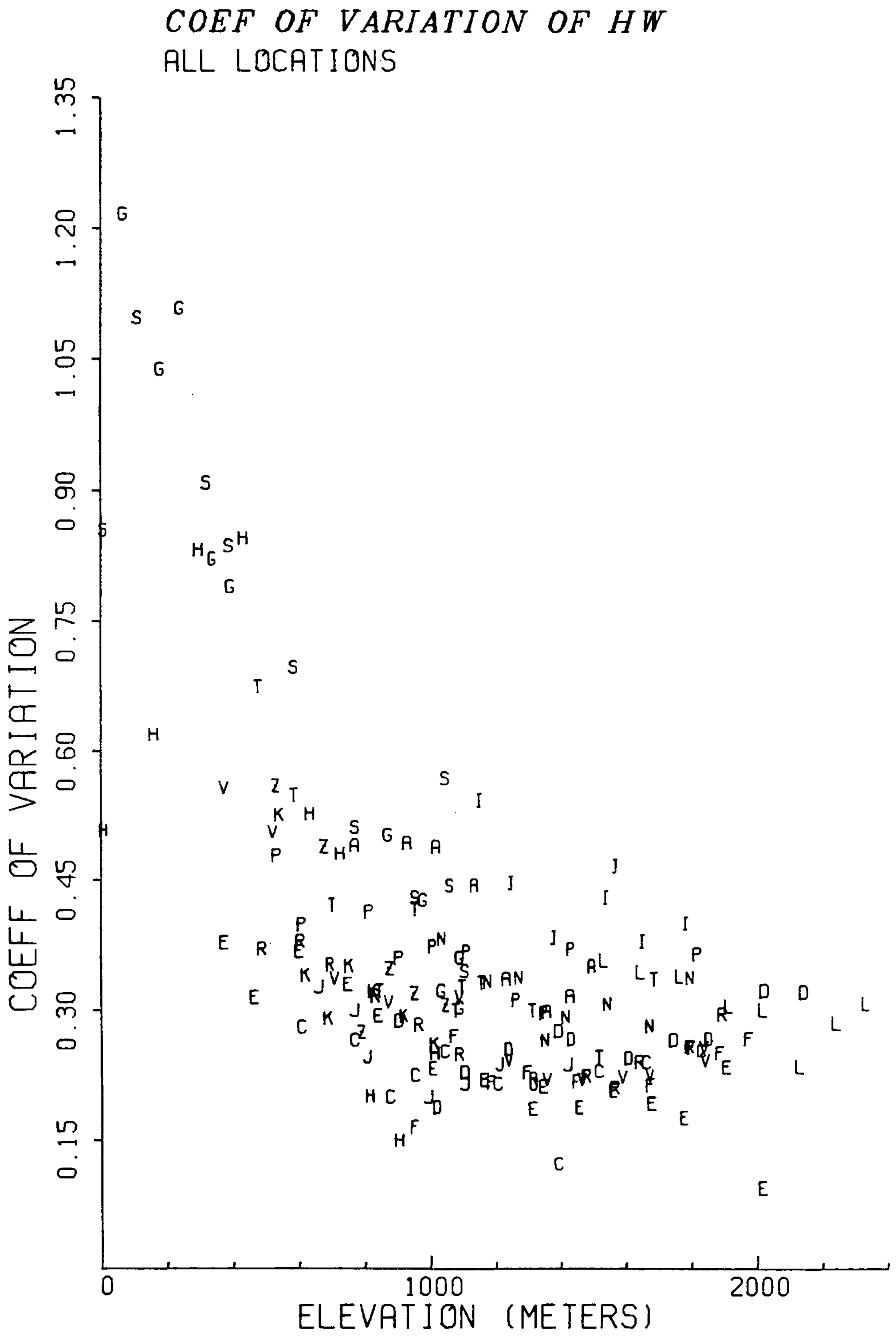


Figure 3.2 Coefficient of variation of water equivalent
All locations plotted.

3.2 Calculation Of 30 Year Return Period Water Equivalents

3.2.1 Choice Of Return Period

In Canada a 30 year return period has been selected as the basis for determining design snow loads. This period was mainly chosen since it is the same as the standard normal period for climatological records, but is otherwise quite arbitrary. [2]

The International Organization for Standardization (1974) (ISO) (in [24]) proposed a return period of 50 years. Salm suggests that more than one return period could be used. For example 5 years could be used for ordinary loads and 50 years for extraordinary loads, with the 50 year return period loads having larger permissible stresses. [24] Likewise one could specify different return periods for different uses. For example lower return periods could be used for farm buildings and higher return periods used for buildings occupied by people. In line with the National Building Code requirements a 30 year return period is used in this thesis for maximum snow loads.

3.2.2 Choice Of Distribution

Rather than debate the merits of the various types of extreme value distributions it was decided to calculate the 30 year return maximum snow water equivalent using several common distributions and then to compare them for similarity. The normal, cube root normal, log-normal, and gumbel distributions were used.

For the distributions based on the normal distribution (eg. normal, cube root normal, and log-normal) the Student-t distribution was used instead of the normal to take into account some of the small number of years of observation. For these distributions the equation used to calculate the maximum values has the form:

X = mean + (K)(standard deviation) (3.1)

where: X is the maximum expected value
K is a coefficient dependent on the return period and on the sample size (degree of freedom)

For small sample sizes the Student-t distribution takes into account the increased uncertainty by increasing the value of "K" for the given return period. The importance of using the Student-t distribution is evident when one compares the values of "K" for different sample sizes n with the value of "K" given by the normal distribution. This is seen in Table III.

The values of the 30 year return maximum snow water equivalents for the probability distributions used at the locations measured are given in Appendix I.

Examination of Appendix I shows that the maximum snow loads obtained from the different distributions are very similar.

Table III

Student-t Values Of K For 30 Year Return

n degrees of freedom	Value of K
2	3.67658
3	2.82131
4	2.50140
5	2.33653
6	2.23650
7	2.16949
8	2.12152
9	2.08511

n Degrees of Freedom	Value of K
10	2.05749
15	1.97744
20	1.93958
25	1.91751
30	1.90306
40	1.88531
50	1.87480
normal dist.	1.834

Generally the student-t distribution used directly gives lower values and the log normal the higher values in predicting the 30 year maximum water equivalents. When some of the yearly values of maximum water equivalent approach zero for some years, but have higher values for other years, such as for the lower elevation stations in the South Coast-Vancouver stations, the log-normal distribution gives results very much higher than those of the other distributions. An example of this would be Mount Seymour Station No. 5, where water equivalents for 9 years of record range either from 1.8 cm to 2.5 cm or from 28 cm to 39 cm. The 30 year maximum values of the normal, log normal, gumbel and cube root distributions are respectively 59 cm, 246 cm, 60 cm, 102 cm. Clearly the log-normal value of 246 cm is anomalous.

The cube root student-t distribution usually gives larger values than the Gumbel, but this is to expected since the cube root student-t includes the increased uncertainty due to small sample size.

Because the cube root student-t includes the effect of sample size, and because it does not exhibit the extreme deviations that the log-normal sometimes has (when compared to other distributions), the cube root student-t will be the primary distribution used in the analysis in this thesis.

3.3 Plotting Of Statistics For Each Location

Scatter plots were made of elevation against the computed statistics (eg. elevation vs. mean, elevation vs. standard deviation, elevation vs. coefficient of variation, etc.). These showed significant correlation with elevation. Least squares regression was then used to quantify the relationship of the computed statistics with elevation and provide a numerical value for the degree of fit (r^2).

3.3.1 Choice Of Curve To Be Fitted

The choice of the curve to fit the computed statistical values with elevation may not be directly representative of one physical cause, but to be an empirical relationship. A linear relationship between ground snow loads and elevation has been found by Golding (in[26]) for the eastern Rocky Mountains of Alberta and by Garstka (in[26]) in Wyoming. Brown [3] found a linear relationship in Nevada, but mentioned the possibility of the curve flattening out at higher elevations.

In Switzerland, a quadratic relationship with elevation is used to specify design snow loads on buildings [15],[29]. For

British Columbia, Schaerer [26] suggests a quadratic relationship, changing to a linear one in the dry cold regions.

In this study linear and quadratic relationships were used to fit curves to the data. In most cases a quadratic curve provided a much improved fit over a linear curve. In a few locations however a linear relationship could have equally well applied. For some areas, such as those with wetter climates (eg. Vancouver) an exponential curve might fit better. For simplification in presentation only the quadratic relationship will be shown on the plots.

The plots of the mean water equivalents fitted by a quadratic curve are given in Figures 3.3 - 3.20 and plots of the 30 year return maximum water equivalents are given in Figures 3.21 - 3.38.

3.3.2 Difficulties With Constant Variance For The Regression

A least squares second order regression has the form:

$$Y = a + bX + cX^2 + e \qquad (3.2)$$

where: Y is the dependent variable (eg. mean water equivalent)
X is the independent variable (eg. elevation)
a,b,c are parameters
e is the residual or deviation from the model

The coefficiants a,b,c are chosen to minimize the sums of the squares of the residuals. This means that one is assuming that the variances of the dependent variable (Y) are all equal, which is not always the case when considering snow loads at different elevations. The reason is that 1) the variance of the mean

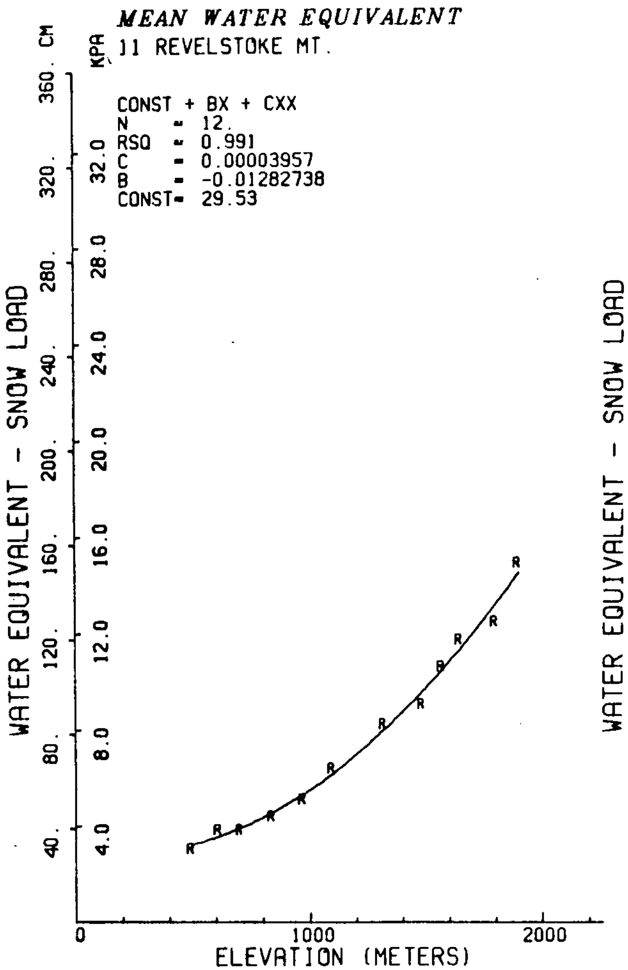
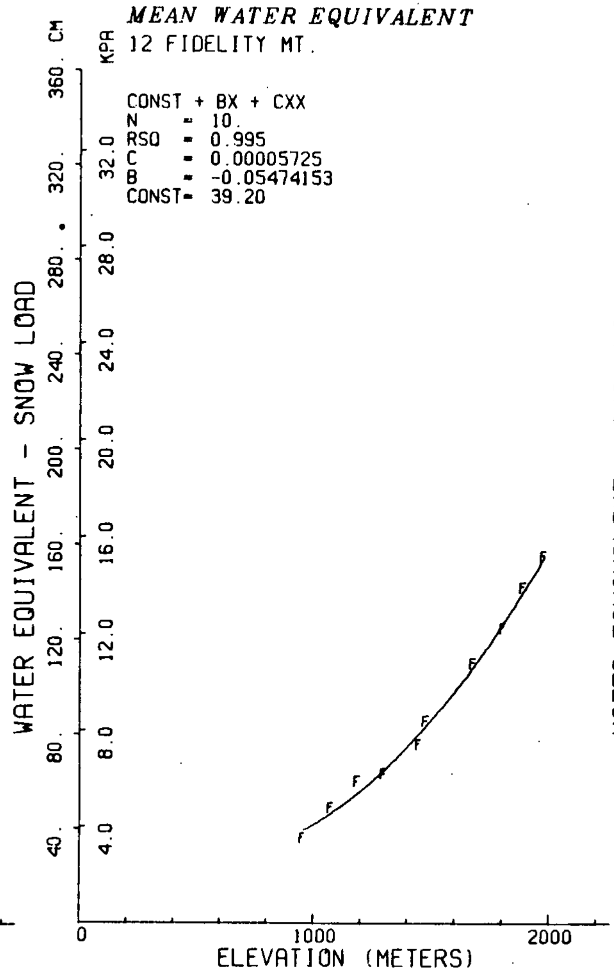


Figure 3.3



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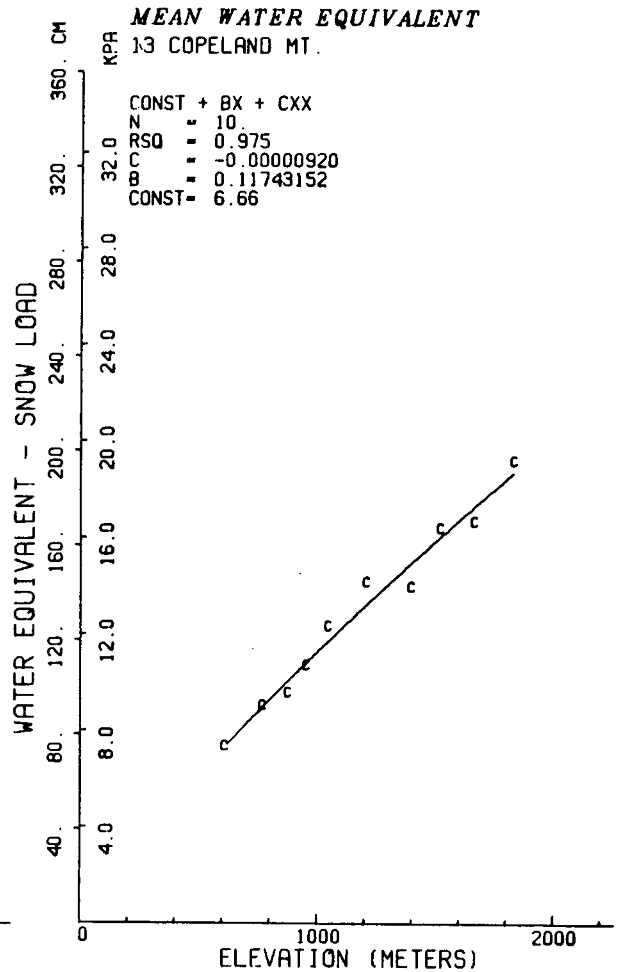

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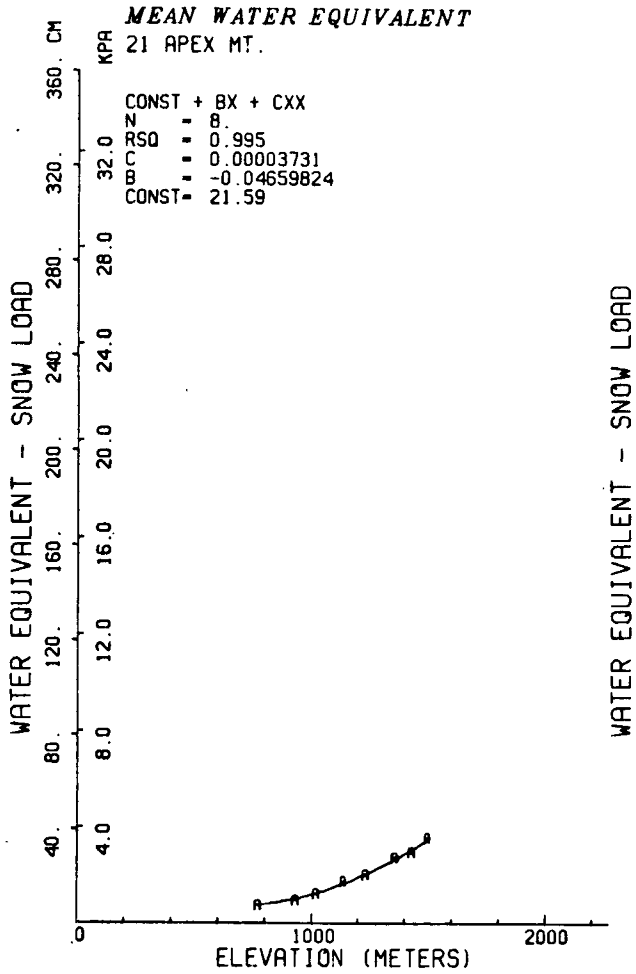

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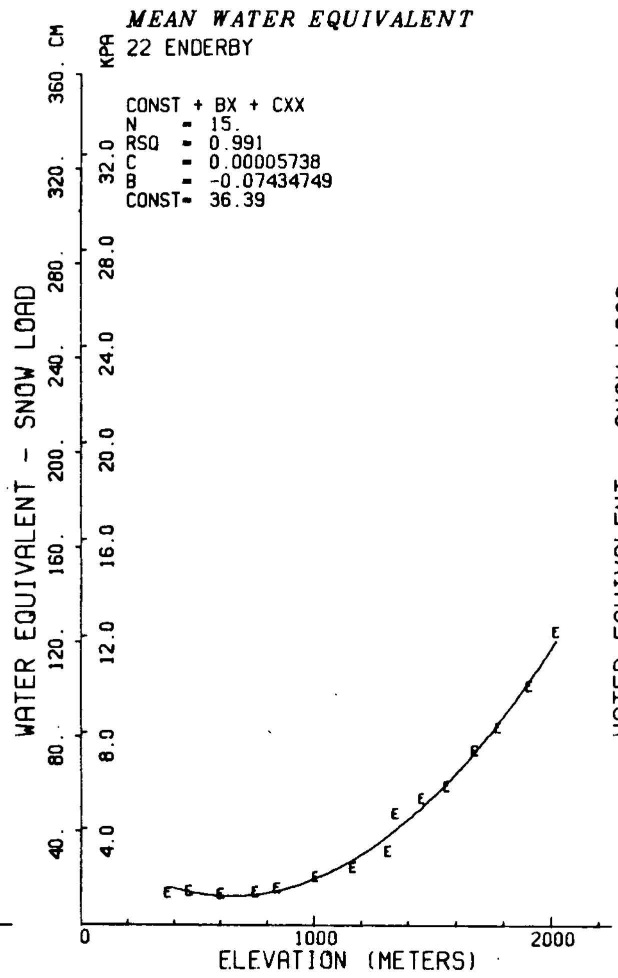

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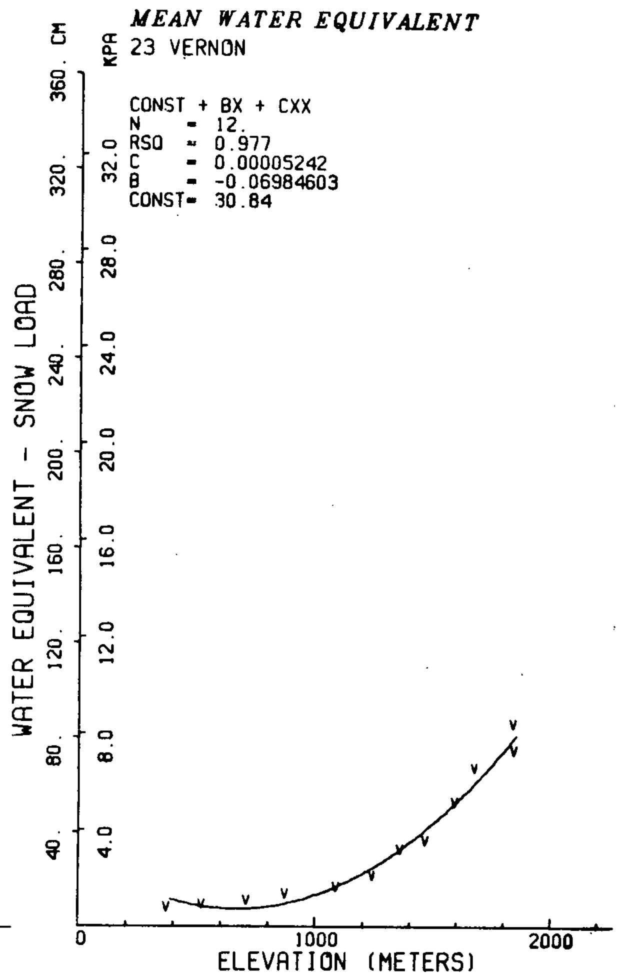

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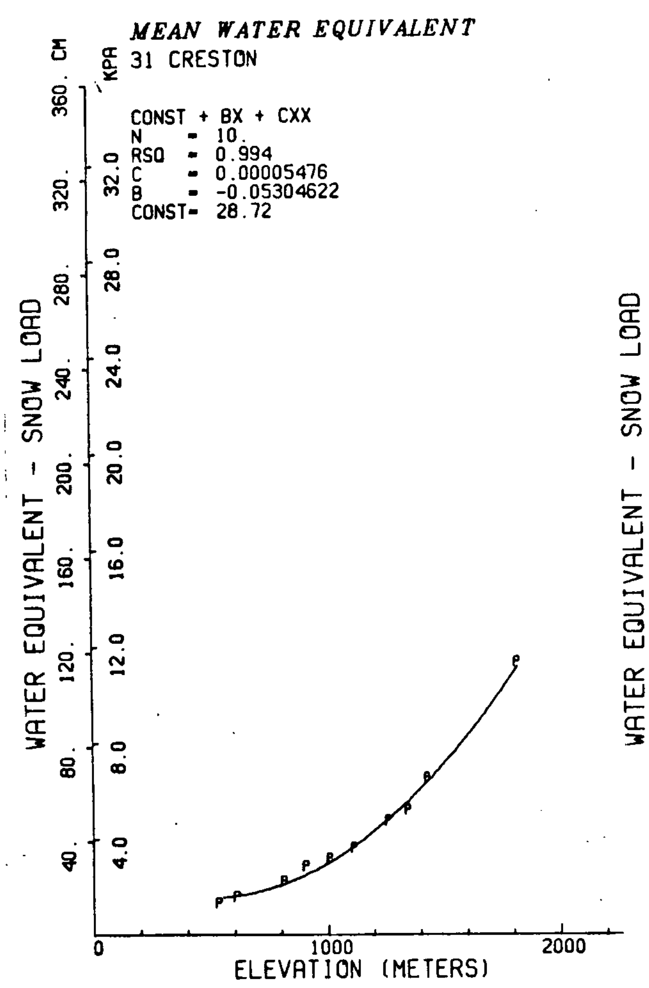

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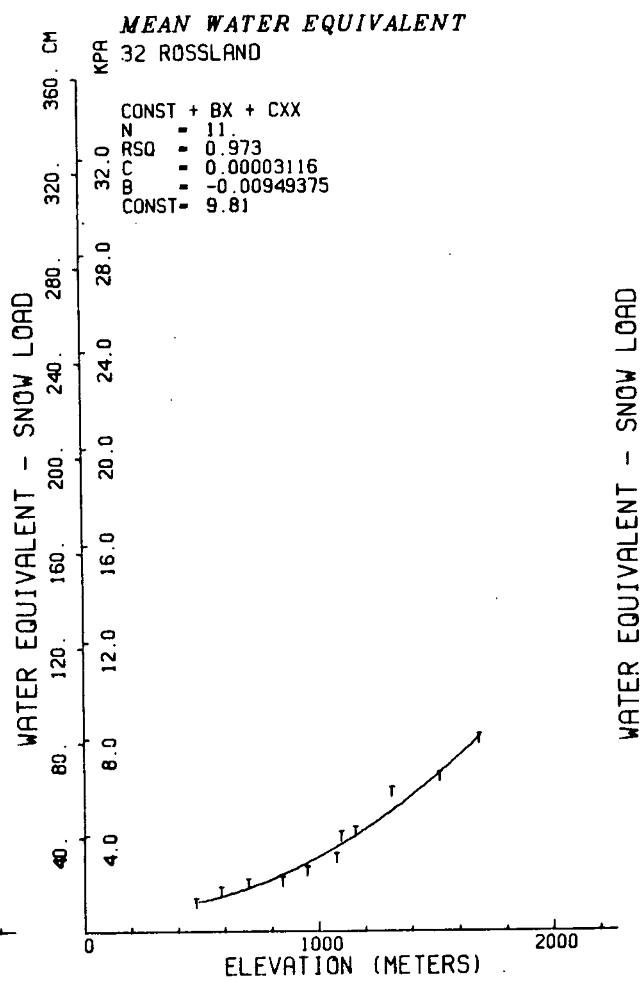
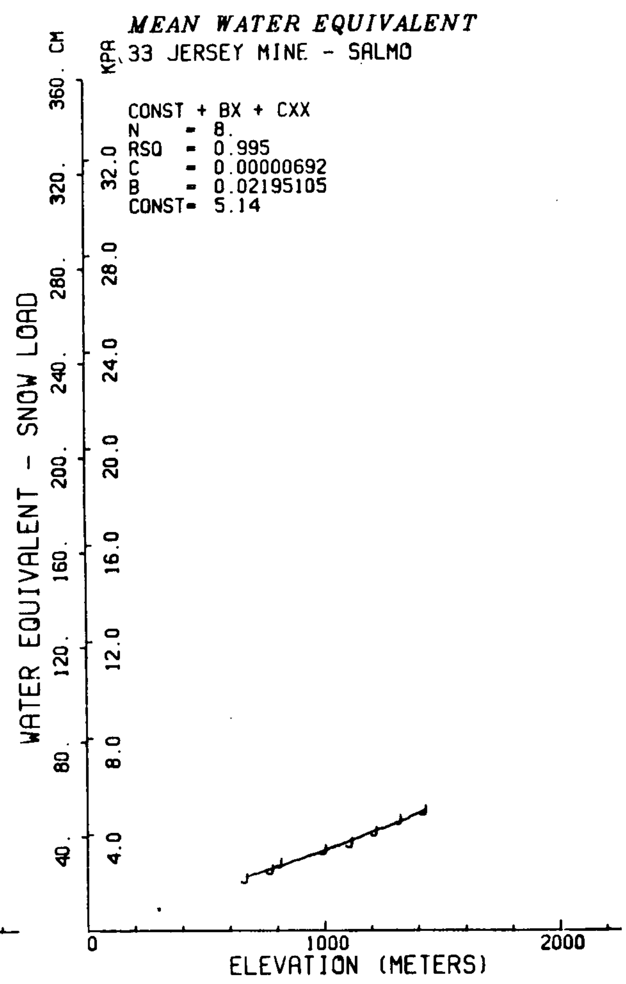


Figure 3.10



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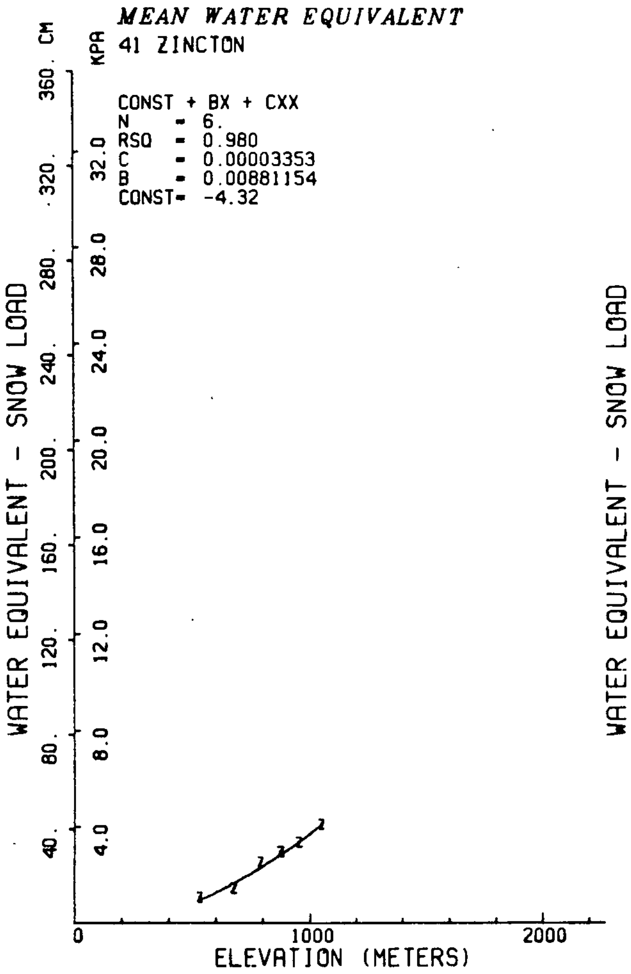

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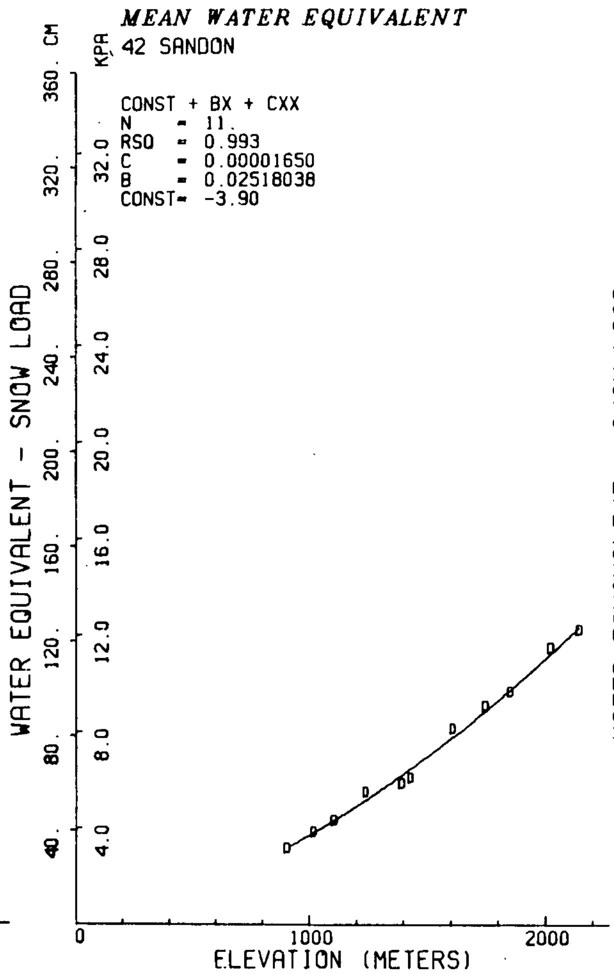
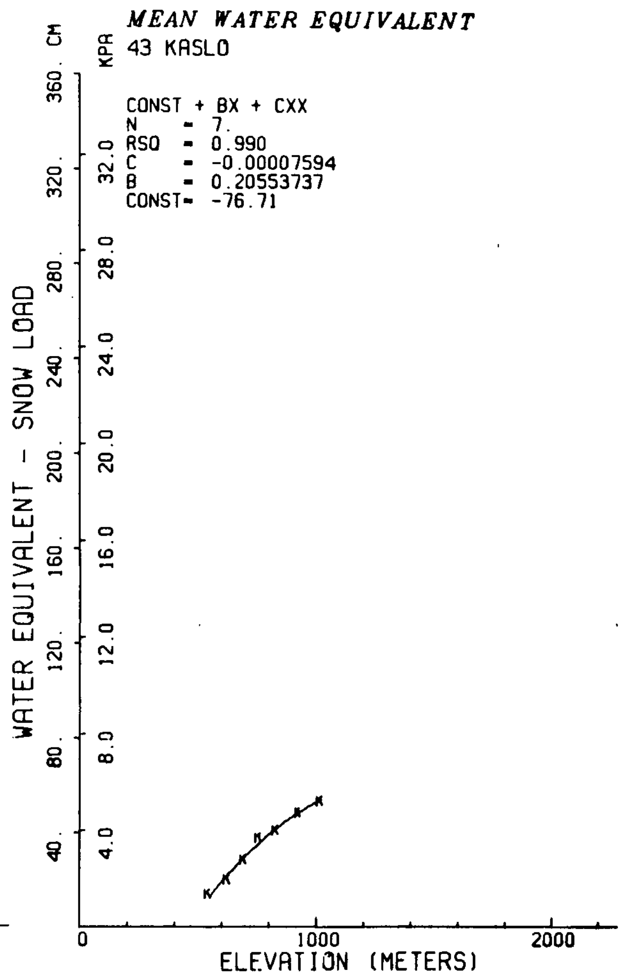


Figure 3.13



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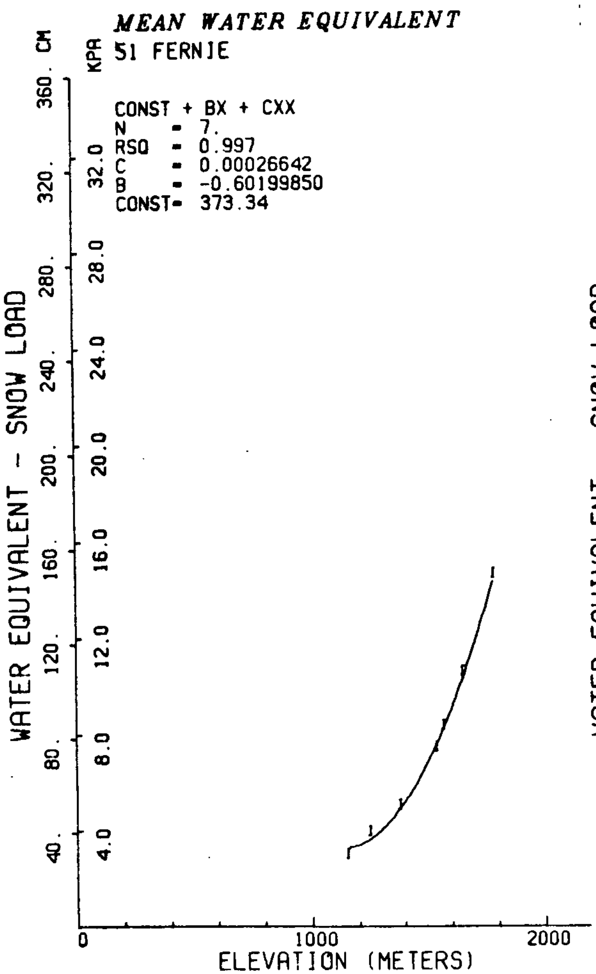

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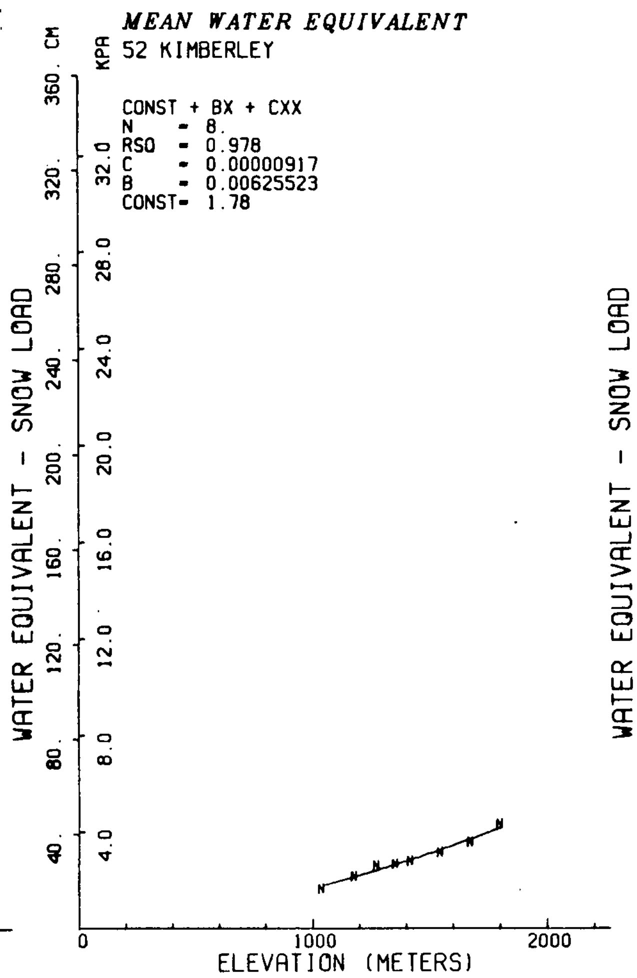

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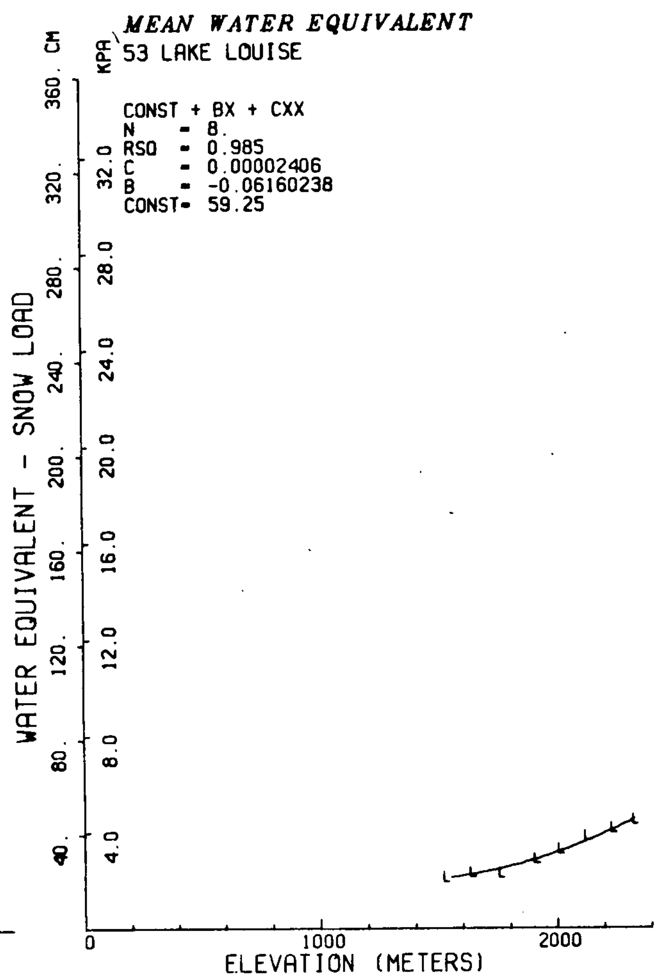

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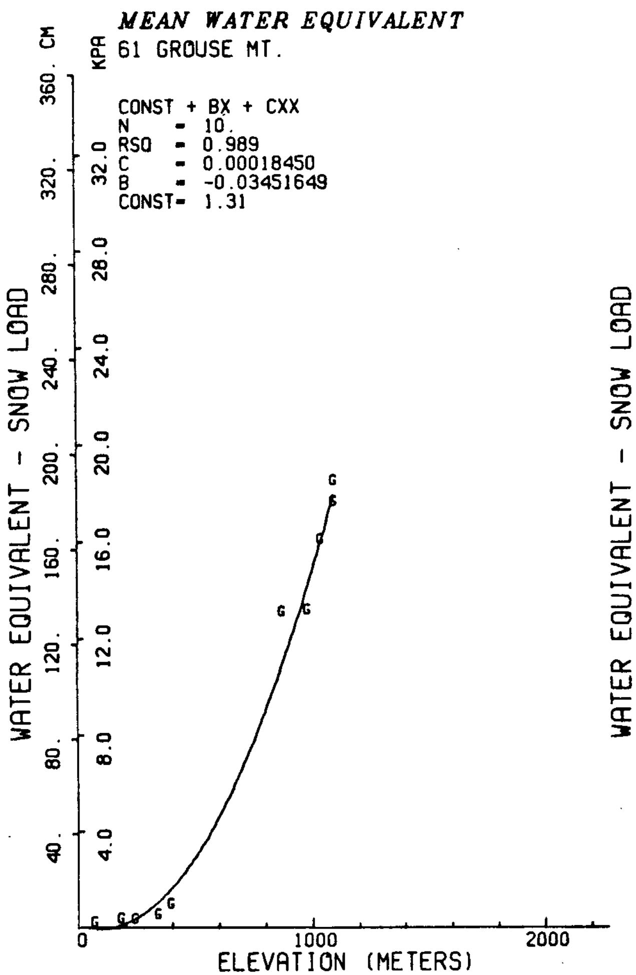

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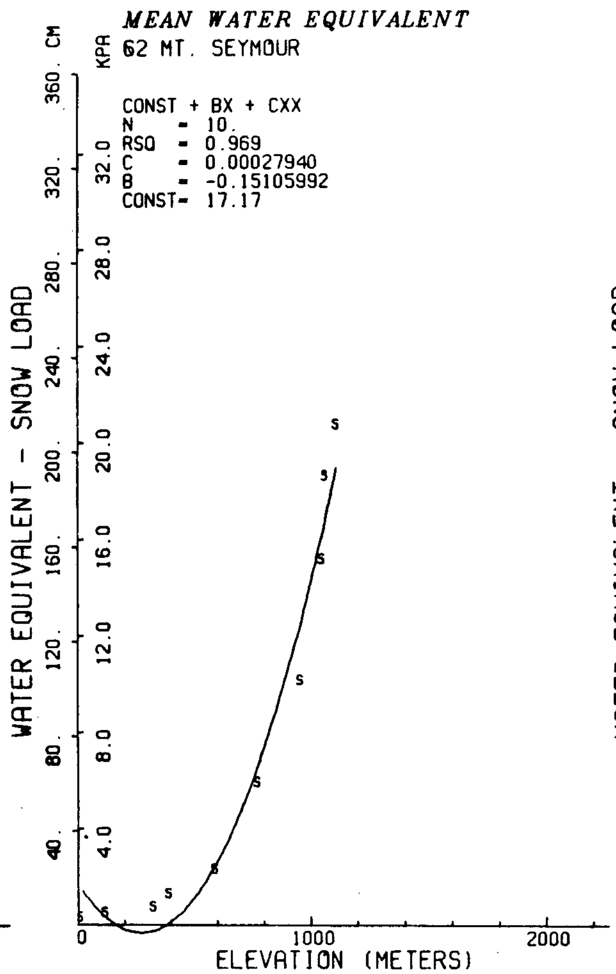

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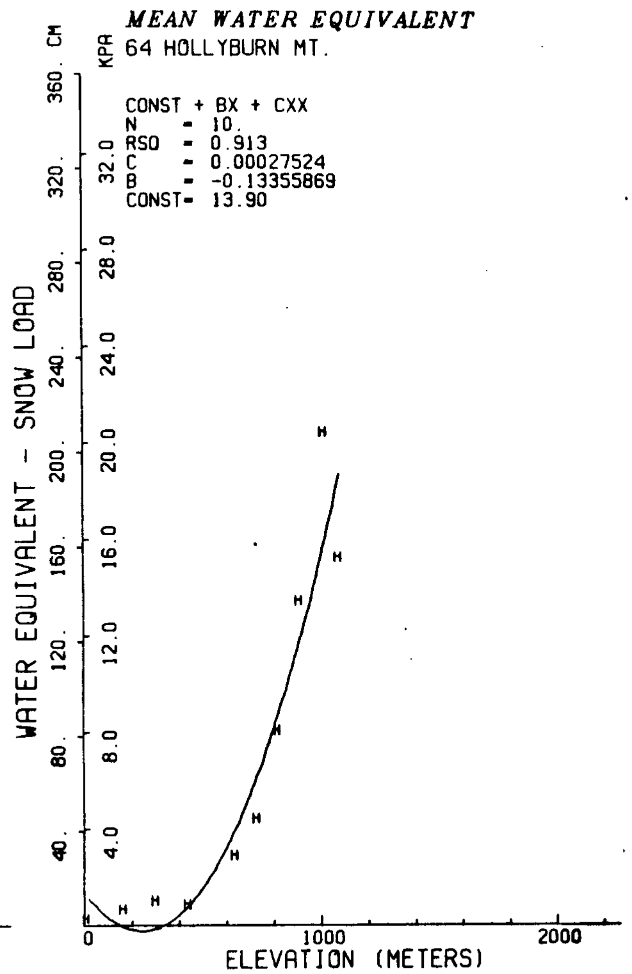

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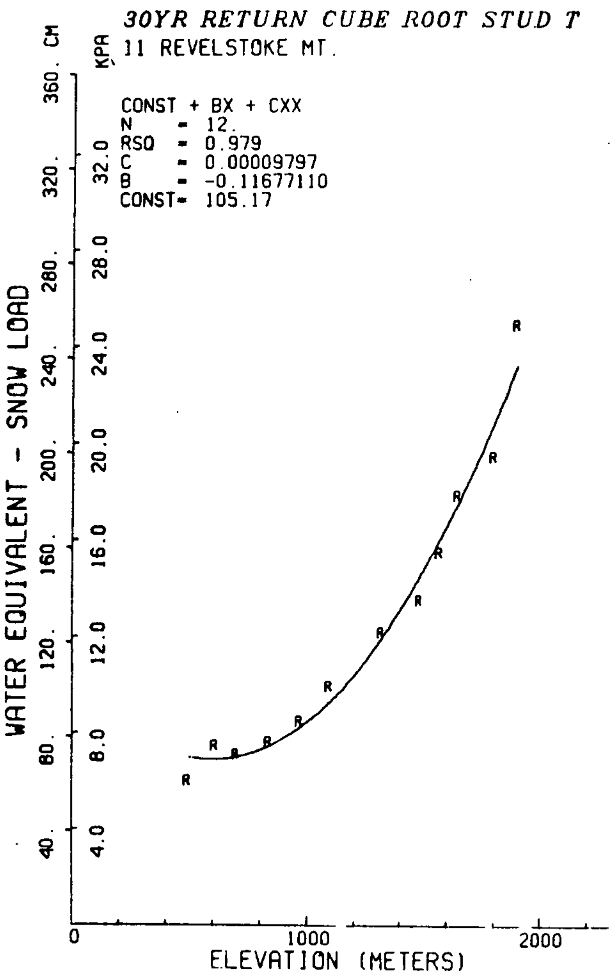

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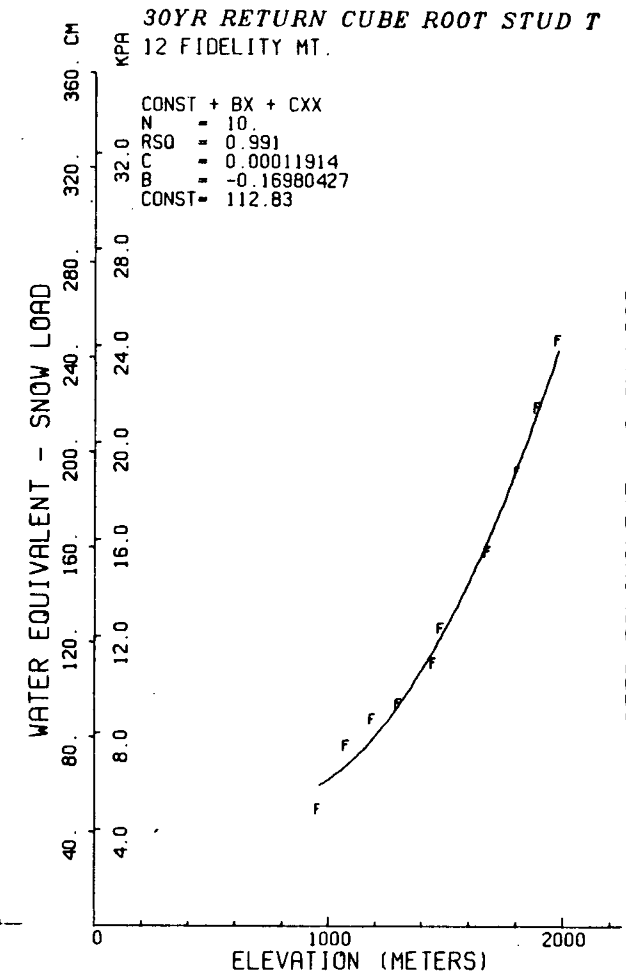

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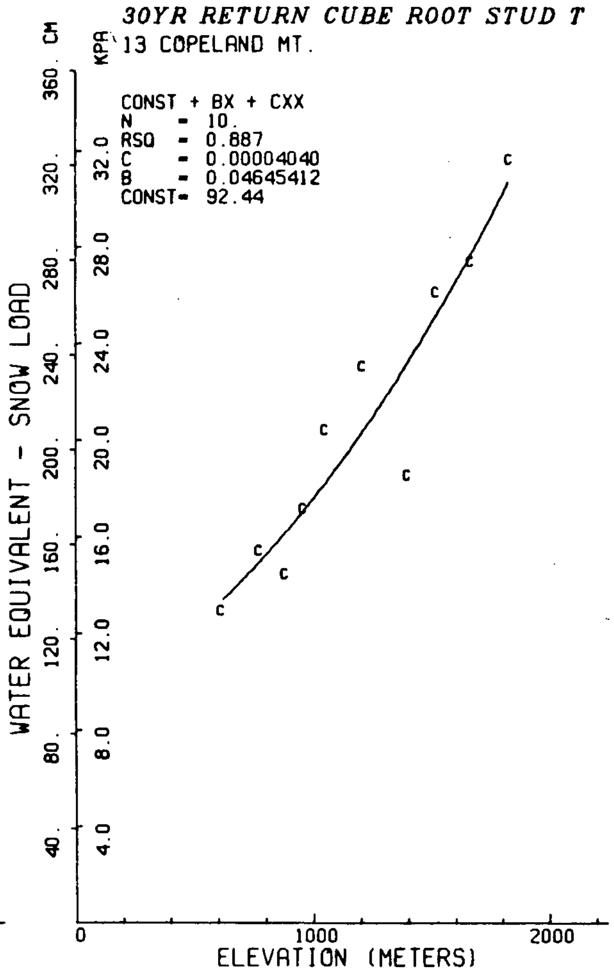

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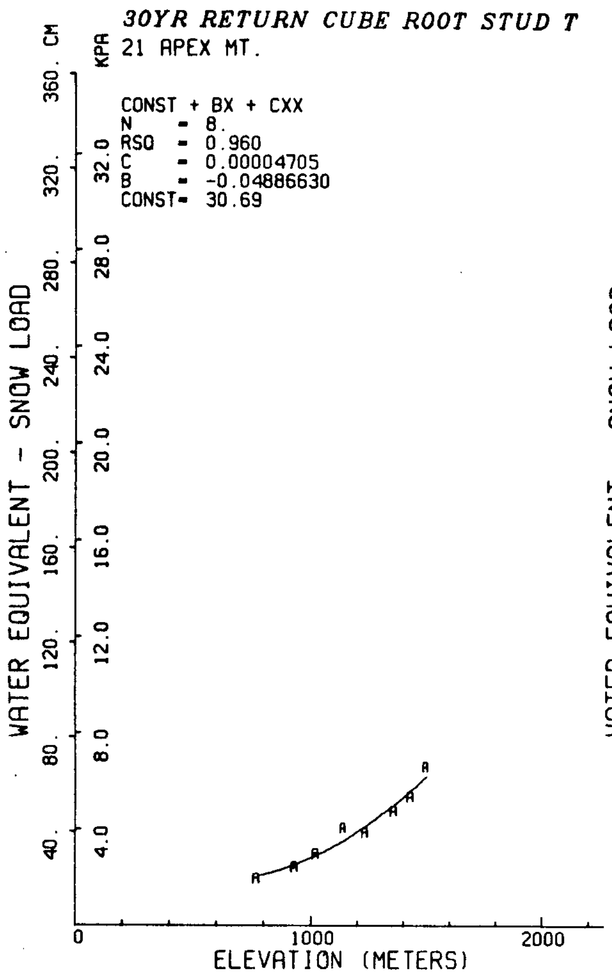

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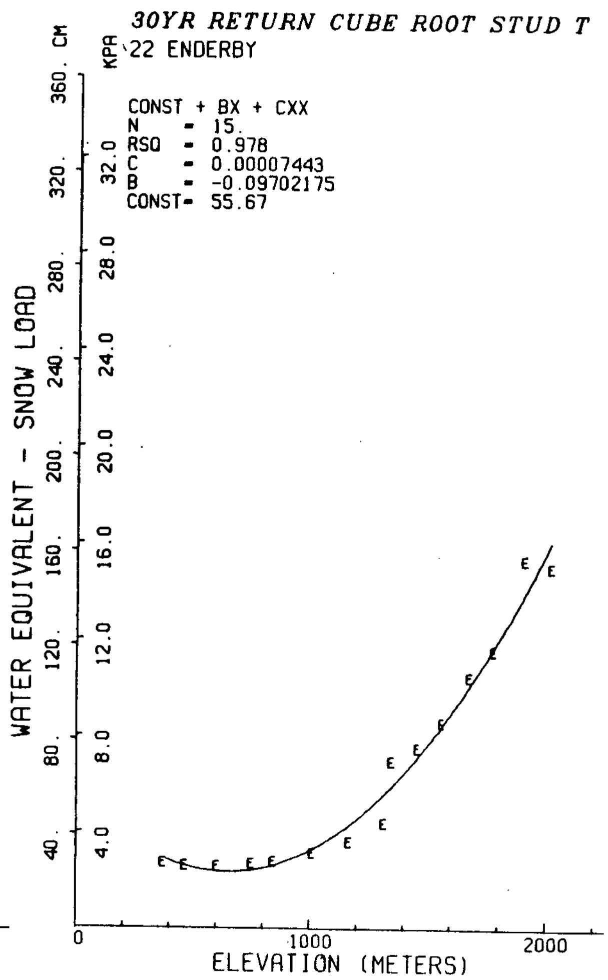

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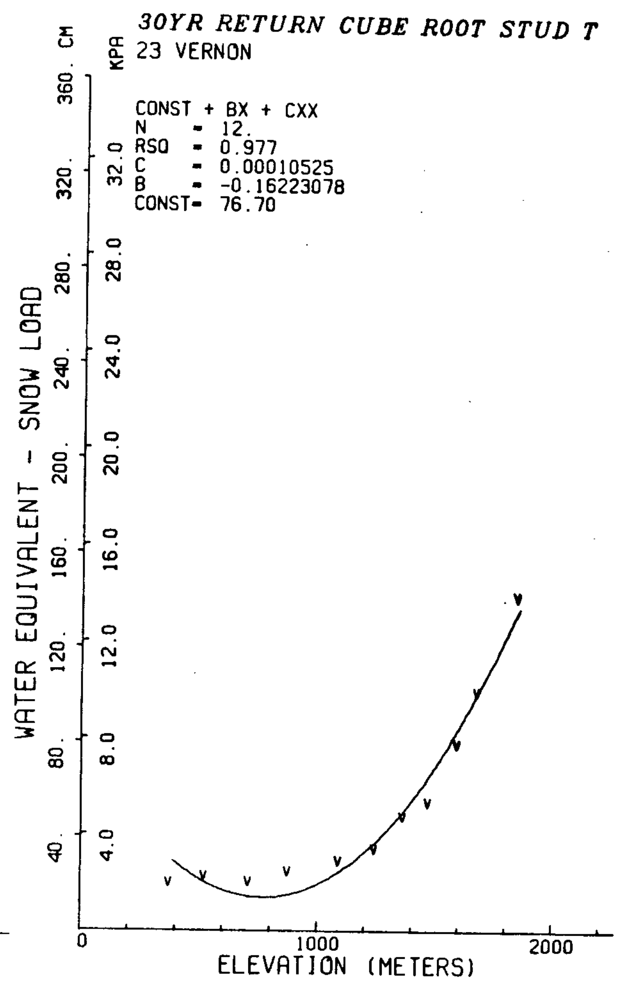

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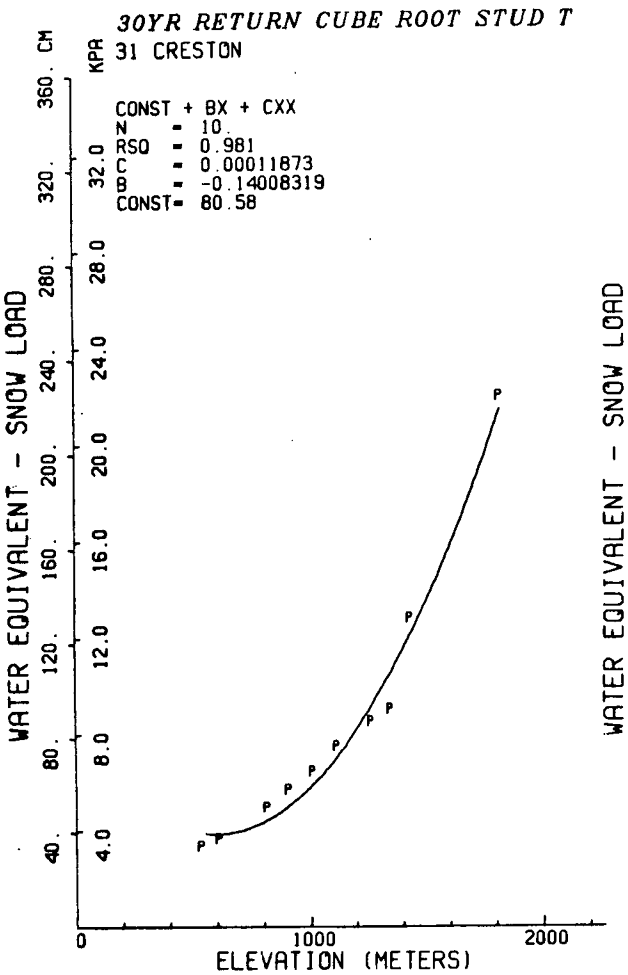


Figure 3.27

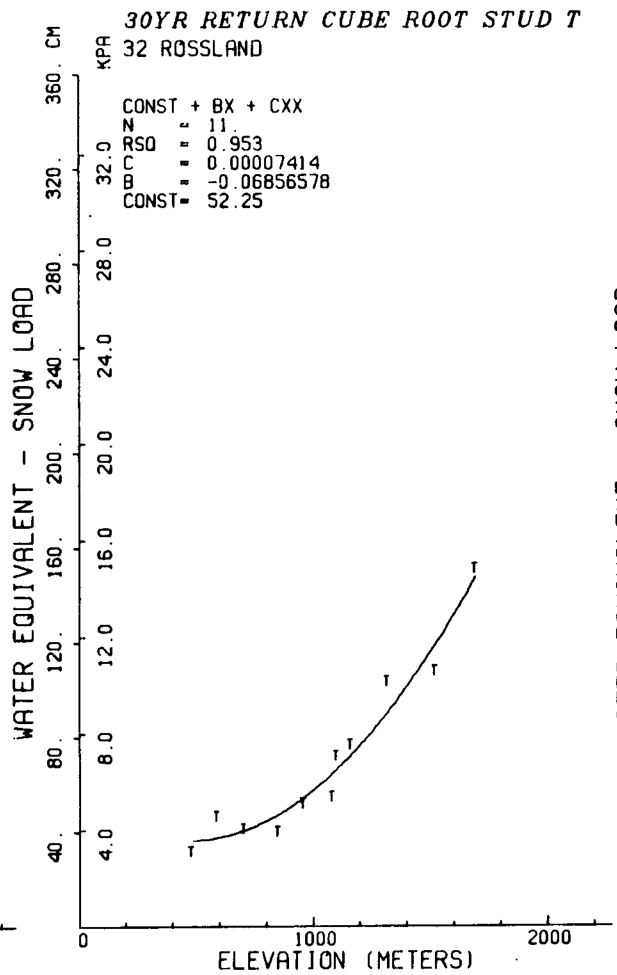
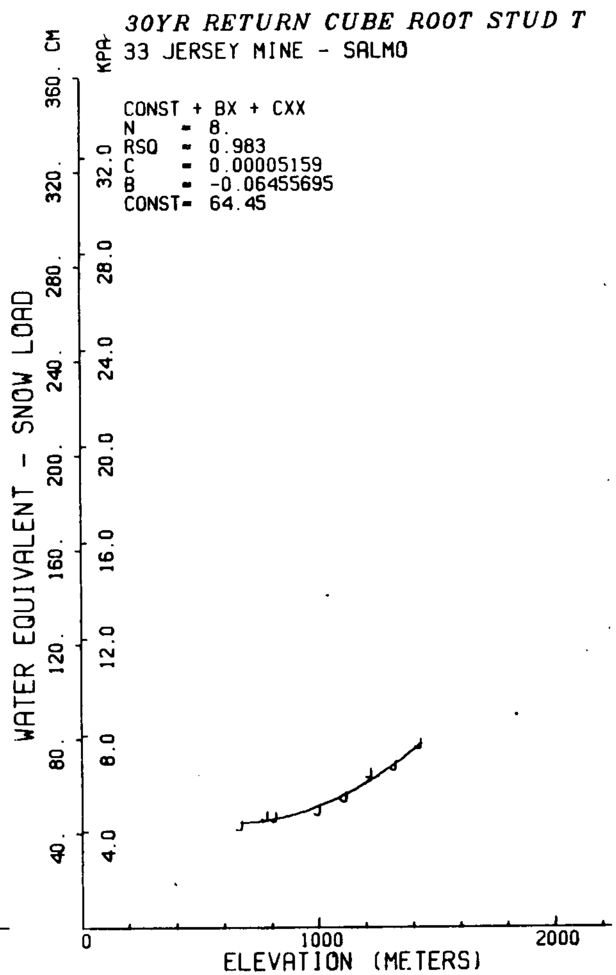


Figure 3.28



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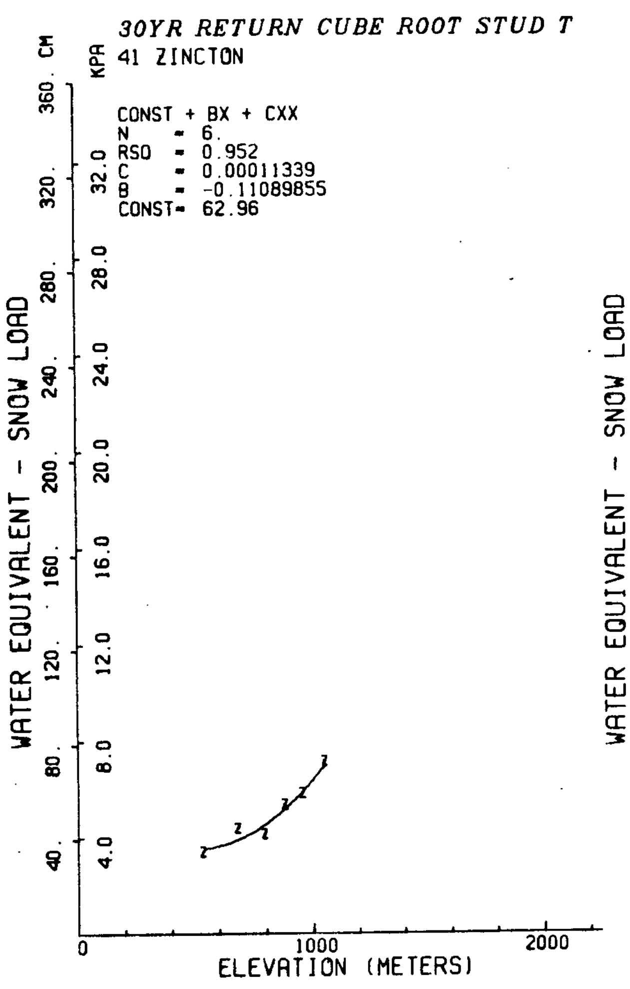
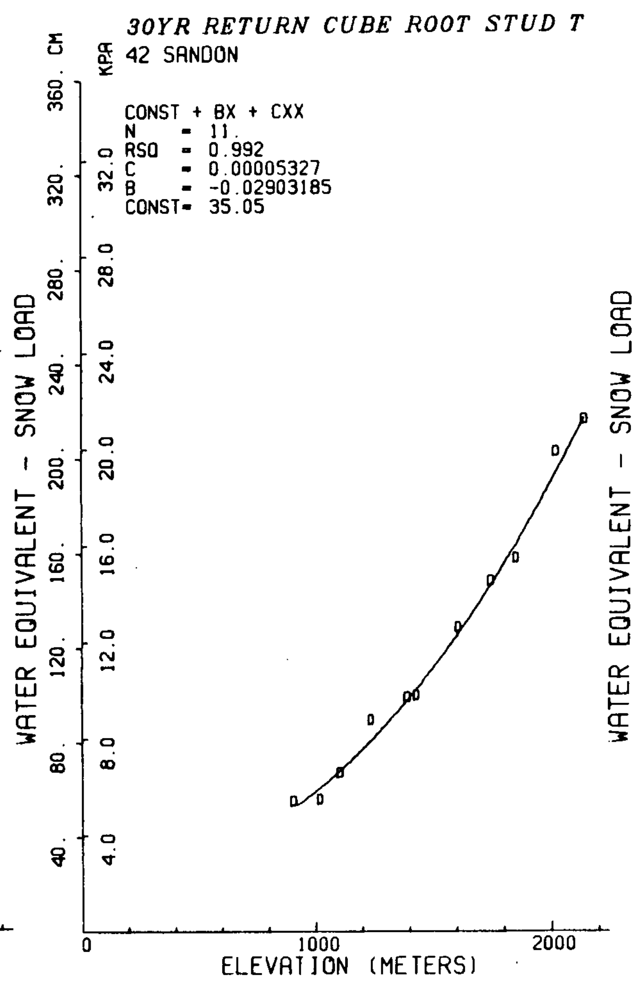


Figure 3.30



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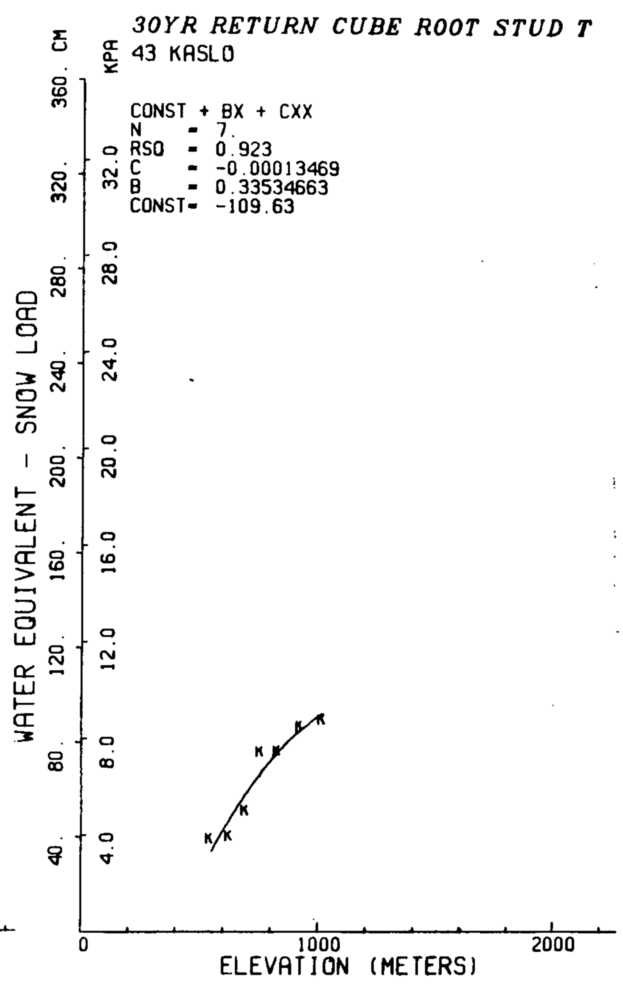


Figure 3.32

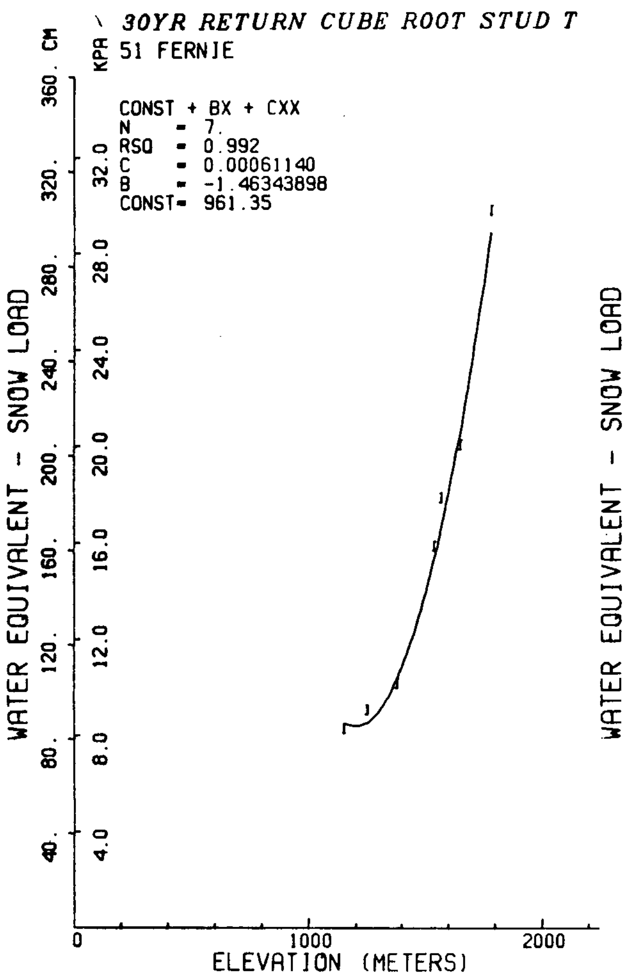


Figure 3.33

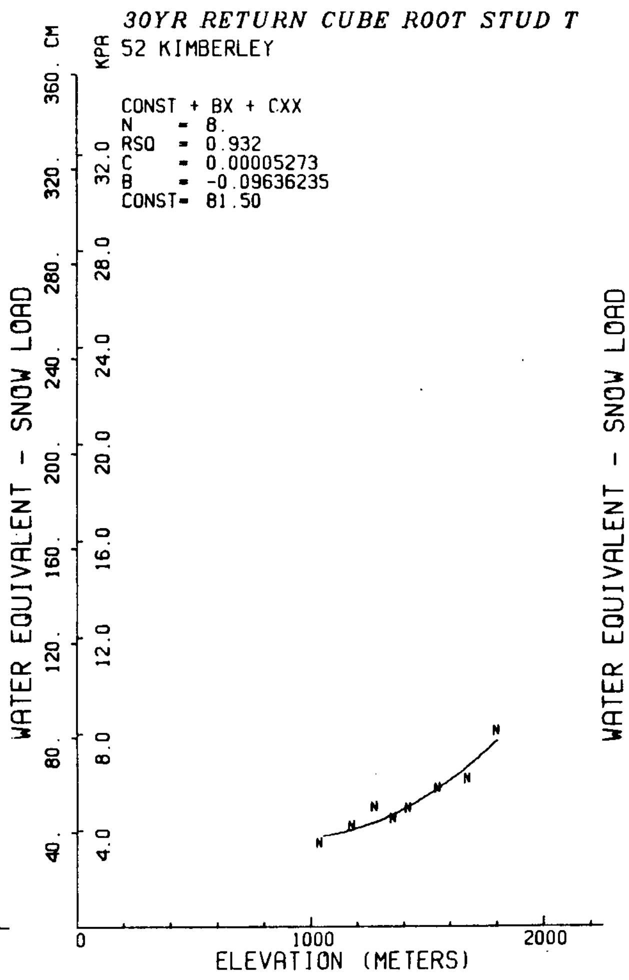


Figure 3.34

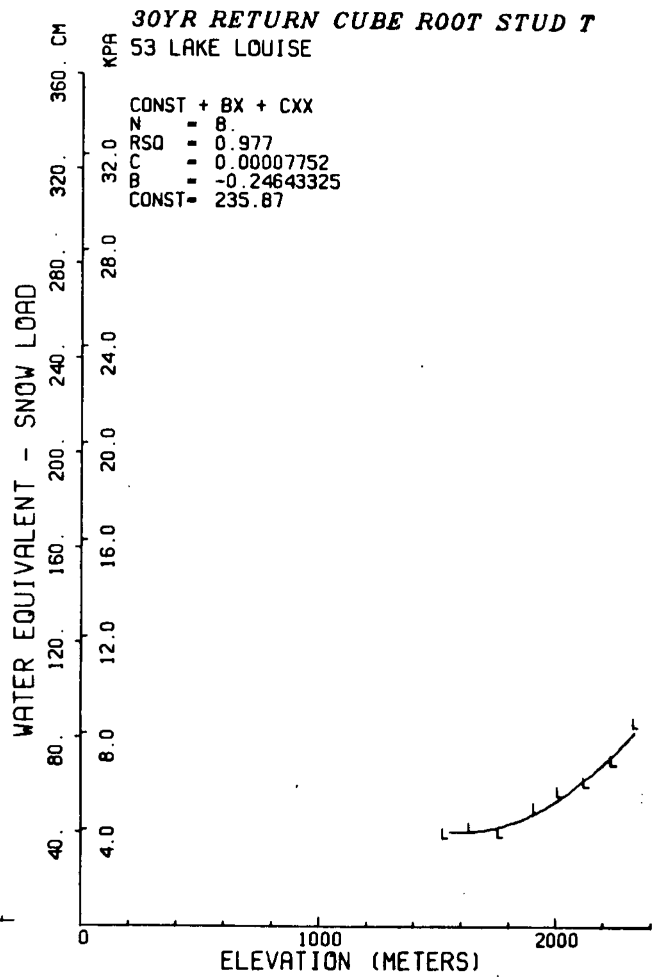
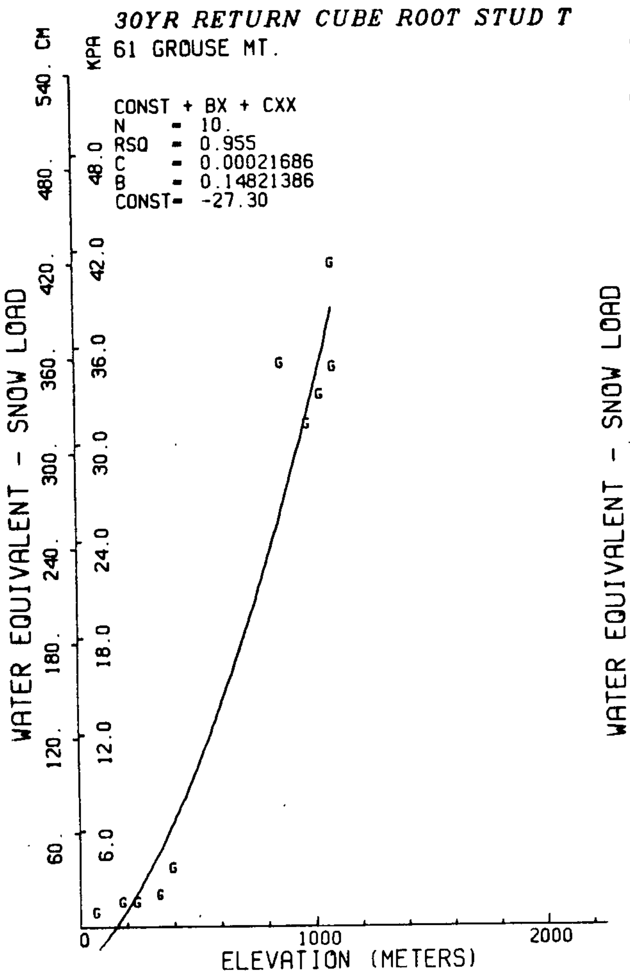


Figure 3.35



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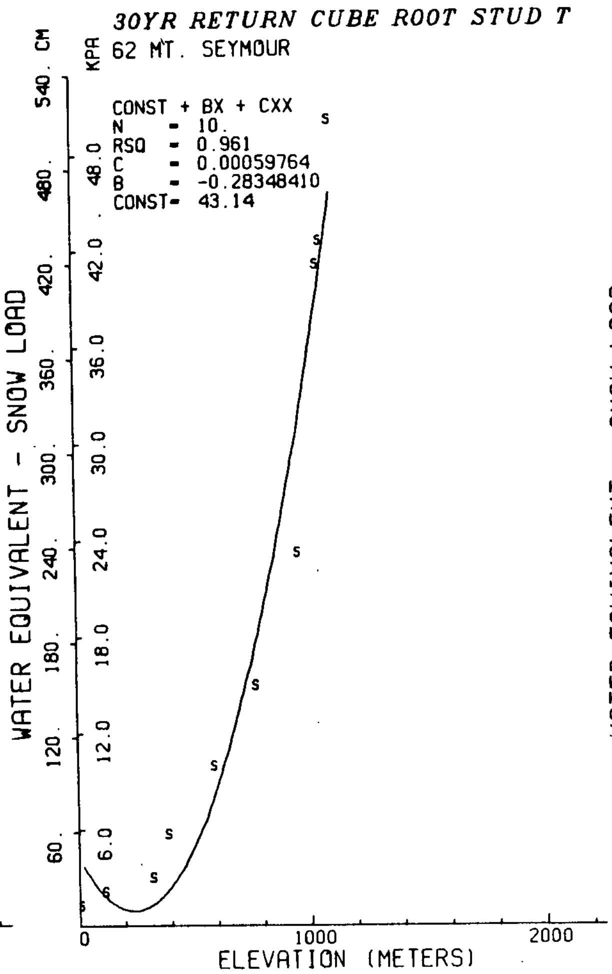


Figure 3.37

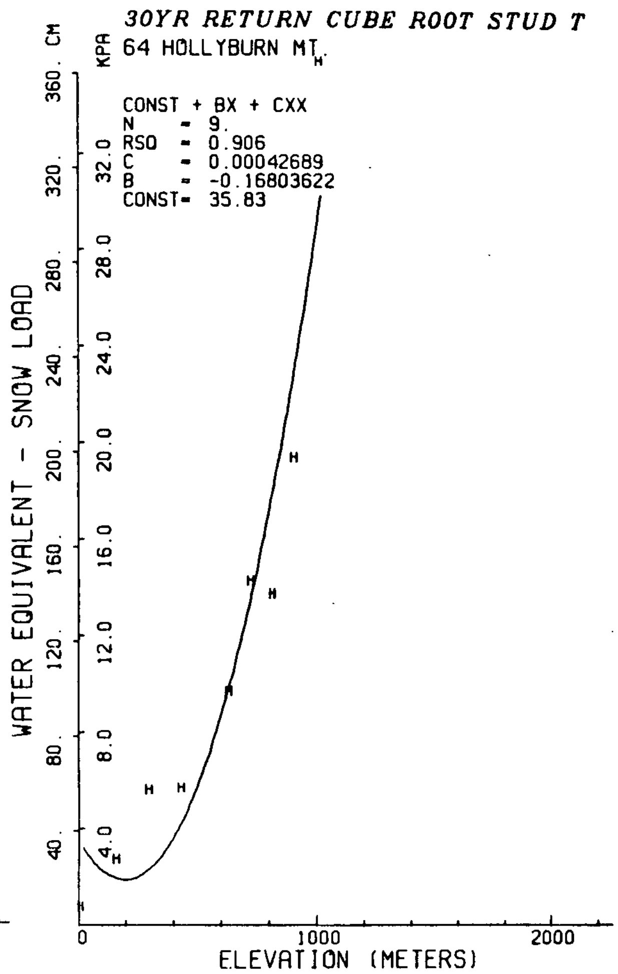


Figure 3.38

annual maximum water equivalent increases with increasing elevation and 2) not all the values of the dependent variable have the same reliability.

3.3.3 Changes In Variance With Elevation

Generally in the case of snow loads, the variance of the mean maximum annual water equivalent increases with increasing elevation. This trend is shown in Figure 3.1 which plots the standard deviations against elevation for all stations observed. This means that the difference between the maximum annual maximum water equivalent (for a given return period) and the mean annual maximum water equivalents becomes progressively larger with increasing elevation. Figure 3.39 illustrates this point.

These changes in the variance violate the assumption in a least squares regression analysis that the variance is constant. Fortunately though, the effect of the changing variance on the curve approximated by the regression is small.

However, this changing variance with elevation, and the problems in determining its value at different elevations prevented the use of the individual water equivalent measurements in the regression directly and necessitated the calculation of a mean water equivalent at each station which was then used in the regression. The former method would have been much preferable since isolated measurements of only one or two years measurements could then be included.

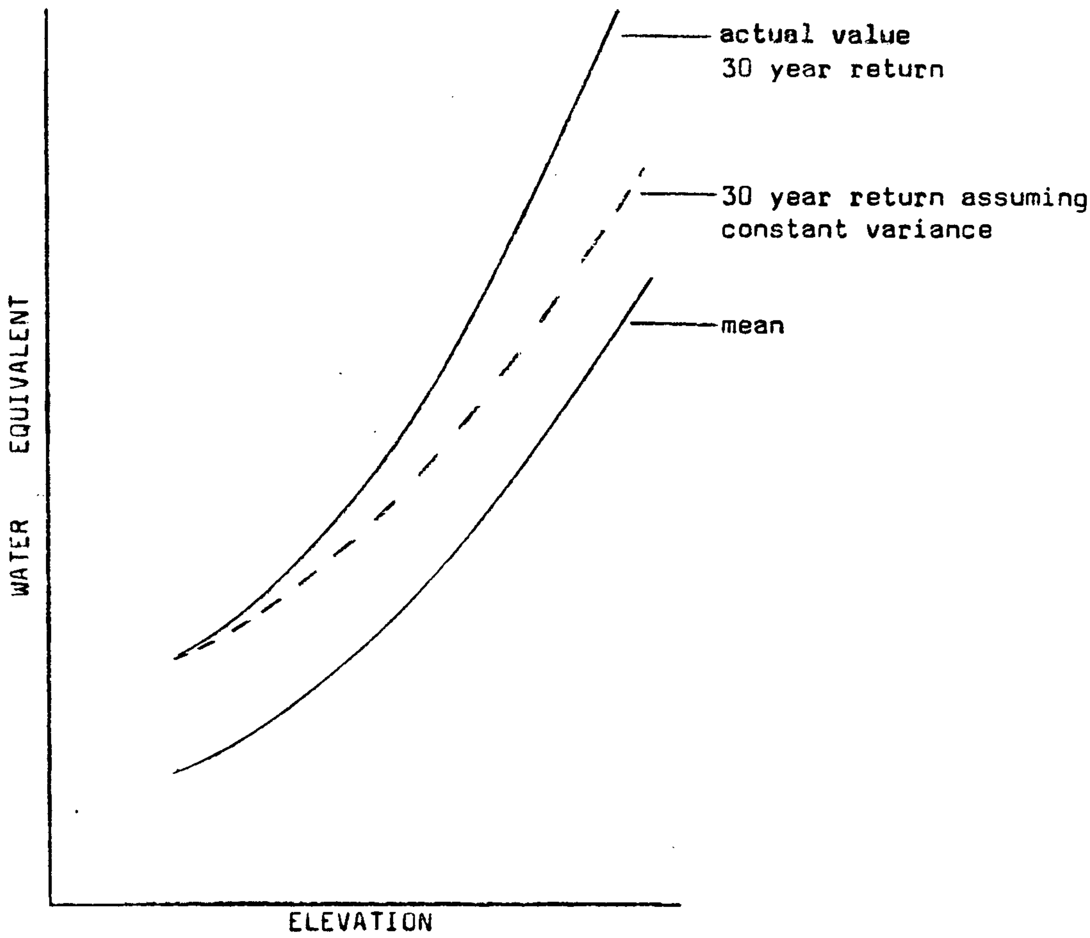


Figure 3.39 Illustration of the effect of assuming constant variance for the regression.

3.3.4 Weighting Of Regression Curve

As can be seen in Appendix I, the means, 30 year water equivalents, etc. at different stations are calculated from varying years of observation. It would therefore probably be desirable to weight these values by the number of years of observations or inversely with the standard deviation to include the effect of increased reliability with larger sample sizes.

However, because of the high degree of fit of the curves to the data it did not seem necessary to do weighting. Furthermore, if weighting by the number of years of observation, it was felt that a group of data values with a large period of observations (eg. at lower elevations) would have an undue influence on the shape of the curve at data values with a smaller observation period (eg. higher elevations). If weighting by using the inverse of the standard deviation, the changes of variance with elevation would be mistakenly included as changes in the reliability.

3.4 Density At Time Of Maximun Water Equivalent

The mean density of snow at the time of maximum water equivalent was determined by dividing the annual maximum water equivalents by the snow depth at the time of observation. The minimum, maximum, mean, and standard deviation of the snow densities are given in Appendix II.

The mean density of the snow at the time of maximum water equivalent is not necessarily the same as the snow density at the time of maximum snow depth since the measurements often have been taken a few days after the last snow fall. The water content remains constant and therefore the densities determined may be slightly higher. The variation of the mean density can be expected to be less for larger snow depths because older snow settles at a considerably slower rate than new snow.

Refering to Appendix II one can see considerable variation in the mean density. Some of the variation will be due to the time of measurement as explained above, however some variation will be due to differences in the snow conditions of the regions.

Spatially, the value of the mean snow densities appears to have similar values for different regions. The approximate ranges and means for the snow densities are given in Table IV. It is particularly evident that the snow densities near the coast have very large variability, likely due to the wet climate and the large variability in snow fall from year to year.

There does not appear to be much correlation of snow density at maximum water equivalent with elevation, except for

Table IV
Snow Densities At Maximum Water Equivalent

Region	minimum (gm/cc)	maximum (gm/cc)	average (gm/cc)
Rogers Pass	.25	.51	.41
Okanagan	.15	.41	.31
Kootenay	.19	.55	.34
Fernie	.20	.50	.38
Kimberley	.17	.40	.29
Lake Louise	.19	.62	.29
Coast-Vancouver	.05? *	.84? *	.36

* may be anomalous values

the Vancouver locations. This however is a possible indication that the mean density of the snow cover is correlated with snow depth. This seems reasonable since a snow cover with a greater depth will be composed of a larger fraction of dense older snow.

Chapter 4.

Regions with similar ground load characteristics

Examination of plots of mean annual maximum water equivalents, 30 year maximum water equivalents, standard deviations, etc, against elevation showed that several locations have significant similarities. It was desirable to group locations with similar ground snowload characteristics together so that regions of British Columbia with similar characteristics could be defined. Primarily what was wanted were regions with similar 30 year maximum water equivalent and methods to calculate the 30 year maximums at different elevations.

4.1 Parameters Used To Determine Similarity Of Locations

The statistical parameters calculated at each station (see Appendix I) were plotted against elevation. The principal parameters plotted were: a)means, b)standard deviations, c)30 year maximum water equivalents and d)coefficient of variation.

It was hoped to determine for a region a curve of mean annual maximum water equivalents against elevation and of the standard deviation of the mean annual maximum water equivalents against elevation. From these two plots it would be then possible to determine the maximum water equivalent at any elevation for any return period.

Least squares regression curves for the mean annual maximum water equivalent fitted the combined data from several locations very well and r^2 values above .95 were not uncommon. Using visual inspection and r^2 values groups of locations with similar mean annual maximum water equivalent could be defined. However it was harder to observe trends defining groups of locations with similar standard deviations. When plotting the standard deviation for the same locations which had similar mean annual maximum water equivalent, there was considerably more scatter than there was for the means. Some indication of the amount of scatter obtained with plots of the standard deviation and of the coefficient of varitation can be seen by refering to Figure 3.1 and Figure 3.2. It was also attempted to find trends among the other statistical parameters as tabulated in Appendix I, but this proved to be unmanagable.

Plots using the 30 year maximum water equivalent data combined from several locations did show an excellent fit to a regression curve. This was mainly because of the high degree of fit of a curve to the mean annual maximum water equivalent to which a smaller number is added (K * standard deviation) to obtain the 30 year value. Since the 30 year maximum water equivalents are the principal values of interest for design, and because they exhibit smooth curves, locations were grouped into regions by similarity of the mean annual maximum water equivalent and of the 30 year maximum water equivalent .

4.2 Regions With Similar Ground Snow Loads

The locations were grouped into larger regions on the basis of similarity of the mean annual maximum water equivalent plots and 30 year maximum water equivalent plots, and also on the basis of precipitation, snow depth and water equivalent maps of Southern British Columbia (Figures 2.2 - 2.4). The boundaries of the regions with similar ground snow load is uncertain since the network of measurement locations was not sufficiently dense. These regions, along with other groups of locations which have similar water equivalent values, are listed in in Table V and their curves are plotted in Figures 4.1 - 4.28. Figure 4.28, a plot of all the means of all the water equivalents measured is shown for reference only, and the regression curve is not meant to signify some relationship.

Table V
Regions With Similar Ground Snow Loads

Region Name	Locations
Rogers Pass	11,12
Mt. Copeland	13
Okanagan	21,22,23
Kootenay	31,32,33,41,42,43
Kootenay south *	31,32,33
Kootenay north *	41,42,43
Interior(not incl. 13)	11,12,21,22,23,31,32,33,41,42,43
Wet Rocky Mt.(Fernie)	51
Dry Rocky Mt.	52,53
Coast Mnt. - Vancouver	61,62,64

* Sub-regions

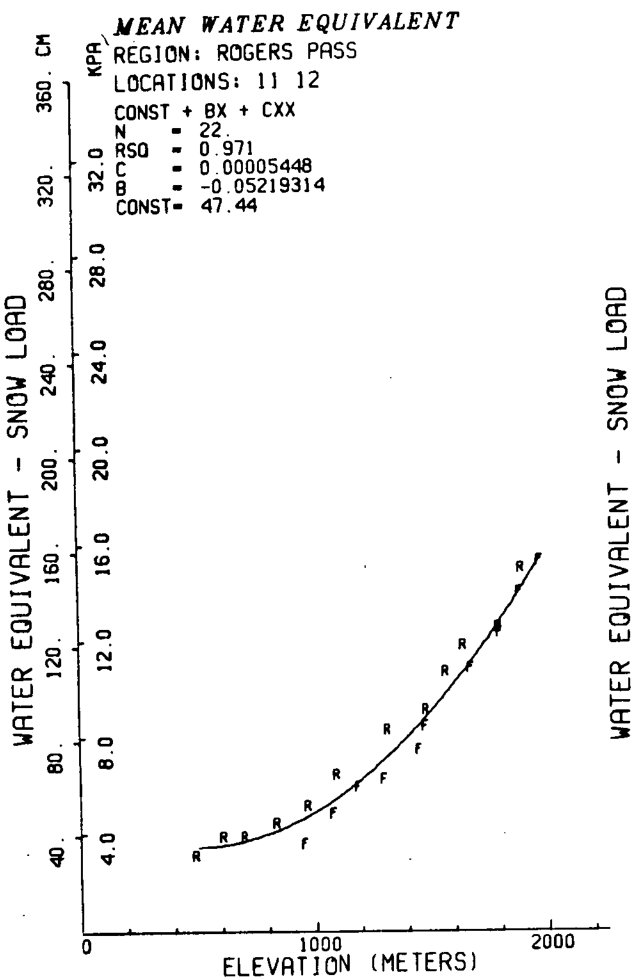


Figure 4.1

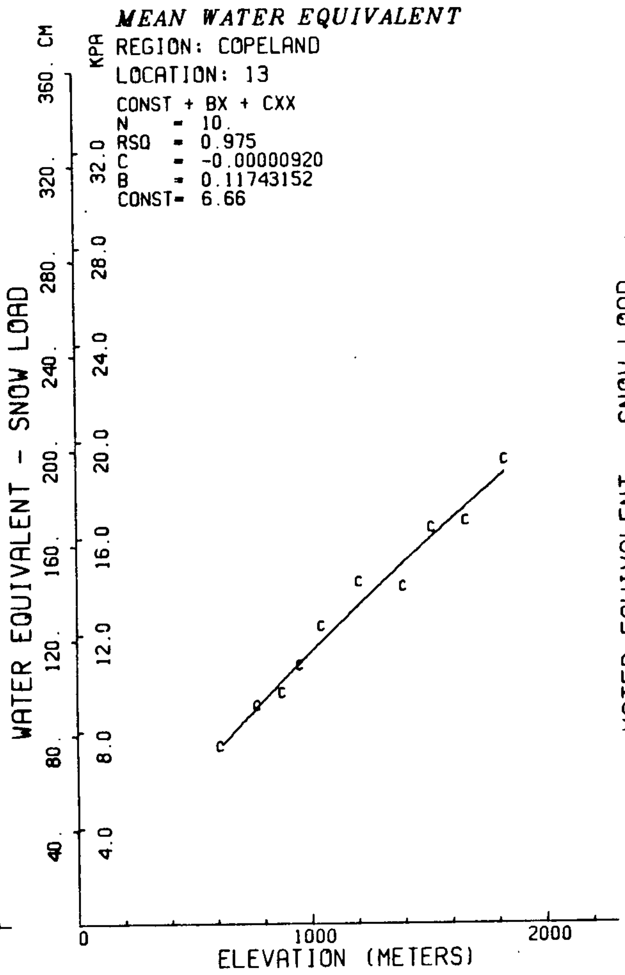


Figure 4.2

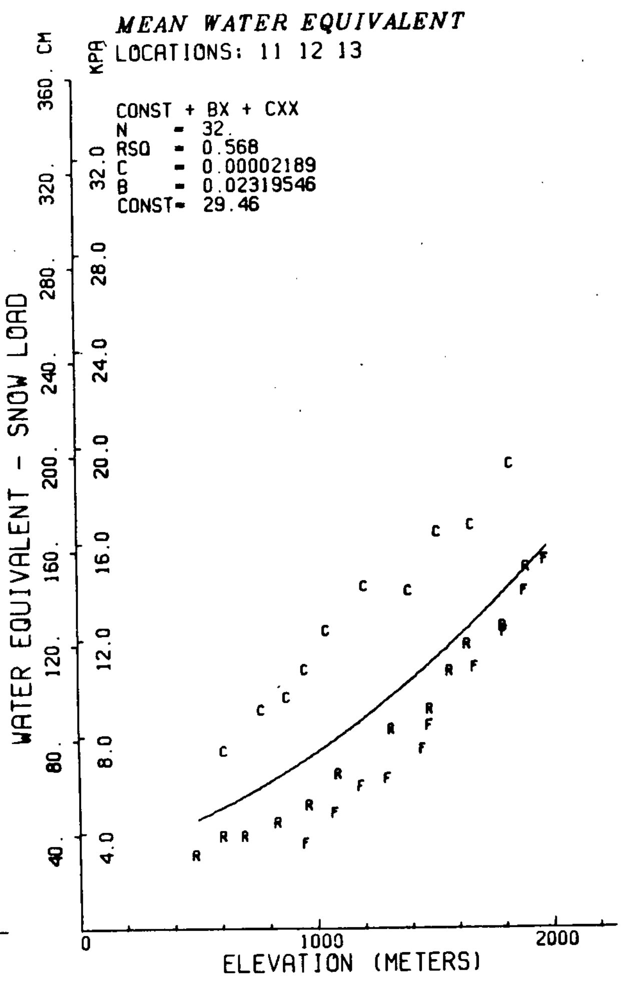


Figure 4.3

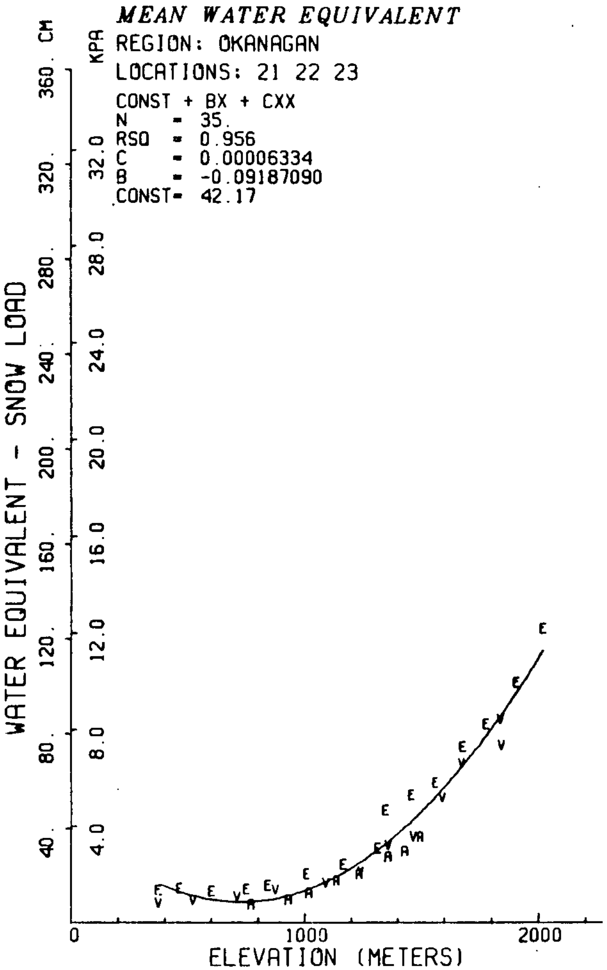

MEAN WATER EQUIVALENT
REGION: OKANAGAN
LOCATIONS: 21 22 23
CONST + BX + CXX
N = 35.
RSQ = 0.956
C = 0.00006334
B = -0.09187090
CONST= 42.17
WATER EQUIVALENT - SNOW LOAD
CM
KPA
ELEVATION (METERS)
0
1000
2000
40.
80.
120.
160.
200.
240.
280.
320.
360.
4.0
8.0
12.0
16.0
20.0
24.0
28.0
32.0

Figure 4.4

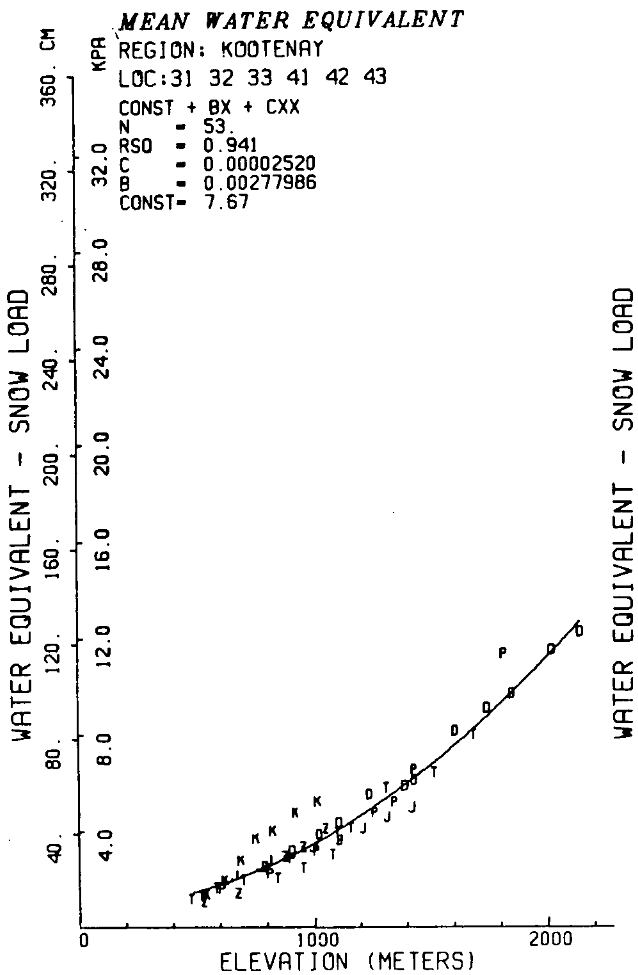


Figure 4.5

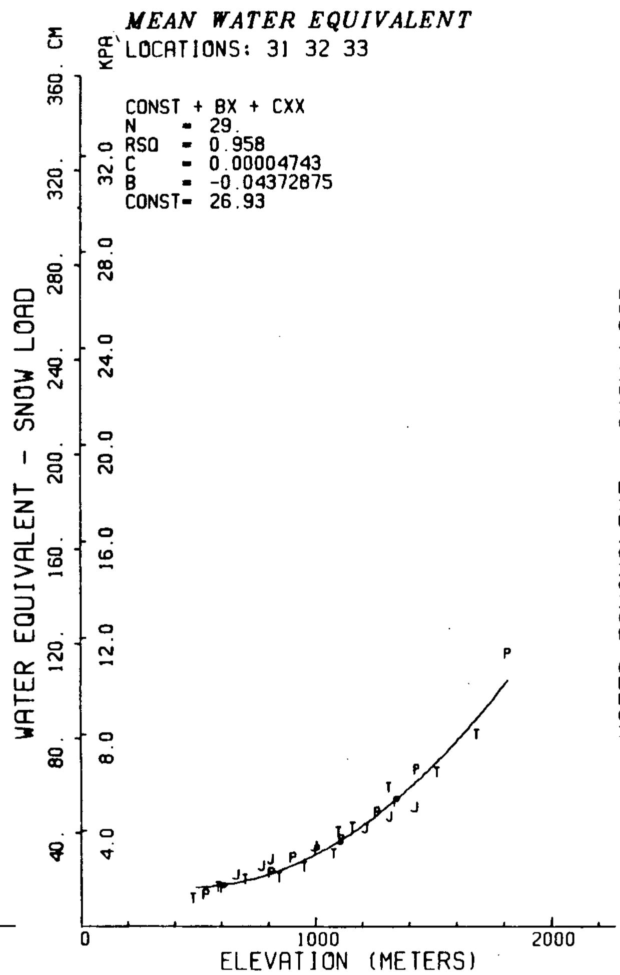


Figure 4.6

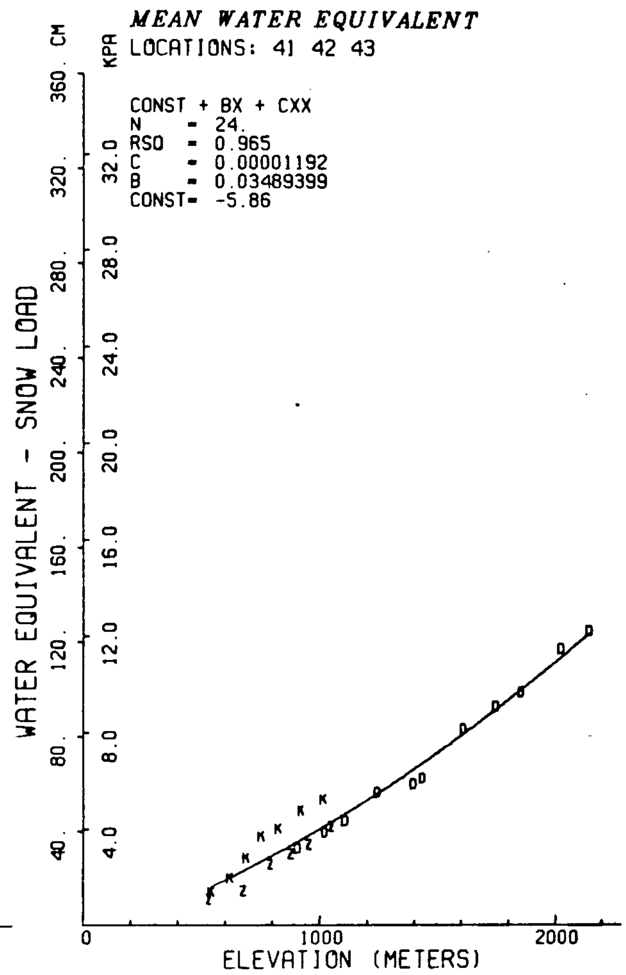


Figure 4.7

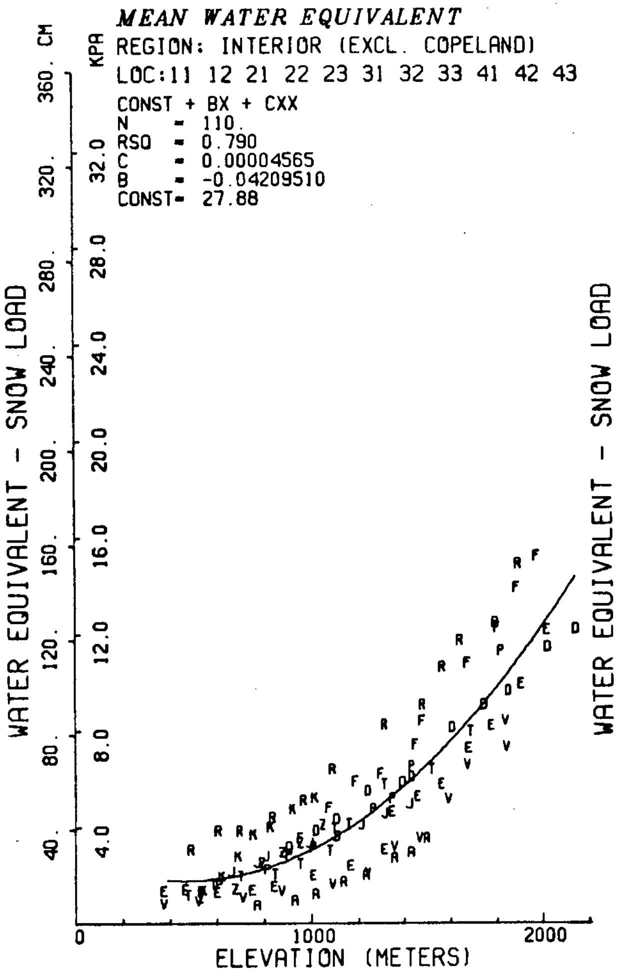


Figure 4.8

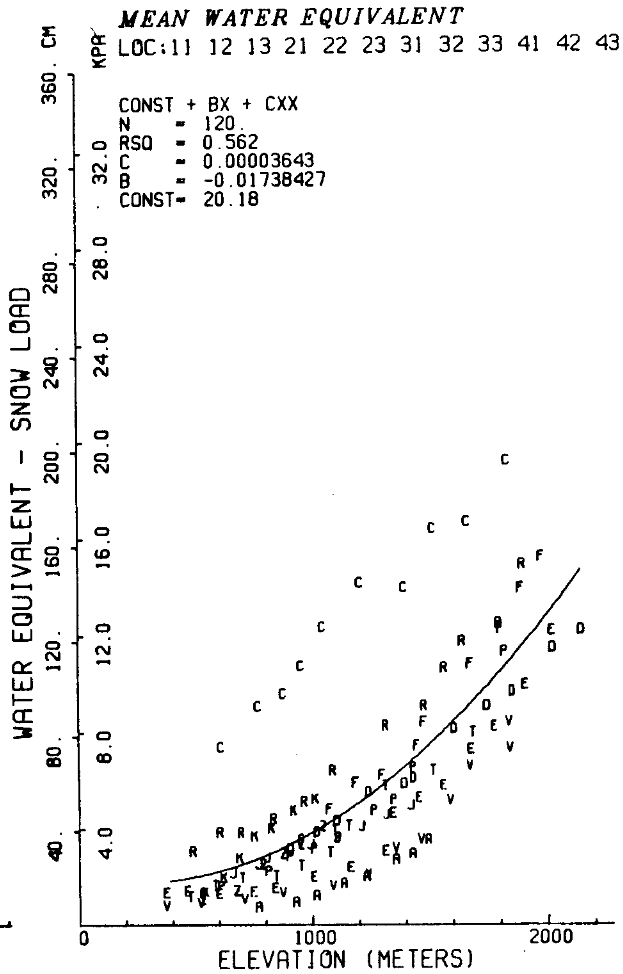
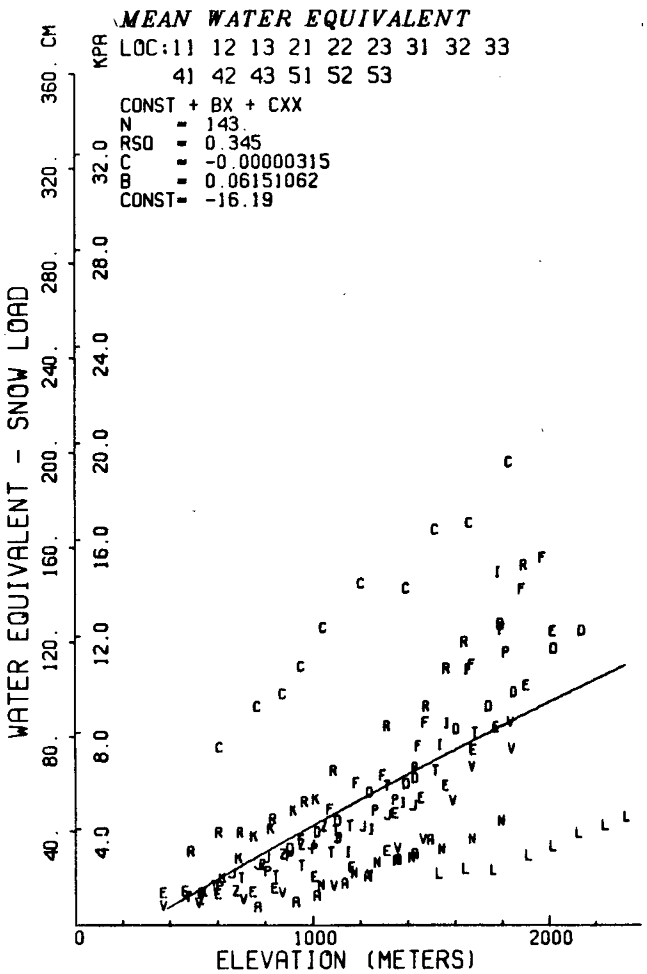


Figure 4.9



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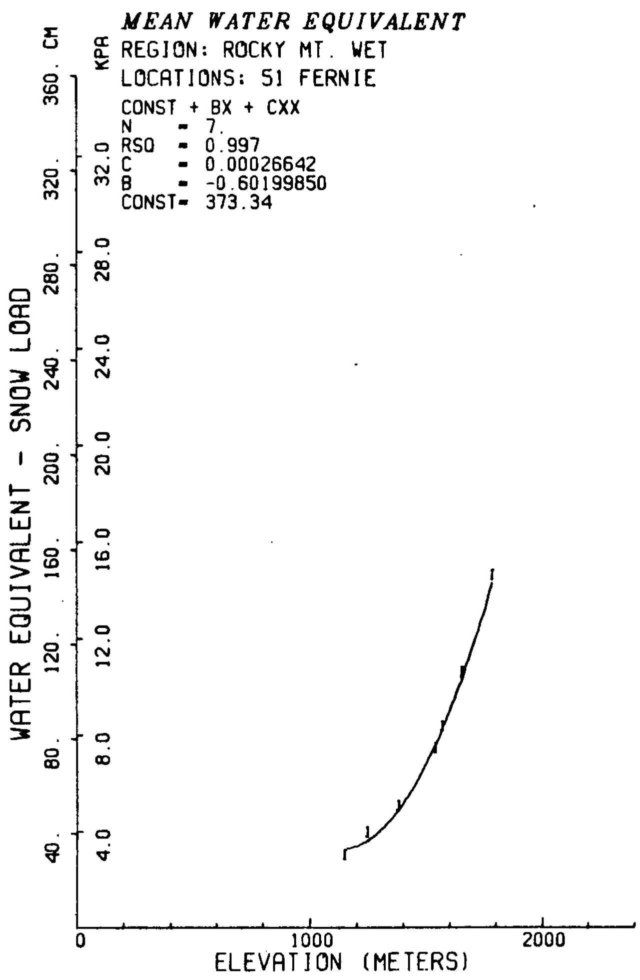


Figure 4.11

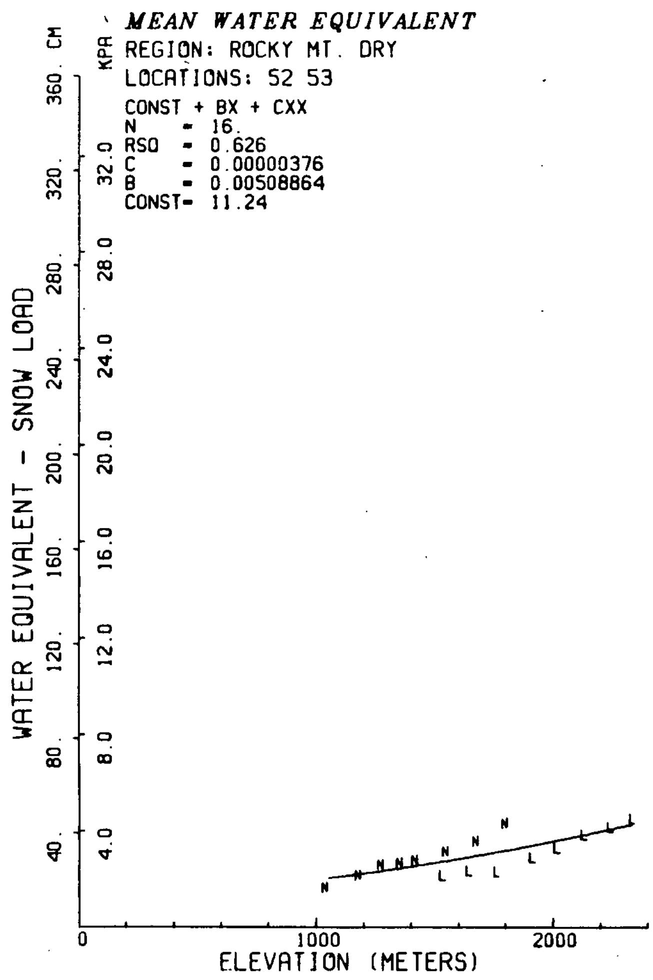


Figure 4.12

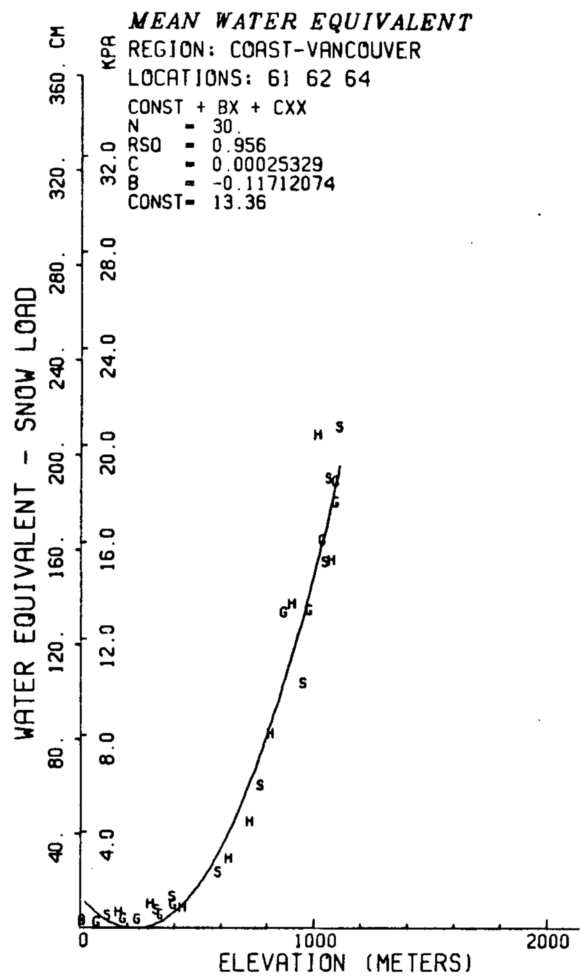


Figure 4.13

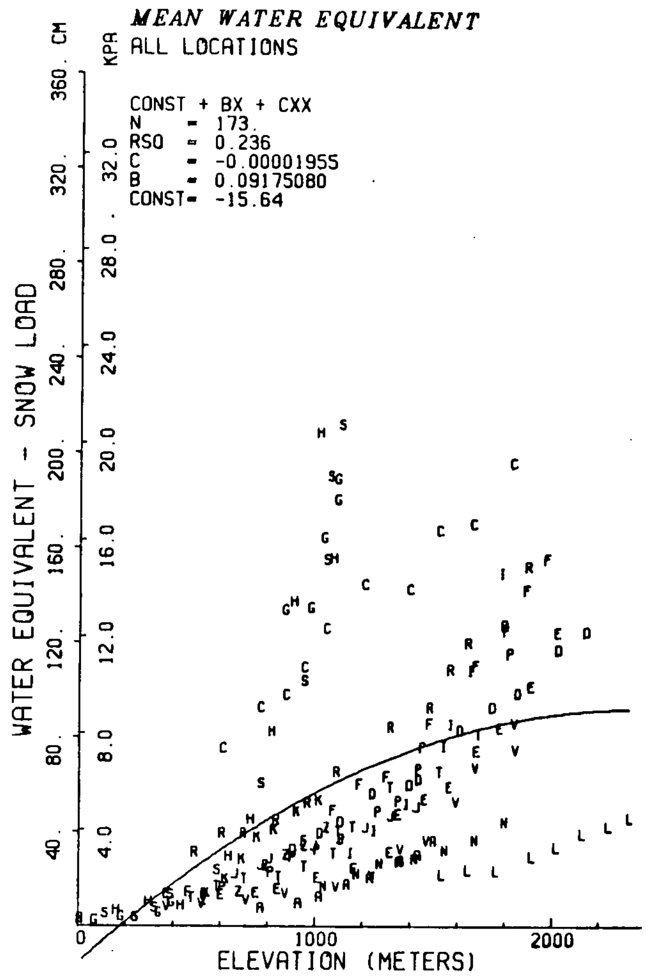


Figure 4.14

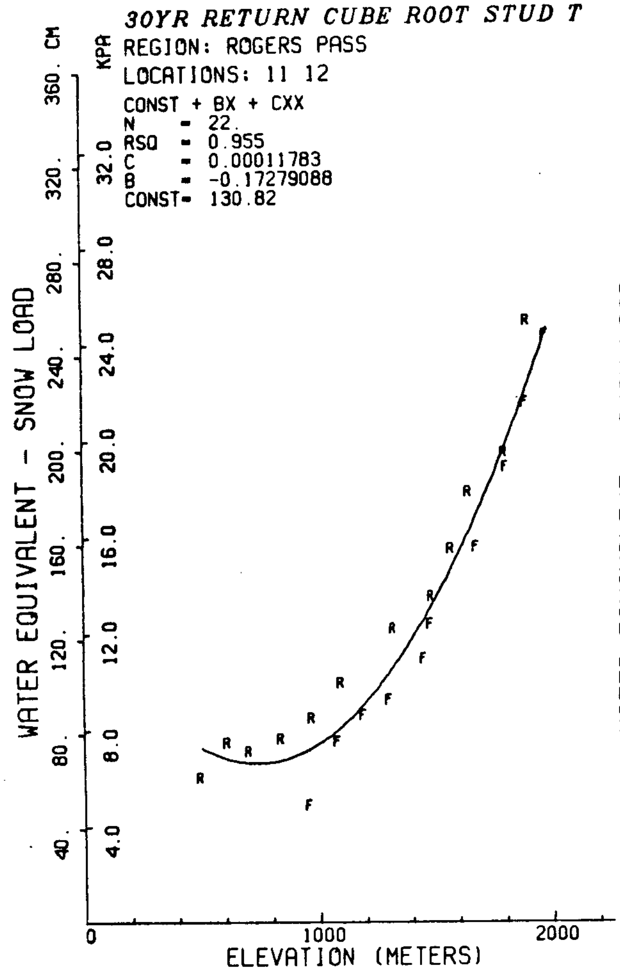


Figure 4.15

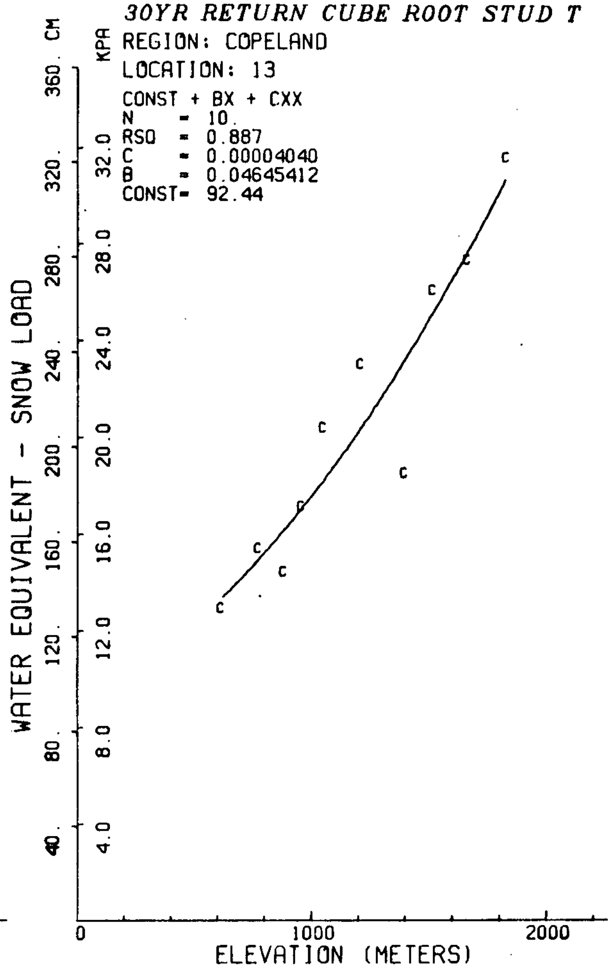


Figure 4.16

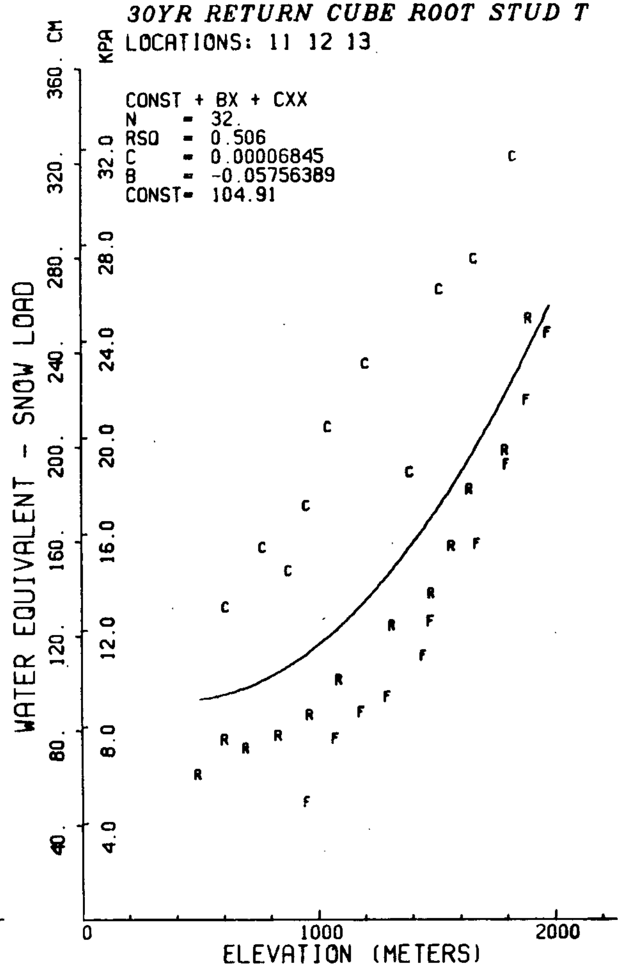


Figure 4.17

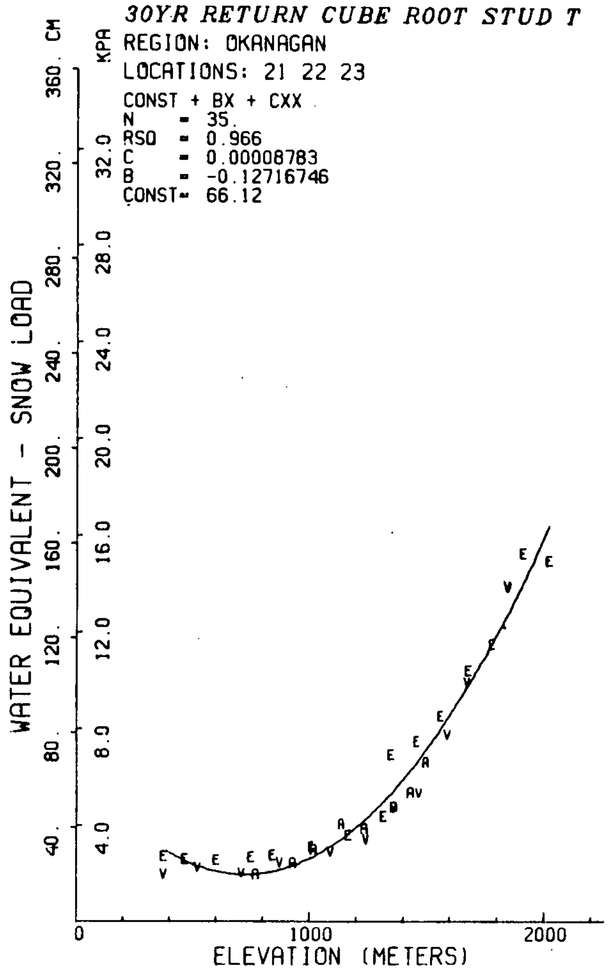

30YR RETURN CUBE ROOT STUD T
REGION: OKANAGAN
LOCATIONS: 21 22 23
CONST + BX + CXX
N = 35.
RSQ = 0.966
C = 0.00008783
B = -0.12716746
CONST= 66.12
WATER EQUIVALENT - SNOW LOAD
CM
KPA
360.
320.
280.
240.
200.
160.
120.
80.
40.
32.0
28.0
24.0
20.0
16.0
12.0
8.0
4.0
0
1000
2000
ELEVATION (METERS)

Figure 4.18

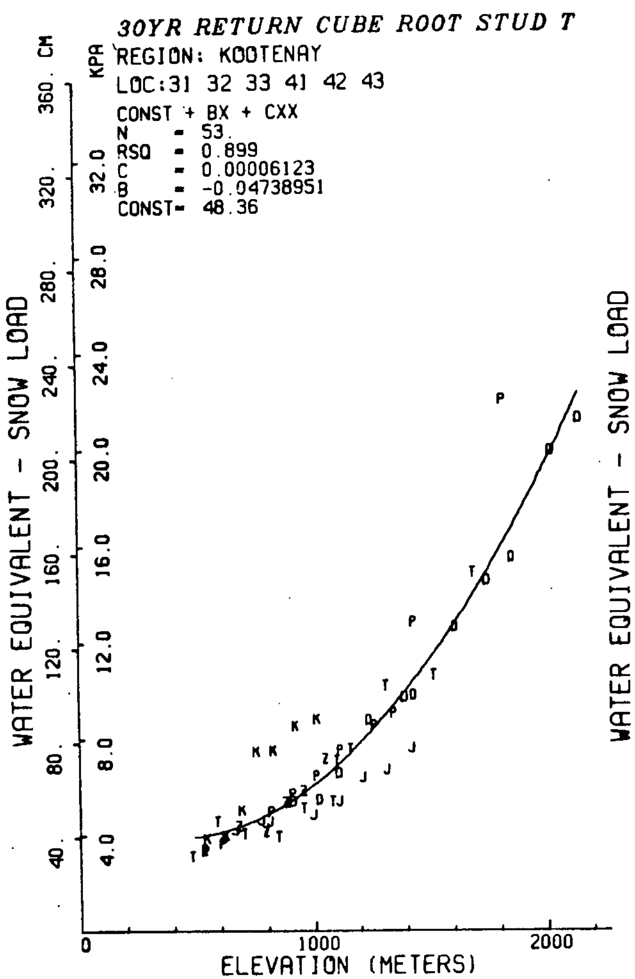


Figure 4.19

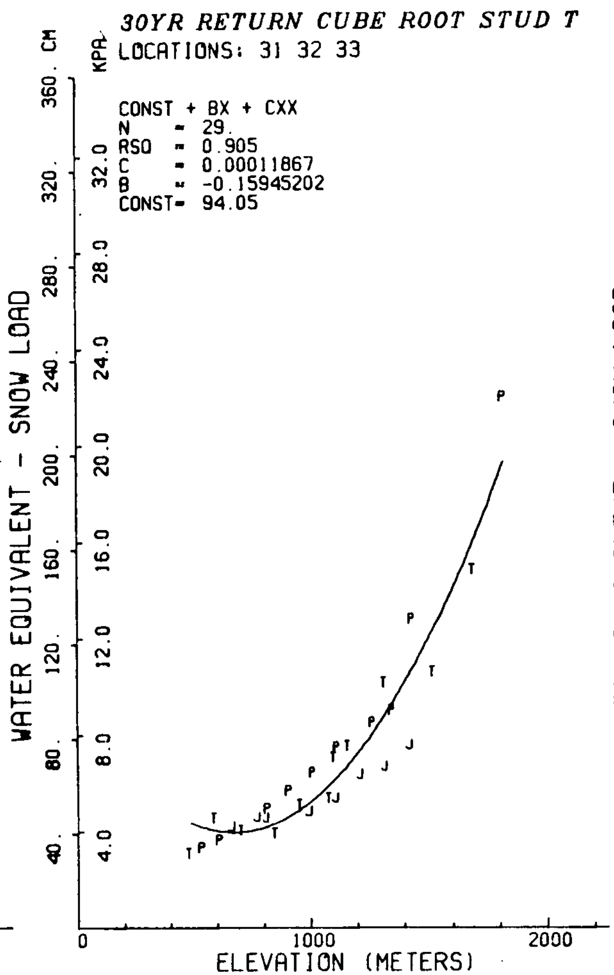
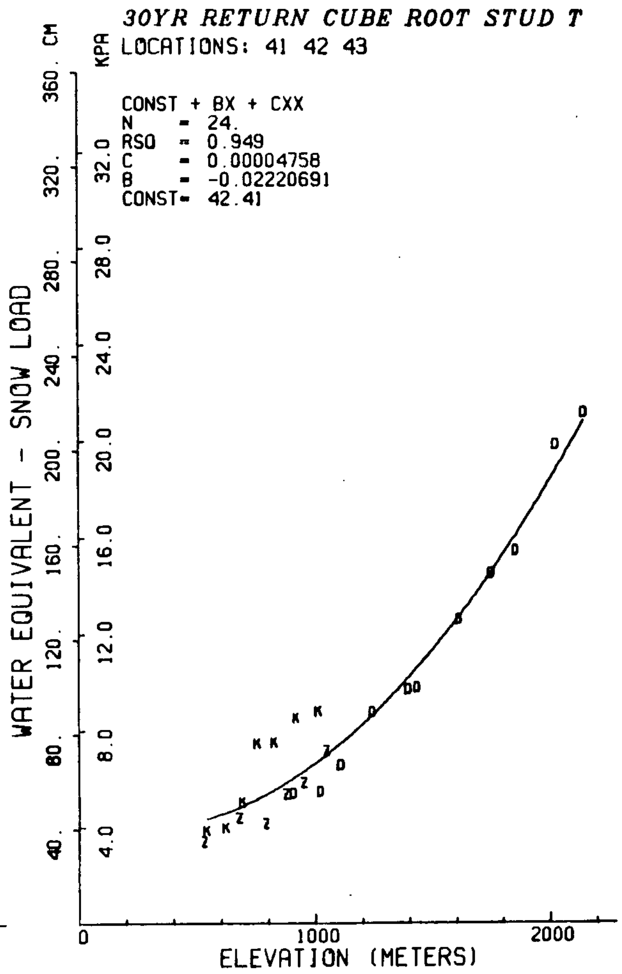


Figure 4.20



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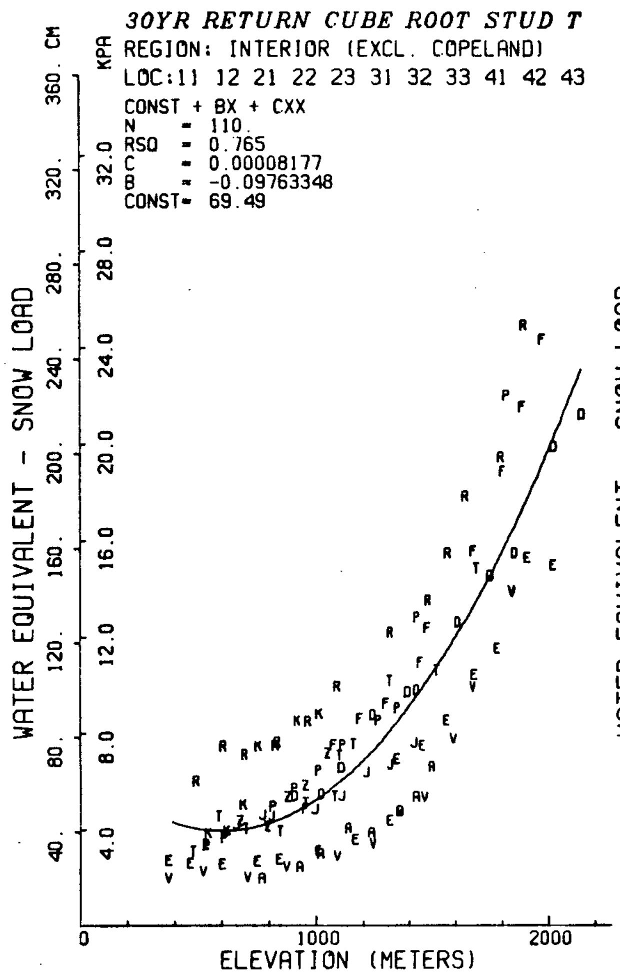
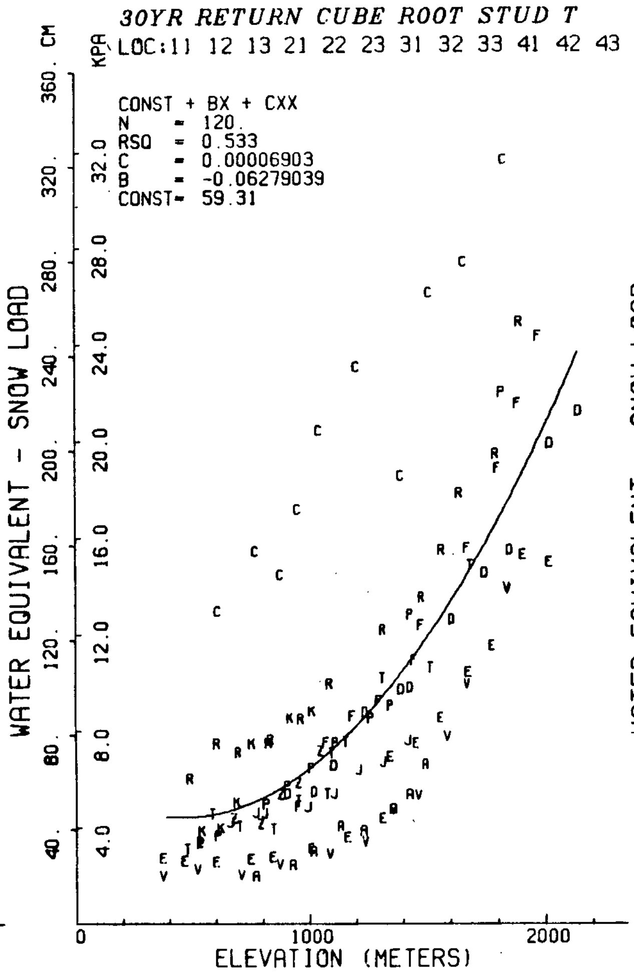


Figure 4.22



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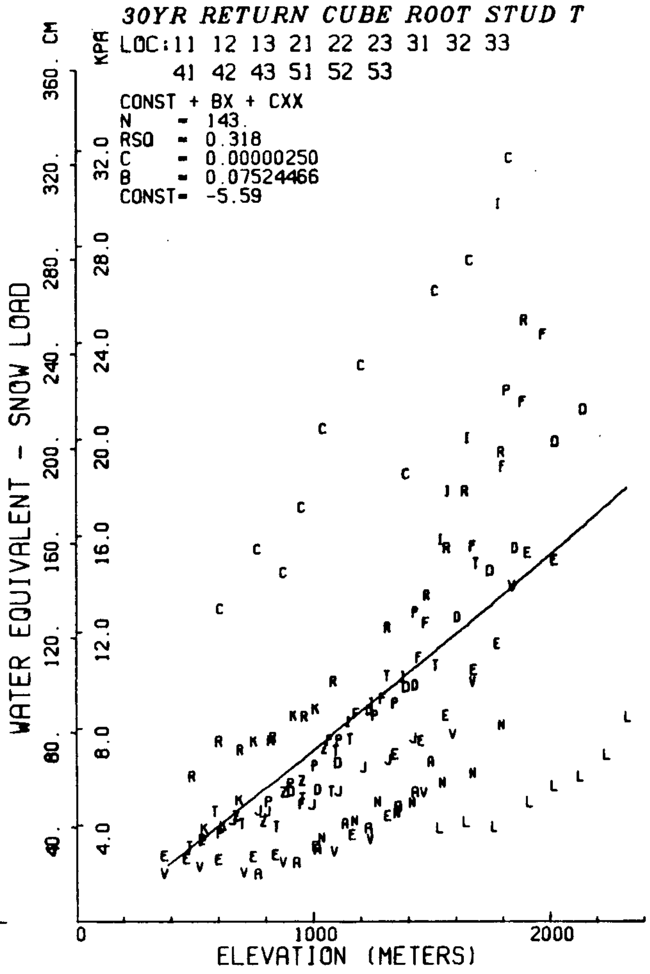


Figure 4.24

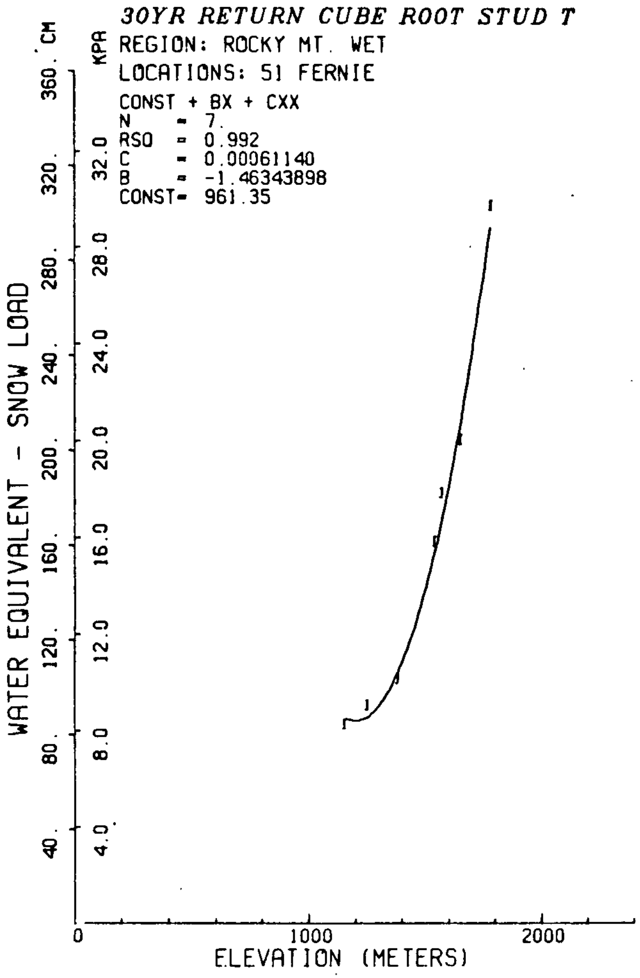


Figure 4.25

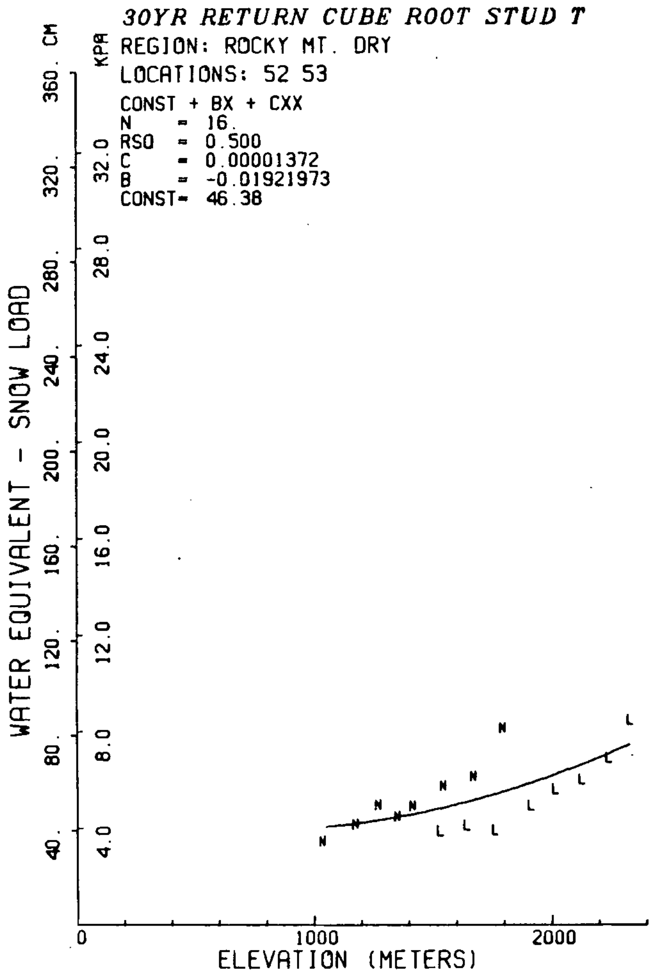


Figure 4.26

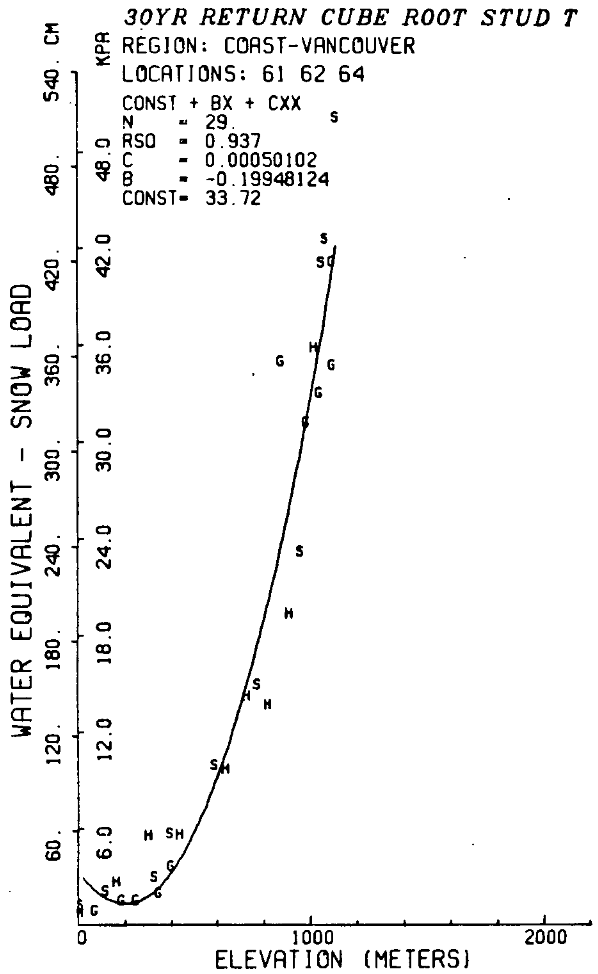


Figure 4.27

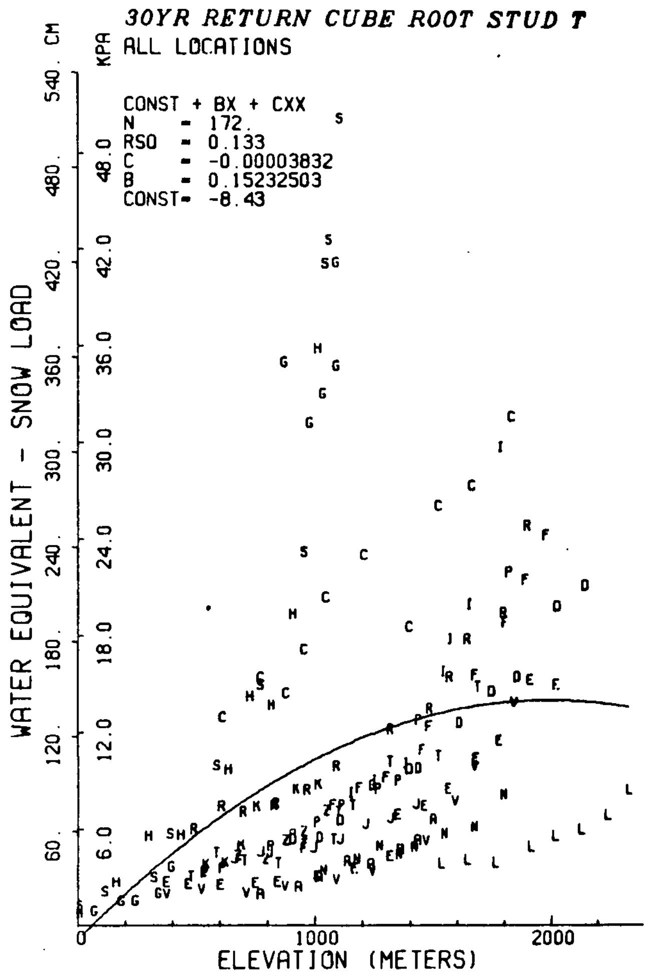


Figure 4.28

4.3 Similarities In The Relative Increase Of Ground Snow Loads

Refering to plots of the mean annual maximum water equivalent and 30 year maximum water equivalent of all the locations observed (Figures 3.3 - 3.38) it can be seen that curves plotted for many locations seem to exhibit similar increases of water equivalent with elevation or similar "curvature", but the origin may vary. By knowing the relative increase (difference) of water equivalent from one elevation to another it will be possible to extrapolate water equivalents from one elevation where values are known to another where they are not.

4.3.1 Method

A least squares regression was done where the "constant" term of the quadratic equation, used to model the relationship between water equivalent and elevation, varied between locations. The model used had the form:

$$Y = bX + cX^2 + a(1)Z(1) + a(2)Z(2) + \ldots \qquad (4.1)$$

where Y is the dependent variable(water equivalent etc.)
X is the elevation
b,c are parameters
Z(s) is a dummy variable, = 1 for location (s)
= 0 otherwise
a(s) is the constant term for location (s)

4.3.2 Results

As before, when considering the actual value of water equivalents, locations exhibiting similar relative water equivalents (mean annual maximum and 30 year maximum) were grouped together into regions. These regions along with other groups of locations having similar relative water equivalent values are listed in Table VI and plotted in Figures 4.29 - 4.48.

Table VI
Regions With Similar Relative Water Equivalents

Region Name		Location
Interior		11,12,13,21,22,23,31,32,33,41,42,43
Rogers Pass	*	11,12,13
Okanagan	*	21,22,23
Kootenay south	*	31,32,33
Kootenay north	*	41,42,43
Kootenay	*	31,32,33,41,42,43
Rocky Mtn. (wet)		51
Rocky Mtn. (dry)		52,53
Coast-Vancouver		61,62,64

* Sub-regions

As can be seen the degree of fit for most of the curves is very high with an average r^2 of 0.92. It is noteworthy that the interior region has very similar relative increases of water equivalent with elevation over a very large area.

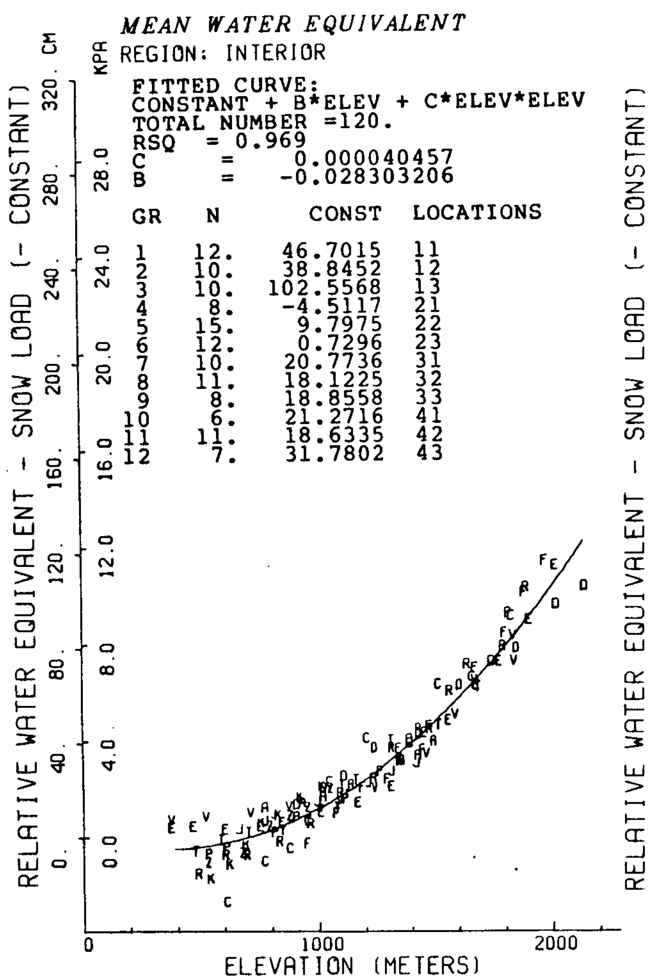


Figure 4.29

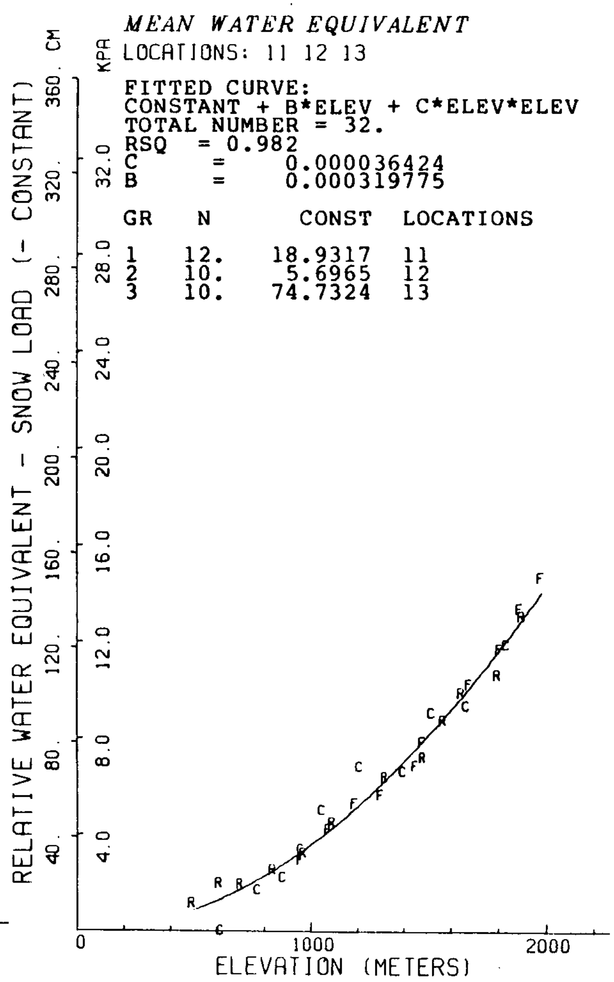


Figure 4.30

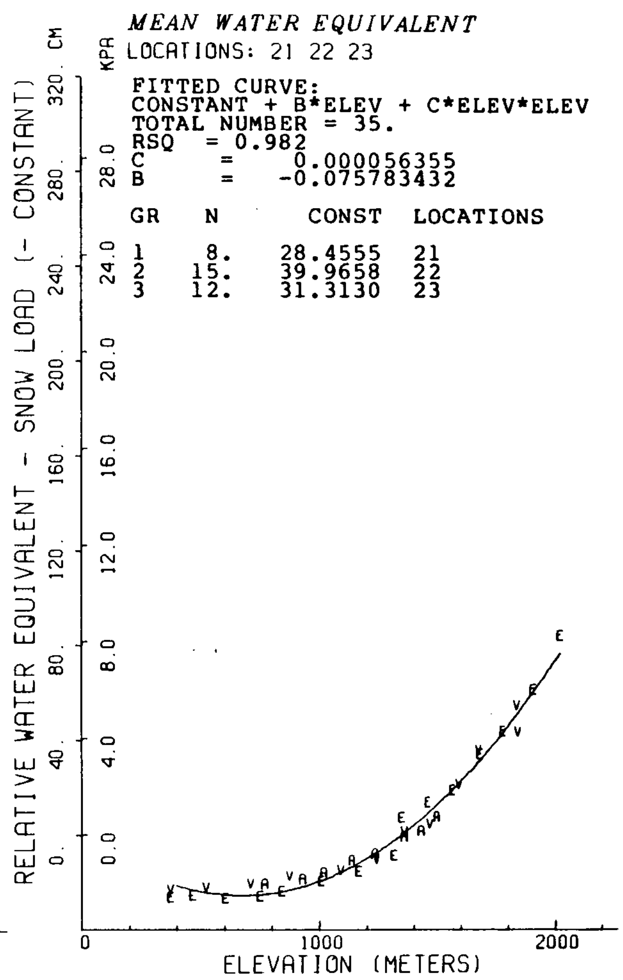


Figure 4.31

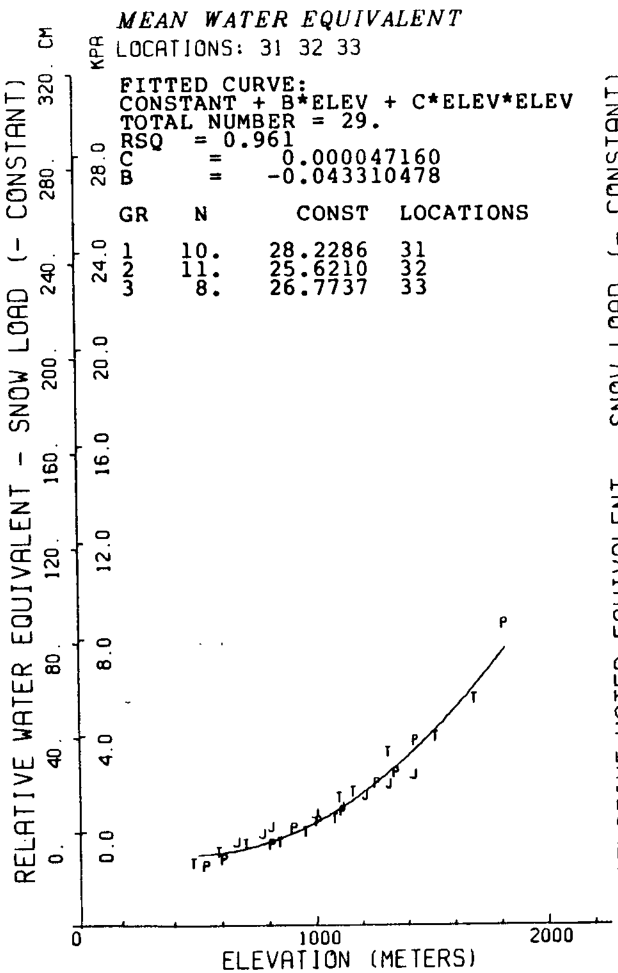
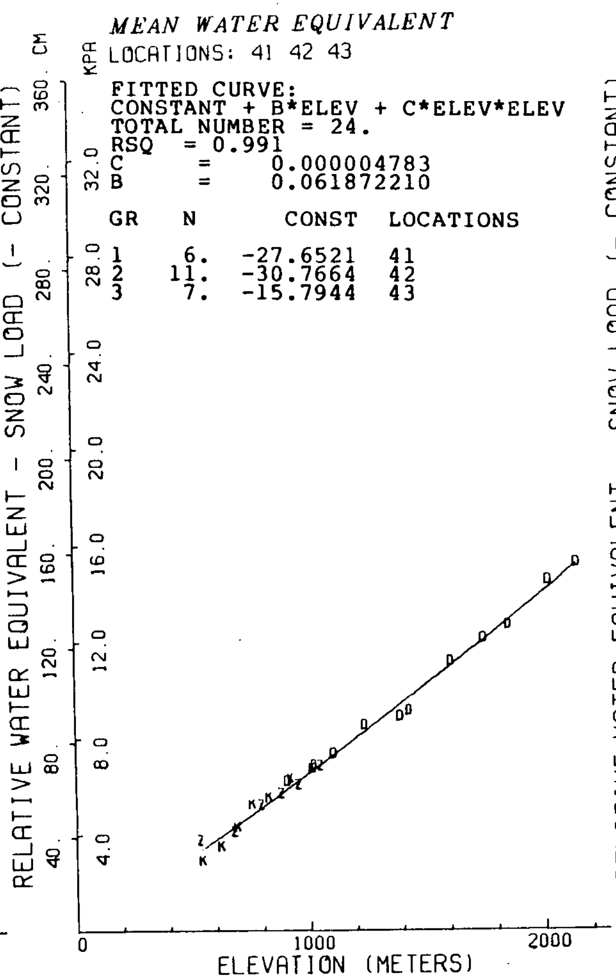


Figure 4.32



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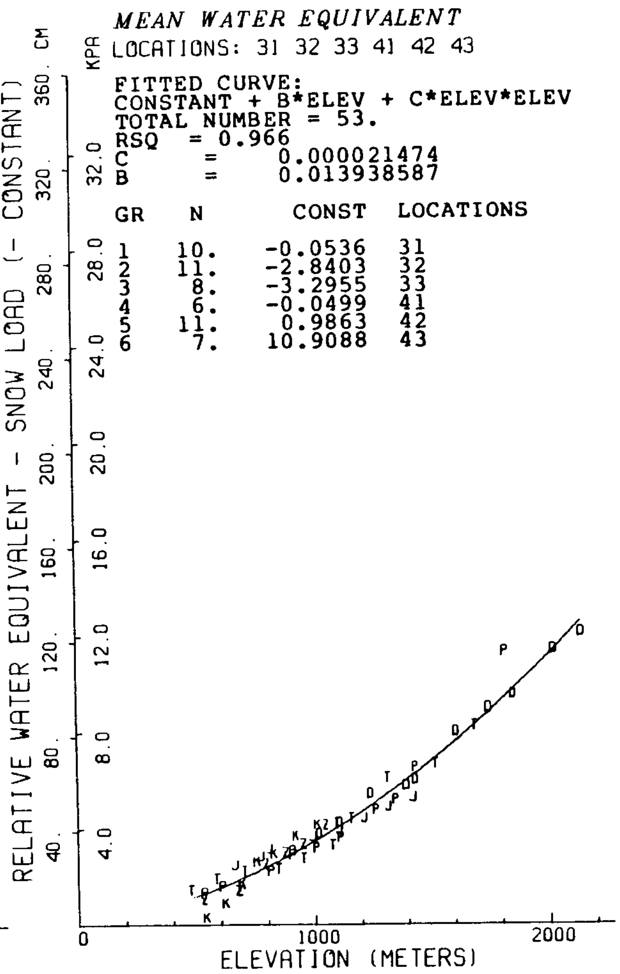


Figure 4.34

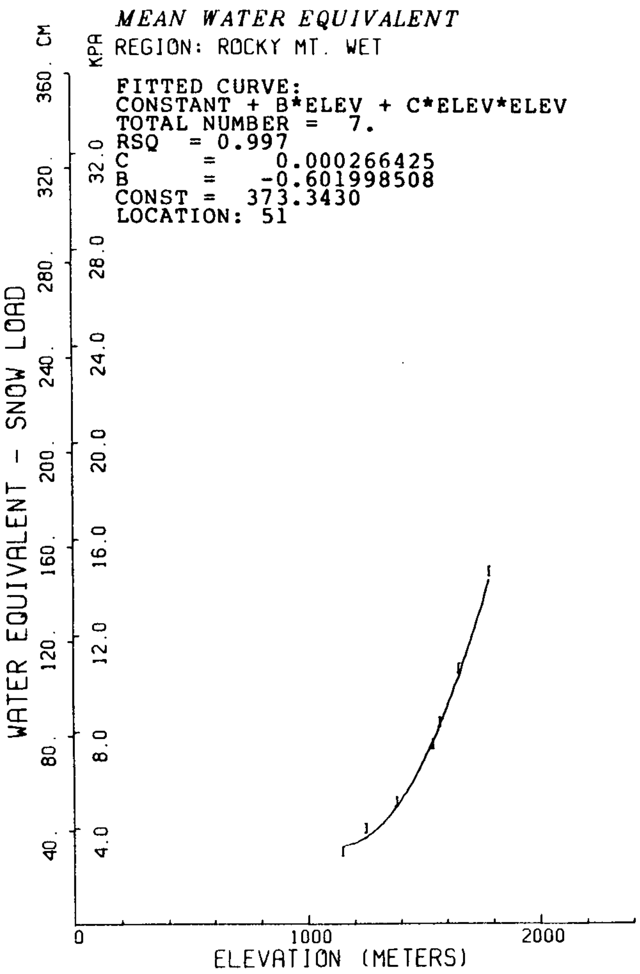


Figure 4.35

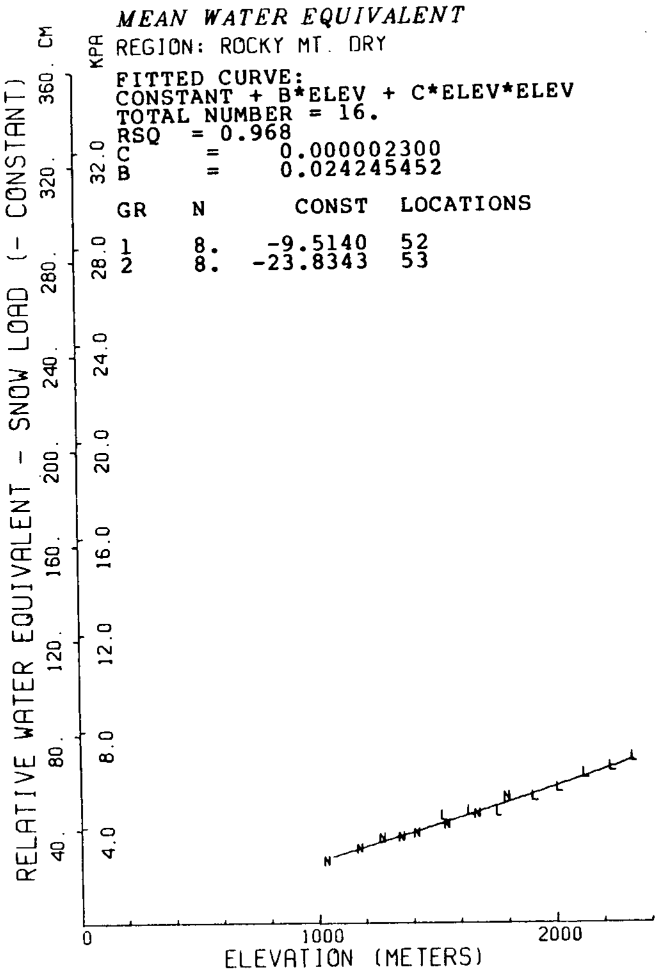


Figure 4.36

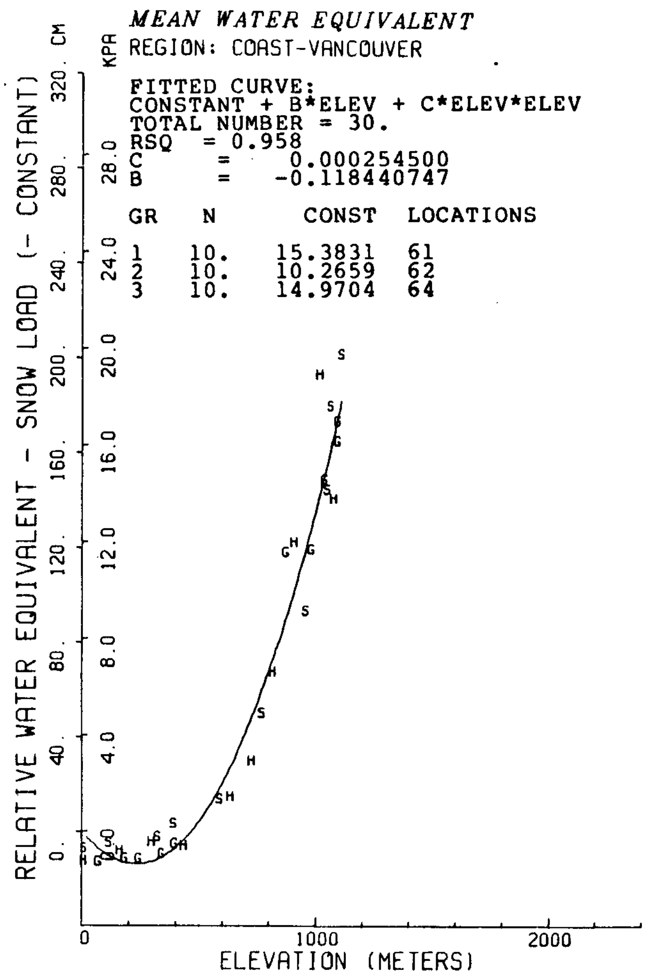
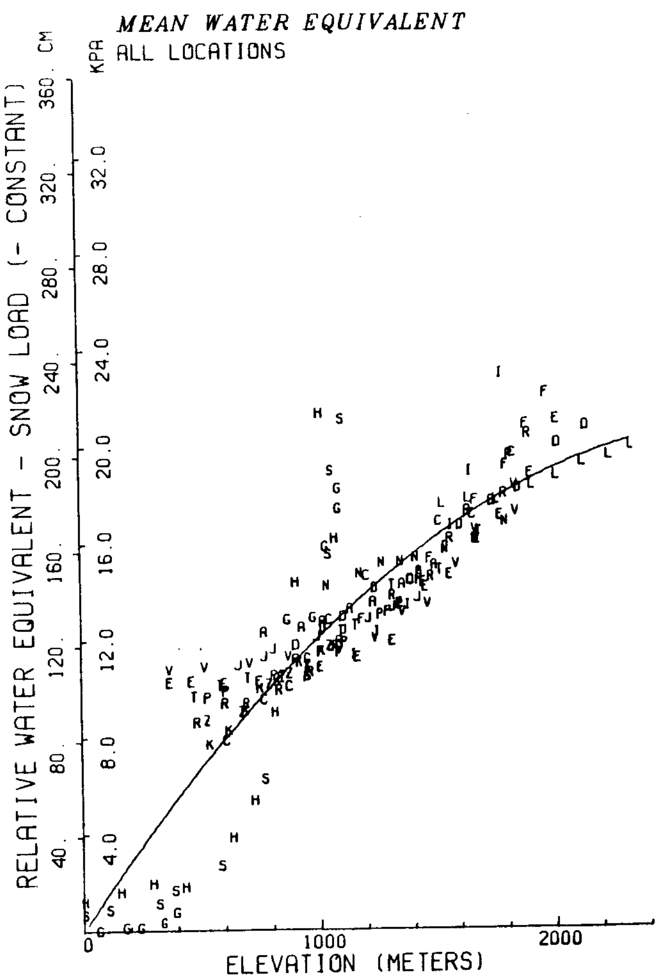


Figure 4.37



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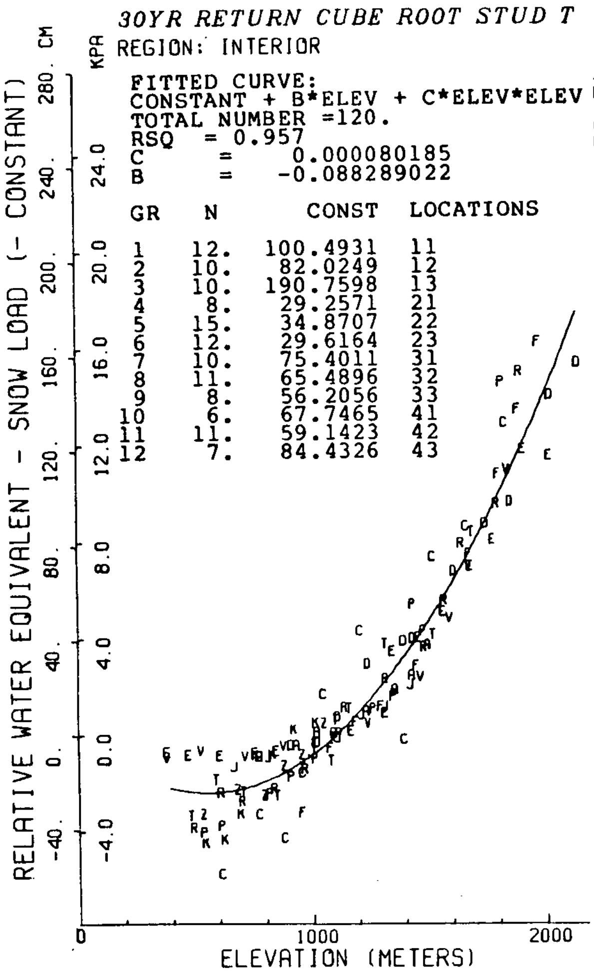

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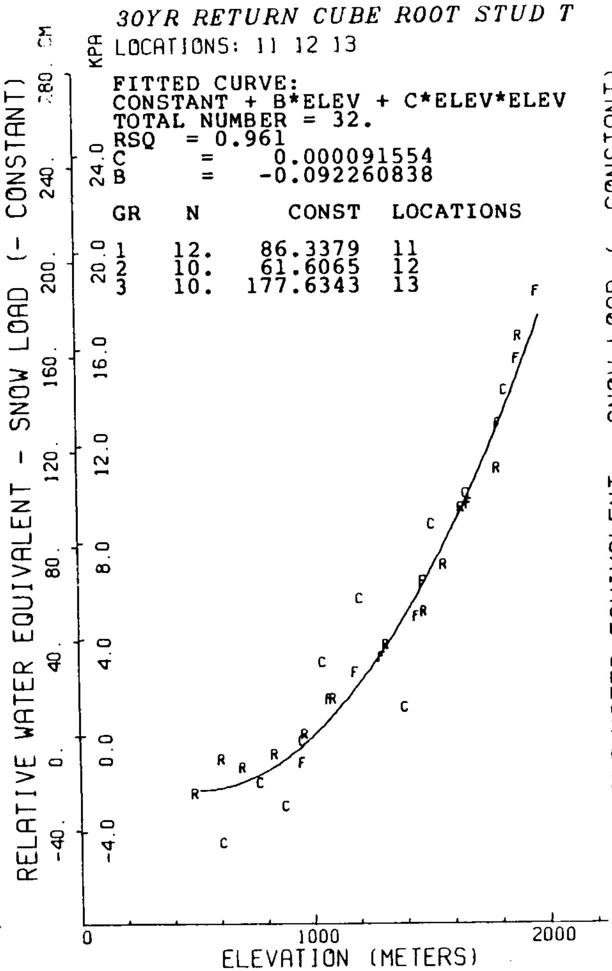

Figure 4.40

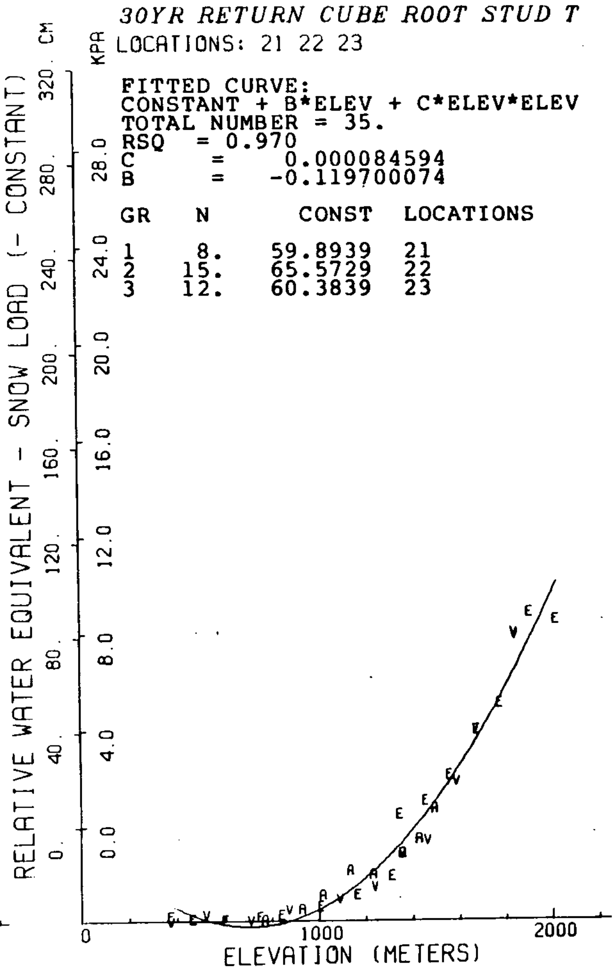

Figure 4.41

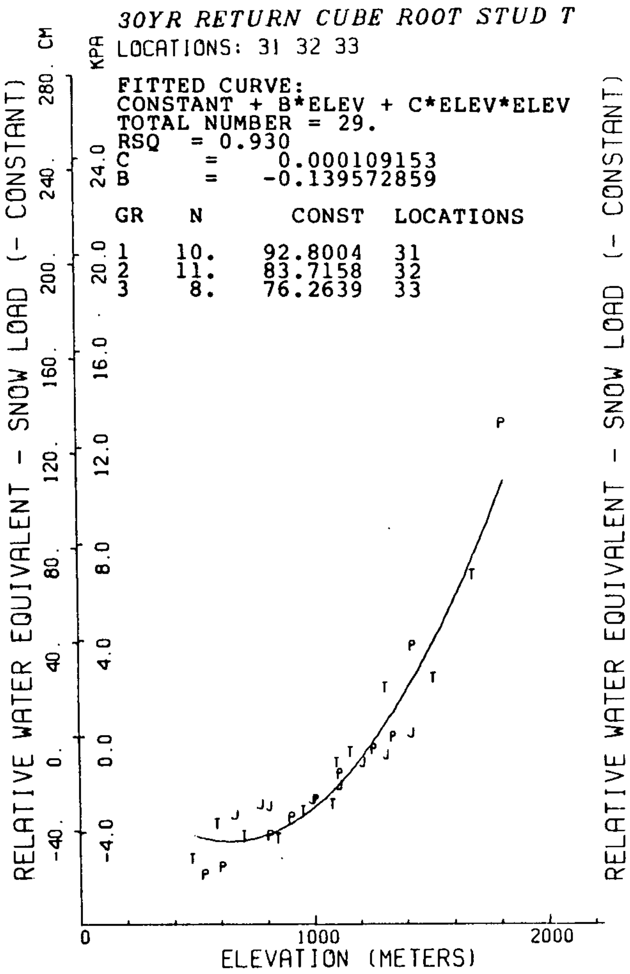

Figure 4.42

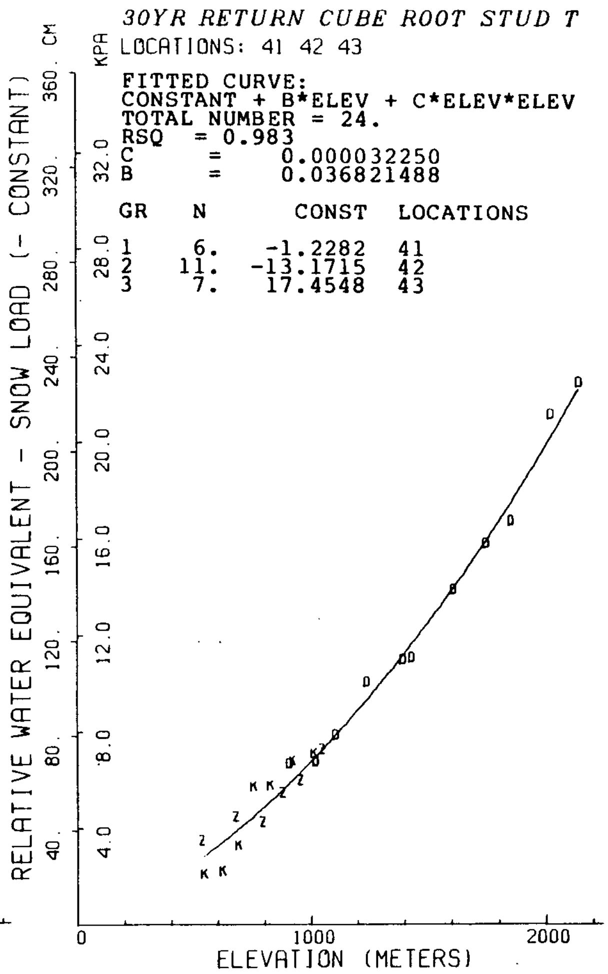

Figure 4.43

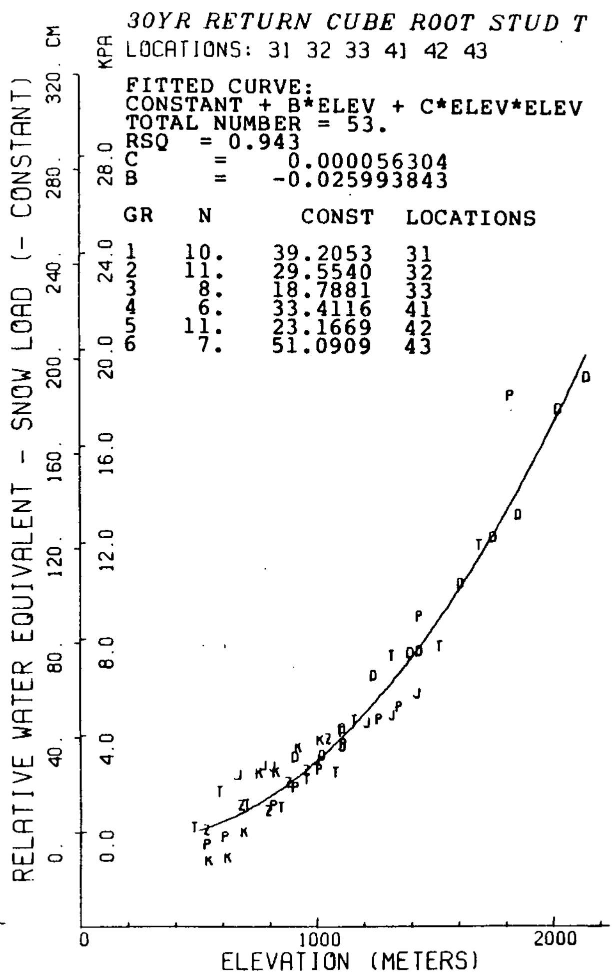

Figure 4.44

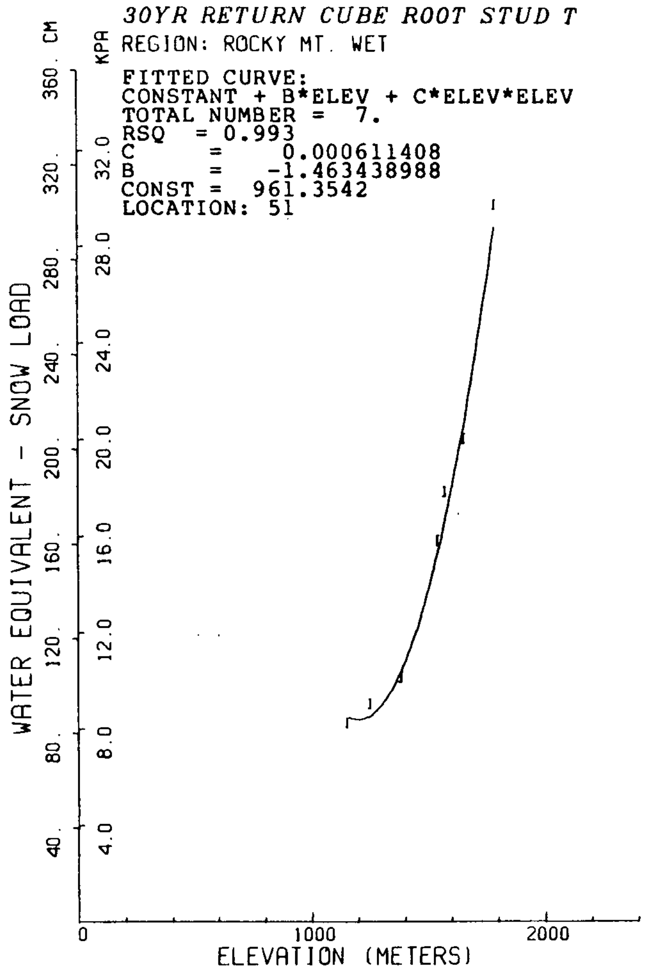

Figure 4.45

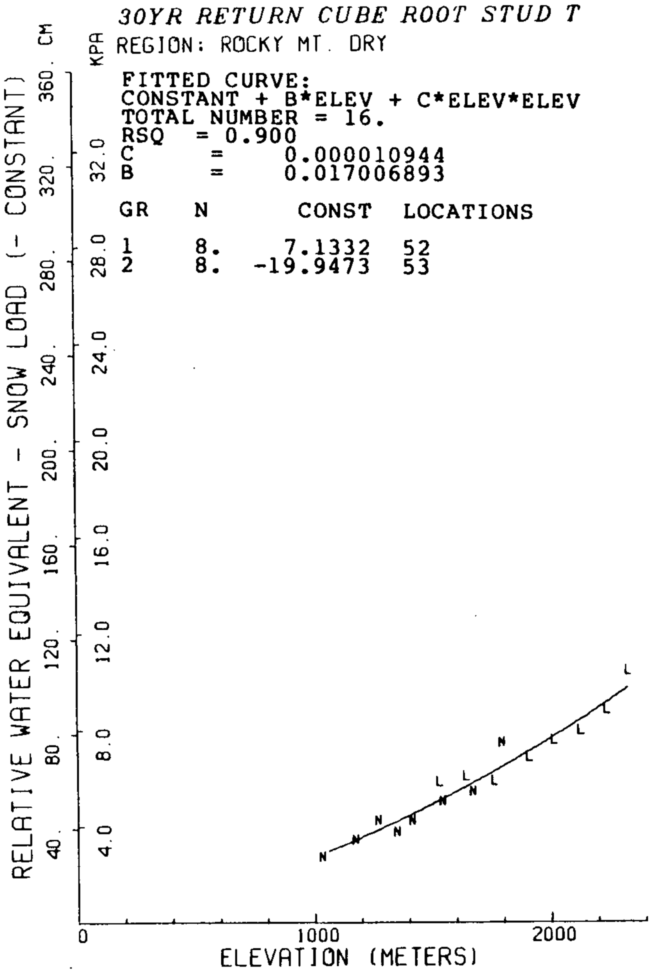

Figure 4.46

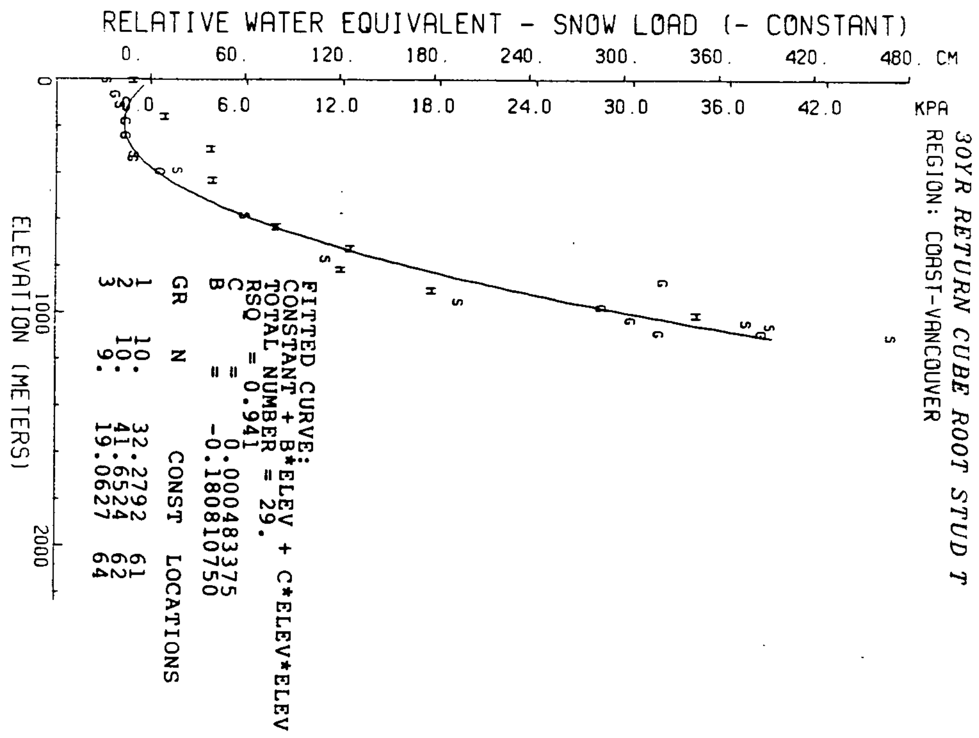

Figure 4.47

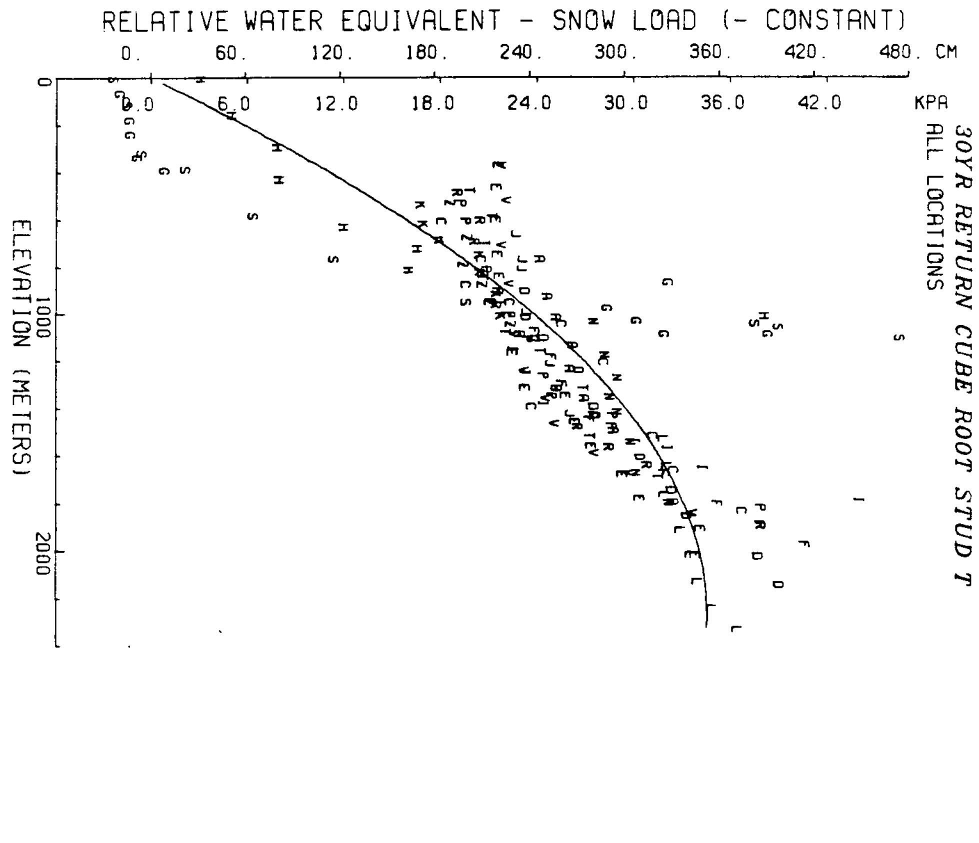

Figure 4.48

4.4 Discussion Of Water Equivalent Plots For The Regions

The regions with similar water equivalent-elevation curves as given in the last sections correspond very well with the climatic regions of southern British Columbia (section 2.1).

Similarities and differences in the water equivalent elevation curves for the regions can be noticed. The water equivalent curves of the wetter regions which are located generally on the windward sides of mountain ranges (eg. Coast-Vancouver, Fernie) increase in value very quickly as one increases in elevation and they have the highest values of water equivalents in the province. A profile across southern British Columbia showing the relation between altitude and water equivalents is given in Figure 4.49. The water equivalent values shown were determined by using the elevation profile and the water equivalent-elevation curves given earlier. Because of the scale used, the water equivalent profile shown in Figure 4.49 is illustrative only.

Refering to the plots of water equivalent against elevation, the water equivalents of the colder regions (Kimberley, Lake Louise) have much lower values and increase linearly at a much lower rate than the wet climate values. The "intermediate" climates have intermediate values and their curves are slightly curved upwards (eg. Okanagan, Kootenay,and Rogers Pass regions). Mt Copeland has very high values of water equivalents and is an exception to these trends. This could be due to local effects.

The difference between the curves of the wet and dry

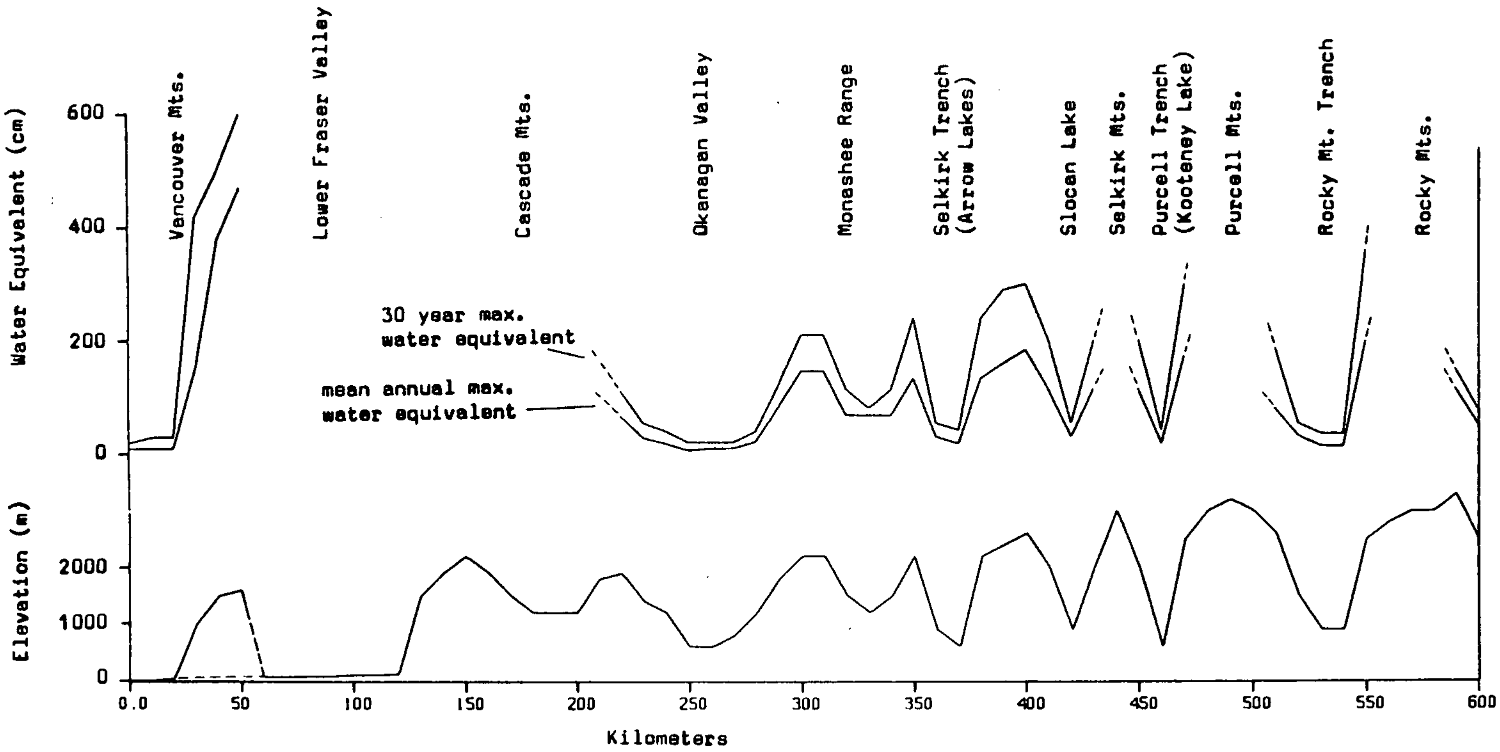

Figure 4.49 Relation of altitude and water equivalent in Southern B.C.

regions seems to lie in the fact that the increase of water equivalents with elevation in the wet climates are mainly due to orographic effects. In the drier climates the water equivalent increase is probably less due to increased snowfall with elevation, than due to the longer accumulation period because of the lower temperatures. This would result in only a gradual increase of water equivalents with elevation.

On Figure 4.13, 4.27 of the South Coast-Vancouver region it can be seen that the data can be broken into two parts, that below 500 meters and that above 500 meters. This is likely because below 500 meters there is no permanent snow and the loads are determined by individual snowfall events, while above 500 meters snow that falls is more permanent and remains for most of a winter. Also in Figures 4.13, 4.27 one can see that the regression curves for the lower elevations of the Vancouver plots obviously do not apply.

Chapter 5.

Comparison of results with the National Building Code

In the National Building Code (1977), snow loads are refered to in three places: 1) Subsection 4.4.7, Live loads due to snow and rain [18], 2) Climate information for the Building Code of Canada [19] and 3) Commentaries on part 4 of the National Building Code, commentary H, snowloads [20].

Basically, the calculation of roof snow loads using the National Building Code are broken down into two parts. First one determines the ground snow load for the locality from the Table of Climatic information [19].. Then one determines the roof snow load by using various coefficients to take into account different roof shapes, exposure, etc. Reference is made in the code to the variability of snow loads in the mountains and of the importance of local conditions.

Comparison of the results of this study with the values of the 30 year return ground snow loads given in the National Building Code (Table of Climatic Information) can readily be made for many locations.

Table VII compares the National Building Code ground snow loads for towns in southern B.C.(taken from [19]) with the ground snow loads for the same towns using the results of this study. Water equivalents were determined from plots of regional values if no observations were made close to the town concerned (eg. Grand Forks uses Kootenay Region values). For one town

Table VII
Comparison With The National Building Code

Location	Elevation	N.B.C Ground Loads		Ground Loads using this study	
	meters	kPa	cm H2O	cm H20	source
Coast-Vancouver					
Abbotsford	27	2.4	24		
Agassiz	18	3.1	32		
Langley		2.2	22		
Vancouver	10	1.9	19		
North Vancouver		2.2	22	30	Fig. 4.27(300m)
Squamish	10	3.2	33		
Okanagan					
Penticton	350	1.3	13	25	Fig. 3.24
Kelowna	350	1.9	19	25	Fig. 4.18
Salmon Arm	353	2.8	29		
Vernon m	350	2.0	20		
Rogers Pass					
Revelstoke	458	4.6	47	70	Fig. 3.21
Glacier	1248	7.6	77	86	Fig. 3.22
Golden	786	3.8	39		
Kootenay					
Kaslo	534	3.0	31	40	Fig. 3.32
Castlegar	494	3.4	35	40	Fig. 4.19
Cresent Valley	610	3.4	35	40	Fig. 4.19
Grand Forks	532	2.0	20	40	Fig. 4.19
Montrose	472	3.2	33	40	Fig. 4.19
Nakusp	431	3.6	37	40	Fig. 4.19
Nelson	539	3.3	34	40	Fig. 4.19
Trail	416	3.2	33	32	Fig. 3.28
R. Mnt. Trench					
Kimberley	1115	3.0	31	36	Fig. 3.34
Cranbrook	99	2.4	24	35	Fig. 3.34
Elko	939	3.5	36		
Fernie	950	4.6	47	70	Fig. 4.25

(North Vancouver) the elevation range is quite large so an average elevation was used for comparison purposes. A few towns were either too far away from a measurement location to permit adequate comparison (eg. Langely, Abbotsford), or they were situated on the border of a climatic region (Elko).

It can be seen from Table VII that some of the values obtained from this work and those from the National Building Code are nearly equal. However, some values including those from towns which have measurements locations nearby (eg. Mt. Revelstoke) are up to 50% higher than the N.B.C. values.

The reason for this difference appears to be due to three causes: 1) Building code measurements were not taken exactly at the same place as the measurements used in this study, and local snow condition variability can be expected to have some effect. 2) Different extreme value probability distributions were used to obtain the National Building Code values and 3) the National Building Code snow loads were determined from snow depth data which requires an estimate of the snow density.

5.1 Differnces Due To Local Variablity

Snow depths can be very variable over small distances, due to local differences in exposure to the wind, local terrain effects, and due to just the plain unpredictability of snow. At Revelstoke, for example the effects of Rogers Pass intersecting with the Columbia Valley can produce significant differences even within a few kilometers. On the north shore of Vancouver the effect of winds coming down Howe Sound can result in much different snow depths near Horseshoe Bay as compared with other parts of Vancouver's north shore. Furthermore, since maximum values are of interest, the measurement sites used for this study were chosen to be as wind freee as possible to maximize snow accumulation. Therefore local effects are of prime importance when determining a snow load for a site.

5.2 Differences Due To Probability Distribution And Sample Size

Different extreme value distributions were used to obtain the values of snow loads given by the National Building Code, and to obtain those loads given in this study. The distribution used to calculate the snow loads given by the Code was the Gumbel distribution, while the principal distribution used in this study was the cube root student-t distribution. Referring to Appendix I which lists maximum water equivalents for several probablility distributions, the Gumbel and cube root normal distributions generally give very close values unless the values obtained from only a few years of data. Here the cube root student-t values were noticeably higher because this distribution includes the uncertainty of using a small sample size. Regardless, the snow loads calculated using the Gumbel distribution as given in appendix I still are generally larger than the corresponding values given by the National Building Code.

It is recognized that the sample size or observation period is relatively short , averaging about ten years, and error exists in extrapolating to a 30 year return period. The observation period for this study also included two winters with higher snow loads (1968 and 1972), which were close to the 30 year maximum and therefore tended to increase the calculated 30 year maximum load.

5.3 Diffences Due To The Estimation Of Snow Density

Snow loads given in the National Building Code (as calculated by Boyd) [2] were calculated by using snow depth data instead of using values of the weight of the snow (water equivalent) directly as is the case with values obtained for this study. The reason for using snow depth data was that water equivalent data is not as routinely available as snow depth data.

Snow depths were converted (by Boyd) to water equivalents by assuming a snow density of 0.2 gm/cc. The maximum 24 hour rainfall that is expected to occur during the months of maximum snow depth was added to this value to obtain the values given in the National Building Code. (refer to section 1.2.1)

The choice of 0.2 as the snow density is not entirely unreasonable since the snow cover at time of maximum depth would be composed of a substantial layer of new snow over a layer of old snow. New snow has a density of about 0.1 and old snow has a density of about 0.3+ and therefore the average is about 0.2.

However, referring to Section 3.4 and to Appendix II it can be seen that the average value of the snow density in Southern British Columbia, depending on the region, averages from about 0.29 to 0.41 which are considerably higher than the value of 0.2 used for the N.B.C. values. In Switzerland, Zingg [29] has used densities of 0.25 and 0.30 to estimate snow loads. At a high elevation and with large snow depths in the Swiss Alps the author observed densities at maximum water equivalent not varying much from 0.40 gm/cm [5].

There are several reasons contributing to the higher calculated densities. Firstly the calculated densities given in the Appendix are not usually taken at the time of maximum snow depth, but a few days later. Although the water equivalent measurement does not change over the course of a few days, the snow surface does settle resulting in a higher calculated density. Secondly, the Federal Snow Sampler used to measure the water equivalents is known to over estimate the water equivalent by 5% to 12%. Thirdly, the National Building Code adds the 24 hour rainfall to the calculated snow load, so the effective National Building Code density is somewhat higher than 0.2 gm/cc.

However, the large difference in the calculated densities of this study with the National Building Code value of 0.2 gm/cc does indicate that the value of 0.2 gm/cc is underestimated. The value of 0.2 gm/cc may be a good estimate for snow density for snow depths of low water equivalent, but for large snow depths a large portion of the snow is composed of old snow which is even more densified under its own weight, especially in wet climates and particularly near the coast.

Therefore most of the evidence suggests that a value of 0.2 is too low to use as a mean snow density and along with local variation and the short observation period contributed to the lower values of ground snow loads given in the National Building Code when compared to the results of this study.

Chapter 6.

Determination of ground snow loads for design

Generally if some water equivalent data or snow depth data convertable to water equivalents is available for a site, it is preferable to use this data to estimate maximum snow loads. However, if no data is available for the site, the results of this study can be used as an aid to determine approximate snow loads for a site at a given elevation. Firstly if the site is on the same mountain as a measurement location, plots of water equivalent against elevation may be used directly. Secondly, if no information on water equivalents are known, plots of water equivalent against elevation for the region, or preferable plots from nearby measurement locations can be used. Thirdly, if some water equivalent data is known on the same mountain but at a different elevation, plots of relative water equivalents can be used to determine the water equivalent at the required elevation.

The coefficients for the regression equations are given in Tables VIII, IX, and X. Since the water equivalent data from the different locations have varying amounts of scatter when plotted, an appreciation of which can only be realized by refering to actual plots with the data plotted on them, and since a better estimate of the water equivalent can sometimes be obtained by simply reading the value from the plot, these tables should only be used in conjuction with the plots given in earlier chapters.

6.1 Snow Loads Required At A Measurement Location

6.1.1 Method

When the site where snow load information is required is on the same mountain as a measurement location, the determination of water equivalents is merely a matter of reading its value from the appropriate plots. These plots are given in Figures 3.3 - 3.38 and are summarized in Table VIII. For example if one wished to know the snow loads on Mount Seymour one would refer to Figure 4.27. If other snow measurements are available, these should always be examined and included in the determination of the calculated snow load.

6.1.2 Accuracy

For the individual locations, the relationship between water equivalent and elevation is very well known. This is seen in the high r^2 values obtained in the least squares quadratic regression. At these individual locations, therefore, estimates of water equivalents at any desired elevation can be made quite accurately.

Table VIII
Regression Coefficients For Measurement Locations

30 year return and cube root Student-t distribution used. Water equivalents in centimeters and elevations in meters. "N" refers to the number of stations. This table should only be used in conjunction with plots of the data with regression curve.
Water Equivalent = A + B(elevation) + C(elevation)^2

Location	A	B	C	r^2	N
11 Revelstoke	105	-0.1168	0.0000980	0.979	12
12 Fidelity	113	-0.1698	0.0001191	0.991	10
13 Copeland	92	0.0465	0.0000404	0.887	10
21 Apex	31	-0.0489	0.0000470	0.960	8
22 Enderby	56	-0.0970	0.0000744	0.978	15
23 Vernon	77	-0.1622	0.0001052	0.977	12
31 Creston	81	-0.1401	0.0001187	0.981	10
32 Rossland	52	-0.0686	0.0000741	0.953	11
33 Salmo	64	-0.0646	0.0000516	0.983	8
41 Zincton	63	-0.1109	0.0001134	0.952	6
42 Sandon	35	-0.0290	0.0000533	0.992	11
43 Kaslo	-110	0.3353	-0.0001347	0.923	7
51 Fernie	961	-1.4634	0.0006114	0.992	7
52 Kimberley	81	-0.0964	0.0000527	0.932	8
53 Lake Louise	236	-0.2464	0.0000775	0.977	8
61 Grouse	-27	0.1482	0.0002169	0.955	10
62 Seymour	43	-0.2835	0.0005976	0.961	10
64 Hollyburn	36	-0.1680	0.0004269	0.906	9

6.2 Water Equivalent Data Not Available

6.2.1 Method

When no water equivalent data or snow depth data convertable to water equivalents is available on the mountain, approximate values of the maximum snow load can be estimated by using plots of water equivalents against elevation as given in Figures 3.3 - 3.38, 4.1 - 4.28 The water equivalent is estimated by reading its value on the plots for the desired elevation. Both plots of regional values and plots of groups of locations can be used. It is preferable to use values from nearby locations rather than regional values because the latter will generally have more scatter due to the larger geographic area and hence greater climatic variability.

Table IX
Regression Coefficients For Selected Regions

30 year return and cube root Student-t distribution used Water equivalents in centimeters and elevations in meters. "N" refers to the number of stations. This table should only be used in conjunction with plots of the data with regression curve.
Water Equivalent = A + B(elevation) + C(elevation)^2

Region	A	B	C	r^2	N
Rogers Pass (11 12)	131	-0.1728	0.0001178	0.955	22
Okanagan (21 22 23)	66	-0.1272	0.0000878	0.966	35
Kootenay (31 32 33 41 42 43)	48	-0.0474	0.0000612	0.899	53
Kootenay-South (31 32 33)	94	-0.1595	0.0001187	0.905	29
Kootenay-North (41 42 43)	42	-0.0222	0.0000476	0.949	24
Interior (11 12 21 22 23 31 32 33 41 42 43)	69	-0.0976	0.0000818	0.765	110
Rocky Mt. Dry (52 53)	46	-0.0192	0.0000137	0.500	16
Vancouver Mt. (61 62 63)	34	-0.1995	0.0005010	0.937	29

Alternatively one can use plots of relative water equivalent against elevation given in Figures 4.29 - 4.48. The constant term of the regression is estimated by examining the value of the constant term for nearby locations.

6.2.2 Accuracy

When no water equivalent data is available, similarity of snow conditions is very important between the site where water equivalents are required and the location(s) used to determine them. The snow conditions should resemble as closely as possible those of the locations or region used. If snow conditions are not definately known to be the same, then the certainty of the estimated values will not be very high, and the values obtained must be treated with extreme caution. Furthermore, if regional plots have to be used because no individual location near the site exists, the scatter of the data is relatively large and may in a few places reach 100% of the water equivalent value. For some regions, there are only a few measurement locations (eg. Rocky Mt. Wet) and one can not expect these locations to be necessarily representative of the region. Therefore water equivalents obtained from most regional plots are only very approximate figures.

6.3 Water Equivalent Data Available At Different Elevations

6.3.1 Method

When water equivalent data is available at another elevation on the same mountain as the site where snow loads are required, the relative differences of water equivalents at different elevations can be determined. Plots of relative water equivalents for groups of nearby locations or for the region given in Figures 4.29 - 4.48 can be used to determine the difference of the water equivalents at the elevations concerned. The coefficients for the regression curves are summarized in Table X. This difference is added to the known water equivalent to determine the value at the site. Since relative water equivalents have little variability over larger areas, it is generally best to use plots of relative water equivalent for groups of locations or plots for the region rather than just one nearby location.

6.3.2 Accuracy

Since the effect of the absolute magnitude of the water equivalent values is eliminated, the plots of relative water equivalent exhibit much less scatter of the data points, and can include much larger regions than plots of absolute values of water equivalent. The degree of fit of the least squares quadratic regressions on the relative water equivalents against

Table X
Relative Water Equivalent Regression Coefficients

30 year return and cube root Student-t distribution used. Water equivalents in centimeters and elevations in meters. "N" refers to the number of stations. See plots for values of constant terms for locations. This table should only be used in conjunction with plots of the data with regression curve.
Water Equivalent = constant + B(elevation) + C(elevation)^2

Region	B	C	r^2	N
Rogers Pass (11 12)	-0.0923	0.0000916	0.961	32
Okanagan (21 22 23)	-0.1197	0.0000846	0.970	35
Kootenay (31 32 33 41 42 43)	-0.0260	0.0000563	0.943	53
Kootenay-South (31 32 33)	-0.1396	0.0001091	0.930	29
Kootenay-North (41 42 43)	-0.0368	0.0000322	0.983	24
Interior (11 12 21 22 23 31 32 33 41 42 43)	-0.0883	0.0000802	0.957	120
Rocky Mt. Dry (52 53)	-0.0170	0.0000109	0.900	16
Vancouver Mt. (61 62 63)	-0.1808	0.0004834	0.941	29

elevation is very high with the r^2 values averaging 0.96. The degree of fit to the regression curve is especially high for the western Kootenay region.

Because the relative water equivalents are very well known, and vary only slightly within a region, the estimates of water equivalents obtained from using data at other elevations, can be expected to be of high accuracy. Caution should be used though, when extrapolating water equivalents from valley stations to very high elevations where snow conditions may be quite different.

6.4 Accuracy Of Estimates

The accuracy of estimating the water equivalents depends firstly on how well the relationship between water equivalents and elevation is known, and secondly on the similarity of snow conditions at the site and the location(s) used in determining the estimated.

The relationship between the water equivalents and elevation is known with varying degrees of certainty for the different regions. The degree of certainty is best evaluated by referring to the r^2 of the least squares regression and to the scatter of the data points which have be plotted mainly for this purpose. If the regression curve does not fit the data points closely, especially near the upper and lower most elevations, the values of the water equivalent should be directly read from the plot using these data points and the regression equation should not used. This is particularly true for the lower elevations of the Coast-Vancouver Region plots.

Similarity of snow conditions at the site and measurement location(s) used is of prime importance. Plots of all the locations in the region should be examined to determine the regional variability. If most plots within the region are all similar and the region definately includes the site then similarity of snow conditions can be expected.

Similarity of snow conditions can be best determined by examining climatic conditions, aspect and local effects. The degree that conditions are the same will largely determine the degree of confidence one may have in the estimated snow loads.

6.4.1 Similarity Of Climatic Factors

An approximate indication of the similarity of snow conditions of the site and location used can be given by examining climatic information for the area. Available precipitation data for the site and locations can be checked to see if they have similar values and show similar trends. Similarity of water equivalents, mean snow depths and precipitation can be estimated on a gross scale by referring to maps of water equivalents, snow depths and precipitation such as given in Figures 2.2 - 2.4.

6.4.2 Similarity Of Aspect

The effect of aspect on snow loads is two fold. Since the amount of solar radiation varies with aspect, aspect can influence the melting of the snow cover. In natural conditions aspect may not have any effect on maximum snow pack [16] probably due to the effect of the forest canopy. This effect should be considered in evaluating any data obtained in forested areas. In clearings or on structures the effect of aspect can be significant where winter melt is common [16]. South facing slopes will generally have a lower snow depth than similar slopes but with a northern exposure.

Aspect also can influence the accumulation of the snowcover. On a regional basis this is evidenced by larger accumulations on the windward side of mountain ranges and smaller accumulations on the leeward side (Figure 4.49). In Southern British Columbia the prevailing winds generally move from west to east.

However, on a more local basis, especially in mountainous (steeper) terrain, aspect may have the opposite effect and snow depths increased. Snow is often entrained in air and carried from the windward sides of mountains to the leeward sides where it is deposited. Therefore, snow loads may be greater than values based mainly on regional snowfalls.

Aspect was not investigated in this study, primarily because the effect of elevation is much more pronounced than that of aspect, and the small number of locations observed would not likely provide any usable results. In most cases the aspect of the locations observed can be readily determined by refering to a topographic map of the area concerned. The aspect of the location can then be compared to that of the sites.

6.4.3 Local Effects

Close geographic distance between the site where snow loads are required and the measurement locations used to determine them is usually a good indicator that snow conditions at the two places are similar. However, snow loads can be extremely variable and local effects can significantly change the snow characteristics over a distance of only a few kilometers. Snow loads estimated from plots of water equivalents against elevation at nearby locations or for the region must be used with extreme caution if no evidence exists to show that snow conditions are similar.

A few examples illustrating the local variability of snow loads can be given. In the Lake Louise area, snow depths seem to vary in bands, possibly due to the effect of smaller valleys intersecting with the main one. At Donald, B.C. snow depths are substantially higher than at Golden, 23 km away, because of the effect of Rogers Pass. Water equivalents at Mt. Copeland (Figures 3.5, 3.23 are noticeably higher than those of nearby Mt. Revelstoke or Mt. Fidelity (Figures 3.3, 3.4 and 3.21, 3.22)

6.5 Determination Of Snow Loads At Other Return Periods

For reasons explained earlier, throughout this paper only mean annual water equivalents and 30 year return maximum water equivalents are given. Refering to equation 3.1, the value of the water equivalents (Xn) for a given return period (n) is given by:

$$Xn = mean + (Kn / K30)(X30 - mean) \qquad (6.1)$$

where: Xn is the maximum expected value in n years
Kn is the coefficient for a return period of n years
K30 is the coefficient of a 30 year return period

A value of 1.834 for K30 can be assumed. Kn for a normal distribution can be found in most statistics books. Actually is would be more correct to use the Student-t values of K, such as given in Table III however, only ratios of K are needed and also the average values of the degree of freedom required by the Student-t would be hard to determine. If it is desired, the appropriate transformations can be made to equation 6.1 to use the cube root normal distribution instead of the normal distribution, but the results will likely not vary much.

Chapter 7.

Summary and Conclusion

The relative change of water equivalents with elevation has been quantified quite well and should give reliable water equivalent values when extrapolating snow loads from one elevation to another. Spatially, water equivalents are not very predictable, primarily because effects of terrain, aspect, and other local conditions are difficult to quantify. As a result the determination of water equivalents when no nearby snow data is available is only approximate and may be significantly different from true values.

One possible method to achieve values with a larger certainty would be to assemble all available water equivalent data for a region. For these locations, the values of the constant term, for the relative water equivalent curves given in this study could be determined (Equation 4.1). The values of the constants would not be dependent on elevation and contour maps of them could be made for the different regions. Water equivalents would be calculated by determining the constant, and then using the appropriate linear and quadratic terms for the region in the regression equation.

The density of snow at the time of maximum water equivalents has been found to show trends between regions and to vary considerably within regions. No dependence of snow density with elevation was found, although there may be some correlation of density with snow depth.

The values of snow density obtained in this study have been considerably higher than the density used (0.2gm/cc) in the determination of snow loads given in the National Building Code. This suggests as far as 30 year return values are concerned (i.e. not the adequacy of the values for design) that the values given in the code are too low. Since ground snow loads depend on the weight of snow, it would be beneficial if new snow loads were obtained using measured values of water equivalent directly.

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APPENDIX I: WATER EQUIVALENT AND SNOW DEPTH STATISTICS

Key for abbreviations used

LOC	Location.
STA	Station.
ELEV	Elevation in meters.
N	Number of years of measurements.
MIN	Minimum value
MAX	Maximum value
MEAN	Mean value
STD	Standard deviation
COV	Coefficient of varitation
N30YR	30 year return using the Student-t distribution
L30YR	30 year return using the log Student-t distribution.
G30YR	30 year return using the Gumbel distribution.
C30YR	30 year return using the cube root Student-t distributio
CRM	Mean of the cube root value
CRCM	Means of the cube roots taken to the third power.
CRSTD	Standard deviation cube root values.
CRCOV	Coefficient of variation of the cube root values.
TCOV	Transformed coefficent of variation of the cube roots. (ie. TCOV = [(CRCOV +1)**3] - 1).
LMEAN	Mean of logs.
LTMEAN	Anti-logs of means logs.

************11 MOUNT REVELSTOKE *************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
11	1.0	497.	12.	13.2	49.0	31.5	11.7	0.370	55.1	68.4	56.9	61.8	3.11	30.1	0.419	0.1347	0.461	1.466	29.3	0.183
11	2.0	614.	12.	19.8	65.3	39.6	15.0	0.379	69.9	82.4	72.3	76.4	3.36	37.8	0.440	0.1310	0.447	1.567	36.9	0.173
11	3.0	703.	12.	21.8	62.2	39.5	13.9	0.352	67.5	77.4	69.7	72.8	3.36	38.0	0.404	0.1202	0.406	1.571	37.2	0.158
11	4.0	841.	12.	28.7	70.9	45.2	14.3	0.316	74.0	81.4	76.3	78.2	3.53	43.9	0.372	0.1054	0.351	1.635	43.2	0.137
11	5.0	972.	12.	31.7	77.0	52.6	14.9	0.283	82.6	89.8	84.9	86.7	3.72	51.3	0.352	0.0946	0.312	1.705	50.7	0.123
11	6.0	1096.	12.	41.9	94.5	65.5	16.3	0.249	98.3	104.2	100.9	101.7	4.01	64.3	0.328	0.0819	0.266	1.804	63.7	0.106
11	7.0	1195.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	8.0	1323.	12.	62.7	126.2	84.6	18.7	0.221	122.3	126.1	125.2	124.5	4.37	83.4	0.310	0.0709	0.228	1.918	82.8	0.091
11	9.0	1487.	12.	64.5	132.3	92.8	20.7	0.223	134.6	140.7	137.9	138.2	4.51	91.5	0.329	0.0731	0.236	1.958	90.8	0.094
11	10.0	1574.	12.	78.0	157.0	108.6	22.8	0.210	154.7	160.1	158.3	157.9	4.75	107.2	0.324	0.0682	0.219	2.028	106.6	0.088
11	11.0	1649.	12.	86.6	184.4	120.1	28.9	0.241	178.4	184.5	183.0	181.9	4.91	118.1	0.376	0.0767	0.248	2.069	117.2	0.098
11	12.0	1801.	11.	89.7	204.0	127.5	32.9	0.258	194.6	201.3	199.2	198.3	5.00	125.2	0.407	0.0814	0.265	2.094	124.1	0.103
11	12.5	1829.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	13.0	1902.	12.	96.0	241.3	152.5	45.0	0.295	243.3	262.8	250.4	254.1	5.30	148.6	0.514	0.0971	0.320	2.166	146.7	0.126

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
11	1.0	497.	12.	38.	145.	95.	36.	0.379	167.	214.	172.	190.	4.48	90.	0.630	0.1407	0.484	1.940	87.	0.193
11	2.0	614.	12.	63.	175.	115.	36.	0.314	187.	215.	193.	202.	4.80	111.	0.529	0.1100	0.368	2.038	109.	0.147
11	3.0	703.	12.	66.	175.	117.	36.	0.311	190.	215.	195.	204.	4.83	113.	0.520	0.1075	0.359	2.046	111.	0.142
11	4.0	841.	12.	58.	175.	126.	35.	0.280	197.	230.	202.	214.	4.96	122.	0.507	0.1021	0.339	2.081	120.	0.140
11	5.0	972.	12.	69.	198.	148.	40.	0.273	229.	265.	235.	248.	5.24	144.	0.518	0.0988	0.327	2.152	142.	0.135
11	6.0	1096.	12.	130.	224.	166.	33.	0.199	233.	241.	238.	237.	5.48	164.	0.355	0.0649	0.207	2.213	163.	0.084
11	7.0	1195.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0
11	8.0	1323.	12.	150.	257.	193.	34.	0.174	261.	269.	266.	266.	5.76	191.	0.331	0.0574	0.182	2.280	190.	0.075
11	9.0	1487.	12.	168.	277.	213.	30.	0.143	274.	279.	279.	277.	5.96	211.	0.279	0.0469	0.147	2.324	211.	0.061
11	10.0	1574.	12.	208.	295.	253.	33.	0.129	319.	325.	324.	323.	6.31	251.	0.272	0.0431	0.135	2.399	251.	0.056
11	11.0	1649.	12.	218.	338.	269.	42.	0.155	353.	362.	360.	359.	6.44	267.	0.329	0.0511	0.161	2.425	266.	0.066
11	12.0	1801.	11.	234.	376.	296.	41.	0.139	379.	387.	385.	384.	6.65	294.	0.305	0.0459	0.144	2.467	293.	0.060
11	12.5	1829.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0
11	13.0	1902.	12	254.	427.	338.	59.	0.175	457.	473.	467.	467.	6.94	335.	0.402	0.0579	0.184	2.523	333.	0.075

************12 FIDELITY MOUNTAIN *************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
12	10.0	959.	11.	25.9	46.2	36.3	6.0	0.165	48.6	50.7	49.4	49.8	3.30	36.0	0.185	0.0561	0.178	1.555	35.9	0.074
12	11.0	1081.	12.	36.1	82.8	49.1	13.3	0.270	75.9	77.6	78.0	76.8	3.64	48.2	0.303	0.0833	0.271	1.679	47.8	0.,104
12	12.0	1192.	12.	45.2	90.2	60.2	13.0	0.216	86.5	88.9	88.5	87.9	3.90	59.5	0.269	0.0689	0.221	1.771	59.1	0.088
12	13.0	1305.	12.	50.0	95.2	63.5	14.5	0.228	92.7	95.5	95.0	94.3	3.97	62.6	0.289	0.0727	0.234	1.793	62.1	0.093
12	14.0	1455.	12.	57.9	111.8	75.9	16.5	0.217	109.1	113.3	111.7	111.6	4.21	74.9	0.297	0.0706	0.227	1.871	74.4	0.091
12	15.0	1486.	11.	66.5	133.3	85.9	19.2	0.223	124.9	127.4	127.6	126.3	4.39	84.7	0.307	0.0699	0.225	1.925	84.2	0.088
12	16.0	1682.	12.	90.2	172.0	110.5	23.5	0.213	157.9	159.7	161.7	158.9	4.78	109.1	0.316	0.0662	0.212	2.035	108.5	0.083
12	17.0	1807.	12.	95.2	208.3	125.3	32.2	0.257	190.3	194.4	195.4	192.4	4.97	123.1	0.396	0.0796	0.258	2.087	122.1	0.100
12	18.0	1894.	12.	102.1	221.0	142.3	35.7	0.251	214.3	223.5	219.9	219.6	5.19	139.8	0.418	0.0806	0.262	2.142	138.6	0.103
12	19.0	1981.	11.	107.2	244.9	155.6	41.6	0.267	240.2	253.9	246.0	248.0	5.34	152.4	0.462	0.0865	0.283	2.179	150.9	0.111

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
12	10.0	959.	12.	81.	135.	104.	16.	0.151	135.	139.	138.	137.	4.69	103.	0.234	0.0499	0.157	2.012	103.	0.065
12	11.0	1081.	12.	107.	173.	133.	24.	0.178	180.	186.	184.	184.	5.09	132.	0.297	0.0585	0.186	2.117	131.	0.076
12	12.0	1192.	12.	122.	196.	156.	23.	0.149	203.	208.	207.	206.	5.37	155.	0.267	0.0497	0.156	2.188	154.	0.065
12	13.0	1305.	12.	132.	213.	161.	25.	0.158	212	216.	216.	214.	5.42	159.	0.279	0.0514	0.162	2.201	159.	0.066
12	14.0	1455.	11.	145.	239.	189.	29.	0.153	247.	255.	251.	252.	5.72	187.	0.292	0.0510	0.161	2.271	187.	0.066
12	15.0	1486.	11.	168.	274.	212.	32.	0.152	278.	285.	283.	282.	5.95	211.	0.298	0.0501	0.158	2.323	210.	0.065
12	16.0	1682.	12.	208.	353.	261.	40.	0.153	341.	347.	347.	345.	6.37	259.	0.317	0.0497	0.157	2.412	258.	0.064
12	17.0	1807.	12.	251.	401.	299.	45.	0.151	389.	395.	396.	393.	6.67	297.	0.324	0.0486	0.153	2.471	296.	0.062
12	18.0	1894.	12.	246.	411.	320.	52.	0.162	424.	438.	432.	432.	6.82	317.	0.368	0.0540	0.171	2.499	316.	0.070
12	19.0	1981.	11.	269.	427.	336.	52.	0.155	442.	457.	449.	451.	6.94	334.	0.360	0.0519	0.164	2.522	333.	0.068

**************13 MOUNT COPELAND **************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
13	1.0	617.	6.	51.6	105.2	75.5	21.2	0.281	122.9	139.9	121.6	132.4	4.19	73.8	0.403	0.0961	0.317	1.863	72.9	0.126
13	2.0	777.	6.	64.8	123.2	92.7	24.7	0.266	147.8	164.8	146.3	157.6	4.50	90.8	0.405	0.0901	0.295	1.954	89.9	0..118
13	3.0	884.	6.	74.4	122.7	98.0	19.6	0.200	141.9	151.7	140.7	147.7	4.59	96.9	0.310	0.0674	0.216	1.984	96.4	0.088
13	4.0	960.	5.	84.3	136.7	109.7	24.6	0.224	167.3	180.9	163.3	175.3	4.77	108.3	0.355	0.0745	0.241	2.032	107.6	0.097
13	5.0	1052.	5.	100.3	176.8	126.1	31.8	0.252	200.5	213.8	195.3	208.3	4.99	124.2	0.402	0.0806	0.262	2.091	123.2	0.102
13	6.0	1213.	4.	112.5	180.3	144.6	31.1	0.215	222.4	244.1	212.2	235.1	5.23	143.0	0.377	0.0721	0.232	2.153	142.1	0.094
13	7.0	1402.	4.	125.0	166.4	142.7	17.4	0.122	186.2	191.2	180.5	189.3	5.22	142.2	0.209	0.0400	0.125	2.152	141.9	0.052
13	8.0	1524.	5.	135.9	226.1	167.5	38.3	0.229	257.1	272.6	250.9	266.4	5.49	165.3	0.405	0.0738	0.238	2.216	164.3	0.094
13	9.0	1670.	5.	127.0	227.6	170.4	40.9	0.240	265.9	289.0	259.3	279.3	5.52	167.8	0.437	0.0792	0.257	2.222	166.6	0.102
13	10.0	1836.	5.	154.9	279.4	196.2	49.7	0.253	312.3	329.7	304.3	322.6	5.78	193.2	0.461	0.0798	0.259	2.283	191.7	0.101

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
13	1.0	617.	6.	127.	254.	195.	55.	0.281	317.	363.	314.	342.	5.75	190.	0.557	0.0968	0.319	2.274	188.	0.128
13	2.0	777.	6.	160.	272.	228.	50.	0.218	340.	372.	337.	359.	6.08	225.	0.457	0.0750	0.242	2.349	224.	0.099
13	3.0	884.	6.	188.	297.	243.	47.	0.193	347.	368.	344.	360.	6.21	240.	0.402	0.0647	0.207	2.378	239.	0.084
13	4.0	960.	5.	208.	325.	253.	49.	0.195	368.	386.	360.	379.	6.30	250.	0.400	0.0635	0.203	2.396	249.	0.082
13	5.0	1052.	5.	246.	330.	284.	41.	0.146	381.	393.	374.	389.	6.56	282.	0.315	0.0481	0.151	2.450	282.	0.062
13	6.0	1213.	4.	274.	384.	328.	53.	0.162	460.	487.	443.	477.	6.88	326.	0.373	0.0542	0.172	2.511	325.	0.071
13	7.0	1402.	4.	284.	340.	312.	26.	0.084	378.	384.	369.	382.	6.78	312.	0.190	0.0280	0.086	2.493	311.	0.036
13	8.0	1524.	5.	300.	417.	345.	50.	0.146	462.	476.	454.	471.	7.00	343.	0.334	0.0477	0.150	2.534	342.	0.062
13	9.0	1670.	5.	315.	467.	366.	62.	0.170	511.	528.	501.	521.	7.14	364.	0.390	0.0547	0.173	2.559	362.	0.070
13	10.0	1836.	5.	300.	495.	378.	76.	0.202	557.	587.	545.	575.	7.21	374.	0.474	0.0657	0.210	2.571	373.	0.084

**********21 APEX MT (PENTICTON) **************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
21	1.0	777.	9.	2.0	15.2	8.1	4.0	0.490	16.4	26.8	16.7	20.5	1.95	7.4	0.379	0.1949	0.706	0.843	7.0	0.280
21	2.0	936.	9.	3.0	19.0	10.2	5.0	0.494	20.6	31.4	21.1	25.2	2.10	9.3	0.397	0.1886	0.679	0.946	8.8	0.264
21	3.0	1024.	9.	4.3	23.6	12.8	6.3	0.489	25.9	37.4	26.5	31.0	2.28	11.8	0.414	0.1818	0.650	1.052	11.3	0.250
21	4.0	1143.	9.	6.9	27.2	18.0	8.0	0.445	34.8	49.0	35.5	41.4	2.56	16.8	0.431	0.1683	0.595	1.208	16.1	0.231
21	5.0	1241.	9.	10.2	28.4	20.8	7.0	0.336	35.4	43.7	36.0	39.7	2.71	20.0	0.335	0.1234	0.418	1.291	19.6	0.168
21	6.0	1366.	9.	17.3	41.1	28.1	8.4	0.299	45.7	51.3	46.5	48.8	3.01	27.4	0.307	0.1017	0.337	1.432	27.0	0.133
21	7.0	1436.	9.	17.8	44.4	30.4	9.6	0.317	50.5	58.4	51.3	54.8	3.09	29.4	0.341	0.1104	0.369	1.462	28.9	0.146
21	8.0	1503.	9.	22.9	58.9	36.5	12.8	0.351	63.1	71.2	64.3	67.5	3.28	35.2	0.382	0.1165	0.392	1.538	34.5	0.151
21	9.0	1762.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	10.0	1911.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
21	1.0	777.	9.	10.	58.	34.	14.	0.421	64.	92.	65.	76.	3.17	32.	0.513	0.1620	0.569	1.485	31.	0.230
21	2.0	936.	9.	15.	66.	38.	16.	0.425	71.	88.	72.	79.	3.29	36.	0.482	0.1468	0.508	1.538	34.	0.196
21	3.0	1024.	9.	23.	76.	49.	17.	0.349	84.	102.	85.	93.	3.60	47.	0.447	0.1241	0.421	1.660	46.	0.167
21	4.0	1143.	9.	36.	99.	68.	26.	0.380	121.	150.	123.	136.	4.01	64.	0.545	0.1360	0.466	1.798	63.	0.182
21	5.0	1241.	9.	36.	102.	71.	21.	0.300	116.	137.	118.	127.	4.11	69.	0.442	0.1076	0.359	1.833	68.	0.146
21	6.0	1366.	9.	63.	137.	99.	24.	0.245	150.	163.	152.	157.	4.60	98.	0.382	0.0830	0.270	1.985	97.	0.109
21	7.0	1436.	9.	61.	147.	97.	28.	0.285	155.	171.	157.	164.	4.56	95.	0.439	0.0963	0.318	1.971	93.	0.126
21	8.0	1503.	9.	84.	147.	117.	26.	0.220	170.	183.	173.	178.	4.86	115.	0.365	0.0751	0.243	2.058	114.	0.099
21	9.0	1762.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0
21	10.0	1911.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0

************22 ENDERBY MOUNTAIN ***************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
22	0.1	381.	11.	6.3	22.1	14.1	5.3	0.379	24.9	30.9	25.7	28.0	2.38	13.4	0.324	0.1366	0.468	1.116	13.0	0.184
22	0.2	472.	11.	6.3	22.1	14.6	4.6	0.315	24.0	29.4	24.6	26.8	2.42	14.1	0.283	0.1170	0.394	1.140	13.8	0.161
22	0.3	610.	8.	6.9	20.8	13.5	5.0	0.368	24.0	28.8	24.3	26.5	2.35	12.9	0.299	0.1276	0.434	1.102	12.6	0.168
22	1.0	756.	12.	5.1	20.3	14.5	4.8	0.330	24.1	31.2	24.9	27.6	2.40	13.9	0.306	0.1274	0.433	1.132	13.6	0.179
22	2.0	850.	12.	7.6	21.6	16.2	4.7	0.293	25.7	30.8	26.5	28.4	2.50	15.7	0.272	0.1088	0.363	1.188	15.4	0.149
22	3.0	1015.	12.	12.7	26.7	20.7	4.8	0.232	30.3	33.2	31.1	32.0	2.73	20.3	0.222	0.0812	0.264	1.303	20.1	0.108
22	4.0	1173.	12.	17.3	33.3	24.7	5.4	0.219	35.6	37.8	36.4	36.9	2.90	24.3	0.215	0.0741	0.239	1.382	24.1	0.097
22	5.0	1320.	12.	22.9	39.9	31.5	5.8	0.186	43.2	45.5	44.2	44.6	3.15	31.1	0.199	0.0633	0.202	1.491	30.9	0.083
22	6.0	1353.	11.	31.0	61.5	47.4	10.0	0.211	67.8	72.8	69.2	70.7	3.60	46.7	0.261	0.0726	0.234	1.667	46.4	0.096
22	7.0	1463.	12.	40.6	70.4	54.0	10.1	0.187	74.4	77.7	76.0	76.4	3.77	53.4	0.236	0.0627	0.200	1.725	53.1	0.082
22	8.0	1567.	12.	41.1	77.5	59.3	12.2	0.206	84.0	89.2	86.0	87.1	3.88	58.6	0.272	0.0702	0.226	1.765	58.2	0.092
22	9.0	1686.	12.	54.1	96.5	74.2	14.3	0.192	103.0	108.6	105.2	106.3	4.19	73.4	0.273	0.0653	0.209	1.863	72.9	0.086
22	10.0	1783.	12.	61.5	105.4	84.1	14.8	0.176	113.9	119.9	116.3	117.5	4.37	83.2	0.264	0.0604	0.192	1.918	82.8	0.080
22	11.0	1913.	12.	67.1	137.2	101.6	23.8	0.234	149.7	160.4	153.4	155.8	4.64	99.9	0.368	0.0792	0.257	1.996	99.0	0.104
22	12.0	2024.	5.	112.8	141.2	124.5	11.5	0.093	151.4	153.6	149.6	152.8	4.99	124.2	0.153	0.0307	0.095	2.094	124.0	0.040

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
22	0.1	381.	11.	25.	99.	55.	23.	0.421	101.	120.	104.	111.	3.72	52.	0.530	0.1423	0.491	1.701	50.	0.186
22	0.2	472.	11.	30.	84.	56.	15.	0.274	87.	97.	90.	93.	3.80	55.	0.357	0.0940	0.309	1.733	54.	0.125
22	0.3	610.	8.	30.	81.	52.	18.	0.349	91.	107.	92.	99.	3.69	50.	0.444	0.1202	0.406	1.693	49.	0.159
22	1.0	756.	11.	36.	216.	70.	50.	0.715	171.	160.	178.	163.	3.99	63.	0.722	0.1810	0.647	1.786	61.	0.205
22	2.0	850.	11.	25.	76.	56.	15.	0.266	86.	103.	88.	95.	3.78	54.	0.380	0.1003	0.332	1.728	53.	0.140
22	3.0	1015.	12.	38.	84.	61.	15.	0.246	91.	99.	94.	96.	3.91	60.	0.328	0.0839	0.273	1.773	59.	0.110
22	4.0	1173.	12.	48.	104.	77.	16.	0.204	108.	115.	111.	112.	4.23	76.	0.295	0.0697	0.224	1.876	75.	0.092
22	5.0	1320.	12.	66.	122.	95.	15.	0.160	126.	132.	128.	130.	4.55	94.	0.251	0.0551	0.175	1.973	94.	0.073
22	6.0	1353.	11.	86.	155.	132.	20.	0.150	172.	183.	175.	178.	5.07	131.	0.273	0.0538	0.170	2.114	130.	0.073
22	7.0	1463.	12.	122.	180.	150.	19.	0.124	188.	192.	190.	190.	5.30	149.	0.220	0.0415	0.130	2.173	149.	0.054
22	8.0	1567.	12.	127.	201.	164.	25.	0.153	215.	221.	219.	219.	5.46	163.	0.279	0.0510	0.161	2.211	162.	0.067
22	9.0	1686.	12.	155.	249.	198.	28.	0.140	254.	261.	259.	258.	5.82	197.	0.273	0.0468	0.147	2.293	197.	0.061
22	10.0	1783.	12.	170.	259.	220.	27.	0.121	274.	281.	278.	278.	6.03	219.	0.248	0.0411	0.128	2.339	218.	0.054
22	11.0	1913.	12.	196.	325.	262.	40.	0.154	343.	353.	349.	349.	6.38	260.	0.328	0.0514	0.162	2.413	259.	0.067
22	12.0	2024.	5.	267.	335.	302.	29.	0.097	370.	378.	365.	375.	6.70	301.	0.218	0.0325	0.101	2.478	301.	0.042

**********23 VERNON - SILVERSTAR ***************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
23	0.1	381.	11.	2.5	18.3	8.4	4.7	0.556	18.0	23.9	18.6	20.5	1.97	7.7	0.376	0.1907	0.688	0.863	7.3	0.253
23	0.2	530.	11.	2.5	15.7	9.5	4.8	0.505	19.3	28.7	19.9	23.3	2.05	8.6	0.396	0.1930	0.698	0.913	8.2	0.268
23	1.0	716.	11.	5.1	16.0	11.1	3.7	0.337	18.7	22.6	19.2	20.7	2.20	10.7	0.268	0.1218	0.412	1.019	10.5	0.165
23	2.0	881.	11.	6.3	20.3	14.0	4.3	0.310	22.8	27.3	23.4	25.1	2.38	13.5	0.269	0.1127	0.378	1.123	13.3	0.154
23	3.0	1097.	12.	8.9	24.1	16.7	5.3	0.315	27.3	31.7	28.1	29.7	2.53	16.1	0.282	0.1115	0.373	1.200	15.9	0.149
23	3.5	1097.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	4.0	1247.	9.	11.7	28.7	21.5	5.2	0.242	32.3	36.7	32.8	34.7	2.76	21.1	0.240	0.0869	0.284	1.319	20.8	0.118
23	4.5	1247.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	5.0	1366.	12.	23.6	47.2	32.9	7.2	0.219	47.5	49.4	48.6	48.6	3.19	32.5	0.228	0.0713	0.230	1.509	32.3	0.092
23	6.0	1472.	10.	27.4	49.8	36.2	7.9	0.219	52.5	55.5	53.5	54.3	3.29	35.7	0.240	0.0729	0.235	1.550	35.4	0.095
23	7.0	1597.	12.	37.8	71.6	52.8	11.7	0.222	76.4	81.2	78.2	79.2	3.73	52.0	0.279	0.0747	0.241	1.713	51.6	0.098
23	8.0	1679.	12.	43.7	93.2	67.2	15.0	0.223	97.5	104.2	99.9	101.4	4.04	66.2	0.306	0.0757	0.245	1.817	65.6	0.100
23	9.0	1844.	9.	48.8	113.5	86.0	22.0	0.256	131.9	149.9	133.9	141.8	4.38	84.1	0.400	0.0912	0.299	1.920	83.2	0.123
23	9.2	1850.	3.	54.1	86.9	74.9	18.1	0.242	126.0	154.3	114.3	141.4	4.20	73.9	0.359	0.0856	0.280	1.865	73.3	0.115
23	9.5	1881.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
23	0.1	381.	10.	18.	76.	37.	20.	0.539	77.	93.	80.	85.	3.23	34.	0.564	0.1742	0.619	1.512	33.	0.221
23	0.2	530.	10.	25.	79.	44.	16.	0.369	78.	87.	80.	82.	3.49	42.	0.419	0.1201	0.405	1.619	42.	0.155
23	1.0	716.	11.	33.	79.	48.	14.	0.294	77.	82.	79.	80.	3.61	47.	0.343	0.0951	0.313	1.667	46.	0.122
23	2.0	881.	11.	33.	71.	53.	12.	0.231	78.	86.	79.	82.	3.73	52.	0.303	0.0813	0.264	1.711	51.	0.109
23	3.0	1097.	12.	30.	79.	58.	17.	0.297	93.	110.	96.	102.	3.84	57.	0.414	0.1079	0.360	1.746	56.	0.146
23	3.5	1097.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0
23	4.0	1247.	9.	46.	104.	74.	20.	0.266	115.	127.	117.	122.	4.17	73.	0.375	0.0898	0.294	1.857	72.	0.118
23	4.5	1247.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0
23	5.0	1366.	12.	81.	122.	101.	14.	0.142	130.	134.	132.	133.	4.65	100.	0.224	0.0482	0.152	2.001	100.	0.063
23	6.0	1472.	10.	97.	137.	115.	16.	0.139	148.	152.	150.	151.	4.86	115.	0.225	0.0464	0.146	2.058	114.	0.060
23	7.0	1597.	12.	119.	190.	149.	24.	0.160	198.	203.	201.	201.	5.29	148.	0.281	0.0531	0.168	2.169	148.	0.069
23	8.0	1679.	12.	130.	234.	177.	29.	0.163	235.	243.	240.	240.	5.60	176.	0.304	0.0543	0.172	2.243	175.	0.071
23	9.0	1844.	9.	160.	259.	217.	39.	0.178	298.	317.	301.	309.	5.99	215.	0.369	0.0616	0.197	2.331	214.	0.082
23	9.2	1850.	3.	145.	226.	194.	43.	0.222	316.	374.	288.	348.	5.77	192.	0.449	0.0779	0.252	2.280	191.	0.104
23	9.5	1881.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0

*******31 CRESTON - KOOTENAY PASS **************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
31	1.0	541.	9.	4.6	20.8	13.9	6.7	0.479	27.8	42.8	28.4	34.5	2.34	12.8	0.440	0.1883	0.678	1.083	12.1	0.263
31	2.0	616.	9.	5.6	24.6	16.8	6.7	0.399	30.8	45.5	31.4	37.4	2.51	15.8	0.402	0.1604	0.562	1.181	15.2	0.229
31	3.0	735.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	4.0	820.	9.	8.4	36.8	23.1	9.6	0.414	43.0	59.9	43.9	50.8	2.79	21.7	0.438	0.1572	0.549	1.321	20.9	0.219
31	5.0	914.	9.	12.7	45.7	29.8	10.7	0.361	52.2	64.5	53.1	58.3	3.06	28.5	0.395	0.1292	0.440	1.445	27.9	0.175
31	6.0	1015.	9.	13.5	50.3	32.8	12.2	0.373	58.4	73.6	59.5	65.9	3.15	31.3	0.425	0.1348	0.461	1.485	30.5	0.183
31	7.0	1119.	9.	11.9	58.9	37.1	13.6	0.367	65.4	90.1	66.7	76.6	3.28	35.3	0.464	0.1415	0.488	1.534	34.2	0.202
31	8.0	1271.	9.	24.1	75.4	48.6	15.2	0.312	80.3	93.2	81.7	87.0	3.61	47.1	0.393	0.1087	0.363	1.666	46.4	0.145
31	9.0	1355.	9.	27.9	82.5	53.1	15.8	0.297	86.0	97.9	87.4	92.3	3.72	51.6	0.381	0.1025	0.340	1.707	50.9	0.136
31	10.0	1439.	9.	30.2	109.0	66.8	24.8	0.371	118.5	143.3	120.7	130.9	4.00	63.9	0.517	0.1294	0.441	1.796	62.5	0.173
31	11.0	1826.	9.	57.4	183.4	115.7	42.2	0.365	203.8	243.9	207.6	224.4	4.81	111.0	0.610	0.1268	0.431	2.036	108.6	0.169

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
31	1.0	541.	9.	10.	84.	47.	27.	0.567	102.	174.	104.	130.	3.46	41.	0.771	0.2228	0.828	1.586	39.	0.314
31	2.0	616.	9.	23.	74.	55.	19.	0.350	95.	133.	97.	114.	3.74	52.	0.528	0.1409	0.485	1.707	51.	0.201
31	3.0	735.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0
31	4.0	820.	9.	41.	114.	77.	23.	0.304	126.	151.	128.	139.	4.21	75.	0.463	0.1100	0.367	1.866	73.	0.149
31	5.0	914.	9.	66.	157.	106.	29.	0.273	166.	186.	169.	177.	4.69	103.	0.441	0.0940	0.309	2.010	102.	0.125
31	6.0	1015.	9.	71.	152.	108.	29.	0.269	168.	184.	170.	177.	4.72	105.	0.429	0.0909	0.298	2.017	104.	0.119
31	7.0	1119.	9.	63.	155.	114.	32.	0.285	181.	208.	184.	196.	4.80	111.	0.480	0.1001	0.331	2.038	109.	0.134
31	8.0	1271.	9.	81.	190.	136.	33.	0.244	205.	226.	208.	216.	5.11	133.	0.431	0.0844	0.275	2.120	132.	0.112
31	9.0	1355.	9.	89.	201.	145.	30.	0.207	207.	223.	210.	216.	5.22	143.	0.373	0.0713	0.230	2.151	142.	0.095
31	10.0	1439.	9.	97.	257.	171.	44.	0.260	263.	289.	267.	277.	5.51	167.	0.485	0.0881	0.288	2.218	165.	0.117
31	11.0	1826.	9.	178.	376.	274.	65.	0.239	410.	445.	416.	430.	6.46	269.	0.523	0.0810	0.263	2.426	267.	0.106

*******32 ROSSLAND - GRANITE MOUNTAIN **********

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
32	1.0	485.	11.	4.1	33.8	12.4	8.4	0.676	29.4	36.4	30.6	32.1	2.22	11.0	0.469	0.2110	0.776	1.015	10.4	0.268
32	2.0	594.	11.	2.3	36.3	17.2	9.4	0.549	36.4	68.3	37.7	47.0	2.48	15.2	0.556	0.2243	0.835	1.146	14.0	0.338
32	3.0	707.	11.	7.6	38.9	20.4	8.6	0.421	37.9	46.2	39.1	41.7	2.68	19.3	0.386	0.1439	0.497	1.273	18.7	0.192
32	3.5	853.	6.	11.4	31.0	21.2	6.8	0.323	36.5	44.2	36.1	40.5	2.74	20.5	0.311	0.1134	0.380	1.306	20.2	0.152
32	4.0	960.	11.	9.7	48.8	25.5	10.7	0.417	47.2	58.1	48.7	52.3	2.89	24.2	0.416	0.1440	0.497	1.371	23.5	0.193
32	4.5	1085.	9.	15.7	43.7	31.1	9.3	0.300	50.5	59.1	51.4	55.1	3.11	30.2	0.332	0.1065	0.355	1.473	29.7	0.143
32	5.0	1106.	8.	24.6	63.5	40.2	13.2	0.327	68.1	75.9	68.9	72.4	3.39	39.0	0.366	0.1078	0.360	1.585	38.4	0.139
32	6.0	1164.	11.	19.0	68.8	42.4	14.1	0.332	71.1	82.8	73.0	77.0	3.45	40.9	0.397	0.1153	0.387	1.604	40.2	0.154
32	7.0	1320.	11.	27.2	87.1	59.4	17.8	0.300	95.6	112.1	98.1	104.2	3.86	57.6	0.414	0.1073	0.358	1.753	56.7	0.146
32	8.0	1524.	5.	49.0	90.2	65.7	16.1	0.246	103.4	111.8	100.8	108.3	4.01	64.7	0.322	0.0802	0.260	1.807	64.2	0.103
32	9.0	1692.	11.	36.8	124.5	81.7	27.5	0.336	137.5	164.7	141.4	151.6	4.28	78.6	0.515	0.1203	0.406	1.886	77.0	0.162

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
32	1.0	485.	10.	18.	91.	43.	23.	0.537	90.	109.	93.	99.	3.40	39.	0.595	0.1749	0.622	1.578	38.	0.224
32	2.0	594.	11.	10.	107.	52.	27.	0.508	107.	175.	110.	132.	3.62	47.	0.725	0.2002	0.729	1.649	45.	0.292
32	3.0	707.	11.	25.	117.	69.	24.	0.345	118.	146.	121.	131.	4.05	67.	0.506	0.1248	0.423	1.813	65.	0.173
32	3.5	853.	6.	53.	89.	68.	14.	0.208	99.	105.	98.	102.	4.06	67.	0.277	0.0682	0.219	1.823	67.	0.088
32	4.0	960.	11.	38.	137.	80.	30.	0.374	140.	166.	145.	153.	4.24	76.	0.547	0.1290	0.439	1.872	75.	0.171
32	4.5	1085.	9.	63.	145.	103.	28.	0.273	161.	179.	164.	171.	4.65	100.	0.434	0.0933	0.307	1.997	99.	0.123
32	5.0	1106.	8.	79.	175.	122.	37.	0.303	200.	227.	202.	215.	4.91	119.	0.508	0.1034	0.344	2.068	117.	0.136
32	6.0	1164.	10.	61.	183.	122.	41.	0.333	206.	238.	210.	223.	4.90	118.	0.564	0.1150	0.386	2.063	116.	0.153
32	7.0	1320.	11.	71.	190.	150.	34.	0.229	220.	256.	225.	239.	5.28	147.	0.456	0.0863	0.282	2.163	145.	0.120
32	8.0	1524.	5.	147.	218.	174.	31.	0.180	247.	258.	242.	254.	5.57	173.	0.327	0.0588	0.187	2.235	172.	0.076
32	9.0	1692.	11.	127.	305.	226.	55.	0.244	338.	376.	346.	359.	6.05	221.	0.520	0.0859	0.281	2.341	219.	0.115

***************33 JERSEY MINE ******************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
33	1.0	668.	11.	8.1	31.0	22.4	7.3	0.327	37.3	49.3	38.4	43.1	2.78	21.5	0.357	0.1285	0.437	1.321	21.0	0.183
33	2.0	777.	11.	10.9	35.1	26.0	7.8	0.300	41.9	52.5	43.0	47.3	2.93	25.2	0.337	0.1150	0.386	1.392	24.7	0.161
33	3.0	815.	11.	14.5	39.9	28.9	7.1	0.247	43.4	49.8	44.4	46.8	3.05	28.3	0.274	0.0898	0.294	1.447	28.0	0.123
33	4.0	1000.	11.	23.6	47.5	34.2	6.8	0.199	48.1	50.6	49.1	49.6	3.23	33.8	0.216	0.0668	0.214	1.527	33.6	0.087
33	5.0	1113.	11.	23.4	51.3	37.1	8.0	0.215	53.4	56.8	54.5	55.4	3.32	36.6	0.241	0.0726	0.234	1.561	36.4	0.095
33	6.0	1219.	11.	26.2	59.9	42.0	10.0	0.238	62.3	67.0	63.7	65.0	3.46	41.3	0.277	0.0802	0.261	1.612	40.9	0.105
33	7.0	1323.	11.	33.5	70.6	46.8	10.1	0.215	67.3	69.3	68.8	68.4	3.59	46.2	0.246	0.0687	0.220	1.662	45.9	0.088
33	8.0	1430.	11.	31.7	77.0	50.6	12.0	0.237	75.0	79.7	76.7	77.6	3.68	49.8	0.288	0.0784	0.254	1.694	49.4	0.102

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
33	1.0	668.	11.	23.	84.	65.	19.	0.301	104.	135.	107.	119.	3.97	62.	0.470	0.1184	0.399	1.786	61.	0.169
33	2.0	777.	11.	43.	114.	81.	23.	0.280	128.	145.	131.	137.	4.29	79.	0.424	0.0987	0.326	1.893	78.	0.132
33	3.0	815.	11.	53.	124.	88.	21.	0.244	132.	145.	135.	139.	4.42	86.	0.376	0.0850	0.277	1.932	86.	0.113
33	4.0	1000.	11.	74.	160.	108.	22.	0.206	153.	158.	156.	156.	4.74	107.	0.314	0.0662	0.212	2.025	106.	0.085
33	5.0	1113.	11.	81.	140.	112.	17.	0.157	147.	153.	150.	151.	4.80	111.	0.255	0.0530	0.168	2.043	110.	0.070
33	6.0	1219.	11.	91.	157.	119.	21.	0.179	162.	167.	165.	165.	4.90	118.	0.288	0.0587	0.187	2.069	117.	0.076
33	7.0	1323.	11.	84.	178.	126.	28.	0.222	183.	190.	186.	187.	4.99	124.	0.358	0.0718	0.231	2.090	123.	0.092
33	8.0	1430.	11.	107.	190.	137.	26.	0.188	189.	193.	193.	191.	5.14	136.	0.307	0.0597	0.190	2.130	135.	0.076

****************41 ZINCTON ******************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
41	1.0	539.	11.	0.5	20.3	11.0	6.2	0.560	23.6	70.3	24.5	34.7	2.11	9.4	0.566	0.2686	1.042	0.911	8.1	0.460
41	2.0	686.	11.	0.5	25.9	14.8	7.2	0.489	29.4	104.0	30.5	44.9	2.34	12.8	0.598	0.2559	0.981	1.045	11.1	0.478
41	3.0	799.	11.	16.5	39.9	26.1	7.1	0.274	40.6	44.1	41.6	42.5	2.94	25.5	0.270	0.0917	0.301	1.401	25.2	0.120
41	4.0	884.	11.	19.6	52.6	30.6	10.6	0.348	52.2	56.9	53.7	54.8	3.09	29.5	0.348	0.1124	0.377	1.463	29.0	0.144
41	5.0	960.	11.	20.3	56.4	34.3	11.0	0.320	56.6	62.5	58.1	59.8	3.22	33.2	0.341	0.1062	0.354	1.515	32.7	0.138
41	6.0	1055.	11.	25.4	64.0	42.2	12.9	0.306	68.4	77.0	70.2	73.1	3.45	40.9	0.361	0.1048	0.348	1.606	40.3	0.138

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
41	1.0	539.	11.	8.	63.	39.	20.	0.504	79.	135.	82.	102.	3.28	35.	0.684	0.2087	0.766	1.517	33.	0.302
41	2.0	686.	11.	8.	81.	49.	25.	0.519	101.	201.	104.	136.	3.51	43.	0.805	0.2293	0.858	1.598	40.	0.347
41	3.0	799.	11.	48.	114.	82.	22.	0.268	127.	143.	130.	136.	4.31	80.	0.408	0.0946	0.311	1.898	79.	0.126
41	4.0	884.	11.	56.	142.	99.	28.	0.285	156.	173.	160.	165.	4.58	96.	0.444	0.0970	0.320	1.977	95.	0.128
41	5.0	960.	11.	56.	152.	102.	29.	0.283	161.	178.	165.	170.	4.63	99.	0.448	0.0967	0.319	1.992	98.	0.128
41	6.0	1055.	11.	74.	160.	117.	27.	0.230	172.	188.	176.	181.	4.87	115.	0.387	0.0796	0.258	2.058	114.	0.106

****************42 SANDON *******************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
42	11.0	914.	11.	18.3	50.5	32.8	9.5	0.288	52.0	58.1	53.3	55.3	3.17	31.9	0.313	0.0988	0.326	1.498	31.5	0.131
42	12.0	1027.	11.	29.2	55.1	39.6	7.5	0.188	54.8	57.1	55.9	56.1	3.40	39.2	0.212	0.0624	0.199	1.591	39.0	0.081
42	13.0	1113.	11.	31.5	65.3	44.6	10.2	0.228	65.2	68.5	66.7	67.1	3.53	43.9	0.264	0.0748	0.241	1.639	43.6	0.097
42	14.0	1247.	10.	37.1	82.5	56.6	14.4	0.255	86.2	92.2	87.9	89.6	3.81	55.5	0.321	0.0842	0.274	1.740	55.0	0.109
42	15.0	1402.	10.	37.6	84.6	60.2	16.6	0.275	94.3	103.2	96.2	99.3	3.89	58.8	0.361	0.0928	0.305	1.764	58.1	0.121
42	16.0	1439.	11.	42.7	90.9	62.4	16.7	0.267	96.3	103.0	98.7	100.2	3.94	61.1	0.346	0.0879	0.288	1.782	60.5	0.114
42	17.0	1615.	11.	58.9	117.6	83.1	20.4	0.245	124.6	131.6	127.5	128.7	4.34	81.7	0.349	0.0804	0.261	1.908	81.0	0.104
42	18.0	1753.	11.	60.2	135.9	92.9	24.7	0.266	143.1	152.6	146.6	148.5	4.50	91.0	0.392	0.0873	0.285	1.954	90.0	0.113
42	19.0	1859.	11.	64.0	141.7	98.6	26.3	0.267	152.2	162.5	155.9	158.1	4.59	96.6	0.402	0.0877	0.287	1.980	95.6	0.113
42	20.0	1957.	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	21.0	2030.	11.	71.1	182.4	117.2	37.9	0.323	194.3	209.6	199.6	202.9	4.85	113.8	0.506	0.1045	0.347	2.050	112.1	0.133
42	22.0	2149.	11.	75.2	185.4	124.6	40.0	0.321	206.0	224.4	211.6	216.3	4.95	120.9	0.520	0.1051	0.349	2.076	119.2	0.135

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
42	11.0	914.	11.	53.	142.	96.	25.	0.263	147.	164.	151.	157.	4.54	94.	0.415	0.0914	0.300	1.967	93.	0.122
42	12.0	1027.	11.	84.	140.	112.	18.	0.166	149.	155.	152.	153.	4.80	111.	0.268	0.0559	0.177	2.042	110.	0.073
42	13.0	1113.	11.	97.	157.	127.	21.	0.164	169.	175.	172.	172.	5.01	126.	0.272	0.0544	0.172	2.098	125.	0.071
42	14.0	1247.	10.	119.	198.	156.	31.	0.196	219.	230.	223.	226.	5.36	154.	0.351	0.0654	0.209	2.186	154.	0.085
42	15.0	1402.	10.	112.	185.	150.	28.	0.190	208.	219.	212.	215.	5.29	148.	0.339	0.0640	0.205	2.168	147.	0.084
42	16.0	1439.	11.	117.	201.	153.	29.	0.187	212.	221.	216.	217.	5.33	152.	0.335	0.0628	0.201	2.178	151.	0.082
42	17.0	1615.	11.	155.	279.	210.	36.	0.174	284.	294.	289.	290.	5.93	208.	0.341	0.0576	0.183	2.316	207.	0.075
42	18.0	1753.	11.	170.	282.	230.	38.	0.165	307.	318.	312.	314.	6.11	228.	0.336	0.0550	0.174	2.356	227.	0.072
42	19.0	1859.	11.	178.	292.	239.	37.	0.154	313.	324.	318.	319.	6.19	237.	0.318	0.0514	0.162	2.373	236.	0.067
42	20.0	1957.	0.	0.	0.	0.	0.	0.0	0.	0.	0.	0.	0.0	0.	0.0	0.0	0.0	0.0	0.	0.0
42	21.0	2030.	11.	193.	343.	269.	49.	0.183	369.	385.	376.	378.	6.43	266.	0.392	0.0610	0.194	2.423	265.	0.080
42	22.0	2149.	11.	213.	386.	296.	58.	0.197	415.	435.	423.	427.	6.64	292.	0.438	0.0660	0.211	2.463	291.	0.086

***************43 KASLO ******************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
43	1.0	549.	6.	5.6	24.1	14.5	7.6	0.526	31.5	49.7	31.0	39.4	2.36	13.2	0.465	0.1967	0.714	1.099	12.6	0.267
43	2.0	628.	8.	8.1	28.4	20.5	7.0	0.341	35.3	46.7	35.6	40.8	2.70	19.6	0.351	0.1303	0.444	1.282	19.1	0.182
43	3.0	698.	8.	16.0	38.6	28.7	8.3	0.290	46.3	56.0	46.8	51.5	3.03	27.9	0.325	0.1071	0.357	1.438	27.4	0.146
43	3.5	762.	7.	20.6	53.8	38.1	13.4	0.351	67.1	84.9	67.2	76.3	3.32	36.6	0.424	0.1278	0.435	1.554	35.8	0.173
43	4.0	832.	8.	22.6	59.2	41.2	13.3	0.322	69.3	83.7	70.1	76.9	3.41	39.8	0.394	0.1155	0.388	1.592	39.1	0.156
43	5.0	927.	8.	26.9	67.8	48.9	14.4	0.294	79.5	93.9	80.3	87.2	3.62	47.6	0.382	0.1054	0.351	1.671	46.9	0.142
43	6.0	1021.	8.	33.3	71.9	53.6	14.0	0.262	83.3	95.7	84.1	90.2	3.74	52.4	0.350	0.0934	0.307	1.714	51.8	0.126

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
43	1.0	549.	6.	15.	81.	47.	26.	0.556	104.	186.	103.	137.	3.47	42.	0.756	0.2179	0.806	1.592	39.	0.303
43	2.0	628.	8.	33.	84.	66.	18.	0.270	104.	126.	105.	116.	4.01	65.	0.407	0.1014	0.336	1.804	64.	0.140
43	3.0	698.	8.	48.	142.	93.	28.	0.304	154.	180.	155.	167.	4.49	91.	0.479	0.1066	0.355	1.951	89.	0.143
43	3.5	762.	7.	69.	147.	112.	27.	0.245	172.	195.	172.	185.	4.79	110.	0.416	0.0868	0.284	2.037	109.	0.116
43	4.0	832.	8.	79.	155.	116.	25.	0.217	169.	183.	170.	177.	4.85	114.	0.361	0.0744	0.240	2.054	113.	0.098
43	5.0	927.	8.	91.	190.	130.	33.	0.251	199.	215.	201.	208.	5.04	128.	0.420	0.0835	0.272	2.102	126.	0.109
43	6.0	1021.	8.	99.	185.	142.	29.	0.201	202.	218.	204.	212.	5.19	140.	0.360	0.0694	0.223	2.144	139.	0.092

***********51 FERNIE - SNOW VALLEY *************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
51	1.0	1158.	10.	5.1	53.3	31.1	16.9	0.544	65.9	116.7	67.9	84.4	3.03	27.7	0.662	0.2187	0.810	1.410	25.7	0.319
51	2.0	1256.	10.	11.4	66.5	40.8	18.2	0.446	78.3	110.2	80.4	92.3	3.36	38.0	0.562	0.1672	0.590	1.562	36.5	0.233
51	3.0	1387.	10.	23.4	81.3	52.2	20.0	0.384	93.4	113.2	95.8	103.4	3.68	49.8	0.493	0.1341	0.459	1.686	48.6	0.179
51	4.0	1545.	9.	35.3	121.9	76.4	32.9	0.431	145.0	177.2	148.0	161.5	4.16	72.2	0.615	0.1477	0.512	1.846	70.1	0.193
51	5.0	1576.	9.	40.1	167.6	85.6	39.9	0.466	168.8	195.8	172.4	182.1	4.32	80.7	0.646	0.1494	0.519	1.894	78.4	0.191
51	6.0	1658.	10.	57.1	196.3	108.3	41.1	0.379	192.7	215.1	197.6	204.2	4.70	104.0	0.577	0.1227	0.415	2.008	101.9	0.158
51	7.0	1789.	10.	67.8	249.7	149.8	60.0	0.400	273.2	333.1	280.3	303.4	5.22	142.4	0.728	0.1394	0.479	2.142	138.6	0.185

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
51	1.0	1158.	9.	61.	137.	96.	28.	0.286	154.	172.	156.	164.	4.54	94.	0.446	0.0981	0.324	1.966	92.	0.129
51	2.0	1256.	10.	43.	183.	124.	44.	0.352	214.	280.	219.	245.	4.91	119.	0.654	0.1331	0.455	2.063	116.	0.187
51	3.0	1387.	10.	66.	203.	149.	49.	0.327	249.	308.	254.	279.	5.23	143.	0.632	0.1208	0.408	2.147	140.	0.166
51	4.0	1545.	9.	94.	272.	194.	65.	0.334	329.	395.	335.	363.	5.72	187.	0.680	0.1190	0.401	2.263	183.	0.160
51	5.0	1576.	9.	122.	330.	198.	61.	0.308	325.	347.	331.	337.	5.78	193.	0.565	0.0978	0.323	2.280	191.	0.125
51	6.0	1658.	10.	160.	396.	257.	72.	0.280	406.	441.	414.	425.	6.31	251.	0.587	0.0930	0.306	2.395	249.	0.121
51	7.0	1789.	10.	198.	493.	338.	94.	0.277	532.	593.	543.	566.	6.91	330.	0.659	0.0954	0.314	2.514	326.	0.126

**********52 KIMBERLY - NORTH STAR *************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
52	0.1	1045.	11.	5.8	27.4	17.3	6.6	0.382	30.7	41.1	31.6	35.6	2.54	16.4	0.369	0.1455	0.503	1.200	15.9	0.203
52	1.0	1186.	11.	8.9	30.5	22.5	7.5	0.333	37.8	47.6	38.9	42.7	2.79	21.6	0.348	0.1250	0.424	1.325	21.1	0.173
52	2.0	1280.	12.	10.2	39.4	26.9	9.1	0.338	45.3	56.4	46.7	50.8	2.96	25.8	0.370	0.1252	0.425	1.402	25.2	0.173
52	3.0	1362.	12.	13.5	36.1	27.5	7.3	0.266	42.2	49.0	43.4	45.9	2.99	26.8	0.291	0.0973	0.321	1.422	26.4	0.133
52	4.0	1423.	12.	12.7	39.9	28.8	8.4	0.292	45.8	54.9	47.2	50.5	3.04	28.0	0.328	0.1081	0.361	1.439	27.5	0.149
52	5.0	1554.	11.	15.2	45.0	32.5	10.0	0.308	52.8	64.5	54.2	58.8	3.15	31.4	0.361	0.1146	0.385	1.488	30.8	0.158
52	6.0	1682.	12.	19.8	51.6	37.0	10.4	0.282	58.0	67.1	59.6	62.9	3.30	36.0	0.335	0.1016	0.337	1.549	35.4	0.137
52	7.0	1804.	12.	17.8	66.8	44.2	14.9	0.338	74.4	92.2	76.7	83.3	3.49	42.5	0.436	0.1249	0.424	1.618	41.5	0.172

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
52	0.1	1045.	11.	23.	97.	64.	22.	0.338	108.	138.	111.	123.	3.94	61.	0.502	0.1274	0.433	1.777	60.	0.178
52	1.0	1186.	11.	43.	124.	81.	24.	0.291	129.	146.	132.	138.	4.29	79.	0.435	0.1015	0.337	1.890	78.	0.135
52	2.0	1280.	12.	48.	130.	92.	24.	0.263	140.	158.	144.	150.	4.47	89.	0.415	0.0929	0.305	1.946	88.	0.125
52	3.0	1362.	12.	66.	124.	97.	21.	0.214	138.	148.	142.	144.	4.57	95.	0.334	0.0731	0.236	1.976	95.	0.096
52	4.0	1423.	12.	66.	130.	99.	20.	0.203	139.	148.	142.	144.	4.60	97.	0.318	0.0690	0.222	1.986	97.	0.091
52	5.0	1554.	11.	58.	140.	105.	25.	0.235	155.	174.	159.	166.	4.69	103.	0.393	0.0839	0.273	2.009	102.	0.113
52	6.0	1682.	12.	69.	208.	122.	36.	0.298	196.	211.	201.	204.	4.92	119.	0.477	0.0970	0.320	2.070	118.	0.125
52	7.0	1804.	12.	66.	183.	138.	34.	0.246	206.	237.	211.	222.	5.12	135.	0.463	0.0904	0.296	2.124	133.	0.124

**************53 LAKE LOUISE ******************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
53	1.0	1542.	12.	10.7	40.6	21.9	7.8	0.357	37.7	41.4	38.9	39.5	2.76	21.1	0.318	0.1150	0.386	1.317	20.7	0.149
53	2.0	1652.	12.	14.0	43.2	23.9	8.2	0.343	40.5	43.5	41.8	42.0	2.85	23.1	0.311	0.1093	0.365	1.357	22.8	0.139
53	3.0	1771.	12.	15.2	44.4	23.5	8.0	0.338	39.5	40.8	40.8	40.1	2.84	22.8	0.291	0.1027	0.341	1.352	22.5	0.128
53	4.0	1920.	12.	17.8	47.0	29.6	9.0	0.304	47.7	52.3	49.1	50.2	3.06	28.8	0.310	0.1013	0.336	1.453	28.3	0.132
53	5.0	2024.	12.	17.8	52.3	33.5	10.0	0.300	53.7	60.1	55.3	57.2	3.19	32.6	0.327	0.1024	0.340	1.506	32.1	0.135
53	6.0	2137.	10.	26.2	50.3	39.2	9.2	0.235	58.2	63.5	59.3	61.3	3.38	38.6	0.274	0.0811	0.263	1.582	38.2	0.107
53	7.0	2249.	12.	27.2	58.4	42.2	12.1	0.286	66.5	73.1	68.4	70.3	3.45	41.1	0.334	0.0968	0.319	1.609	40.6	0.127
53	8.0	2339.	6.	24.9	66.5	46.1	14.2	0.307	77.8	94.2	76.9	86.3	3.55	44.8	0.388	0.1092	0.365	1.645	44.1	0.147

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
53	1.0	1542.	12.	56.	107.	80.	16.	0.204	113.	119.	116.	117.	4.29	79.	0.294	0.0685	0.220	1.896	79.	0.090
53	2.0	1652.	12.	63.	127.	90.	19.	0.214	128.	134.	131.	132.	4.46	88.	0.313	0.0702	0.226	1.944	88.	0.091
53	3.0	1771.	12.	58.	140.	83.	21.	0.259	126.	128.	129.	127.	4.33	81.	0.343	0.0793	0.257	1.906	80.	0.099
53	4.0	1920.	12.	81.	155.	107.	21.	0.193	149.	152.	152.	151.	4.73	106.	0.293	0.0618	0.197	2.023	105.	0.079
53	5.0	2024.	12.	84.	165.	117.	22.	0.188	162.	167.	165.	165.	4.88	116.	0.301	0.0617	0.197	2.062	115.	0.080
53	6.0	2137.	10.	99.	160.	129.	23.	0.174	176.	183.	178.	180.	5.04	128.	0.297	0.0589	0.187	2.105	127.	0.077
53	7.0	2249.	12.	107.	190.	143.	27.	0.188	197.	204.	201.	201.	5.21	141.	0.323	0.0621	0.198	2.148	141.	0.081
53	8.0	2339.	6.	79.	208.	138.	45.	0.330	239.	281.	236.	261.	5.11	133.	0.573	0.1123	0.376	2.118	131.	0.148

**************61 GROUSE MOUNTAIN ****************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
61	1.0	76.	11.	0.5	12.7	2.8	3.4	1.217	9.8	10.9	10.3	9.7	1.29	2.1	0.417	0.3239	1.320	0.275	1.9	0.375
61	2.0	189.	10.	0.5	15.2	4.3	4.5	1.039	13.6	22.8	14.1	16.1	1.48	3.2	0.511	0.3466	1.442	0.437	2.7	0.448
61	2.5	250.	8.	0.5	14.5	4.1	4.6	1.108	13.8	22.8	14.1	16.2	1.45	3.1	0.509	0.3511	1.466	0.418	2.6	0.443
61	3.0	347.	8.	1.3	16.3	6.0	5.0	0.822	16.5	28.9	16.8	20.7	1.70	4.9	0.493	0.2900	1.147	0.642	4.4	0.386
61	4.0	402.	9.	1.5	25.4	10.5	8.3	0.791	27.7	61.3	28.5	38.0	2.02	8.3	0.642	0.3177	1.288	0.852	7.1	0.449
61	6.0	878.	8.	38.1	218.4	133.8	67.3	0.503	276.6	473.5	280.2	357.2	4.95	121.1	1.013	0.2047	0.748	2.056	113.8	0.292
61	7.0	985.	8.	46.0	188.0	134.8	57.6	0.427	257.0	394.8	260.1	318.6	5.01	125.5	0.859	0.1716	0.608	2.080	120.2	0.243
61	8.0	1042.	5.	81.3	215.9	164.5	53.0	0.322	288.2	387.1	279.6	337.2	5.42	159.0	0.660	0.1219	0.412	2.193	155.9	0.169
61	9.0	1097.	5.	70.4	227.8	180.4	65.0	0.360	332.3	528.2	321.8	420.1	5.56	171.9	0.826	0.1486	0.515	2.222	166.7	0.214
61	10.0	1097.	6.	109.7	242.6	189.1	57.2	0.303	317.1	387.6	313.6	354.8	5.68	183.7	0.624	0.1097	0.367	2.257	180.8	0.148

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
61	1.0	76.	11.	3.	38.	16.	12.	0.768	41.	65.	43.	50.	2.37	13.	0.648	0.2738	1.067	1.076	12.	0.363
61	2.0	189.	10.	5.	69.	25.	20.	0.825	66.	106.	68.	80.	2.71	20.	0.780	0.2880	1.137	1.250	18.	0.377
61	2.5	250.	8.	5.	51.	22.	17.	0.784	59.	96.	60.	73.	2.63	18.	0.731	0.2778	1.087	1.216	16.	0.361
61	3.0	347.	8.	8.	71.	29.	22.	0.750	76.	125.	77.	95.	2.91	25.	0.776	0.2665	1.031	1.351	22.	0.351
61	4.0	402.	9.	8.	94.	42.	32.	0.761	110.	217.	112.	145.	3.25	34.	0.962	0.2960	1.177	1.481	30.	0.411
61	6.0	878.	7.	74.	406.	260.	129.	0.496	540.	948.	540.	706.	6.18	236.	1.256	0.2033	0.742	2.347	222.	0.290
61	7.0	985.	8.	91.	394.	279.	121.	0.432	535.	851.	542.	674.	6.38	259.	1.127	0.1767	0.629	2.393	247.	0.253
61	8.0	1042.	5.	165.	437.	343.	110.	0.319	599.	823.	581.	709.	6.92	331.	0.855	0.1236	0.419	2.512	325.	0.173
61	9.0	1097.	4.	333.	498.	429.	70.	0.162	603.	652.	580.	632.	7.52	426.	0.423	0.0563	0.178	2.628	424.	0.075
61	10.0	1097.	6.	196.	462.	369.	111.	0.301	618.	775.	611.	700.	7.10	358.	0.795	0.1119	0.375	2.547	352.	0.153

****************62 MOUNT SEYMOUR ****************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
62	1.0	15.	11.	0.3	10.2	3.6	3.1	0.856	10.0	24.3	10.4	13.3	1.41	2.8	0.474	0.3372	1.391	0.365	2.3	0.502
62	2.0	122.	11.	0.8	20.3	5.8	6.3	1.097	18.7	28.7	19.6	21.9	1.61	4.1	0.587	0.3656	1.546	0.544	3.5	0.449
62	3.0	329.	11.	1.3	21.6	8.1	7.4	0.909	23.1	47.6	24.1	31.1	1.81	6.0	0.654	0.3609	1.521	0.694	4.9	0.483
62	4.0	396.	10.	1.3	33.0	13.8	11.5	0.836	37.4	122.4	38.8	58.6	2.13	9.7	0.850	0.3981	1.733	0.878	7.5	0.588
62	5.0	594.	9.	1.8	39.4	24.1	16.8	0.698	59.1	246.3	60.6	101.8	2.61	17.8	0.986	0.3772	1.612	1.144	13.9	0.598
62	6.0	777.	10.	19.0	107.4	60.6	31.0	0.512	124.5	189.5	128.2	152.8	3.80	55.0	0.750	0.1972	0.716	1.716	52.0	0.273
62	7.0	960.	10.	35.6	162.1	103.9	44.7	0.430	195.8	287.9	201.0	237.1	4.59	96.7	0.777	0.1693	0.599	1.967	92.6	0.239
62	8.0	1052.	8.	48.3	287.0	155.2	88.2	0.568	342.4	523.2	347.1	419.6	5.18	139.3	1.085	0.2093	0.768	2.118	131.2	0.283
62	9.0	1067.	9.	73.9	312.2	190.3	84.4	0.444	366.4	513.6	374.0	434.6	5.62	177.5	0.937	0.1668	0.589	2.232	170.5	0.230
62	10.0	1113.	3.	129.5	268.2	212.2	73.1	0.344	418.4	610.3	371.1	511.4	5.90	205.8	0.742	0.1256	0.426	2.306	202.4	0.170

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
62	1.0	15.	11.	1.	28.	15.	11.	0.726	36.	116.	38.	55.	2.25	11.	0.767	0.3413	1.413	0.966	9.	0.539
62	2.0	122.	11.	5.	63.	23.	19.	0.819	62.	103.	65.	77.	2.66	19.	0.785	0.2954	1.174	1.221	17.	0.390
62	3.0	329.	11.	8.	79.	32.	23.	0.706	78.	120.	81.	94.	3.01	27.	0.757	0.2514	0.959	1.398	25.	0.335
62	4.0	396.	10.	3.	117.	44.	36.	0.816	119.	310.	123.	168.	3.23	34.	1.114	0.3447	1.431	1.446	28.	0.508
62	5.0	594.	9.	8.	109.	64.	42.	0.645	151.	413.	155.	230.	3.74	52.	1.148	0.3072	1.234	1.651	45.	0.463
62	6.0	777.	10.	58.	287.	168.	79.	0.471	332.	476.	341.	397.	5.38	155.	0.961	0.1787	0.638	2.171	148.	0.246
62	7.0	960.	10.	81.	389.	234.	107.	0.458	454.	646.	467.	540.	6.01	217.	1.039	0.1729	0.614	2.317	207.	0.240
62	8.0	1052.	8.	94.	516.	299.	165.	0.552	648.	1050.	657.	818.	6.44	267.	1.371	0.2128	0.784	2.399	251.	0.293
62	9.0	1067.	9.	160.	564.	355.	145.	0.408	657.	852.	670.	752.	6.95	335.	1.029	0.1481	0.513	2.512	325.	0.201
62	10.0	1113.	3.	284.	452.	393.	94.	0.240	659.	805.	598.	738.	7.29	387.	0.620	0.0851	0.278	2.585	384.	0.114

**************64 HOLLYBURN MOUNTAIN ************

WATER EQUIVALENT STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
64	1.0	15.	4.	1.5	5.1	3.1	1.6	0.509	6.9	10.2	6.4	8.4	1.42	2.9	0.246	0.1733	0.615	0.441	2.8	0.226
64	2.0	168.	4.	1.8	12.7	7.3	4.5	0.619	18.7	49.1	17.2	28.3	1.86	6.4	0.474	0.2546	0.975	0.773	5.9	0.367
64	3.0	305.	4.	1.8	20.3	10.9	9.1	0.832	33.7	128.2	30.7	57.4	2.04	8.5	0.725	0.3544	1.485	0.864	7.3	0.497
64	4.0	442.	3.	2.0	17.8	9.4	7.9	0.845	31.8	153.5	26.7	58.4	1.97	7.6	0.678	0.3445	1.430	0.825	6.7	0.482
64	5.0	640.	4.	9.7	43.2	30.2	15.9	0.528	70.0	149.3	64.8	99.4	3.02	27.5	0.646	0.2140	0.789	1.414	25.9	0.304
64	6.0	732.	4.	14.0	64.3	45.5	21.9	0.482	100.3	226.2	93.1	146.0	3.47	41.7	0.719	0.2074	0.760	1.595	39.4	0.303
64	7.0	823.	3.	64.3	96.5	82.8	16.6	0.201	129.7	148.4	119.0	140.4	4.34	82.0	0.302	0.0695	0.223	1.912	81.6	0.092
64	8.0	914.	4.	108.5	152.4	137.6	20.7	0.150	189.4	203.6	182.6	197.8	5.15	136.8	0.270	0.0523	0.165	2.135	136.4	0.070
64	9.0	1021.	4.	153.7	266.7	208.7	52.4	0.251	339.7	385.6	322.6	365.7	5.90	205.4	0.500	0.0848	0.276	2.309	203.7	0.111
64	10.0	1082.	1.	156.2	156.2	156.2	0.0	0.0	0.0	0.0	322.6	0.0	5.39	0.0	0.0	0.0	0.0	2.194	0.0	0.0

SNOW DEPTH STATISTICS (CENTIMETERS)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV	N30YR	L30YR	G30YR	C30YR	CRM	CRCM	CRSTD	CRCOV	TCOV	LMEAN	LTMEAN	LSTD
64	1.0	15.	4.	8.	18.	13.	5.	0.359	24.	31.	23.	28.	2.31	12.	0.284	0.1227	0.415	1.084	12.	0.161
64	2.0	168.	4.	13.	41.	31.	12.	0.400	61.	105.	57.	80.	3.08	29.	0.494	0.1605	0.563	1.450	28.	0.228
64	3.0	305.	4.	13.	69.	47.	26.	0.551	112.	276.	104.	168.	3.49	42.	0.812	0.2328	0.874	1.596	39.	0.337
64	4.0	442.	3.	15.	74.	36.	33.	0.900	129.	310.	107.	192.	3.13	31.	0.937	0.2996	1.195	1.449	28.	0.369
64	5.0	640.	4.	33.	107.	82.	33.	0.405	165.	295.	154.	220.	4.26	77.	0.709	0.1664	0.587	1.874	75.	0.238
64	6.0	732.	4.	56.	142.	109.	37.	0.340	202.	292.	190.	245.	4.72	105.	0.615	0.1301	0.443	2.014	103.	0.181
64	7.0	823.	3.	124.	193.	170.	40.	0.234	282.	342.	257.	315.	5.51	168.	0.458	0.0830	0.270	2.222	167.	0.111
64	8.0	914.	4.	211.	312.	279.	46.	0.166	395.	434.	380.	418.	6.52	277.	0.383	0.0587	0.187	2.441	276.	0.079
64	9.0	1021.	4.	307.	521.	398.	92.	0.231	627.	683.	597.	660.	7.32	392	0.553	0.0756	0.244	2.591	390.	0.097
64	10.0	1082.	1.	323.	323.	323.	0.	0.0	0.	0.	597.	0.	6.86	0.	0.0	0.0	0.0	2.509	0.	0.0

APPENDIX II: SNOW DENSITY STATISTICS

Densities at time of maximum water equivalent

Key for abbreviations used

LOC	Location.
STA	Station.
ELEV	Elevation in meters.
N	Number of years of measurements.
MIN	Minimum value of the density
MAX	Maximum value of the density
MEAN	Mean value of the density
STD	Standard deviation of the mean density
COV	Coefficient of varitation of the mean density

*************11 MOUNT REVELSTOKE *************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
11	1.0	497.	12.	0.251	0.603	0.344	0.091	0.263
11	2.0	614.	12.	0.259	0.430	0.343	0.056	0.165
11	3.0	703.	12.	0.257	0.462	0.339	0.059	0.175
11	4.0	841.	12.	0.298	0.547	0.364	0.070	0.191
11	5.0	972.	12.	0.302	0.459	0.361	0.053	0.147
11	6.0	1096.	12.	0.304	0.502	0.394	0.059	0.151
11	7.0	1195.	0.	0.0	0.0	0.0	0.0	0.0
11	8.0	1323.	12.	0.382	0.491	0.437	0.039	0.089
11	9.0	1487.	12.	0.369	0.512	0.433	0.049	0.112
11	10.0	1574.	12.	0.374	0.532	0.427	0.046	0.108
11	11.0	1649.	12.	0.380	0.554	0.443	0.046	0.105
11	12.0	1801.	11.	0.345	0.543	0.426	0.053	0.125
11	12.5	1829.	0.	0.0	0.0	0.0	0.0	0.0
11	13.0	1902.	12.	0.315	0.572	0.444	0.064	0.144

*************12 FIDELITY MOUNTAIN *************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
12	10.0	959.	11.	0.291	0.406	0.355	0.036	0.101
12	11.0	1081.	12.	0.324	0.508	0.367	0.049	0.134
12	12.0	1192.	12.	0.330	0.460	0.385	0.043	0.111
12	13.0	1305.	12.	0.320	0.486	0.394	0.049	0.124
12	14.0	1455.	11.	0.324	0.468	0.393	0.042	0.108
12	15.0	1486.	11.	0.331	0.486	0.402	0.036	0.090
12	16.0	1682.	12.	0.370	0.487	0.422	0.035	0.082
12	17.0	1807.	12.	0.369	0.519	0.414	0.043	0.105
12	18.0	1894.	12.	0.382	0.538	0.441	0.049	0.110
12	19.0	1981.	11.	0.396	0.574	0.457	0.056	0.122

**************13 MOUNT COPELAND **************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
13	1.0	617.	6.	0.313	0.487	0.392	0.059	0.152
13	2.0	777.	6.	0.336	0.453	0.404	0.045	0.111
13	3.0	884.	6.	0.367	0.483	0.406	0.045	0.112
13	4.0	960.	5.	0.405	0.485	0.433	0.033	0.075
13	5.0	1052.	5.	0.390	0.536	0.440	0.056	0.128
13	6.0	1213.	4.	0.411	0.470	0.438	0.025	0.057
13	7.0	1402.	4.	0.434	0.489	0.456	0.025	0.055
13	8.0	1524.	5.	0.443	0.542	0.482	0.039	0.082
13	9.0	1670.	5.	0.397	0.513	0.462	0.054	0.118
13	10.0	1836.	5.	0.484	0.564	0.515	0.031	0.060

************21 APEX MT (PENTICTON) ****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
21	1.0	777.	9.	0.167	0.336	0.233	0.051	0.220
21	2.0	936.	9.	0.165	0.353	0.263	0.060	0.229
21	3.0	1024.	9.	0.182	0.333	0.253	0.058	0.228
21	4.0	1143.	9.	0.192	0.310	0.260	0.043	0.165
21	5.0	1241.	9.	0.222	0.339	0.290	0.042	0.145
21	6.0	1366.	9.	0.233	0.311	0.280	0.023	0.082
21	7.0	1436.	9.	0.274	0.407	0.311	0.039	0.127
21	8.0	1503.	9.	0.256	0.421	0.306	0.049	0.160
21	9.0	1762.	0.	0.0	0.0	0.0	0.0	0.0
21	10.0	1911.	0.	0.0	0.0	0.0	0.0	0.0

**************22 ENDERBY MOUNTAIN *****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
22	0.1	381.	11.	0.185	0.408	0.268	0.070	0.262
22	0.2	472.	11.	0.207	0.341	0.259	0.044	0.172
22	0.3	610.	8.	0.194	0.340	0.262	0.055	0.211
22	1.0	756.	11.	0.024	0.333	0.248	0.082	0.332
22	2.0	850.	11.	0.214	0.318	0.283	0.029	0.103
22	3.0	1015.	12.	0.230	0.498	0.346	0.074	0.213
22	4.0	1173.	12.	0.251	0.424	0.324	0.047	0.146
22	5.0	1320.	12.	0.286	0.390	0.330	0.032	0.098
22	6.0	1353.	11.	0.282	0.421	0.359	0.039	0.109
22	7.0	1463.	12.	0.292	0.440	0.359	0.044	0.123
22	8.0	1567.	12.	0.306	0.412	0.359	0.035	0.097
22	9.0	1686.	12.	0.313	0.425	0.373	0.036	0.096
22	10.0	1783.	12.	0.327	0.422	0.380	0.030	0.078
22	11.0	1913.	12.	0.322	0.441	0.384	0.036	0.093
22	12.0	2024.	5.	0.393	0.428	0.413	0.013	0.033

************23 VERNON - SILVERSTAR *****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
23	0.1	381.	10.	0.174	0.380	0.255	0.060	0.234
23	0.2	530.	10.	0.152	0.313	0.227	0.053	0.232
23	1.0	716.	11.	0.147	0.345	0.232	0.057	0.247
23	2.0	881.	11.	0.166	0.327	0.262	0.041	0.158
23	3.0	1097.	12.	0.193	0.385	0.288	0.048	0.165
23	3.5	1097.	0.	0.0	0.0	0.0	0.0	0.0
23	4.0	1247.	9.	0.221	0.387	0.294	0.054	0.183
23	4.5	1247.	0.	0.0	0.0	0.0	0.0	0.0
23	5.0	1366.	12.	0.254	0.421	0.325	0.044	0.136
23	6.0	1472.	10.	0.269	0.377	0.312	0.030	0.098
23	7.0	1597.	12.	0.292	0.437	0.352	0.047	0.133
23	8.0	1679.	12.	0.335	0.427	0.377	0.034	0.090
23	9.0	1844.	9.	0.299	0.447	0.391	0.044	0.113
23	9.2	1850.	3.	0.371	0.412	0.385	0.023	0.060
23	9.5	1881.	0.	0.0	0.0	0.0	0.0	0.0

*******31 CRESTON - KOOTENAY PASS **************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
31	1.0	541.	9.	0.248	0.510	0.324	0.087	0.270
31	2.0	616.	9.	0.243	0.357	0.300	0.039	0.130
31	3.0	735.	0.	0.0	0.0	0.0	0.0	0.0
31	4.0	820.	9.	0.195	0.352	0.289	0.050	0.174
31	5.0	914.	9.	0.192	0.333	0.277	0.050	0.179
31	6.0	1015.	9.	0.190	0.397	0.300	0.065	0.217
31	7.0	1119.	9.	0.189	0.408	0.321	0.068	0.212
31	8.0	1271.	9.	0.274	0.397	0.355	0.046	0.130
31	9.0	1355.	9.	0.295	0.410	0.361	0.040	0.110
31	10.0	1439.	9.	0.289	0.457	0.382	0.057	0.148
31	11.0	1826.	9.	0.314	0.508	0.412	0.066	0.159

*******32 ROSSLAND - GRANITE MOUNTAIN **********

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
32	1.0	485.	10.	0.228	0.371	0.297	0.042	0.143
32	2.0	594.	11.	0.230	0.375	0.316	0.041	0.129
32	3.0	707.	11.	0.220	0.332	0.291	0.040	0.136
32	3.5	853.	6.	0.215	0.381	0.309	0.058	0.187
32	4.0	960.	11.	0.255	0.358	0.317	0.034	0.106
32	4.5	1085.	9.	0.249	0.356	0.301	0.033	0.111
32	5.0	1106.	8.	0.290	0.363	0.329	0.024	0.072
32	6.0	1164.	10.	0.241	0.500	0.351	0.076	0.217
32	7.0	1320.	11.	0.318	0.476	0.392	0.046	0.118
32	8.0	1524.	5.	0.333	0.414	0.375	0.031	0.084
32	9.0	1692.	11.	0.290	0.408	0.354	0.046	0.130

***************33 JERSEY MINE ******************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
33	1.0	668.	11.	0.265	0.398	0.345	0.037	0.109
33	2.0	777.	11.	0.253	0.375	0.318	0.044	0.137
33	3.0	815.	11.	0.250	0.383	0.329	0.041	0.124
33	4.0	1000.	11.	0.243	0.372	0.319	0.034	0.107
33	5.0	1113.	11.	0.219	0.404	0.333	0.053	0.159
33	6.0	1219.	11.	0.240	0.424	0.353	0.055	0.156
33	7.0	1323.	11.	0.310	0.466	0.376	0.050	0.133
33	8.0	1430.	11.	0.296	0.460	0.369	0.054	0.145

****************41 ZINCTON *****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
41	1.0	539.	11.	0.033	0.638	0.292	0.143	0.490
41	2.0	686.	11.	0.063	0.630	0.312	0.133	0.425
41	3.0	799.	11.	0.263	0.373	0.320	0.036	0.113
41	4.0	884.	11.	0.262	0.370	0.308	0.038	0.123
41	5.0	960.	11.	0.268	0.397	0.336	0.042	0.126
41	6.0	1055.	11.	0.282	0.408	0.355	0.043	0.122

****************42 SANDON *****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
42	11.0	914.	11.	0.285	0.424	0.341	0.035	0.103
42	12.0	1027.	11.	0.302	0.471	0.357	0.045	0.127
42	13.0	1113.	11.	0.269	0.450	0.350	0.045	0.130
42	14.0	1247.	10.	0.292	0.439	0.360	0.043	0.119
42	15.0	1402.	10.	0.336	0.457	0.396	0.039	0.100
42	16.0	1439.	11.	0.343	0.474	0.404	0.045	0.111
42	17.0	1615.	11.	0.303	0.439	0.394	0.046	0.117
42	18.0	1753.	11.	0.331	0.487	0.399	0.048	0.119
42	19.0	1859.	11.	0.349	0.499	0.408	0.050	0.123
42	20.0	1957.	0.	0.0	0.0	0.0	0.0	0.0
42	21.0	2030.	11.	0.334	0.548	0.428	0.067	0.156
42	22.0	2149.	11.	0.333	0.507	0.414	0.058	0.140

****************43 KASLO *****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
43	1.0	549.	6.	0.249	0.373	0.324	0.049	0.152
43	2.0	628.	8.	0.241	0.379	0.303	0.046	0.151
43	3.0	698.	8.	0.232	0.372	0.311	0.050	0.162
43	3.5	762.	7.	0.245	0.386	0.332	0.048	0.143
43	4.0	832.	8.	0.263	0.430	0.349	0.051	0.147
43	5.0	927.	8.	0.296	0.428	0.373	0.049	0.130
43	6.0	1021.	8.	0.311	0.416	0.374	0.036	0.097

***********51 FERNIE - SNOW VALLEY *************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
51	1.0	1158.	9.	0.202	0.465	0.342	0.081	0.236
51	2.0	1256.	10.	0.265	0.391	0.318	0.042	0.132
51	3.0	1387.	10.	0.284	0.430	0.349	0.049	0.140
51	4.0	1545.	9.	0.297	0.470	0.386	0.059	0.153
51	5.0	1576.	9.	0.329	0.510	0.416	0.069	0.167
51	6.0	1658.	10.	0.357	0.496	0.412	0.041	0.100
51	7.0	1789.	10.	0.342	0.506	0.429	0.061	0.142

**********52 KIMBERLY - NORTH STAR *************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
52	0.1	1045.	11.	0.167	0.396	0.271	0.060	0.221
52	1.0	1186.	11.	0.202	0.330	0.276	0.047	0.169
52	2.0	1280.	12.	0.212	0.347	0.289	0.043	0.148
52	3.0	1362.	12.	0.205	0.332	0.283	0.045	0.158
52	4.0	1423.	12.	0.192	0.366	0.288	0.052	0.179
52	5.0	1554.	11.	0.221	0.361	0.304	0.043	0.143
52	6.0	1682.	12.	0.218	0.391	0.306	0.054	0.175
52	7.0	1804.	12.	0.222	0.365	0.315	0.044	0.140

*************53 LAKE LOUISE ******************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
53	1.0	1542.	12.	0.191	0.390	0.268	0.051	0.191
53	2.0	1652.	12.	0.213	0.340	0.262	0.042	0.162
53	3.0	1771.	12.	0.230	0.320	0.281	0.031	0.111
53	4.0	1920.	12.	0.215	0.330	0.271	0.037	0.135
53	5.0	2024.	12.	0.212	0.324	0.281	0.038	0.134
53	6.0	2137.	10.	0.240	0.338	0.301	0.032	0.108
53	7.0	2249.	12.	0.225	0.338	0.291	0.035	0.119
53	8.0	2339.	6.	0.239	0.620	0.354	0.137	0.387

**************61 GROUSE MOUNTAIN ****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
61	1.0	76.	11.	0.036	0.433	0.190	0.115	0.609
61	2.0	189.	10.	0.100	0.263	0.159	0.048	0.300
61	2.5	250.	8.	0.100	0.284	0.167	0.058	0.347
61	3.0	347.	8.	0.131	0.316	0.203	0.061	0.302
61	4.0	402.	9.	0.150	0.359	0.243	0.066	0.271
61	6.0	878.	7.	0.400	0.515	0.468	0.041	0.088
61	7.0	985.	8.	0.422	0.614	0.489	0.064	0.132
61	8.0	1042.	5.	0.425	0.521	0.481	0.037	0.076
61	9.0	1097.	4.	0.457	0.519	0.488	0.026	0.053
61	10.0	1097.	6.	0.451	0.560	0.515	0.042	0.082

***************62 MOUNT SEYMOUR ****************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
62	1.0	15.	11.	0.111	0.507	0.285	0.142	0.499
62	2.0	122.	11.	0.111	0.500	0.238	0.133	0.560
62	3.0	329.	11.	0.052	0.330	0.220	0.086	0.394
62	4.0	396.	10.	0.130	0.472	0.295	0.126	0.426
62	5.0	594.	9.	0.138	0.452	0.332	0.114	0.344
62	6.0	777.	10.	0.273	0.437	0.354	0.049	0.138
62	7.0	960.	10.	0.362	0.784	0.458	0.121	0.264
62	8.0	1052.	8.	0.443	0.837	0.534	0.130	0.244
62	9.0	1067.	9.	0.462	0.646	0.528	0.067	0.127
62	10.0	1113.	3.	0.456	0.593	0.530	0.069	0.130

***************64 HOLLYBURN MOUNTAIN ************

SNOW DENSITY STATISTICS (GM/CC)

LOC	STA	ELEV	N	MIN	MAX	MEAN	STD	COV
64	1.0	15.	4.	0.150	0.340	0.240	0.089	0.370
64	2.0	168.	4.	0.138	0.353	0.226	0.100	0.444
64	3.0	305.	4.	0.112	0.308	0.201	0.092	0.457
64	4.0	442.	3.	0.133	0.420	0.265	0.145	0.548
64	5.0	640.	4.	0.270	0.451	0.355	0.087	0.244
64	6.0	732.	4.	0.250	0.527	0.397	0.124	0.312
64	7.0	823.	3.	0.454	0.519	0.491	0.033	0.068
64	8.0	914.	4.	0.470	0.514	0.494	0.019	0.039
64	9.0	1021.	4.	0.456	0.657	0.528	0.089	0.168
64	10.0	1082.	1.	0.484	0.484	0.484	0.0	0.0