EVALUATING AREAL ERRORS IN NORTHERN CASCADE GLACIER INVENTORIES

by

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ABSTRACT

This thesis evaluates spatial errors, inherent to image-based analysis, that affect our ability to detect areal changes in glaciers. Analysis of areal differences of 742 North Cascade glaciers, observed in A.D. 1958 and A.D. 2006 inventories, suggests change detection is limited by linear errors of 5 m, 7 m, and 184 m caused by the imagery, digitization operators, and snowpack variability, respectively. Using the cumulative error of 196 m as a threshold for detecting areal change over the 48-year period, only 250 glaciers were detectable outside of the error threshold. Of those detectable changes, 240 glaciers were decreasing in area and 10 were increasing in area. Coupling the A.D. 2006 inventory with a contemporary 15 m resolution digital elevation model allows for correlation of areal changes with common geometric, geographic, and hypsometric derivatives. Generally, correlations are poor between the measured variables for shrinking glaciers, but the large number of glaciers suggests that warming or drying trends dominate the study period. For the 10 growing glaciers, the skewness has a strong positive correlation coefficient with kurtosis and AABR, as well as strong negative correlations with ELA and HI. These relationships suggest common geometries that are advantageous for high-altitude accumulation areas. The intrinsic errors in the analysis of these images are comparable to the observed changes over the past half century for a large fraction of the glaciers.

Chapter 1

INTRODUCTION

Multi-temporal airborne and spaceborne imagery are commonly used to delineate glacier boundaries and to evaluate areal changes of glaciers over time. When glacier boundary datasets are coupled with hypsometric data, readily available from a variety of digital elevation models (DEMs), we are able to extract and derive a substantial amount of geometric information that can be used to relate the physical characteristics of glaciers to climate forcings. When attempting to analyze a large number of glaciers, or when a glacier population is inaccessible, a GIS-based framework is optimal (i.e., Norway: Paul and Andreassen, 2009; Cordillera Blanca: Silvero et al., 2005; Pakistan: Ashraf et al., 2012).

In the northern Cascade Mountain Range, GIS-based techniques have been used to evaluate changes in glacier termini at both the local and regional scale (O'Neal, 2005; Granshaw, 2002; Satinsky, 2009). The largest inventory in number and geographic domain (Satinsky, 2009) compared 742 glacier boundaries in A.D. 2006 (Figure 1), with map- and photo-based geometries from A.D. 1958 (Post et al., 1971). These boundary data were coupled with the National Elevation Dataset (NED) from the U.S. Geological Survey (USGS) to derive geometric data for each glacier. The resultant dataset was used to evaluate basic planimetric and hypsometric properties of area, perimeter, minimum elevation, maximum elevation, mean elevation, mean aspect, and mean slope. These data were used for basic exploratory statistics

(Satinsky, 2009) and did not examine the error introduced to each set created in a GIS production environment.

The purpose of this thesis is twofold. First, it provides the first statistical estimates of areal errors for the A.D. 2006 glacier inventory, based on the evaluation of inherent image errors, operator-introduced errors, and annual variations in ice-marginal snow cover that affect perceived glacier geometries. Operator-based errors are estimated via comparison of 25-glacier boundaries digitized by 6 different operators. Ice marginal snow cover variability is estimated by comparing 51 glacier boundaries between the years of A.D. 2006 and A.D. 2009. Secondly, this thesis provides hypsometric data for each glacier, contemporary with the A.D. 2006 inventory, produced from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) instrument (METI, NASA, and J-spacesystems). The ASTER DEM data allow for: 1) the characterization of individual glacier hypsometries with the areal inventory data, 2) the calculation of hypsometric statistics including: standard deviation, skewness, kurtosis, equilibrium line altitude (ELA), hypsometric integral (HI), and the area-altitude balance ratio (AABR), 3) an analysis of boundary sensitivity, by statistic, with expanded and contracted glacier boundary datasets. Results of this study account for spatial errors to gain a more appropriate understanding of shrinking and growing glaciers over time with advanced statistical analyses on glacier groups and defined geometric characteristics of these groups.

Chapter 2

BACKGROUND AND METHODS

2.1 Study Area

The northernmost section of the Cascade Range, the North Cascades, refers to the portion of the range east of Washington State's Puget Sound (Figure 1). This study primarily focuses on a 171 km by 120 km area of heavily glaciated peaks within 2 km of the USA/Canada border and approximately 70 km north of Mount Rainier. Though most of the peaks in the study area are under 3,000 m (10,000 feet) in elevation, local relief is often over 1,800 m (6,000 feet). Recognizable place names (from north to south) within the study area are: Mount Redoubt, Mount Challenger, Mount Shuksan, Mount Baker (stratovolcano), Eldorado Peak, Dome Peak, Glacier Peak (stratovolcano), and Mount Daniel.

2.2 Areal Digital Error Assessments

Satinsky (2009) manually digitized glacier boundaries for 742 glaciers in the North Cascades that were originally included in the Post et al. (1971) glacier inventory, which used imagery and maps from ca. A.D. 1958. The goal of the A.D. 2006 inventory was to produce a simple estimate of glacier changes over the 48-year period. Because Satinsky (2009) focused on the labor-intensive digitization of the glacier inventory and subsequently derived spatial statistics, a further, quantitative assessment of areal errors was not completed.

2.2.1 Area Error Estimates

Manual glacier boundary digitization has inherent errors that include: 1) those associated with the accuracy of the imagery, 2) the accuracy and precision of placed vertices along glacier margins, and 3) natural variability of the glacier margin from year-to-year as a result of changes in snowpack. Error associated with our imagery, the NAIP (National Agriculture Imagery Program) orthoimagery, has a linear error of 5 m (USDA, 2006). User error is estimated in this study via comparison of the digitized glacier boundaries by six different users. All users manually digitized the same 25 randomly selected glaciers (of varying size) from the A.D. 2006 NAIP orthoimagery at a scale of 1:1,000. With varying degrees of GIS experience, and given the same instructions on identifying glacier boundaries in the orthoimagery, the group of users represent a diverse sample of possible operators for any study where digitizing is necessary. Once the six sets of 25 glacier polygons were digitized, the resultant datasets were collected and their areas and perimeters calculated. Area, perimeter length, and the number of vertices for each glacier among the six different datasets were tabulated from the associated database file for every polygon.

The error, associated with the digitization will be called E_1, is calculated using Equation 1 (Ghilani, 2000), where A_i represents the area of an indexed glacier, p is pixel accuracy and u is user accuracy of vertex placement along glacier margins:

$$E_1 = \sqrt{A_i} \times (\Delta p + \Delta u) \times \sqrt{2} \quad (1)$$

Pixel accuracy is determined by the inherent error of orthorectified imagery. User accuracy is the mean of the average standard deviation for six different operators defining the same 25 glacier boundaries.

The second error, E_2 assumes that snowpack variability could mask the true glacier margins and annually vary between historical imagery:

$$E_2 = \sqrt{A_i} \times \Delta s \times \sqrt{2} \quad (2)$$

where *s* is snowpack variability. Snowpack variability is the mean bias of 51 glacier areas from years A.D. 2006 and A.D. 2009.

In both errors, glacier geometries are converted to equivalent square areas. The square root of this square area represents a linear measurement, permitting calculation of the change in length for each digitized glacier (Basagic and Fountain, 2011). The square root of 2 is multiplied in both equations because squares have non-additive errors in two directions.

When the two errors are calculated, their cumulative linear error can be used as a threshold for identifying which glaciers display detectable change. For glaciers changing more than the threshold, those with positive change are classified as increasing in area since A.D. 1958 and those with negative change are classified as decreasing in area since A.D. 1958.

2.3 Digital Elevation Models and Hypsometric Statistics Production

Satinsky (2009) used the USGS NED data, readily available at that time, which included data from diverse sources that were not chronologically synchronous over the scale of the study area. Although there are many DEM products now available, the current study relied on A.D. 2005 to A.D. 2007 DEMs derived from ASTER Level 1B orthoimagery. These imagery are the most contemporary with the boundaries derived for the A.D. 2006 inventory. ASTER data products contain horizontal and vertical

errors no larger than the 15 m cell spacing for the grid models (Mukherjee et al., 2013).

2.3.1 Foundational Digital Elevation Models

The 15 m spatial resolution ASTER A.D. 2006 composite DEM was primarily derived from ASTER Level 1B orthoimagery (NASA LP DAAC, 2005-2007) using SilcAst software (Sensor Information Laboratory Corp., 2004). The composite DEM contains 15 m resampled (bilinear interpolation) ASTER GDEM (Global DEM) Version 2 (METI and NASA, 2011) values and values from summertime, ASTER Level 1B orthoimagery DEMs between the years A.D. 2005 and A.D. 2007 because the available A.D. 2006 ASTER Level 1B orthoimagery is not completely cloud free. The resulting DEM (except for the GDEM) contains values measured within one year of the A.D. 2006 NAIP imagery from which the 742 glaciers were digitized.

All A.D. 2006, 15 m DEM raster mosaics were compiled first to ascertain which glaciers lack elevation values in the A.D. 2006 DEMs, or which glacier elevation values may be altered by cloud cover. Those glaciers for which these situations apply received values from A.D. 2005 and A.D. 2007 DEMs and the resampled GDEM. All mosaics of A.D. 2005 to A.D. 2007 DEMs and the GDEM were used to create a new composite DEM with a mosaic operator of only minimum values in overlapping imagery. The following list identifies the glaciers (by glacier ID) without pure A.D. 2006 elevation values in the composite DEM:

- Possible 2005 values along glacier edge only: 10, 13, 14, 32, 142, 143

- Possible mixed 2005 and 2006 values: 5, 6, 7, 8, 9, 15, 144, 147, 741
- Completely 2007 values: 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575
- Possible mixed 2006 and 2007 values: 556
- Completely GDEM values: 360, 601, 602, 720, 721

2.3.2 Glacier Elevation Preprocessing

Elevation data for each glacier were extracted using the 742 glacier boundaries to mask the composite DEM (i.e., we masked the elevation grid and extracted only elevation values underlying the glacier polygon features). This process generated a discontinuous DEM of elevation values only within glacier boundaries. Artificial 15 m and 30 m internal and external buffers were used to evaluate the sensitivity of different glacier statistics to the areal errors from orthorectification and manual digitization of glacier boundaries. The original areas associated with each glacier were expanded and contracted by 1 and 2 pixels, where each pixel is a 15 m cell representing a boundary increase and decrease of 15 m and 30 m from the original 742 glacier dataset. This procedure yields five different DEMs:

1. 30 m expanded perimeter glacier DEM
2. 15 m expanded perimeter glacier DEM
3. original perimeter glacier DEM
4. 15 m retracted perimeter glacier DEM
5. 30 m retracted perimeter glacier DEM

Each DEM was converted to sets of individual elevation points, with each point having the glacier ID of the original glacier with which it was associated. Because some of the original glaciers were nearly adjacent, the expanded-glacier DEMs contain points associated with more than one glacier.

2.3.3 Areal and Surficial Statistics

Several areal statistics from Satinsky (2009) were used in this study: area (A.D. 1958 and A.D. 2006), latitude, longitude, and percent change (A.D. 1958 to A.D. 2006). In this study, the length of the minimum bounding rectangle for each glacier was used as glacier length. In addition to these areal statistics, surficial statistics of slope and aspect were calculated using the improved ASTER composite DEM.

Local slope for each cell within the glacier boundary was computed from the DEM (Figure 2). The other surficial statistic calculated was the real mean aspect (average glacier surface orientation) based on the composite DEM of the original glacier boundaries only. Aspect was calculated for every elevation cell in raster form (Figure 3). It was necessary to export these values from a GIS framework because aspects in such files exist as values between $0°$ and $360°$ and a simple arithmetic mean of values between these numbers can result in a false average aspect (i.e., a set of values $1°$ and $359°$ returns an average of $180°$, or southern aspect, instead of $360°$, a northern aspect). The real mean aspect, $\bar{\alpha}$, was calculated from

$$\bar{\alpha} = tan^{-1}\left(\frac{\sum_{i=1}^{n}\cos\alpha_i}{\sum_{i=1}^{n}\sin\alpha_i}\right)$$

In addition to slope and aspect, an orographic lift proxy was calculated. Each point in the North Cascades DEM was determined to be on an east-west line originating at an elevation effectively at sea level in the Puget lowland. The orographic lift index for each glacier is calculated as the integral of the slope along a path from sea level to the centroid of each glacier (Figure 4).

2.3.4 Hypsometric Statistics

Data were exported from a GIS and statistically analyzed using a suite of Python scripts (Figures B1 to B4). Statistics on elevation included mean, maximum, minimum, range, standard deviation, skewness, and kurtosis. In our case, skewness (γ_1) measures the asymmetry of the distribution of elevation values within a glacier (Figure 5):

$$\gamma_1 = \frac{\mu_3}{\mu_2^{3/2}}$$

Here μ equals the mean of X (an array of elevations by each glacier) represented by E(X) of which E is the expected value. The value of μ_i is a central moment of the distribution equal to $E(X - \mu)^i$ where *i* is the order of the central moment (Jöreskog, 1999). Using the same variables, kurtosis (γ_2) measures the amount of peakedness within the distribution of our elevation values:

$$\gamma_2 = \frac{\mu_4}{\mu_2^2}$$

Frequency based statistics for elevation data include median elevation, lower quartile, upper quartile, interquartile range, and equilibrium line altitude (ELA). The first four statistics explain the dispersion of elevation values for each glacier. The ELA denotes the altitude separating the accumulation zone from the ablation zone, or 60% of the surface area from the other 40%, respectively. The area-altitude balance ratio (AABR) for each glacier was calculated using the ELA obtained previously. Rea (2009) explains the AABR relationship by the following equation, where *ac* and *ab*, respectively, signify accumulation areas and ablation areas, *b* represents the net mass balance gradient, *z* is the area-weighted mean altitude, and *A* equals the area:

$$\text{AABR} = \frac{b_{ab}}{b_{ac}} = \frac{\bar{z}_{ac}A_{ac}}{\bar{z}_{ab}A_{ab}}$$

The area-weighted mean altitude is a positive number representing vertical distance from the ELA for both accumulation and ablation zones.

Finally, we calculated the hypsometric integral for each of the 742 glaciers. The hypsometric integral is the area below a hypsometric curve (the distribution of elevations) and has a calculated value between 0 and 1 (e.g., Brocklehurst and Whipple, 2004). A hypsometric integral (HI) is calculated for each glacier by the difference of the mean elevation (H_{mean}) and the minimum elevation (H_{min}) divided by the difference of the maximum elevation (H_{max}) and the minimum:

$$\text{HI} = \frac{H_{mean} - H_{min}}{H_{max} - H_{min}}$$

All of these hypsometric derivatives for the original glacier boundaries were combined with areal derivatives to create a correlation matrix of all derivatives for further analysis.

Chapter 3

RESULTS

3.1 Areal and Surficial Derivatives

The total glacial area of all 742 glaciers is 227.5 km^2 with an average glacier area of 0.3 km^2, and areal range of 0.0008 km^2 to 6.2 km^2 (Satinsky, 2009; Figure 6). The average glacier perimeter is 5584 m ranging from 164 m to 35689 m (Figure 7). The average glacier length (planar) is 845 m ranging from a minimum length of 46 m to a maximum of 4901 m (Figure 8). The mean average glacier slope is 29° with average slopes per glacier ranging from 13° to 60°. Real mean glacier aspect (Figure 9) is simplified into eight primary directions based on returned values from 0° to 360°: 234 glaciers (31.5%) oriented to the north (0° to 22.5°, 337.5° to 360°), 203 glaciers (27.4%) oriented to the northeast (22.5° to 67.5°), 80 glaciers (10.8%) oriented to the east (67.5° to 112.5°), 49 glaciers (6.6%) oriented to the southeast (112.5° to 157.5°), 22 glaciers (3.0%) oriented to the south (157.5° to 202.5°), 32 glaciers (4.3%) oriented to the southwest (202.5° to 247.5°), 41 glaciers (5.5%) oriented to the west (247.5° to 292.5°), 81 glaciers (10.9%) oriented to the northwest (292.5° to 337.5°). The majority of glacier surfaces are generally northern facing (i.e. 518 glaciers or 69.8%).

3.2 Hypsometric Derivatives

The ASTER composite DEM, confined to the glacier boundaries, contained 1,011,310 data points for analysis. The overall average glacier elevation is 1992 m, with individual average glacier elevations ranging from a minimum of 1180 m to a

maximum of 2718 m. The average of minimum glacier elevations is 1827 m, with minimum elevations ranging from 1104 m to 2611 m. The average of maximum glacier elevations is 2167 m with maximum elevations ranging from 1320 m to 3274 m. The average range of elevations for each glacier is 340 m with minimum range of 4 m and a maximum range of 2042 m. Other hypsometric derivatives subsequently reported in this section are derived from 740 glaciers; 2 glacier boundaries contain fewer than the five elevation values from the DEM grid necessary for more involved statistics. The average of the standard deviation of elevations for the 740 glaciers is 77.12 m, ranging from 6.16 m to 434.30 m.

The average skewness for all glaciers is 0.11, with skewness values ranging from -1.56 to 2.73. These skewness values explain the asymmetry in elevation values for each glacier lending to our comprehension of its profile and geometry (i.e., positive skewness from a greater number of lower elevation points and negative skewness from a greater number of higher elevation points). Keeping in mind that a kurtosis of 1 is a completely uniform distribution of values, the average kurtosis for all glaciers is 2.58, ranging in kurtosis from 1.28 to 12.25. Higher kurtosis values mean that a glacier's distribution of elevation values will favor a certain altitude. The average ELA for all glaciers is 2015 m ranging from 1192 m to 2733 m (Figure 10). The average HI for all glaciers is 0.48 with HI values ranging from 0.15 to 0.77. Because the HI measures the area under a hypsometric curve, this value allows for a simple approach of identifying glaciers that have similar elevation distributions. The average AABR for all significant glaciers is 0.90 with AABR values ranging from 0.17 to 5.30. AABRs with a value of 1 indicate equal ablation and accumulation

gradients, high AABRs represent small ablation areas, and low AABRs have small accumulation areas (Rea, 2009).

3.3 Errors and Areal Change

A significant part of the areal change analysis is based on the examination of the derivatives in the above section using the four 15 m and 30 m expanded and contracted DEMs that compensate for cumulative areal error. The count of significant glaciers may be different for each set because some hypsometric statistics required five or more elevation values per glacier, a criterion that is not met by all of the population. For each modified boundary dataset, root-mean-square errors (RMSE) from the original glacier boundaries are reported for the following; skewness (Figure 11), kurtosis (Figure 12), ELA (Figure 13), and HI (Figure 14). The 30 m contracted dataset has 627 glaciers with the following RMSE by each derivative: skewness (0.75), kurtosis (4.25), ELA (28.01 m), and HI (0.11). The 15 m contracted dataset has 716 glaciers with the following RMSE by each derivative: skewness (0.46), kurtosis (1.48), ELA (17.68 m), and HI (0.08). The 15 meter expanded dataset contains 742 glaciers with the following RMSE by each derivative: skewness (0.17), kurtosis (0.50), ELA (9.97 m), and HI (0.03). The 30 meter expanded dataset contains 742 glaciers with the following RMSE by each derivative: skewness (0.27), kurtosis (0.70), ELA (17.08 m), and HI (0.05).

The imagery (pixel) and operator errors are relatively small at 5 m and 7 m, respectively. Snowpack variability error is substantially greater at 184 m, based on the digitized boundary difference between A.D. 2006 and A.D. 2009 snowpack. The total cumulative (summation) areal error for pixel, user, and snowpack is 196 m. Using this 196 m as a minimum threshold for detectable changes between glacier areas of A.D.

1958 and A.D. 2006, 250 glaciers experienced observable change beyond the threshold within the entire 742 glacier inventory (Figure 15). Out of these detectably changed glaciers, 240 are decreasing in area and 10 glaciers are increasing in area. 492 glaciers have no detectable change.

Both the growing glacier correlation matrix (Table 1) and the shrinking glacier correlation matrix (Table 2) have expectedly high correlations with basic geometric properties (e.g., A.D. 2006 area with length has strong correlation coefficients with each other: 0.90 among the growing glaciers or 0.88 among the shrinking glaciers). However, several skewness correlation coefficients are of note within the matrices of the 10 growing glaciers. The skewness for growing glaciers has a strong correlation coefficient of 0.84 with kurtosis, -0.75 with ELA, -0.97 with HI, and 0.93 with AABR. Also of note, in the growing glaciers, is the high correlation coefficient of -0.81 between maximum elevation and percent change in glacier area from A.D. 1958 to A.D. 2006. All growing glaciers are in the top 25.8% of all glaciers for largest A.D. 2006 area and within the top 19.2% for largest A.D. 2006 area of all glaciers with detectable change.

Chapter 4

DISCUSSION

Areal change, beyond the threshold from image, snowpack, and manual digitization errors, was detected in 250 (34%) of the 742 glaciers between A.D. 1958 and A.D. 2006. Of these 250 with detectable areal changes, 240 glaciers are shrinking in area and 10 are growing. However, for the large majority of glaciers in the inventory – the remaining 492 (66%) – we are unable to detect change in magnitude and direction beyond our error threshold. This is not to say that these glaciers are not shrinking or growing, but that change detection is simply not possible given the types of data and techniques we use. Despite this limitation, we use a much larger glacier population than previous attempts to perform similar analyses (e.g., Pelto, 2008), which complies with the statistical constraints of Roe and O'Neal (2009).

The 240 shrinking glaciers have poor correlations with the range of geographic, geometric, and hypsometric variables used in this evaluation of the A.D. 2006 inventory. Despite these poor correlations, the shrinking signal suggests a regionally synchronous climate forcing in the North Cascades over our 48 year study period. At the least, our shrinking areal change data shows glacier disintegration or segregation. At most, it is a likely result of long term decreasing trends in snowpack and possible impacts of anthropogenic warming (Stoelinga et al., 2010; O'Neal et al., 2010). O'Neal (2005) showed from long-term meteorological data that climate forcings appear to be synchronous across the region. However, Roe and O'Neal (2009) emphasized that glacier lengths and areas in the Cascade Range display high

variability over time in response to noisy climate forcings due to the array of inherent responses for different glaciers.

For the 10 growing glaciers, maximum elevation correlates strongly with percent area change between A.D. 1958 and A.D. 2006. Within the growing glacier dataset, skewness correlates strongly with kurtosis, ELA, HI, and AABR. Together, these statistics suggests that the 10 growing glaciers have similar geometries with high altitude accumulation areas. Unfortunately, conventional statistical significance of our areal change results is not easily applied given the fact that glacier sizes are not normally distributed.

This study presents the first analysis of areal errors in determining glacier geometric changes in the North Cascades. During the onset of the study, we assumed that human error would prove to be a major component of areal error. Surprisingly, it proved to be relatively small (i.e., 7 m). We subsequently sought to characterize what effect inherent errors in manually identifying glacier boundary data might have on calculations of hypsometric statistics through our analyses of the 15 m and 30 m expanded and contracted glacier boundary datasets. The 15 m expanded and contracted datasets account for all of the average error observed from the manual digitization process (7 m) as well as inherent imagery errors reported by NAIP (5 m). The 30 m expanded and contracted datasets then represent a worst-case scenario of potential errors in identifying glacier boundaries. In general, hypsometric values calculated from each expanded or contracted dataset display relatively small RMSEs compared to those values calculated from the original glacier boundary dataset, with few extreme deviations. However, contracting boundaries artificially segregates

smaller perennial snow and ice areas into different pieces, limiting the usefulness of our approach in providing single-glacier hypsometric statistics.

The inherent imagery and operator errors pale by comparison to the 184 m error introduced by snowpack variability. This result emphasizes the potential magnitude of natural, inter-annual variation, and underscores the uncertainty in assessing areal changes between randomly selected time series of orthoimagery. It should be noted that the A.D. 2006 and A.D. 2009 orthoimagery used in this study represents the before-and-after conditions of a significant snowfall event that occurred between A.D. 2007 and A.D. 2008 (personal communication, Dr. Brian Hanson). Although decreasing areas of perennial snow and ice have been correlated with recent declining extents of snowpack (Stoelinga et al., 2010), it seems unlikely that the difference between the A.D. 1958 and A.D. 2006 inventories represent extreme conditions in snowpack variability alone. It is possible to gain a more complete picture of glacier change by creating more glacier inventories from imagery that exists at different time periods. However, the enormous effort involved in manually converting relevant imagery to a GIS-based dataset severely limits the availability of such comprehensive and useful data.

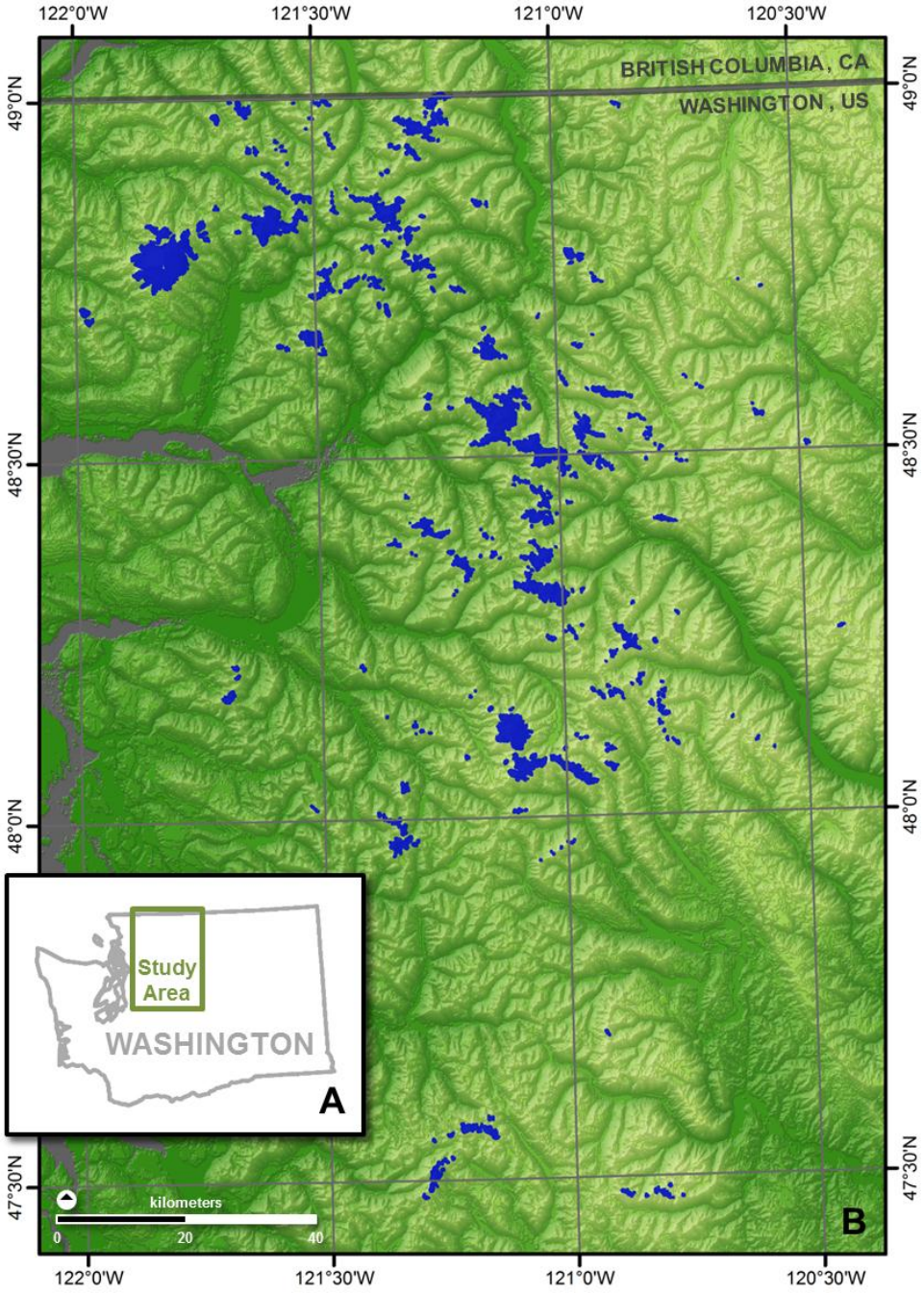

Figure 1 **Study Area with Glacier Extents.** A. Reference map representing the State of Washington with study area boundary. B. Shaded relief map of the North Cascades displaying the relative elevation (i.e., light green = high and dark green = low) and extent of the 742 glaciers (in blue) analyzed in this study.

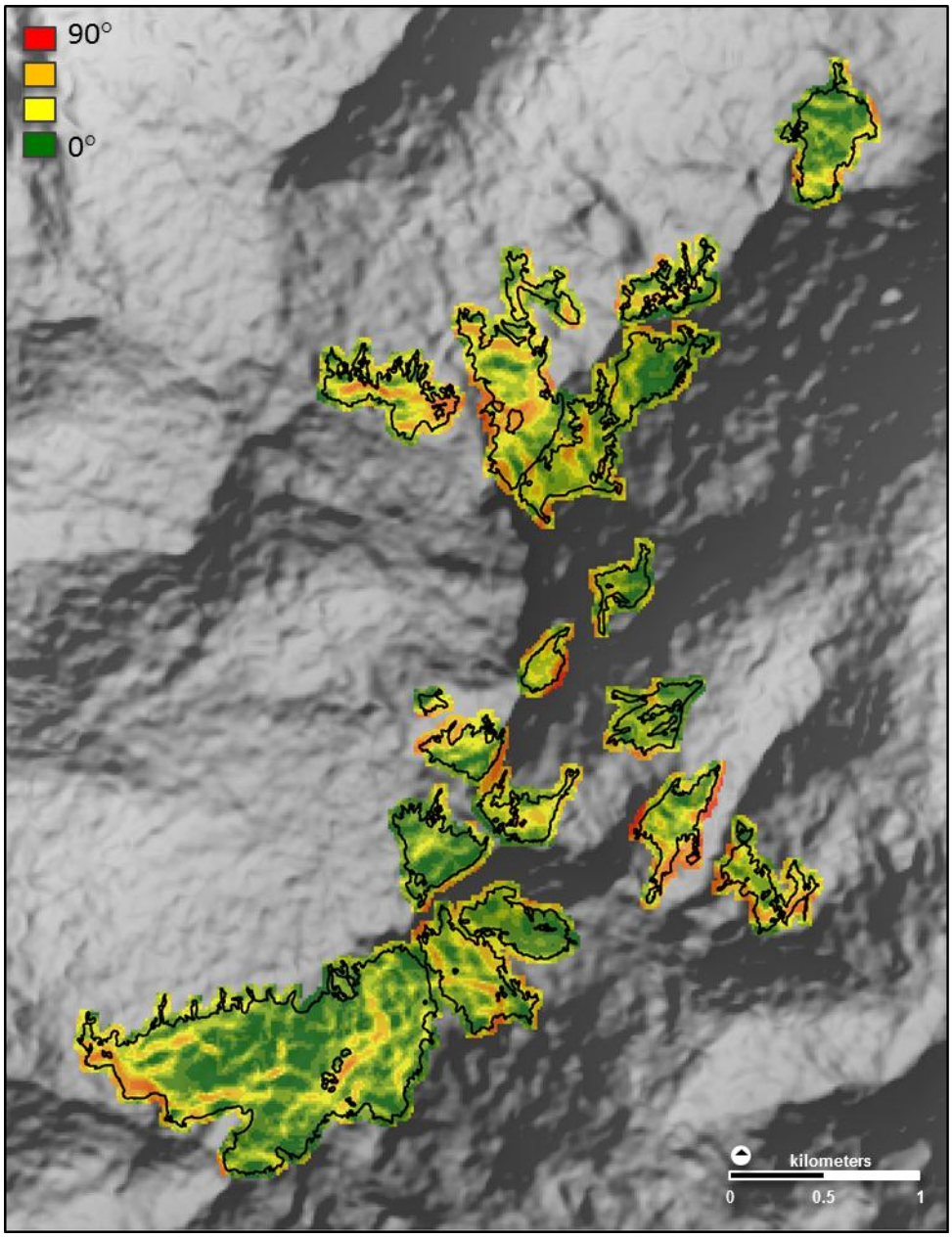

Figure 2 **Slope Raster Sample.** Sample glacier boundaries (black) displaying 15-meter slope raster values atop composite A.D. 2006 shaded relief and 15-meter DEM.

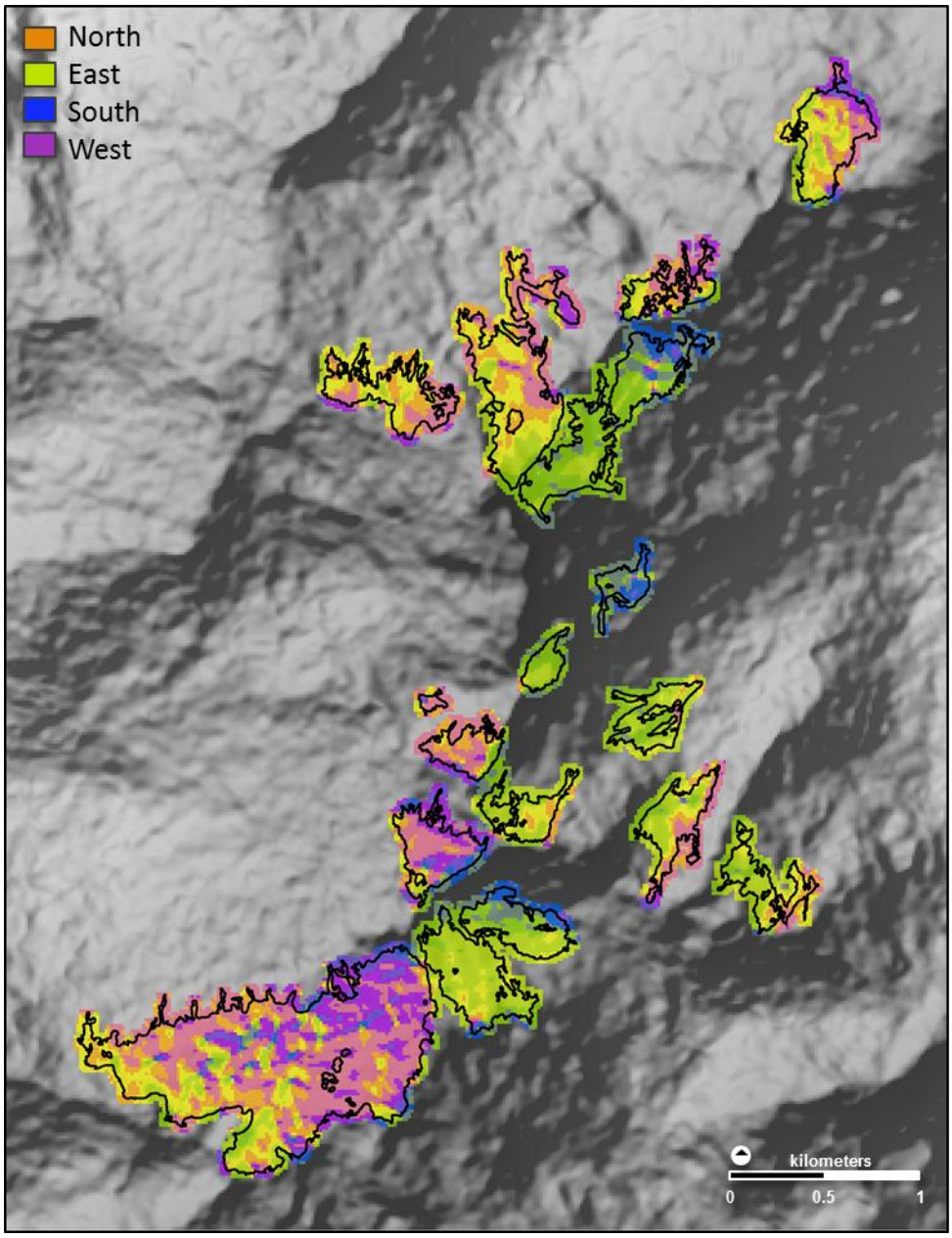

Figure 3 **Aspect Raster Sample.** Sample glacier boundaries (black) displaying 15-meter aspect raster values atop composite A.D. 2006 shaded relief and 15 meter DEM.

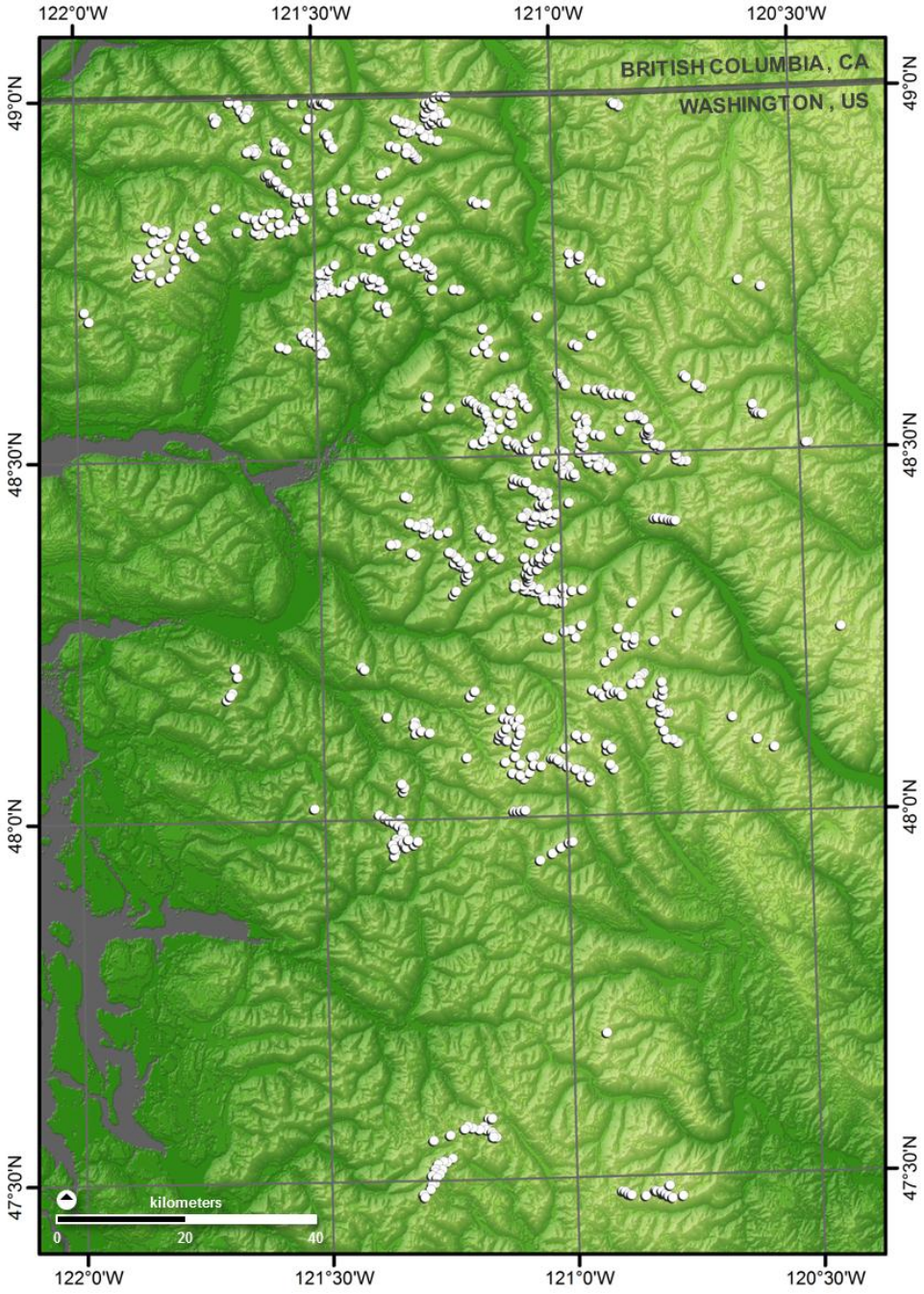

Figure 4 **Glacier Centroids in Study Area.** Shaded relief map of the North Cascades displaying the relative elevation (i.e., light green = high and dark green = low) and distribution of centroid point locations (in white) for the 742 glaciers analyzed in this study.

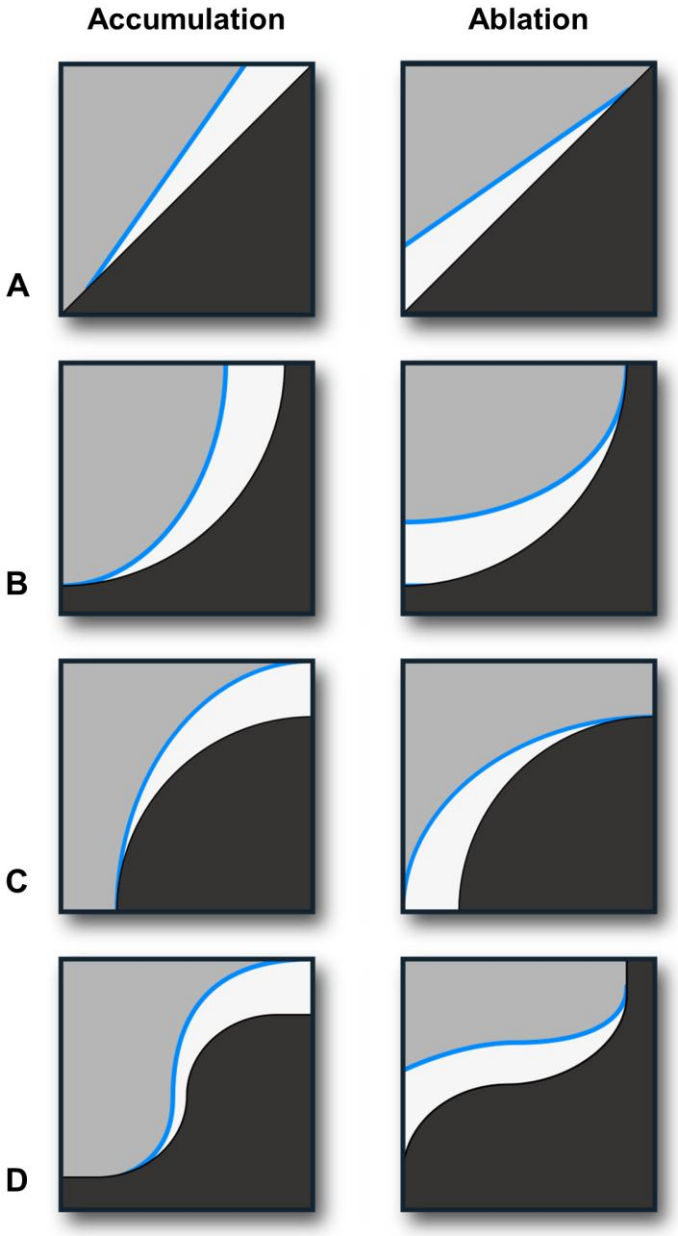

Figure 5 **Glacier Geometry.** Idealized glacial accumulation and ablation profiles in comparison to generalized, geometric slope profiles. Slope profile types (dark grey) are A. straight B. concave, C. convex, D. concave/convex. White form (outlined in blue) represents the profile of a glacier where thicker upslope sections display accumulation and thinner upslope sections display ablation.

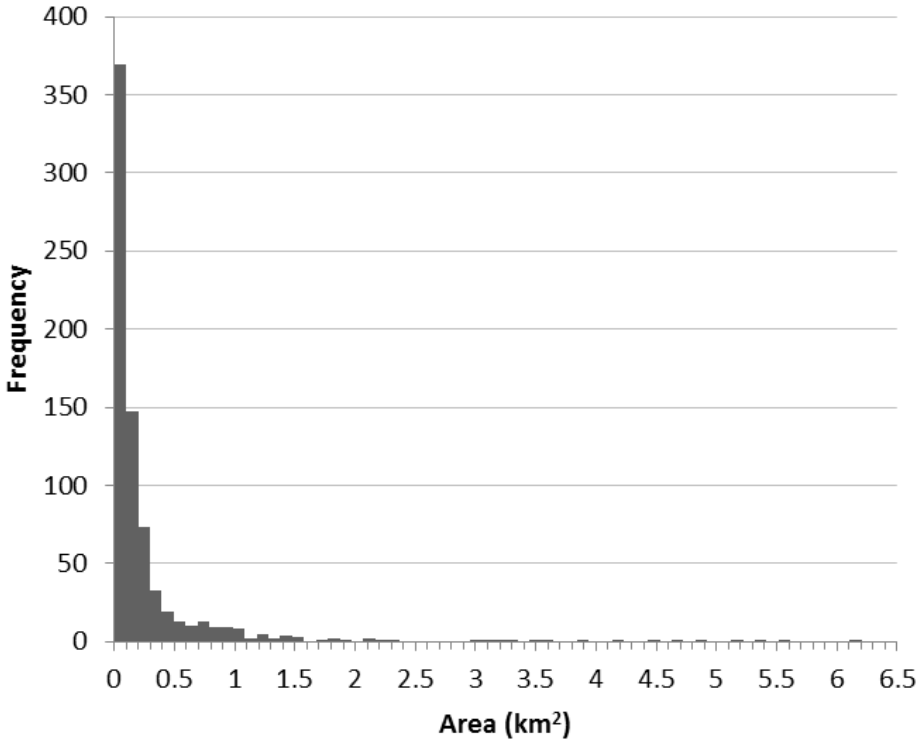

Figure 6 **Glacier Area.** Histogram displaying the frequency distribution of A.D. 2006 inventory areas in square kilometers for 742 glaciers.

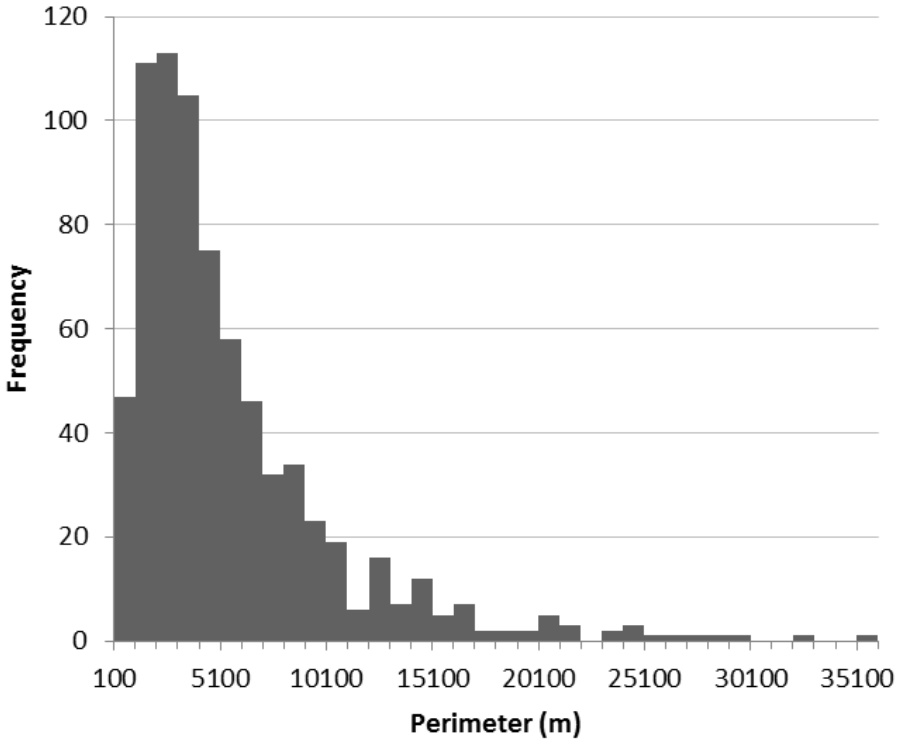

Figure 7 **Glacier Perimeter.** Histogram displaying the frequency distribution of A.D. 2006 inventory perimeters in meters for 742 glaciers.

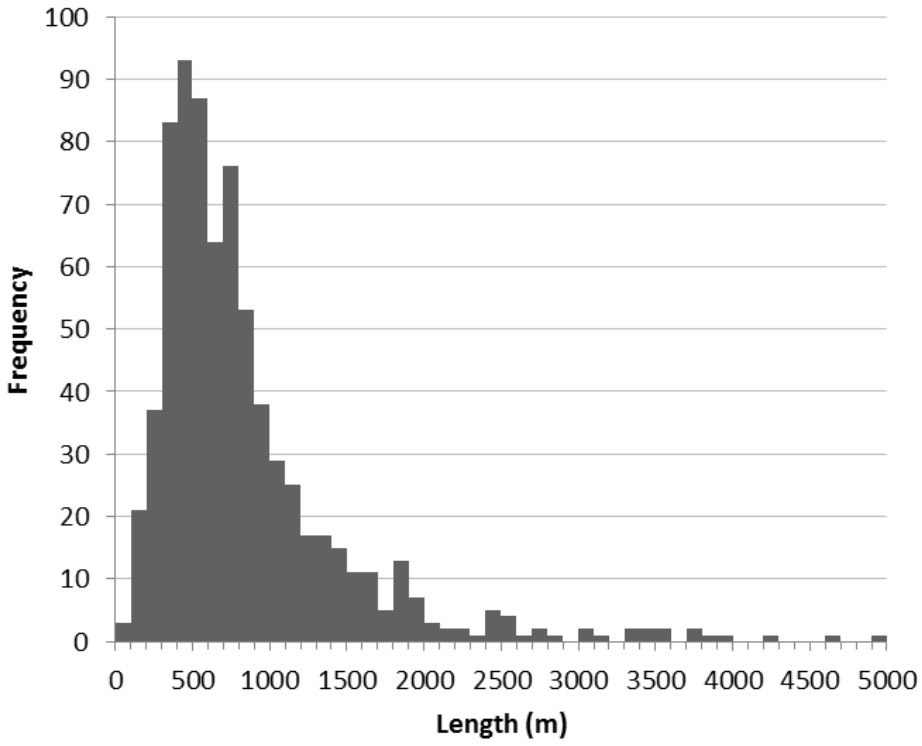

Figure 8 **Glacier Length.** Histogram displaying the frequency distribution of A.D. 2006 inventory lengths in meters for 742 glaciers.

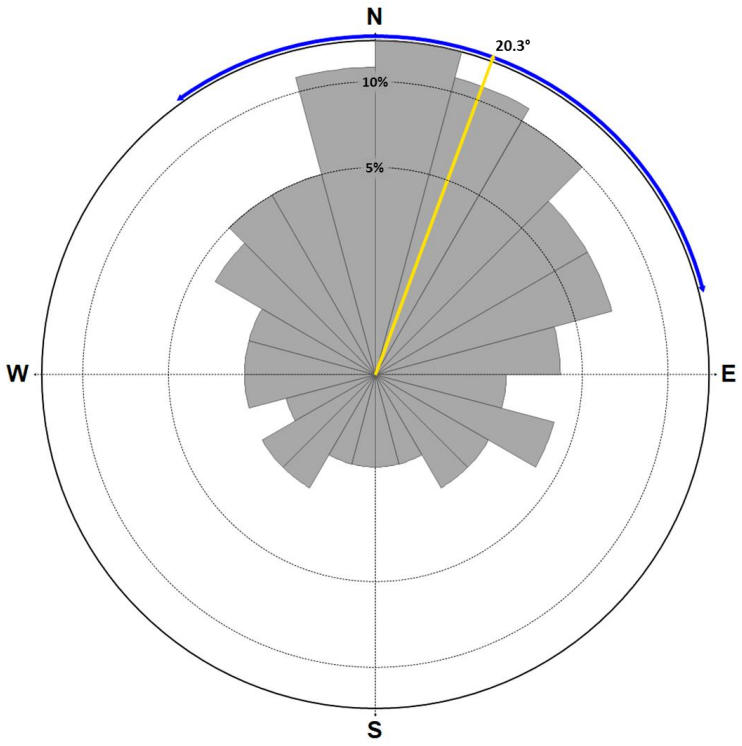

Figure 9 **Real Mean Aspect.** Rose diagram showing percentage of the real mean aspect for 742 glaciers based on aspect values obtained from the composite A.D. 2006 DEM. Grey frequency wedges are separated in to 15 degree equal interval classes. The gold line plots the overall mean (20.3 degrees) and the blue arc represents the standard deviation.

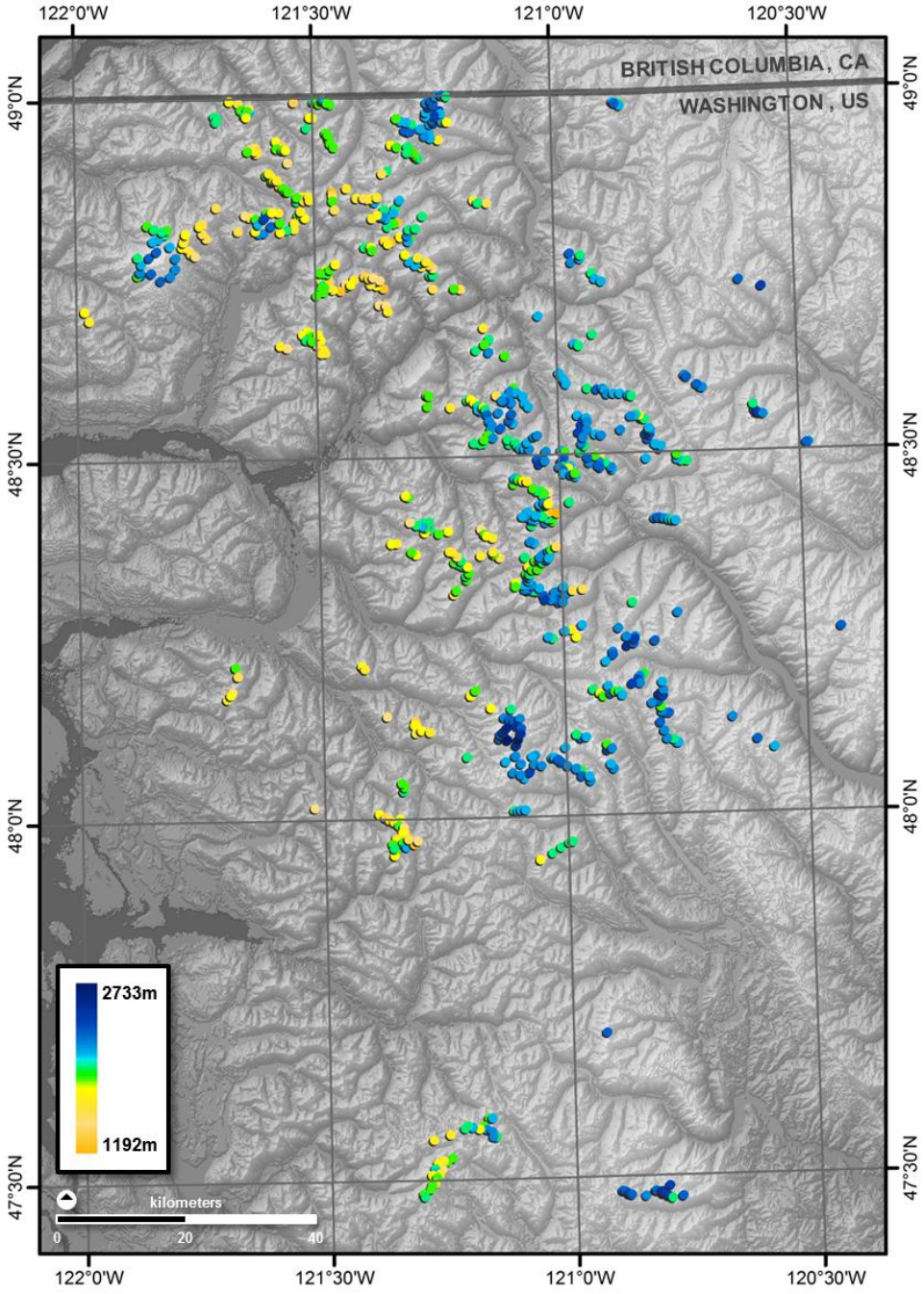

Figure 10 **ELA Distribution.** Shaded relief map with A.D. 2006 composite DEM ELAs displayed by the glacier centroids within the study area. Legend (bottom left) shows ramped colors corresponding to 10, equal interval ELA classes from 1192 to 2733 meters.

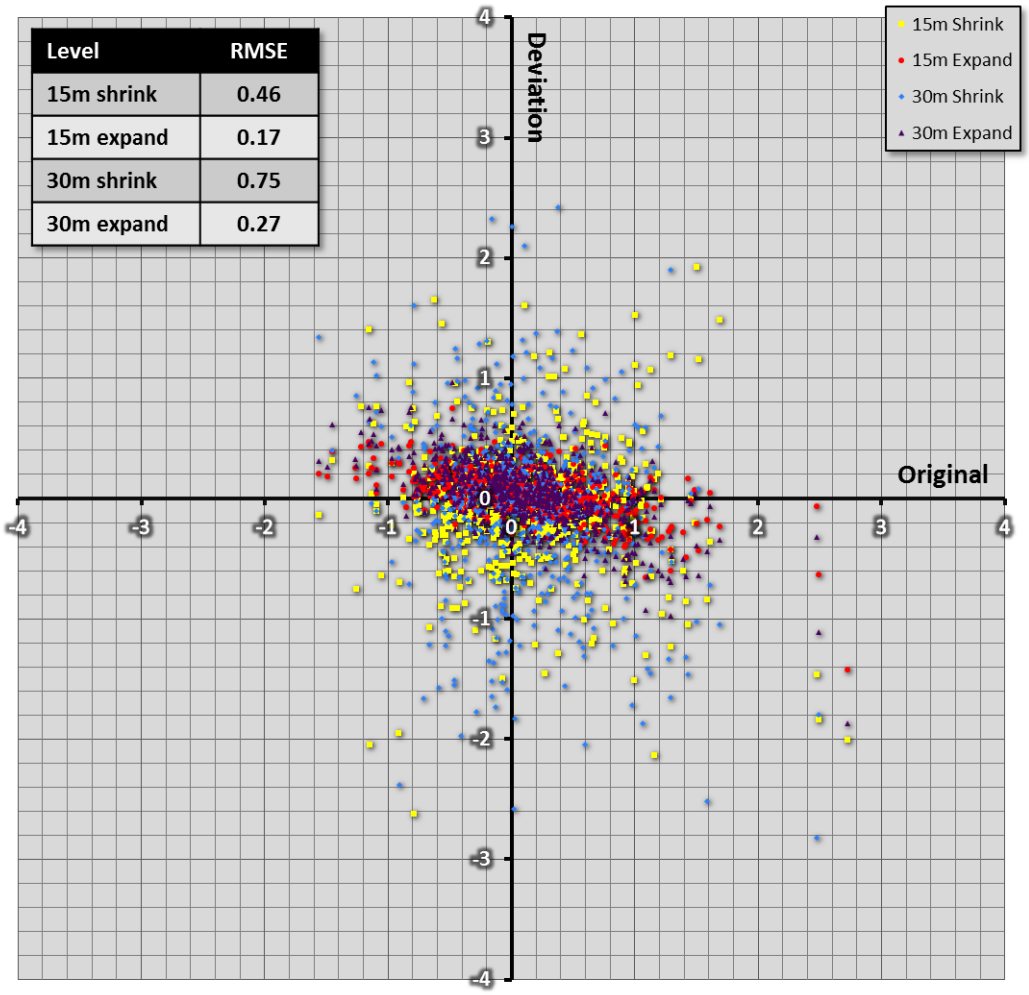

Figure 11 **Skewness Sensitivity.** Deviation of skewness values, from the original glacier boundary (x-axis), for each glacier within each error level (15m shrink, 15m expand, 30m shrink, 30m expand).

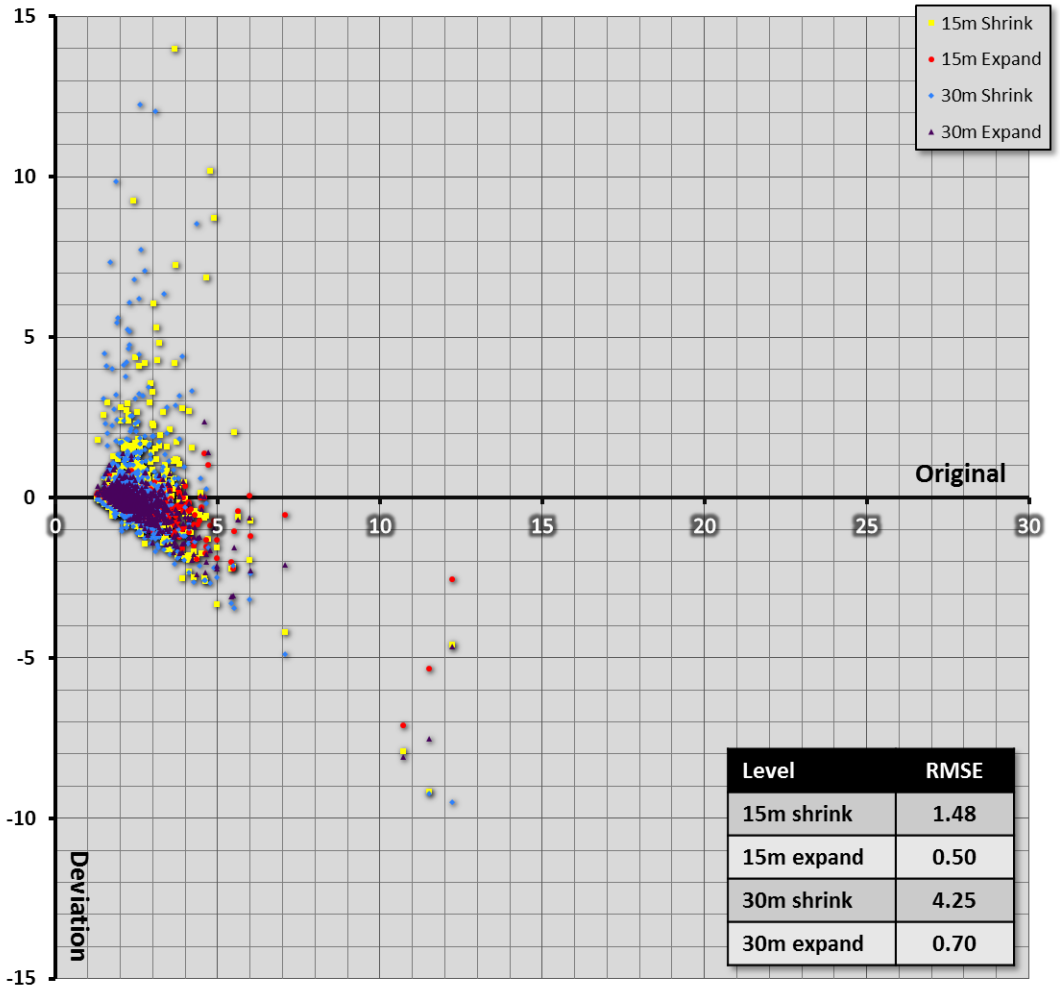

Figure 12 **Kurtosis Sensitivity.** Deviation of kurtosis values, from the original glacier boundary (x-axis), for each glacier within each error level (15m shrink, 15m expand, 30m shrink, 30m expand).

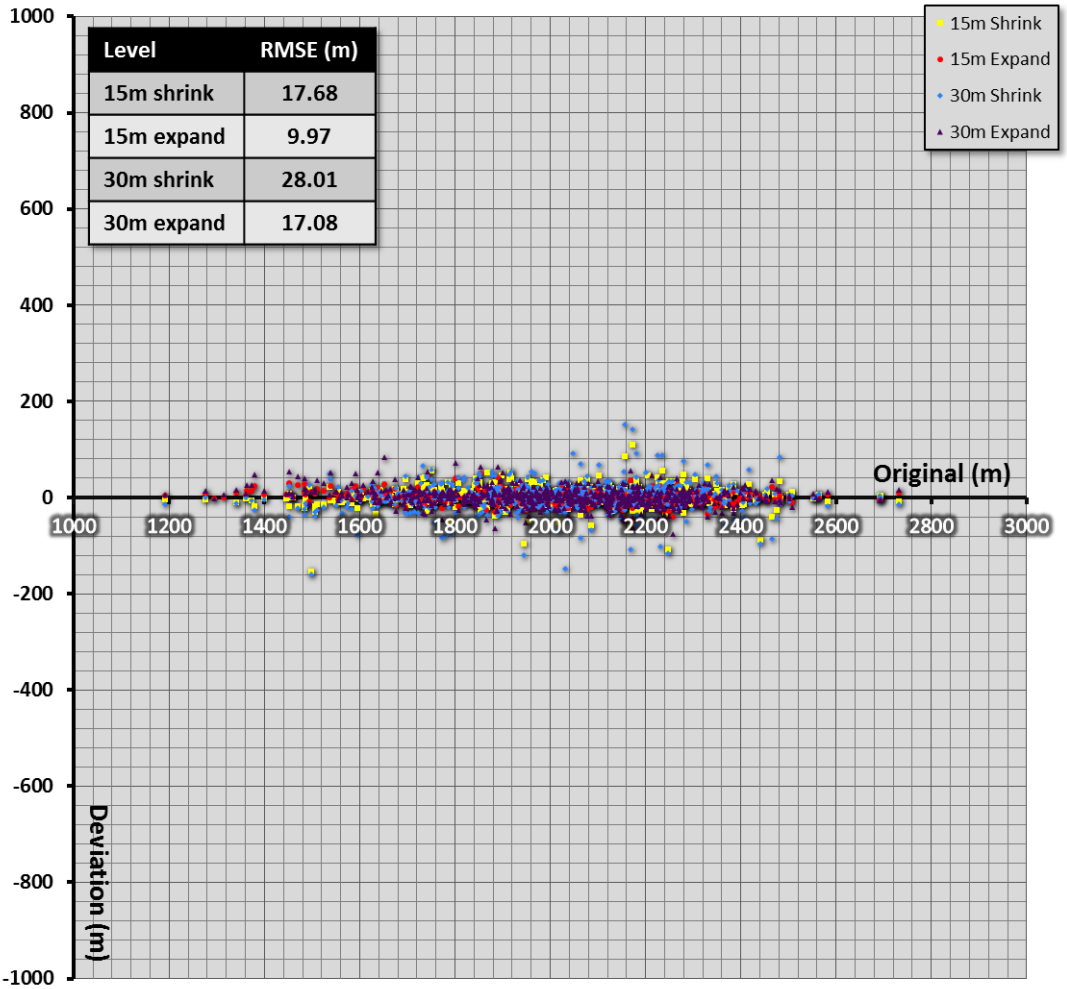

Figure 13 **ELA Sensitivity.** Deviation of ELA values (meters), from the original glacier boundary (x-axis), for each glacier within each error level (15m shrink, 15m expand, 30m shrink, 30m expand).

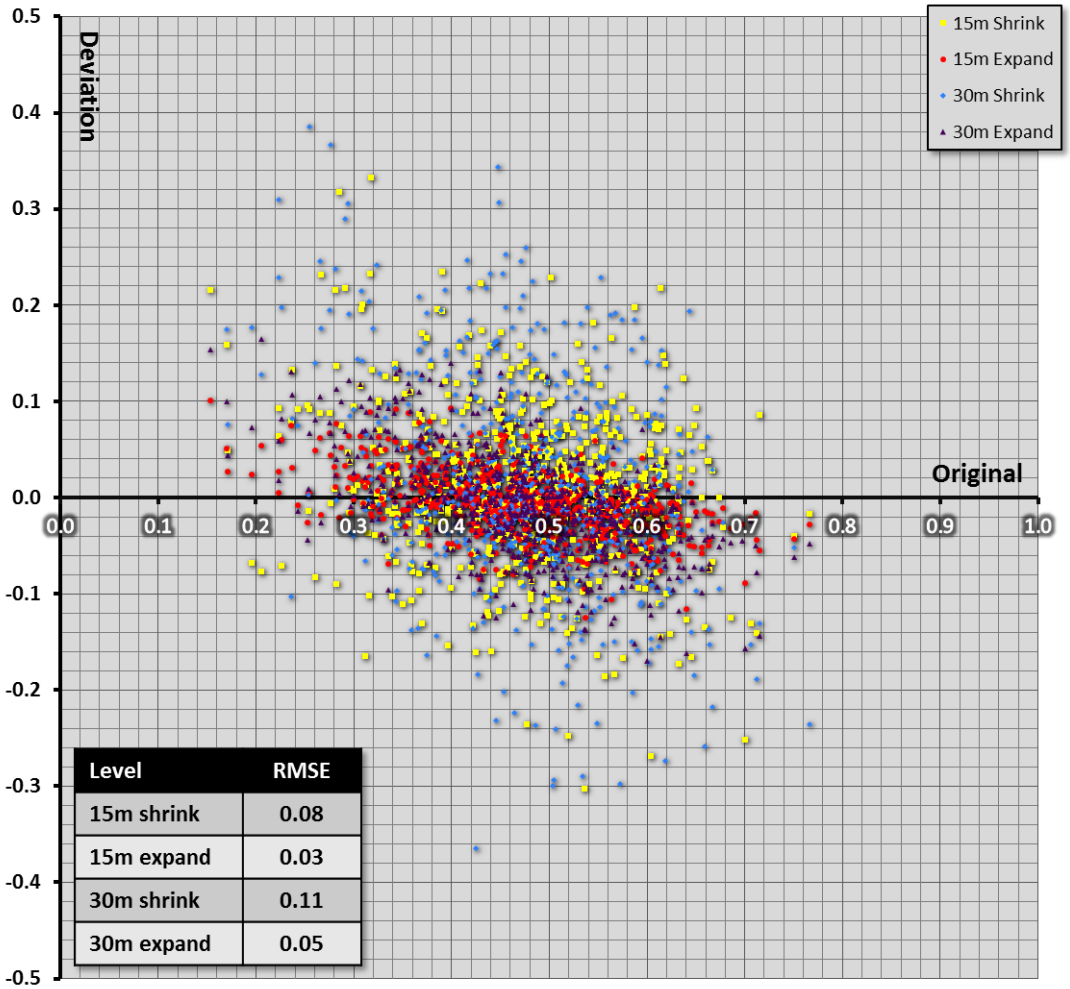

Figure 14 **HI Sensitivity.** Deviation of HI values, from the original glacier boundary (x-axis), for each glacier within each error level (15m shrink, 15m expand, 30m shrink, 30m expand).

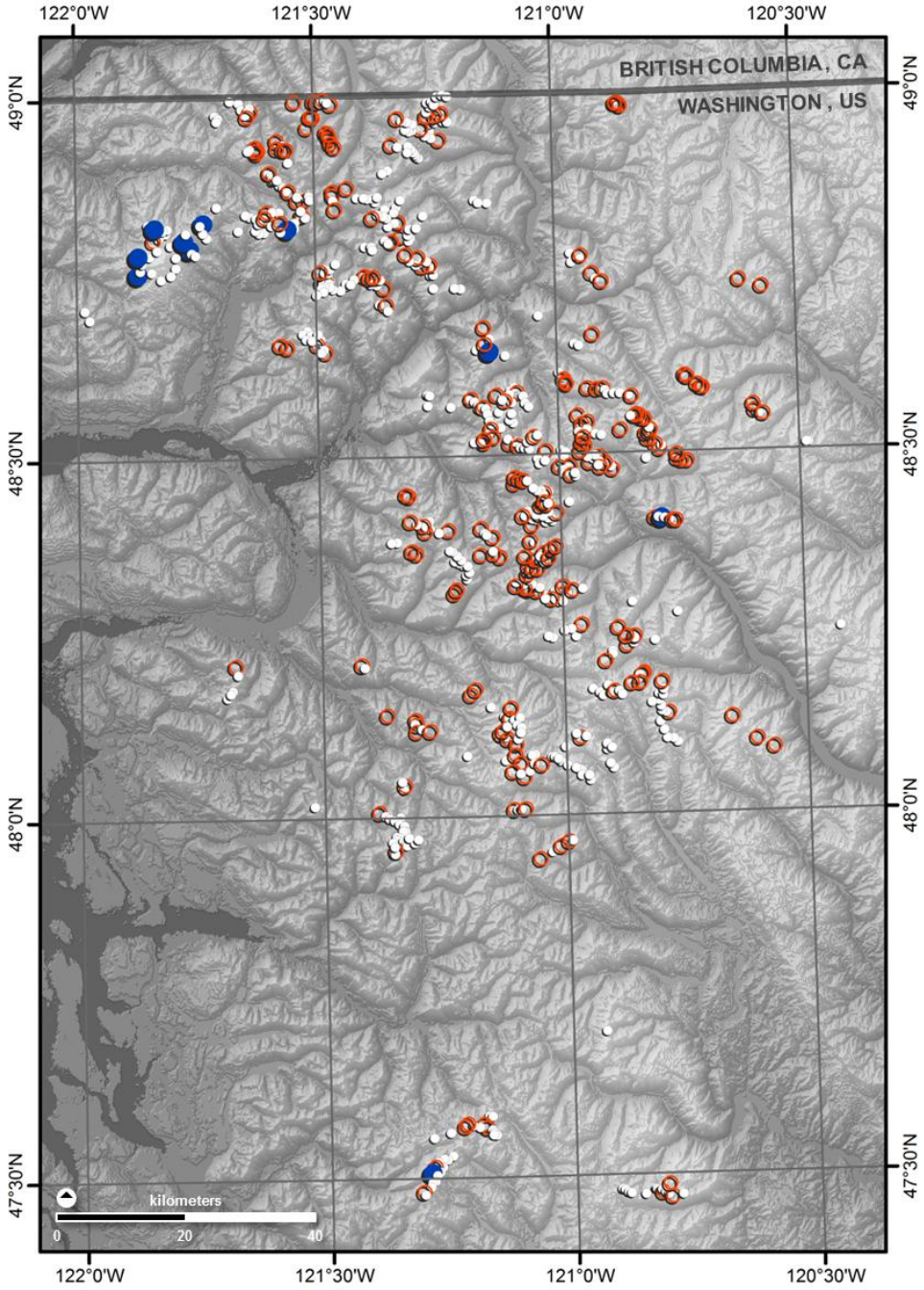

Figure 15 **Areal Change by Glacier.** Shaded relief map with 10 increasing glaciers (dark blue circles), 240 decreasing glaciers (orange rings), and 492 glaciers of undetectable change (white points) displayed by the glacier centroids within the study area.

	Northing (UTM)	Easting (UTM)	Area 1958 (sqkm)	Area 2006 (sqkm)	Perimeter (m)	Length (m)	% Change (1958-2006)	Mean Elevation (m)	Median Elevation (m)	Min Elevation (m)	Max Elevation (m)	Range of Elevation (m)	Standard Deviation of Elevation (m)	Skewness	Kurtosis	ELA	HI	AABR	Real Mean Aspect (degrees)	Mean Slope (degrees)	Orographic Lift Proxy
Northing (UTM)																					
Easting (UTM)	-0.53																				
Area 1958 (sqkm)	0.08	0.30																			
Area 2006 (sqkm)	0.12	0.24	0.99																		
Perimeter (m)	0.16	-0.22	0.52	0.58																	
Length (m)	0.02	0.09	0.86	0.90	0.81																
% Change (1958-2006)	0.10	-0.31	-0.71	-0.65	-0.18	-0.51															
Mean Elevation (m)	-0.13	0.56	0.44	0.41	0.22	0.42	-0.70														
Median Elevation (m)	-0.10	0.54	0.43	0.40	0.22	0.40	-0.70	1.00													
Min Elevation (m)	-0.22	0.52	0.03	-0.01	-0.04	0.06	-0.46	0.89	0.89												
Max Elevation (m)	-0.19	0.53	0.62	0.59	0.31	0.56	-0.81	0.93	0.92	0.68											
Range of Elevation (m)	0.02	0.07	0.76	0.78	0.45	0.66	-0.49	0.14	0.13	-0.31	0.48										
Standard Deviation of Elevation (m)	-0.07	0.38	0.90	0.89	0.42	0.74	-0.59	0.34	0.33	-0.10	0.62	0.93									
Skewness	-0.38	-0.22	-0.27	-0.27	-0.31	-0.30	0.35	-0.73	-0.76	-0.66	-0.54	0.08	-0.08								
Kurtosis	-0.23	-0.23	-0.37	-0.38	-0.29	-0.46	0.30	-0.63	-0.64	-0.56	-0.42	0.12	-0.09	0.84							
ELA	-0.09	0.55	0.50	0.47	0.26	0.46	-0.74	1.00	1.00	0.85	0.94	0.20	0.40	-0.75	-0.64						
HI	0.36	0.29	0.41	0.41	0.32	0.42	-0.44	0.80	0.82	0.68	0.64	0.02	0.21	-0.97	-0.89	0.82					
AABR	-0.48	-0.09	-0.35	-0.34	-0.30	-0.28	0.49	-0.65	-0.69	-0.51	-0.54	-0.08	-0.17	0.93	0.71	-0.69	-0.88				
Real Mean Aspect (degrees)	-0.10	-0.43	-0.20	-0.21	-0.18	-0.13	-0.10	-0.19	-0.18	-0.14	-0.18	-0.06	-0.24	0.10	-0.07	-0.19	-0.16	-0.04			
Mean Slope (degrees)	-0.35	-0.05	-0.58	-0.63	-0.50	-0.65	0.26	-0.29	-0.31	0.00	-0.32	-0.42	-0.52	0.56	0.58	-0.34	-0.59	0.51	0.09		
Orographic Lift Proxy	-0.38	0.98	0.41	0.36	-0.15	0.17	-0.37	0.62	0.61	0.53	0.60	0.15	0.46	-0.32	-0.30	0.62	0.41	-0.20	-0.51	-0.12	

Table 1 **Growing Glacier Correlation Matrix.** Correlation matrix for all areal, hypsometric, and surficial derivatives for the 10 growing glaciers.

	Northing (UTM)	Easting (UTM)	Area 1958 (sqkm)	Area 2006 (sqkm)	Perimeter (m)	Length (m)	% Change (1958-2006)	Mean Elevation (m)	Median Elevation (m)	Min Elevation (m)	Max Elevation (m)	Range of Elevation (m)	Standard Deviation of Elevation (m)	Skewness	Kurtosis	ELA	HI	AABR	Real Mean Aspect (degrees)	Mean Slope (degrees)	Orographic Lift Proxy
Northing (UTM)																					
Easting (UTM)	-0.40																				
Area 1958 (sqkm)	-0.07	-0.02																			
Area 2006 (sqkm)	-0.05	-0.01	0.96																		
Perimeter (m)	-0.09	-0.08	0.83	0.80																	
Length (m)	-0.06	-0.03	0.90	0.88	0.92																
% Change (1958-2006)	-0.12	0.00	0.53	0.55	0.72	0.75															
Mean Elevation (m)	-0.27	0.56	0.12	0.13	0.13	0.17	0.23														
Median Elevation (m)	-0.28	0.55	0.12	0.13	0.12	0.15	0.21	0.99													
Min Elevation (m)	-0.26	0.58	-0.13	-0.10	-0.16	-0.15	-0.04	0.93	0.92												
Max Elevation (m)	-0.23	0.50	0.32	0.31	0.38	0.42	0.46	0.94	0.92	0.76											
Range of Elevation (m)	-0.01	0.00	0.65	0.60	0.80	0.83	0.75	0.21	0.20	-0.15	0.53										
Standard Deviation of Elevation (m)	0.00	0.02	0.54	0.50	0.71	0.74	0.69	0.23	0.21	-0.13	0.52	0.97									
Skewness	-0.05	0.06	-0.08	-0.08	-0.08	-0.09	-0.07	-0.26	-0.29	-0.15	-0.20	-0.10	-0.14								
Kurtosis	0.05	0.01	-0.02	-0.01	-0.02	-0.01	-0.02	-0.14	-0.18	-0.10	-0.12	-0.06	-0.17	0.40							
ELA	-0.26	0.55	0.15	0.15	0.17	0.20	0.27	1.00	0.99	0.91	0.95	0.26	0.28	-0.29	-0.16						
HI	0.05	-0.07	0.10	0.09	0.13	0.14	0.15	0.31	0.28	0.17	0.26	0.17	0.19	-0.83	-0.19	0.33					
AABR	-0.05	-0.02	-0.11	-0.10	-0.13	-0.15	-0.17	-0.23	-0.25	-0.12	-0.22	-0.18	-0.22	0.78	0.51	-0.26	-0.66				
Real Mean Aspect (degrees)	-0.11	-0.01	0.00	-0.04	-0.02	0.00	-0.02	0.16	0.17	0.14	0.14	0.02	0.03	-0.05	0.00	0.17	0.09	0.01			
Mean Slope (degrees)	0.19	0.14	-0.17	-0.14	-0.12	-0.14	-0.06	0.12	0.12	0.05	0.15	0.17	0.22	-0.19	-0.21	0.13	0.19	-0.20	-0.05		
Orographic Lift Proxy	-0.19	0.90	-0.08	-0.06	-0.13	-0.08	-0.05	0.49	0.48	0.53	0.44	-0.02	0.00	0.06	0.02	0.48	-0.11	-0.01	-0.05	0.16	

Table 2 **Shrinking Glacier Correlations.** Correlation matrix for all areal, hypsometric, and surficial derivatives for the 240 shrinking glaciers.

REFERENCES

Ashraf, A., R. Naz, and R. Roohi (2012) Monitoring and Estimation of Glacial Resource of Azad Jammu and Kashmir Using Remote Sensing and GIS Techniques. *Pakistan Journal of Meteorology*, Volume 8, Issue 16, pp. 31-41

Basagic, H.J. and A.G. Fountain (2011) Quantifying 20th Century Glacier Change in the Sierra Nevada, California. *Arctic, Antarctic, and Alpine Research*, Volume 43, Issue 3, pp. 317-330

Brocklehurst, S.H. and K.X. Whipple (2004) Hypsometry of glaciated landscapes. *Earth Surface Processes and Landforms*, Volume 29, Issue 7, pp. 907-926

Ghilani, C.D. (2000) Demystifying area uncertainty: more or less. *Surveying and Land Information Systems*, Volume 60, pp. 177-182

Granshaw, F. (2002) Glacier Change in the North Cascades National Park Complex, Washington State USA, 1958-1999 (Master's thesis). Retrieved from Glacier Research at Portland State University, Portland, OR. 134 pages

Jöreskog, K.G. (1999) Formulas for Skewness and Kurtosis. Retrieved from Scientific Software International. http://www.ssicentral.com/lisrel/techdocs/kurtosis.pdf

O'Neal, M.A. (2005) Late little ice age glacier fluctuations in the Cascade Range of Washington and northern Oregon (Ph. D. dissertation). Retrieved from Earth and Space Sciences at University of Washington, Seattle, WA. (UMI No. 3178155), 116 pages

O'Neal, M.A., L.B. Roth, B. Hanson, and D.J. Leathers (2010) A field-based model of the effects of landcover changes on daytime summer temperatures in the North Cascades. *Physical Geography*, Volume 31, Issue 2, pp. 137-155

Paul, F. and M. Andreassen (2009) A new glacier inventory for the Svartisen region, Norway, from Landsat ETM+ data: challenges and change assessment. *Journal of Glaciology*, Volume 55, Issue 192, pp. 607-618

Pelto, M.S. (2008) Impact of Climate Change on North Cascade Alpine Glaciers, and Alpine Runoff. *Northwest Science*, Volume 82, Issue 1, pp. 65-75

Post, A., D. Richardson, W.V. Tangborn, and F.L. Rosselot (1971) Inventory of Glaciers in the North Cascades Washington. Professional Paper 705-A, US Geological Survey, 19 pages

Rea, B.R. (2009) Defining modern day Area-Altitude Balance Ratios (AABRs) and their use in glacier-climate reconstructions. *Quaternary Science Reviews*, Volume 28, Issue 3-4, pp. 237-248

Roe, G. and M.A. O'Neal (2009) The response of glaciers to intrinsic climate variability: observations and models of late Holocene variations in the Pacific Northwest. *Journal of Glaciology*, Volume 155, Issue 193, pp. 839-854

Mukherjee, S., P.K. Joshi, S. Mukherjee, A. Ghosh, R.D. Garg, and A. Mukhopadhyay (2013) Evaluation of vertical accuracy of open source Digital Elevation Model (DEM). *International Journal of Applied Earth Observation and Geoinformation*, Volume 21, pp. 205-217

Satinsky, A.M. (2009). Geometric changes of 742 North Cascade glaciers derived from 1958 and 2006 aerial imagery (Master's thesis). Retrieved from Dissertations & Theses at University of Delaware, Newark, DE. (UMI No. 1469516), 69 pages

Sensor Information Laboratory Corp. (2004) SilcAst: ASTER DEM/Ortho (Version 1.09a) [software]. http://www.silc.co.jp

Silvero, W. and J. Jaquet, (2005) Glacial cover mapping (1987–1996) of the Cordillera Blanca (Peru) using satellite imagery. *Remote Sensing of Environment*, Volume 95, Issue 3, pp. 342-350

Stoelinga, M.T., M.D. Albright, and C.F. Mass (2010) A New Look at Snowpack Trends in the Cascade Mountains. *Journal of Climate*, Volume 23, pp. 2473-2491

Appendix A

COMPOSITE 2006 DEM STATISTICS FOR 742 NORTH CASCADE GLACIER INVENTORY

Table A1 Areal and Surficial Statistics for Composite A.D. 2006 DEM. Table is continued through to page 55.

Glacier Name (if applicable)	Glacier ID	Northing (UTM)	Easting (UTM)	Area (sqkm)	Perimeter (m)	Length (m)	% Change (1958-2006)	Real Mean Aspect (degrees)	Grow (G), Shrink (S), Not detectable (N)
Sulphide	0	5407800	602369	3.19	18244.80	3489.14	0	137.57	N
Crystal	1	5408870	603521	2.27	14555.60	2809.72	-1	162.32	N
West Nooksack	2	5410970	604654	0.12	6423.35	611.47	21	62.16	N
Nooksack	3	5409400	604868	2.12	29052.30	3045.36	-27	47.70	S
Price	4	5411020	603563	1.33	27844.70	1914.32	-17	355.35	N
Coleman	5	5404030	584760	5.26	25883.10	4229.67	1	327.18	N
Roosevelt	6	5404970	585916	3.98	20818.30	3830.78	-3	311.09	N
Bastille	7	5406520	585340	0.04	2623.61	648.50	-78	320.07	S
	8	5404030	582963	1.11	12997.40	1745.52	39	352.03	G
Thunder	9	5402970	583576	0.86	12489.00	1890.54	-5	286.62	N
Easton	10	5400510	586549	5.65	24343.80	3720.43	13	181.22	N
Squak	11	5401160	588062	1.77	15359.30	2407.61	-7	127.76	N
Boulder	12	5402340	588799	3.35	24119.10	3574.60	-1	101.06	N
Park	13	5403940	588831	5.47	24745.50	3795.66	7	85.01	N
Rainbow	14	5405610	589785	1.50	10182.20	2463.98	0	62.65	N
Mazama	15	5405710	587940	3.58	18067.80	3359.80	-13	17.65	N
Shales	16	5407600	590311	0.97	9558.30	1666.09	-3	9.75	N
	17	5404230	591824	0.21	7415.15	740.74	107	50.47	N
	18	5404580	591306	0.23	5706.58	669.72	127	54.64	N
	19	5405140	590918	0.31	7428.81	733.36	207	34.35	G
	20	5406950	593535	0.25	4419.25	831.38	25	28.80	N
	21	5407670	592948	0.32	10983.60	1288.92	59	42.40	N
	22	5408220	598341	0.14	5208.18	748.18	42	354.53	N
Curtis	23	5409180	601481	0.97	12714.90	2049.12	21	281.80	N
	24	5408120	601069	0.12	3741.14	732.26	16	272.40	N
	25	5407730	601610	0.13	2900.37	569.73	26	247.32	N
	26	5408310	605912	0.26	8118.59	1055.90	164	175.33	G

Glacier Name (if applicable)	Glacier ID	Northing (UTM)	Easting (UTM)	Area (sqkm)	Perimeter (m)	Length (m)	% Change (1958-2006)	Real Mean Aspect (degrees)	Grow (G), Shrink (S), Not detectable (N)
	27	5407890	605002	0.07	3709.27	439.66	-27	135.96	N
	28	5395730	574949	1.02	10512.90	1486.80	13	26.53	N
	29	5394230	575667	0.59	10146.60	1252.13	-2	9.80	N
	30	5401230	582980	0.43	13810.00	1179.68	117	289.33	G
	31	5401830	583339	0.14	3988.92	703.13	42	283.24	N
	32	5401380	583633	0.10	4189.47	749.57	3	275.58	N
Redoubt	33	5423920	626434	1.87	14855.00	2529.62	-25	13.77	S
White Salmon	34	5410000	601162	0.48	12307.50	1341.92	19	353.24	N
Upper Curtis	35	5410910	602833	0.11	2289.44	506.12	-47	4.77	S
Hanging	36	5410080	602423	0.38	5619.33	1139.31	-53	301.49	S
Spillway	37	5410550	608239	0.08	3538.42	619.13	-73	357.63	S
Colonial	38	5391500	637021	0.76	12256.20	1641.88	-16	6.59	N
Neve	39	5389520	636958	3.61	23136.40	3034.84	20	51.45	G
Challenger	40	5411490	620854	3.01	20736.30	2686.41	-12	353.30	N
Monogram	41	5381170	627541	0.36	7225.53	850.30	21	101.44	N
Eldorado	42	5376340	637656	1.09	13819.00	2245.26	-27	175.19	S
	43	5376050	636251	0.28	6709.63	987.99	-65	334.19	S
Boston	44	5374320	645735	6.24	29672.40	4900.67	-11	25.68	S
Forbidden	45	5375650	642890	1.57	21363.50	2482.80	-17	324.49	N
Ladder Creek	46	5390710	636274	0.47	6727.05	1610.27	-61	316.47	S
Inspiration	47	5377830	638792	4.94	23749.50	3371.13	-3	110.92	N
McAllister	48	5380210	638435	4.80	35688.50	3125.67	-11	343.98	N
Klawatti	49	5380040	640465	2.00	17091.00	2541.96	5	85.53	N
North Klawatti	50	5381740	640436	1.44	12780.40	2450.36	-10	99.09	N
Borealis	51	5383310	641233	0.89	14624.40	1503.38	-26	35.16	S
Quien Sabe	52	5373110	644460	0.86	12801.10	1794.17	-4	273.47	N
	53	5374620	643175	0.12	4683.96	581.64	-38	208.47	N
	54	5374680	642450	0.27	6004.71	932.97	-11	195.32	N
	55	5374790	641795	0.07	4020.80	435.57	-30	246.20	N
	56	5375060	641439	0.03	1854.32	296.75	-72	265.03	S
	57	5426760	598817	0.91	14359.80	1632.64	2	24.90	N
	58	5426580	599816	0.17	4163.94	780.96	-16	5.34	N
	59	5427760	598383	0.34	9469.60	1186.33	12	50.89	N
	60	5425720	594746	0.48	6108.70	996.78	-20	355.99	N
	61	5428060	597039	0.05	3216.48	467.42	-48	278.70	N
	62	5424910	594997	0.09	4986.91	745.71	-7	105.15	N
	63	5425350	595205	0.09	5425.72	490.88	-10	114.35	N
	64	5420930	600983	0.03	1698.37	469.34	-67	133.24	S
	65	5420380	601362	0.02	1229.77	271.65	-75	54.82	S
	66	5420020	601164	0.02	1551.09	328.77	-84	23.75	S
	67	5420410	600947	0.02	707.88	175.75	-84	76.04	S
	68	5425630	599632	0.01	626.99	176.16	-93	107.68	S
	69	5425890	599392	0.13	5371.59	701.25	28	115.12	N
	70	5426410	600183	0.02	801.46	175.50	-82	27.19	S

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	71	5427040	600037	0.09	3826.20	800.00	-11	343.56	N
	72	5423980	608870	0.01	1407.95	241.63	-86	17.12	S
	73	5418650	606002	0.04	1690.00	412.44	-55	19.40	N
	74	5420610	605689	0.01	1298.45	240.68	-91	50.54	S
	75	5420580	605243	0.03	1971.57	456.91	-73	357.59	S
	76	5421250	605136	0.05	2391.97	465.65	-48	26.04	N
	77	5420810	604322	0.00	345.59	100.58	-96	40.12	S
	78	5421970	604233	0.08	4638.59	576.92	-59	41.06	S
	79	5421100	613077	0.04	2993.09	465.87	-57	350.20	S
	80	5421510	612730	0.07	6591.54	458.54	-66	81.00	S
	81	5422300	612380	0.04	2773.14	486.12	-60	57.32	S
	82	5422510	612285	0.02	1190.89	268.40	-82	75.25	S
	83	5423250	611861	0.03	2238.33	375.31	-70	41.09	S
	84	5422990	612196	0.03	3452.77	394.75	-73	33.07	S
	85	5427640	612511	0.03	1408.44	342.58	-73	12.96	S
	86	5427890	612029	0.12	6587.11	770.98	-39	48.74	N
	87	5428150	611649	0.06	2599.73	416.22	-43	66.81	N
	88	5428210	611353	0.03	2192.03	391.16	-67	340.72	S
	89	5427730	610842	0.05	2969.27	560.53	-47	328.89	N
	90	5427940	610405	0.03	1997.08	405.46	-71	62.73	S
	91	5428030	609947	0.03	2643.51	405.12	-70	330.22	S
	92	5425550	609753	0.03	1602.37	467.07	-71	4.93	S
	93	5425600	609388	0.03	1672.52	308.84	-67	18.56	S
	94	5427940	606900	0.01	752.54	278.76	-86	93.18	S
	95	5427320	627773	0.08	2230.21	580.49	-18	291.67	N
	96	5426470	627245	0.06	4473.80	431.51	-42	338.18	N
	97	5425820	627233	0.00	328.27	98.71	-95	197.69	S
	98	5425200	628333	0.10	4353.61	754.46	-2	281.40	N
	99	5424700	627876	0.10	6596.73	675.52	4	290.10	N
	100	5424580	625121	1.01	12398.40	1715.56	1	20.44	N
	101	5424930	624235	0.37	10742.50	1409.23	-9	40.70	N
	102	5425110	623436	0.20	8152.74	872.16	-1	345.07	N
	103	5425490	622720	0.13	7257.02	979.34	-56	19.62	S
	104	5423700	624033	0.04	1253.10	388.56	-56	261.31	N
	105	5423430	624560	0.06	4111.37	567.59	-43	236.05	N
	106	5421410	621854	0.10	5335.87	588.93	-68	26.23	S
	107	5421080	622843	0.17	8607.52	903.10	-13	340.90	N
	108	5417430	621296	0.10	7098.10	562.64	-1	52.76	N
	109	5417000	620506	0.05	2334.84	495.25	-52	306.11	N
	110	5413140	618885	0.22	4862.07	864.71	-26	336.22	N
	111	5413090	618217	0.13	4085.44	572.11	-34	351.32	N
	112	5413220	616580	0.41	14147.90	1927.29	-18	9.23	N
	113	5413230	617676	0.05	1774.92	331.40	-49	5.95	N
	114	5413610	612906	0.01	1185.73	185.44	-95	350.15	S

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	115	5414720	615058	0.01	1046.18	320.16	-87	13.56	S
	116	5414170	612868	0.00	486.13	157.24	-95	328.59	S
	117	5413420	609268	0.05	5032.18	561.14	-46	16.11	N
	118	5413430	608229	0.23	9502.55	962.82	15	43.30	N
	119	5413390	608830	0.09	3844.13	444.21	-13	359.07	N
	120	5420590	600096	0.19	8522.90	1002.22	-5	345.41	N
	121	5420400	599799	0.10	4867.77	608.35	-5	49.79	N
	122	5413360	607425	0.53	16614.50	1421.09	6	353.82	N
	123	5414280	605765	0.04	2062.80	546.60	-57	331.58	N
	124	5414190	606106	0.04	2968.29	466.03	-62	52.09	S
	125	5414760	605319	0.05	5108.51	476.20	-51	50.73	N
	126	5415100	604763	0.07	3123.40	754.55	-29	39.29	N
	127	5415960	604342	0.06	3414.46	452.83	-41	357.88	N
	128	5415910	603927	0.12	5984.90	973.17	16	32.89	N
	129	5415750	603631	0.10	4511.06	516.67	1	41.05	N
	130	5416280	603642	0.15	8637.82	799.57	-27	56.92	N
	131	5416650	603431	0.04	2869.97	354.93	-55	36.55	N
	132	5416750	602743	0.22	7079.06	1336.36	-26	338.40	N
	133	5417010	603127	0.04	2028.76	351.28	-62	46.34	S
	134	5412700	607408	0.04	1148.54	351.71	-64	258.53	S
	135	5410630	607644	0.48	10679.00	1063.12	-4	303.95	N
	136	5409370	607090	0.55	19829.20	1731.05	38	301.97	N
	137	5410230	600191	0.19	6620.37	914.55	-4	10.33	N
	138	5410500	599512	0.16	8676.88	584.00	60	16.75	N
	139	5411700	595033	0.19	6430.91	801.42	87	37.90	N
	140	5408850	592107	0.44	12397.90	1473.69	11	352.91	N
	141	5409150	592961	0.34	11749.90	1079.19	238	334.56	G
	142	5408030	586705	0.71	12984.80	1653.28	18	351.87	N
	143	5407570	587176	0.34	12414.90	1849.77	69	88.20	N
	144	5406820	586179	0.28	6551.35	1145.17	39	314.93	N
	145	5408270	587451	0.10	3167.48	722.43	4	41.80	N
	146	5408380	585481	0.61	26709.30	1887.80	204	29.02	G
	147	5408910	584409	0.06	3134.38	350.11	-44	5.10	N
	148	5406360	590018	0.73	14494.80	1692.55	265	143.98	G
	149	5406800	590118	0.22	5156.23	1124.11	125	142.26	N
	150	5408460	607066	0.18	9335.25	1128.47	76	87.60	N
	151	5410250	608623	0.22	9177.83	699.63	123	71.36	N
	152	5411190	608017	0.14	7184.56	857.29	42	49.41	N
	153	5412840	608543	0.02	1304.89	244.76	-91	70.95	S
	154	5412870	609395	0.07	5999.55	692.33	-28	85.80	N
	155	5412780	612890	0.07	3143.72	511.78	-34	67.41	N
	156	5411430	613196	0.25	10901.60	1327.49	-37	68.43	S
	157	5410650	619759	0.15	4728.35	1015.38	-23	296.67	N
	158	5410110	618955	0.02	2311.51	396.60	-77	331.78	S

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	159	5410030	621223	0.60	8617.87	1317.80	-25	238.59	N
	160	5410370	620346	0.08	3775.22	696.07	-24	218.55	N
	161	5410380	620655	0.10	2739.09	842.64	1	218.39	N
	162	5408830	621373	0.16	7032.94	1124.54	59	265.86	N
	163	5409360	622390	1.24	21611.30	2793.25	-5	68.48	N
	164	5409510	622914	0.11	2879.62	857.11	-89	63.63	S
	165	5410950	622277	0.32	6302.07	890.56	60	115.82	N
	166	5411800	622629	0.98	8618.36	1322.71	9	65.91	N
	167	5412950	623236	0.68	9311.75	1272.01	13	5.10	N
	168	5407500	624450	0.57	10104.50	1088.42	-5	107.37	N
	169	5406650	624569	0.12	6116.20	773.35	23	132.24	N
	170	5404090	625972	0.38	8667.21	1197.64	-37	359.43	S
	171	5404560	624094	0.33	10340.30	1221.63	-63	47.94	S
	172	5406650	620912	0.14	3547.40	692.98	-30	350.10	N
	173	5405690	618833	0.15	6188.99	665.07	-24	19.75	N
	174	5405780	617898	0.24	6347.91	948.89	-19	321.29	N
	175	5400680	616234	0.38	16199.80	1731.39	-25	346.80	N
	176	5400880	618531	0.05	2960.65	418.93	-85	9.87	S
	177	5401200	617839	0.07	2472.12	669.52	-64	9.96	S
	178	5399700	615290	0.05	1059.92	296.69	-53	324.70	N
	179	5400020	615010	0.15	2718.71	809.67	-24	325.94	N
	180	5398950	614201	0.05	1749.26	333.08	-55	348.45	N
	181	5399150	612981	0.08	4528.61	617.38	-17	32.51	N
	182	5399520	612555	0.10	3651.04	802.13	2	14.23	N
	183	5399590	611759	0.07	3635.41	533.47	-26	34.95	N
	184	5403060	613328	0.16	3309.94	703.99	-21	352.89	N
	185	5400020	612408	0.08	3765.56	544.63	-19	60.36	N
	186	5401580	612178	0.27	8452.42	1286.48	-11	99.87	N
	187	5402260	612490	0.07	5197.15	607.91	-30	350.33	N
	188	5400290	611837	0.04	1156.66	383.56	-62	77.86	S
	189	5400710	612253	0.05	1980.11	484.63	-53	146.14	N
	190	5402250	611799	0.05	2358.53	489.89	-53	322.67	N
	191	5401720	611029	0.13	6495.80	727.07	-55	352.32	S
	192	5401710	611677	0.24	5619.53	982.38	21	3.76	N
	193	5398230	610474	1.07	12473.90	1877.73	7	323.18	N
	194	5399360	611241	0.12	3615.91	583.32	-39	302.10	N
	195	5400100	611244	0.01	592.16	134.07	-91	320.70	S
	196	5399850	611429	0.07	2444.45	423.71	-30	337.76	N
	197	5390070	605988	0.12	6439.29	640.68	-70	5.34	S
	198	5390400	604891	0.23	8288.48	940.52	-43	15.55	S
	199	5392140	608347	0.52	7297.97	1078.31	5	357.85	N
	200	5391340	608924	0.10	2520.99	595.82	-2	289.71	N
	201	5389290	611225	0.06	3590.45	806.48	-36	313.26	N
	202	5391020	611030	0.07	4255.85	895.17	-35	149.08	N

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	203	5391150	609814	1.08	10784.90	1805.57	8	113.15	N
	204	5390600	610616	0.16	3503.52	634.24	-59	246.81	S
	205	5392150	610719	0.82	10457.60	1406.32	2	2.57	N
	206	5391980	609631	0.99	7980.25	1507.55	10	13.13	N
	207	5389780	611628	0.14	5393.35	747.54	41	33.87	N
	208	5389320	611870	0.04	1438.86	373.23	-61	66.93	S
	209	5392690	609065	0.09	4539.67	489.95	-10	19.77	N
	210	5391360	611101	0.10	5367.89	501.84	-2	59.17	N
	211	5398770	611555	0.29	7216.94	787.95	-28	61.00	N
	212	5399940	615790	0.08	5830.62	637.51	-22	117.59	N
	213	5399930	618776	0.04	2420.28	547.06	-56	270.65	N
	214	5395770	621409	0.41	9444.03	1299.25	2	73.09	N
	215	5396720	621186	0.10	4446.85	497.57	-75	349.34	S
	216	5396770	620108	0.16	3921.62	889.00	57	354.37	N
	217	5399340	620786	0.01	417.09	170.73	-95	52.99	S
	218	5400440	619573	0.21	4785.98	777.10	5	24.92	N
	219	5399770	619709	0.24	6168.90	943.69	20	78.49	N
	220	5400560	620178	0.06	2928.87	497.84	-39	20.49	N
	221	5401010	619178	0.10	3750.95	501.13	-50	6.06	S
	222	5405050	619254	0.18	4927.94	791.06	-10	62.94	N
	223	5406190	621433	0.09	4575.52	691.47	-8	71.26	N
	224	5406480	621875	0.01	737.27	319.08	-93	82.91	S
	225	5407290	623346	0.04	1586.39	288.86	-82	214.68	S
	226	5402930	625694	0.74	14858.60	1634.88	47	144.27	N
	227	5403520	624660	0.20	9173.12	1075.05	1	230.51	N
	228	5402730	626644	0.09	3433.54	728.76	-55	231.85	S
	229	5403370	626664	0.18	6432.20	822.62	-8	164.90	N
	230	5399350	631656	0.25	8250.55	1226.44	24	354.95	N
	231	5399270	632561	0.22	6832.19	1329.80	-28	23.71	N
	232	5399300	628390	0.11	4259.64	897.70	10	63.61	N
	233	5401330	627925	0.09	2631.72	522.33	-11	288.21	N
	234	5401410	628390	0.10	7295.68	663.20	4	116.21	N
	235	5402450	628378	0.09	2995.49	510.94	-14	51.93	N
	236	5402920	627851	0.10	2993.56	629.49	-48	34.91	S
	237	5403510	627391	0.33	9379.10	1306.69	66	111.19	N
	238	5389870	635020	0.20	5229.54	951.00	1	351.93	N
	239	5382150	633669	0.10	3588.61	612.62	-5	301.59	N
	240	5381010	631093	0.11	5504.60	762.76	9	11.44	N
	241	5382620	627799	0.22	10267.60	960.09	125	104.64	N
	242	5382870	627448	0.06	3550.19	752.73	-39	326.30	N
	243	5410500	626743	0.11	4649.71	779.10	10	347.53	N
	244	5408590	625716	0.22	7478.15	1287.24	10	328.46	N
	245	5408420	624555	0.42	5870.12	934.48	4	1.72	N
	246	5412600	619474	0.21	7290.87	781.12	3	136.02	N

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Whatcom	247	5413350	619737	0.34	9949.06	1012.87	12	46.00	N
	248	5420240	624370	0.08	2705.50	443.35	-22	283.51	N
	249	5419410	626045	0.13	4919.44	629.33	27	24.31	N
	250	5419610	625737	0.06	3343.88	572.83	-39	36.15	N
	251	5419900	625562	0.04	1359.94	360.56	-55	37.43	N
	252	5420260	625306	0.14	8952.05	811.83	36	52.93	N
	253	5420720	624899	0.17	6285.68	892.77	-16	47.70	N
	254	5421190	624477	0.17	10077.20	817.85	71	54.71	N
	255	5423600	625047	0.49	6294.78	1197.54	64	117.52	N
	256	5422460	627969	0.43	7859.57	1337.99	8	47.07	N
	257	5422790	627077	0.08	4504.90	605.12	-17	276.48	N
	258	5422210	629191	0.03	1688.26	365.85	-67	15.27	S
	259	5423470	627727	0.19	4047.01	1051.11	-5	45.23	N
	260	5425460	629373	0.25	7590.87	839.45	23	69.47	N
	261	5424840	628548	0.20	5101.69	637.26	1	136.35	N
	262	5428860	628739	0.55	10052.70	1475.30	10	350.77	N
	263	5428890	630406	0.32	7700.00	1537.53	7	17.62	N
	264	5428110	628052	0.27	6008.83	996.86	-9	339.25	N
	265	5429110	629635	0.11	5982.92	906.88	10	7.60	N
	266	5426300	629500	0.06	2660.70	538.48	-72	108.40	S
	267	5426000	628588	0.43	7043.34	1040.09	-52	326.69	S
	268	5426720	629350	0.07	1771.76	540.43	-33	327.65	N
	269	5427950	627336	0.16	5341.50	808.81	-21	1.68	N
	270	5427640	628416	0.20	9071.72	1187.46	0	110.00	N
	271	5425030	629842	0.10	4364.92	1283.83	2	338.24	N
	272	5424980	630473	0.08	3343.28	741.34	-21	77.03	N
	273	5412500	636566	0.08	3525.35	802.17	-24	15.70	N
	274	5412910	634574	0.08	3160.19	436.85	-21	350.53	N
	275	5412530	635201	0.49	9489.49	1114.05	-18	22.83	N
	276	5395130	644487	0.06	2368.32	740.82	-40	7.59	N
	277	5386400	647682	0.07	4860.90	571.45	-33	13.35	N
	278	5376790	644399	0.08	2125.34	485.83	-15	336.04	N
	279	5376520	643883	0.31	8619.05	1136.43	-37	341.92	S
	280	5375600	641074	0.13	5619.05	635.45	-34	359.68	N
	281	5376120	639861	0.22	3952.87	669.24	9	33.59	N
	282	5379050	640113	0.52	8459.79	1347.33	-26	206.11	N
	283	5378610	640717	0.10	9083.66	743.47	-3	138.51	N
	284	5381100	643054	0.17	3934.26	723.55	72	31.38	N
	285	5381670	642508	0.20	4495.51	777.23	2	53.32	N
	286	5382730	642209	0.16	4548.69	967.37	-19	67.30	N
	287	5384080	640780	0.04	2470.81	500.71	-56	1.49	N
	288	5382940	640091	0.44	9425.88	1560.89	-26	314.54	N
	289	5383570	640225	0.06	1202.62	315.12	-44	263.94	N
	290	5382560	639086	0.20	5867.42	946.28	0	356.98	N

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	291	5382100	638993	0.06	5119.95	466.57	-43	220.13	N
	292	5381960	639382	0.02	1109.91	279.73	-79	236.83	S
	293	5382870	638126	0.09	3528.11	597.63	-57	5.29	S
	294	5380770	636440	0.27	3840.70	1302.60	-8	359.97	N
	295	5381010	636114	0.08	3273.36	559.60	-59	24.43	S
	296	5381290	635296	0.77	12686.90	1442.41	-3	26.37	N
	297	5381780	634687	0.11	2878.63	596.16	-43	21.27	N
	298	5388940	639414	0.16	3877.43	728.32	-22	353.64	N
	299	5393250	636132	0.07	3316.33	593.86	-66	351.38	S
	300	5382230	634207	0.10	4182.53	673.06	-68	56.62	S
	301	5380480	635680	0.08	4430.84	526.34	-23	219.88	N
	302	5380690	635333	0.06	2968.49	444.29	-38	190.26	N
	303	5378910	637054	0.15	3946.80	759.97	-24	200.71	N
	304	5379920	636703	0.72	10094.90	1299.39	-10	255.23	N
	305	5378340	637434	0.49	10325.80	1139.81	-2	271.37	N
	306	5377620	637268	0.03	1712.84	341.92	-66	308.92	S
	307	5376780	636858	0.13	4236.75	832.45	-34	301.09	N
	308	5375560	634715	0.25	8491.80	1096.07	-16	321.11	N
	309	5375420	635644	0.08	5004.17	615.75	-23	224.22	N
	310	5375520	636202	0.04	2219.43	411.08	-57	127.20	S
	311	5375440	640106	0.00	500.89	118.41	-95	232.57	S
	312	5428000	656386	0.02	1255.06	311.14	-84	1.05	S
	313	5427890	656193	0.03	952.76	315.91	-75	357.51	S
	314	5428110	655896	0.05	1194.87	404.18	-50	5.32	N
Jerry	315	5400920	653206	0.29	8078.24	1150.47	-27	33.70	N
	316	5400540	654220	0.02	1467.01	370.69	-92	354.89	S
	317	5401820	652704	0.02	1779.08	318.85	-81	14.99	S
	318	5404530	650979	0.32	5228.72	1104.15	-36	36.58	S
	319	5404840	649333	1.52	9411.10	1891.05	-16	322.60	N
	320	5404000	650938	0.15	4202.71	751.93	-25	105.63	N
	321	5403430	649569	0.08	3313.11	712.13	-22	125.25	N
Lewis	322	5375510	662528	0.03	1130.19	302.72	-86	13.71	S
	323	5375240	663433	0.06	2164.71	552.55	-43	10.22	N
	324	5377710	661744	0.03	1697.45	321.94	-66	61.68	S
	325	5376970	661683	0.07	3244.21	428.18	-26	122.67	N
	326	5377980	661585	0.05	2844.93	717.83	-50	356.18	N
	327	5376310	661345	0.02	1282.08	323.82	-81	91.54	S
	328	5379330	660852	0.03	1108.58	339.19	-71	81.13	S
Mesahchie	329	5383240	657109	0.45	8573.59	1513.57	-10	346.43	N
Katsuk	330	5383180	655089	0.79	9145.80	1958.11	-13	31.32	N
	331	5382860	658833	0.07	2366.78	386.83	-65	23.65	S
	332	5382980	658374	0.05	3084.86	502.63	-50	39.83	N
	333	5392330	652858	0.01	853.66	297.06	-85	10.72	S
Kimtah	334	5383890	653543	0.64	15331.10	1554.62	-29	32.35	S

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	335	5383710	654758	0.11	1962.46	506.42	10	37.67	N
	336	5384020	654428	0.10	2297.47	549.23	-51	357.99	S
	337	5383260	656121	0.24	4193.65	1085.56	-21	342.95	N
	338	5384000	652090	0.03	1798.20	461.50	-75	340.26	S
	339	5385720	648134	0.05	3264.05	566.26	-51	47.26	N
	340	5384930	648654	0.03	2973.55	321.60	-74	51.40	S
	341	5384690	648866	0.03	2667.98	332.56	-65	54.43	S
	342	5385390	648395	0.04	3215.29	490.63	-59	36.58	S
	343	5390580	650762	0.23	6356.52	967.89	16	37.85	N
	344	5390870	650027	0.07	3382.89	565.62	-26	2.22	N
	345	5379900	660059	0.02	1774.74	392.43	-78	24.09	S
	346	5379470	660388	0.04	1587.58	313.83	-59	347.52	S
	347	5380070	659615	0.02	964.00	251.23	-77	31.87	S
	348	5379860	659308	0.02	1131.22	230.50	-77	7.59	S
	349	5379780	658698	0.15	5668.26	608.89	-25	346.73	N
	350	5377670	657190	0.04	1856.03	488.92	-61	0.80	S
Douglas	351	5377690	652025	0.84	10438.40	1598.90	-7	82.65	N
	352	5376840	654247	0.21	5965.23	926.71	-31	0.03	N
	353	5377000	653298	0.31	6800.96	1071.87	-22	2.47	N
Banded	354	5378490	651206	0.41	6021.92	1089.57	-49	349.63	S
Fremont	355	5377300	650772	0.99	14837.50	1939.04	-10	283.54	N
	356	5379460	651913	0.18	7451.10	860.93	-39	354.83	N
	357	5378880	652094	0.17	4533.62	708.08	-44	84.75	S
	358	5379240	651585	0.10	3957.36	624.43	0	7.25	N
	359	5379840	650578	0.18	4955.93	1121.44	-40	22.94	S
	360	5374260	650985	0.08	3783.39	546.40	-61	328.94	S
	361	5375540	651218	0.02	1402.83	371.35	-89	269.31	S
Thunder Creek	362	5374210	648700	0.11	4651.76	781.17	-44	43.29	N
	363	5374480	648088	0.16	6969.28	865.50	-20	31.21	N
Wythe	364	5373450	652105	0.81	20136.10	1839.88	-19	25.27	N
	365	5373160	652912	0.05	1493.34	370.16	-47	339.60	N
	366	5375150	651713	0.09	4767.90	677.38	-54	55.10	S
	367	5376500	651430	0.13	5439.86	902.08	-78	121.21	S
	368	5377140	661048	0.17	4025.63	689.91	-42	343.62	S
	369	5377330	661577	0.02	1096.24	292.59	-81	312.15	S
	370	5373310	661138	0.05	2336.47	436.91	-50	357.52	N
	371	5374780	663141	0.03	2067.93	364.91	-75	300.72	S
	372	5375960	686109	0.06	2045.96	506.19	-41	354.01	N
	373	5375930	685742	0.11	3457.98	811.24	-44	29.11	N
	374	5380270	679062	0.05	3866.37	611.83	-73	2.25	S
	375	5380310	678479	0.12	3921.74	703.59	-41	19.53	N
	376	5380400	678079	0.17	4018.91	745.60	-17	45.01	N
	377	5380840	677793	0.02	1968.34	294.64	-76	357.44	S
	378	5381770	677538	0.01	566.42	171.30	-88	24.55	S

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	379	5384230	669746	0.02	833.51	249.29	-84	355.13	S
	380	5384330	669466	0.04	1967.46	303.88	-63	38.81	S
	381	5384730	668890	0.02	1912.68	296.92	-84	326.09	S
	382	5386160	666958	0.02	1536.81	371.09	-76	1.13	S
	383	5385840	667316	0.01	488.27	167.05	-93	49.40	S
	384	5399990	678761	0.04	1847.31	434.34	-58	62.66	S
	385	5400960	675273	0.01	633.13	170.44	-93	347.01	S
	386	5427580	656957	0.04	1698.44	527.55	-64	13.08	S
	387	5427900	656733	0.03	1284.44	321.31	-68	30.67	S
	388	5406990	624850	0.05	2827.17	401.75	-48	70.95	N
	389	5369650	642841	0.11	4375.96	712.55	6	2.31	N
	390	5369720	642235	0.04	1898.97	479.98	-59	13.47	S
	391	5369940	641555	0.09	3612.50	834.82	-57	39.57	S
	392	5370190	640916	0.11	2025.31	701.38	-65	359.01	S
Goode	393	5372590	654812	0.45	7641.07	1380.13	-35	23.85	S
	394	5372770	653897	0.18	4910.34	746.32	-39	17.00	N
	395	5373670	653253	0.07	2283.31	451.04	-30	13.40	N
	396	5373530	653989	0.04	1709.68	536.50	-59	34.09	S
	397	5371600	655950	0.02	1278.09	353.29	-75	68.43	S
	398	5371970	655765	0.07	3148.19	521.77	-32	72.75	N
	399	5347720	691111	0.16	6749.90	1041.86	61	12.76	N
Middle Cascade	400	5364440	644186	0.89	10280.60	1893.32	-11	335.47	N
	401	5364700	643348	0.27	6127.98	981.79	-10	26.68	N
	402	5366200	644814	0.07	3060.51	455.57	-28	316.59	N
	403	5365010	642904	0.06	2361.55	501.13	-42	326.82	N
	404	5364530	642661	0.08	3745.96	470.09	-18	312.54	N
	405	5364250	642507	0.07	2256.09	446.90	-30	318.14	N
	406	5364250	642155	0.02	1192.66	227.42	-82	316.61	S
	407	5369230	640858	0.04	1337.01	411.23	-60	237.23	S
	408	5363800	643462	0.05	2403.57	566.07	-49	211.54	N
	409	5363820	643647	0.05	2465.89	548.16	-48	237.23	N
	410	5360430	643292	0.02	1699.11	258.75	-75	318.38	S
	411	5358050	644840	0.14	5432.12	789.57	-29	285.77	N
	412	5357460	644809	0.07	3085.68	601.20	-32	262.08	N
South Cascade	413	5357510	644055	1.89	14964.80	2524.49	-35	346.12	S
	414	5358020	642502	0.33	8670.03	1073.61	-33	348.98	S
	415	5358440	637718	0.28	5568.96	1144.56	-53	28.91	S
	416	5358810	637580	0.04	1518.29	298.96	-56	87.88	N
	417	5357920	638665	0.03	1105.96	325.63	-72	29.23	S
	418	5361000	637538	0.03	1058.07	338.11	-74	17.14	S
	419	5361270	636636	0.07	4731.14	572.47	-32	34.04	N
	420	5361530	636282	0.07	4158.22	548.15	-35	19.06	N
	421	5362310	635781	0.01	693.03	176.27	-91	54.57	S
	422	5358230	635734	0.04	1481.64	358.54	-79	325.11	S

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	423	5357420	632773	0.59	16684.10	1537.13	-26	2.55	N
	424	5358050	632140	0.10	3909.10	574.24	2	23.57	N
	425	5358740	631337	0.07	3307.97	720.54	-27	13.58	N
	426	5358870	630944	0.11	4317.39	622.09	7	27.79	N
	427	5361950	630745	0.04	3209.71	560.96	-60	7.92	S
	428	5361580	629302	1.16	20996.70	2752.16	-11	4.89	N
	429	5362300	627929	0.20	8253.11	877.91	-2	74.32	N
	430	5362840	627631	0.06	1525.28	311.17	-44	88.90	N
	431	5363420	627843	0.29	5199.11	960.43	-3	33.38	N
	432	5363310	626889	0.74	10829.10	1475.66	-7	3.16	N
	433	5363330	624883	0.00	163.89	45.90	-99	36.25	S
	434	5362910	625905	0.24	10506.20	1157.34	-20	316.39	N
	435	5367220	624605	0.01	628.94	198.62	-87	112.20	S
	436	5367400	624208	0.03	1871.85	483.40	-67	2.69	S
	437	5362700	626911	0.04	2721.51	326.39	-61	138.11	S
	438	5362580	627273	0.06	3003.90	621.05	-38	230.73	N
	439	5361740	627177	0.31	4871.66	932.15	-38	293.36	S
	440	5360060	622995	0.35	8988.89	1497.62	16	353.58	N
	441	5360080	621990	0.10	3458.01	834.75	-2	318.67	N
	442	5358360	625802	0.01	1280.06	199.41	-90	216.31	S
	443	5358720	625143	0.01	1474.64	340.11	-93	211.24	S
	444	5357210	631695	0.11	7204.54	753.04	12	290.61	N
	445	5356930	632374	0.15	6567.99	829.01	50	198.15	N
	446	5356620	633034	0.11	4504.24	543.82	9	252.39	N
	447	5356530	633726	0.65	14555.60	1678.31	-19	62.34	N
	448	5355100	633516	0.06	4391.13	523.14	-35	305.16	N
	449	5352880	632006	0.03	2495.83	349.75	-68	4.09	S
	450	5352250	631645	0.02	869.03	243.40	-81	129.79	S
	451	5354500	633618	0.06	3754.02	583.24	-41	95.78	N
	452	5355540	633992	0.24	9018.60	763.52	20	110.00	N
	453	5356570	643031	0.02	1023.53	246.63	-79	313.07	S
	454	5355600	642757	0.05	2503.66	453.99	-46	341.25	N
	455	5355240	642884	0.03	1567.27	333.18	-68	295.04	S
	456	5354450	643110	0.08	3438.46	423.00	-24	294.96	N
Spire	457	5353750	642342	0.82	9781.75	1633.63	-18	338.49	N
	458	5354030	641140	0.08	3572.87	579.08	-22	5.96	N
	459	5353500	641100	0.03	1994.09	331.88	-65	342.97	S
	460	5353120	642515	0.02	2610.28	344.44	-88	207.41	S
	461	5352880	642913	0.04	2583.63	413.75	-61	220.36	S
	462	5353060	643122	0.03	1527.90	328.88	-66	226.77	S
	463	5352840	643844	0.09	4683.91	652.13	-5	190.18	N
	464	5352770	644289	0.03	1818.41	305.46	-74	224.78	S
Dome	465	5352150	645445	1.00	7724.24	1398.48	-9	257.08	N
	466	5351520	645645	0.11	4595.21	569.67	8	201.00	N

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	467	5351530	646646	0.08	2785.35	497.17	-61	185.06	S
	468	5351500	647176	0.10	2838.64	657.81	-1	226.86	N
	469	5351130	647807	0.34	4789.24	816.47	14	166.73	N
	470	5346720	648688	0.07	4608.86	533.00	-34	299.45	N
	471	5345580	646844	0.22	6022.17	834.19	-27	11.74	N
	472	5345780	646158	0.16	3782.69	801.86	-21	29.90	N
	473	5336720	654591	0.14	4661.22	782.99	37	1.29	N
	474	5337750	653030	0.13	5934.77	816.88	29	65.22	N
	475	5337160	654112	0.19	3618.94	790.58	-4	15.58	N
	476	5330420	651988	0.04	2502.97	548.10	-56	52.47	N
	477	5330260	651133	0.04	1836.22	350.86	-61	67.12	S
	478	5330810	650480	0.08	2408.98	474.73	-23	14.92	N
	479	5328800	648782	0.08	3892.95	623.29	-17	347.42	N
	480	5327230	647134	0.13	5445.83	714.11	34	346.77	N
	481	5327210	646701	0.12	5775.83	824.48	16	6.96	N
Honeycomb	482	5326190	643969	3.26	17601.10	3933.22	-12	36.04	N
Moth	483	5326930	647683	0.39	6475.63	1037.91	-2	34.55	N
	484	5327560	644109	0.08	2620.69	499.02	-17	4.06	N
	485	5327440	643642	0.09	5895.70	722.17	-11	0.03	N
Suiattle	486	5326240	641948	2.37	13163.30	2042.45	-18	21.12	S
	487	5327430	641096	0.33	5627.86	993.87	-46	80.25	S
Cool	488	5329920	641492	1.49	13877.90	2120.87	-7	101.38	N
	489	5329120	641227	0.90	12339.30	1870.40	-30	151.28	S
Chocolate	490	5330870	641902	2.20	19410.00	3561.25	-12	67.73	N
North Guardian	491	5331680	641998	0.91	10060.00	1867.36	-17	59.39	N
Dusty	492	5332080	641309	1.28	11663.70	2382.69	6	45.68	N
	493	5333210	641780	0.14	3723.10	723.25	-30	19.20	N
Ermine	494	5332840	640886	1.20	12029.60	2112.33	-7	9.59	N
Vista	495	5333090	640150	0.79	14316.90	1597.84	-39	25.08	S
Kennedy	496	5331750	639784	1.32	13926.20	2480.66	-12	315.05	N
Scimitar	497	5331140	639203	0.63	9281.35	2501.87	-29	329.02	S
	498	5330750	638756	0.03	2202.50	292.11	-71	270.11	S
	499	5330190	639464	0.37	8303.95	1161.94	-26	246.99	N
	500	5330090	638630	0.34	8421.38	1058.78	13	304.90	N
	501	5329910	639851	0.10	2088.08	442.21	-68	195.30	S
	502	5326590	639621	0.09	5567.86	645.62	-14	331.07	N
White Chuck	503	5324880	640730	0.82	8606.65	1396.02	-74	302.38	S
	504	5327270	633673	0.12	9409.46	631.95	-38	23.02	N
	505	5334690	640415	0.04	3381.63	650.48	-59	350.47	S
Ptarmigan	506	5333390	639284	0.77	9123.06	1275.57	29	352.57	N
Milk Lake	507	5334570	637106	0.21	3486.01	723.80	-29	48.01	N
	508	5336650	634185	0.05	2136.45	337.81	-83	14.76	S
	509	5337500	634916	0.01	696.93	167.04	-93	222.51	S
	510	5341190	617526	0.11	3314.78	589.34	-72	347.09	S

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	511	5340750	617919	0.06	3222.08	602.25	-37	80.46	N
	512	5331040	627992	0.02	2134.59	397.66	-77	25.73	S
	513	5331320	626716	0.08	4809.49	528.11	-16	20.53	N
	514	5330930	625842	0.01	489.96	131.55	-93	344.09	S
	515	5332030	625920	0.02	1661.32	324.72	-82	43.04	S
	516	5332130	625591	0.08	5610.54	608.57	-23	1.86	N
	517	5332740	625702	0.00	167.36	68.40	-100	321.20	S
	518	5333450	621374	0.02	1385.89	259.76	-76	114.84	S
	519	5316440	623981	0.37	7976.53	1020.80	-8	59.71	N
Cadet	520	5314640	624818	0.51	7727.30	1262.14	-15	33.18	N
	521	5315650	624167	0.06	1878.50	435.23	-43	75.36	N
	522	5315700	623794	0.09	5179.88	701.93	-6	50.92	N
	523	5323230	623683	0.05	2943.05	464.18	-52	10.70	N
	524	5322010	623940	0.07	3579.75	520.53	-33	125.15	N
Sloan	525	5322610	624116	0.66	18229.00	1200.75	-27	63.04	S
	526	5317750	623395	0.05	1662.73	490.91	-54	152.83	N
	527	5317270	622470	0.16	5849.96	722.77	56	18.84	N
	528	5317320	622991	0.10	4158.93	615.64	1	19.82	N
	529	5316760	623229	0.09	2692.02	488.13	-10	38.48	N
	530	5318470	620179	0.11	4252.56	696.96	-64	60.58	S
	531	5317930	621095	0.30	4694.87	1214.10	1	9.31	N
	532	5317570	621721	0.08	2409.40	528.44	-23	310.78	N
	533	5314250	622880	0.17	4903.18	879.28	-16	0.42	N
	534	5313840	622212	0.29	5454.77	942.05	44	295.70	N
	535	5314770	622807	0.05	2610.71	538.49	-47	350.51	N
	536	5314590	623329	0.06	1806.42	348.64	-44	313.32	N
Whitehorse	537	5340910	598096	0.27	8546.95	1005.66	-55	353.54	S
	538	5339550	598426	0.12	7033.43	833.61	22	311.42	N
Three Fingers	539	5336060	596805	0.66	15571.20	1549.58	33	317.10	N
	540	5336670	597343	0.15	3666.26	961.02	47	356.73	N
	541	5337090	597641	0.16	7380.99	948.00	59	28.45	N
	542	5319350	610285	0.17	4583.62	1418.70	-16	354.16	N
	543	5312130	622569	0.05	1598.75	436.43	-51	90.38	N
	544	5312570	622689	0.04	1543.16	390.90	-60	106.68	S
	545	5313210	622544	0.07	2649.71	482.16	-25	74.13	N
Columbia	546	5313440	623287	0.77	6487.49	1659.59	-15	149.07	N
	547	5314140	623843	0.09	2275.12	406.40	-10	230.16	N
	548	5313580	624184	0.06	2382.77	487.88	-43	262.11	N
	549	5313440	624405	0.08	2266.70	479.54	-20	122.29	N
	550	5313860	625605	0.14	3502.33	673.12	41	85.59	N
	551	5314380	626159	0.05	1923.22	435.67	-52	21.96	N
	552	5271830	637079	0.09	2680.49	725.10	-6	353.78	N
Lynch	553	5270060	636790	0.51	8197.71	1108.78	-43	8.98	S
	554	5270550	636295	0.03	1557.84	346.18	-67	323.36	S

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	555	5270100	635630	0.22	8754.23	1453.15	-27	1.17	N
	556	5270350	634594	0.62	15070.70	1306.01	-23	32.46	N
	557	5270720	633866	0.09	3376.97	559.91	-54	330.21	S
Hinman	558	5270160	633384	0.58	21140.70	1573.33	-56	332.38	S
	559	5268380	628598	0.10	3251.30	568.42	-5	350.93	N
	560	5269210	631203	0.14	8254.96	1002.69	37	4.44	N
	561	5263980	628819	0.34	5857.82	872.08	-33	42.95	S
	562	5264710	629244	0.11	3728.78	824.94	9	323.25	N
	563	5265070	630648	0.05	1898.66	405.49	-48	347.84	N
	564	5262970	628369	0.26	11880.20	1448.28	159	261.79	G
	565	5265200	630113	0.16	6051.23	1057.56	57	359.47	N
	566	5260090	627087	0.01	564.38	200.34	-90	27.37	S
	567	5259650	627279	0.11	8079.51	944.66	-43	53.93	N
	568	5260830	628130	0.16	7307.50	799.13	-19	109.49	N
	569	5261760	628795	0.06	3129.39	1170.69	-39	127.91	N
	570	5261540	628371	0.20	9003.84	1107.60	0	93.63	N
	571	5262660	629096	0.29	6637.47	923.39	-28	124.59	N
	572	5263220	629524	0.14	2710.88	469.82	39	60.71	N
	573	5263440	628922	0.21	3058.65	738.18	5	31.82	N
	574	5263900	629921	0.07	2936.35	438.46	-34	142.52	N
	575	5265650	631495	0.08	4108.93	489.74	-17	51.79	N
	576	5269310	637842	0.08	5837.25	620.31	-19	104.64	N
	577	5269730	637559	0.53	15846.50	1256.93	6	42.28	N
	578	5268900	638233	0.14	3699.27	588.62	-32	46.05	N
	579	5271810	637617	0.05	3232.51	486.44	-55	70.67	N
	580	5268940	637762	0.08	3549.62	669.01	-22	89.25	N
	581	5260010	666928	0.05	2206.14	336.50	-50	26.64	N
	582	5261560	664875	0.08	3298.81	443.50	-59	354.41	S
Snow Creek 1	583	5259640	665300	0.01	584.63	217.57	-97	108.06	S
Snow Creek 2	584	5259930	664680	0.13	6015.41	699.14	33	37.68	N
Snow Creek 3	585	5260240	664193	0.10	6087.79	870.29	3	21.36	N
Snow Creek 4	586	5260260	663785	0.02	1129.85	220.31	-76	61.09	S
Snow Creek 5	587	5260620	663672	0.14	4808.75	719.33	-30	48.48	N
Snow Creek 6	588	5260680	662869	0.08	3294.04	1019.12	-17	323.18	N
Snow Creek 7	589	5260760	662657	0.06	1897.29	605.51	-39	28.84	N
	590	5259970	661246	0.07	3123.99	486.63	-32	354.90	N
	591	5260090	659008	0.10	3315.47	818.69	-3	6.27	N
	592	5260220	658542	0.07	1812.70	506.65	-31	19.69	N
	593	5260590	658056	0.14	3593.09	629.81	42	5.75	N
	594	5260680	657591	0.07	2428.44	361.09	-34	28.13	N
	595	5285040	655278	0.11	8811.04	1015.55	11	79.26	N
	596	5311500	644980	0.02	1240.07	242.23	-84	9.33	S
	597	5314350	649967	0.08	4353.40	776.12	-17	346.12	N
	598	5314260	649376	0.04	1464.51	522.16	-62	358.99	S

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	599	5313470	648143	0.03	2252.15	366.54	-66	336.93	S
	600	5312570	646849	0.05	2095.10	719.94	-49	339.06	N
	601	5319200	642662	0.04	2575.10	382.11	-64	349.18	S
	602	5319120	641973	0.05	3021.14	395.00	-47	9.64	N
	603	5319030	641472	0.17	6201.59	735.84	73	347.46	N
	604	5319040	640915	0.04	2151.45	445.57	-59	334.98	S
White River	605	5324560	641914	1.00	15658.50	1832.23	-17	199.15	N
	606	5324070	642518	0.13	5433.33	715.26	-57	65.74	S
	607	5324980	643307	0.20	5664.99	747.13	-34	82.48	N
	608	5325980	645136	0.03	1031.51	341.38	-67	304.87	S
Clark	609	5323710	652692	0.99	13260.00	1965.72	24	34.13	N
	610	5324440	652445	0.09	5636.00	622.91	-15	78.79	N
Richardson	611	5324430	651305	1.24	16229.30	2046.98	-12	33.08	N
	612	5325290	651265	0.04	1586.43	538.34	-55	17.15	N
	613	5325330	650942	0.05	2676.19	381.06	-53	64.46	N
Pilz	614	5325560	650431	0.63	9275.96	1454.81	-9	53.26	N
Butterfly	615	5325960	649133	1.29	16708.10	1822.29	-8	0.47	N
	616	5326550	648154	0.21	4457.48	849.80	112	54.40	N
	617	5328480	655223	0.12	3060.29	526.41	18	276.31	N
	618	5329300	655191	0.08	2327.36	467.87	-20	354.35	N
	619	5325630	656269	0.15	6456.21	726.50	53	65.02	N
	620	5328730	655938	0.20	7223.22	964.89	95	41.39	N
	621	5326330	655662	0.36	11414.30	1945.10	21	35.97	N
	622	5336910	657542	0.07	3857.28	1013.14	-27	101.32	N
	623	5332780	663348	0.09	6185.48	827.39	-11	40.22	N
	624	5329640	666185	0.04	2306.44	539.87	-55	0.02	N
	625	5329640	665987	0.05	2111.56	532.44	-45	22.53	N
	626	5330150	665402	0.06	2970.08	576.08	-44	25.75	N
	627	5330260	664434	0.06	3915.44	624.84	-45	27.27	N
	628	5331470	663950	0.05	2567.74	427.36	-47	35.75	N
Entiat 1	629	5334220	664666	0.03	1572.97	437.08	-67	20.26	S
Entiat 2	630	5334210	664189	0.24	3028.75	615.03	22	3.89	N
Entiat 5	631	5336050	663106	0.10	2786.28	656.78	4	137.34	N
Entiat 3	632	5334420	663572	0.21	4813.39	971.86	4	20.10	N
Entiat 4	633	5335140	663439	0.23	7079.91	895.95	-22	65.65	N
	634	5333700	674456	0.02	2241.38	469.10	-76	4.55	S
	635	5330340	678302	0.09	3702.58	772.85	-57	26.10	S
	636	5329080	680933	0.02	1098.13	385.68	-79	68.44	S
	637	5336890	663769	0.14	2497.71	632.19	-28	43.95	N
	638	5337740	663843	0.12	5040.79	731.71	-42	44.46	N
	639	5338970	663596	0.04	1652.01	389.92	-64	5.82	S
	640	5337140	662985	0.09	3122.45	589.09	-14	339.51	N
	641	5335730	662066	0.16	6690.06	901.27	62	339.63	N
	642	5338770	660259	0.03	1975.02	436.50	-68	59.76	S

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	643	5339270	659938	0.14	2259.41	492.21	36	81.34	N
	644	5340290	660827	0.00	452.87	146.27	-96	38.23	S
	645	5340100	660591	0.04	2422.52	419.86	-59	9.03	S
	646	5339890	660185	0.08	4469.19	669.57	-16	8.59	N
	647	5338680	658996	0.04	1099.73	410.75	-64	20.66	S
	648	5337460	657076	0.10	4437.61	662.13	4	335.69	N
Lyman	649	5337450	656390	0.27	6523.94	900.71	-47	11.71	S
	650	5337170	655758	0.26	7052.18	915.03	-14	45.26	N
	651	5343080	656124	0.10	7877.06	830.19	3	105.75	N
Hanging	652	5338310	655297	0.09	3084.87	564.17	-11	29.00	N
Isella	653	5344500	658237	0.37	6734.01	1083.52	-38	149.04	S
Mary Green	654	5344870	659250	0.74	10714.40	1954.02	-7	84.98	N
	655	5345590	659383	0.08	3506.46	655.07	-20	99.54	N
	656	5345950	659440	0.03	3102.21	362.15	-69	63.11	S
Company	657	5345910	658112	1.00	16830.90	1867.00	-52	32.91	S
	658	5345320	662503	0.19	5069.73	737.14	-4	68.36	N
	659	5349690	665997	0.07	4632.10	709.60	-29	29.30	N
	660	5351190	659040	0.05	2311.51	474.41	-55	18.65	N
Dark	661	5347250	656899	0.59	11445.00	1384.06	-47	358.98	S
Grant	662	5343560	656045	0.26	7566.06	1151.58	-12	5.27	N
	663	5342100	654966	0.01	738.52	234.36	-92	309.78	S
	664	5347650	651295	0.03	2852.01	351.10	-72	8.79	S
	665	5346860	649698	0.32	10137.00	1401.15	6	29.40	N
	666	5345780	650408	0.08	3302.27	608.10	-24	107.09	N
	667	5351170	648395	0.25	5734.85	742.06	-18	132.43	N
	668	5353140	651395	0.08	3422.91	830.24	-22	24.84	N
	669	5352950	649858	0.03	2546.49	511.65	-65	351.04	S
Blue	670	5352470	648950	0.27	6623.89	754.27	-9	51.95	N
	671	5353510	648419	0.01	1190.81	292.99	-95	309.79	S
	672	5352810	648463	0.10	4951.83	567.46	-1	304.03	N
	673	5352440	648508	0.04	2358.29	309.09	-62	254.82	S
Chickamin	674	5352670	647078	4.27	32537.30	3484.12	-9	20.98	N
Dana	675	5353300	644808	1.45	13470.40	1691.23	-10	2.15	N
	676	5353750	643604	0.79	12158.20	1478.80	-12	54.64	N
	677	5354960	643167	0.05	2880.64	316.31	-49	74.03	N
	678	5355410	643251	0.06	3946.90	555.15	-43	95.06	N
	679	5356090	643634	0.03	1982.15	406.38	-65	75.26	S
	680	5356190	644495	0.04	1419.09	479.22	-64	249.51	S
	681	5357210	645274	0.07	2792.18	696.13	-34	126.30	N
	682	5357580	645904	0.09	2196.61	522.30	-54	128.87	S
	683	5357880	646214	0.10	3992.40	883.53	-50	109.50	S
	684	5358540	646357	0.25	7444.12	808.35	-18	82.30	N
	685	5359670	647295	0.01	692.19	210.70	-90	45.32	S
	686	5359230	646537	0.02	1227.85	231.98	-82	349.99	S

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	687	5358990	646216	0.12	3981.17	584.51	-38	25.07	N
Le Conte	688	5358580	645416	1.57	12752.40	2225.34	-22	348.47	S
	689	5360260	643954	0.21	8709.04	1209.93	-31	65.95	N
	690	5362890	643577	0.03	1361.52	320.40	-74	62.95	S
	691	5363720	644102	0.13	5579.06	717.85	-36	168.85	N
	692	5363360	645702	0.19	5561.37	620.89	-7	117.91	N
	693	5363530	646735	0.05	1991.63	387.08	-54	115.74	N
	694	5363960	646584	0.09	4650.76	982.66	-12	40.37	N
	695	5363980	646077	0.21	3939.81	891.16	-30	353.32	N
Spider	696	5364250	645245	0.30	6886.28	1020.24	-1	22.26	N
	697	5364600	644710	0.03	1154.81	410.44	-66	24.43	S
	698	5364930	644818	0.05	1573.92	358.41	-49	60.17	N
	699	5364890	645362	0.10	2288.74	487.61	-2	46.69	N
	700	5364910	646153	0.10	3250.81	1044.40	0	44.75	N
	701	5364800	647407	0.04	852.17	230.44	-62	35.36	S
	702	5365920	644934	0.01	648.98	221.93	-91	151.38	S
	703	5366060	645816	0.02	1660.34	346.12	-75	106.26	S
	704	5366260	646044	0.10	4165.37	1113.86	4	118.29	N
	705	5366540	649334	0.10	3709.82	815.62	3	347.08	N
S	706	5366450	645484	0.26	7370.20	835.80	-36	38.86	S
	707	5367180	645971	0.16	3577.78	1172.57	-22	61.80	N
	708	5367990	646147	0.07	2106.25	619.67	-34	132.21	N
	709	5367810	645463	0.03	2091.98	359.94	-70	155.97	S
	710	5367540	645317	0.08	2566.41	408.92	-23	106.11	N
Yawning	711	5368230	645001	0.22	7147.74	1326.28	9	13.24	N
	712	5368170	644357	0.09	2739.51	571.48	-12	348.06	N
	713	5368590	643792	0.31	7174.79	1244.94	3	37.33	N
Sahale	714	5372320	644699	0.22	5135.53	744.85	11	171.39	N
Davenport	715	5372810	645593	0.44	8902.38	1311.24	11	139.45	N
	716	5371880	647799	0.03	1654.06	358.78	-68	280.25	S
	717	5371420	648420	0.12	3879.28	827.49	18	288.73	N
	718	5370890	648486	0.06	3989.56	578.94	-44	191.88	N
	719	5370690	649621	0.03	1451.91	378.06	-73	188.23	S
	720	5370480	650314	0.05	1665.31	476.31	-48	41.56	N
	721	5370970	650209	0.04	1998.78	418.29	-57	34.03	N
	722	5371750	649202	0.06	2776.09	506.00	-41	33.17	N
	723	5372080	649380	0.03	909.48	293.29	-73	200.79	S
	724	5372000	648499	0.26	4315.96	792.32	-12	56.70	N
Buckner 1	725	5372700	648085	0.29	6565.63	960.08	-3	120.83	N
Buckner 2	726	5373320	648490	0.26	7497.00	790.90	-15	113.88	N
	727	5372600	652421	0.02	2547.15	495.23	-77	179.78	S
	728	5372150	653775	0.05	2738.64	374.30	-50	269.78	N
	729	5371880	654062	0.04	1630.90	401.89	-60	284.37	S
	730	5373990	665827	0.01	628.38	181.92	-90	64.44	S

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	731	5373250	665877	0.02	998.65	244.28	-83	71.18	S
Lyall	732	5373000	666547	0.07	4260.97	596.41	-77	12.48	S
	733	5373010	667404	0.02	766.34	164.18	-83	33.08	S
Sandalee 5	734	5363790	665708	0.01	1050.71	332.48	-88	2.34	S
Sandalee 4	735	5363780	665232	0.02	1025.25	230.96	-94	18.17	S
Sandalee 3	736	5363890	664666	0.11	4784.85	562.88	-43	12.36	N
Sandalee 2	737	5364110	663963	0.11	3178.97	479.91	-46	3.28	N
Sandalee 1	738	5364140	663502	0.24	5312.63	822.64	138	14.62	G
	739	5364240	662962	0.16	4987.74	527.80	55	31.62	N
	740	5364150	662458	0.02	672.81	197.36	-84	288.32	S
Deming	741	5401590	585105	4.53	20622.80	4620.42	1	218.65	N

Table A2 Hypsometric and Surficial Statistics for Composite A.D. 2006 DEM.
Table is continued through to page 67.

Glacier ID	Data Points	Mean Elevation (m)	Median Elevation (m)	Min Elevation (m)	Max Elevation (m)	Range of Elevation (m)	Standard Deviation of Elevation (m)	Skewness	Kurtosis	ELA	HI	AABR	Mean Slope (degrees)	Slope Accumulation Proxy
0	14170	2127.19	2145.0	1668	2601	933	203.00	0.00	1.98	2220	0.49	0.49	22.70	649
1	10088	2236.60	2261.0	1711	2614	903	186.56	-0.32	2.29	2321	0.58	0.48	24.02	686
2	548	1703.08	1701.0	1554	1843	289	59.41	0.03	2.31	1723	0.52	0.68	28.39	417
3	9439	1805.09	1794.0	1377	2369	992	240.06	0.19	1.88	1878	0.43	0.75	32.92	618
4	5898	1738.38	1780.0	1168	2547	1379	353.77	0.09	2.09	1844	0.41	0.71	33.04	417
5	23388	2225.40	2228.0	1301	3274	1973	384.78	0.07	2.80	2336	0.47	0.74	24.65	280
6	17674	2266.60	2223.0	1472	3270	1798	375.64	0.73	3.21	2299	0.44	1.20	23.82	345
7	190	2074.10	2070.0	1931	2164	233	48.18	-0.24	2.61	2086	0.61	0.87	28.59	337
8	4982	2019.00	2031.0	1776	2213	437	92.53	-0.39	2.16	2069	0.56	0.37	22.48	221
9	3809	2136.99	2101.0	1811	2583	772	200.83	0.38	1.94	2170	0.42	1.03	25.99	305
10	25101	2223.48	2199.0	1602	3060	1458	294.75	0.38	2.59	2278	0.43	0.96	22.23	427
11	7886	2196.31	2121.5	1761	3044	1283	287.59	0.95	3.07	2186	0.34	1.64	26.79	487
12	14893	2175.36	2129.0	1497	3094	1597	347.42	0.37	2.40	2229	0.42	1.04	25.59	505
13	24289	2168.98	2172.0	1188	3230	2042	434.30	0.05	2.27	2275	0.48	0.83	27.10	464
14	6660	1729.64	1740.0	1204	2117	913	201.85	-0.33	2.32	1803	0.58	0.61	24.66	373
15	15896	2074.87	2060.0	1385	2929	1544	270.14	0.22	3.23	2132	0.45	0.88	24.03	373
16	4309	1763.38	1769.0	1533	2010	477	102.42	0.05	2.22	1791	0.48	0.78	22.29	369
17	923	1529.42	1536.0	1384	1689	305	72.12	0.11	1.97	1555	0.48	0.65	26.37	390
18	994	1732.99	1733.5	1571	1885	314	70.95	0.09	2.06	1755	0.52	0.73	29.56	390
19	1368	1510.70	1491.0	1352	1814	462	92.32	1.19	4.23	1511	0.34	1.51	29.11	373
20	1109	1641.60	1643.0	1514	1719	205	43.10	-0.30	2.39	1656	0.62	0.66	20.41	360
21	1404	1598.97	1624.0	1402	1744	342	101.58	-0.32	1.60	1665	0.58	0.27	20.37	369
22	633	1613.05	1621.0	1505	1692	187	34.16	-0.41	2.39	1630	0.58	0.45	22.63	484
23	4297	1930.76	1775.0	1465	2504	1039	316.39	0.18	1.28	2150	0.45	0.30	27.57	548
24	518	1841.95	1840.0	1715	2055	340	61.46	0.53	3.37	1857	0.37	0.82	28.48	629
25	562	2219.19	2231.0	2061	2319	258	59.32	-0.48	2.28	2244	0.61	0.50	31.31	629
26	1172	1974.42	1978.0	1834	2089	255	59.43	-0.14	2.16	1993	0.55	0.71	30.57	686
27	326	1809.30	1809.0	1716	1899	183	38.62	-0.06	2.53	1820	0.51	0.81	27.21	649
28	4542	1764.49	1766.0	1563	2013	450	77.45	0.11	2.81	1785	0.45	0.78	22.23	68
29	2599	1714.47	1724.0	1520	1900	380	80.32	-0.26	2.33	1745	0.51	0.57	26.29	119
30	1938	1920.61	1936.0	1614	2258	644	110.68	0.12	3.45	1963	0.48	0.54	28.28	287
31	632	2161.33	2141.0	1924	2452	528	109.98	0.50	2.61	2176	0.45	1.09	45.08	351
32	460	2296.03	2310.0	2147	2394	247	59.44	-0.53	2.38	2323	0.60	0.46	40.75	351
33	8322	2152.12	2152.5	1838	2422	584	84.90	0.11	3.81	2170	0.54	0.87	22.01	916
34	2120	1851.26	1854.0	1570	2203	633	124.69	0.16	2.71	1883	0.44	0.80	33.16	418
35	471	1924.82	1906.0	1746	2181	435	87.69	0.33	2.01	1939	0.41	1.04	39.50	465
36	1665	2377.41	2434.0	1962	2604	642	164.58	-0.76	2.35	2472	0.65	0.27	32.54	465
37	358	1958.79	1978.0	1753	2104	351	91.64	-0.49	2.20	1995	0.59	0.55	32.58	585
38	3361	1958.46	1948.0	1787	2227	440	107.86	0.22	1.92	1993	0.39	0.73	21.17	1350
39	16022	2120.62	2131.0	1642	2457	815	188.01	-0.33	2.14	2219	0.59	0.40	21.15	1260
40	13370	1995.78	1998.0	1438	2415	977	186.82	-0.20	2.69	2046	0.57	0.78	24.12	773
41	1616	1909.72	1903.0	1825	2054	229	47.04	0.96	3.93	1913	0.37	1.28	16.94	819
42	4848	2140.35	2150.0	1826	2297	471	102.76	-0.64	2.89	2184	0.67	0.51	23.80	859
43	1250	1937.89	1937.0	1697	2139	442	99.54	-0.12	2.14	1971	0.55	0.68	36.14	776
44	27742	2161.54	2171.0	1744	2630	886	152.25	-0.08	2.61	2211	0.47	0.67	25.20	964
45	7003	2089.65	2099.0	1602	2484	882	179.80	-0.27	2.25	2163	0.55	0.55	30.60	849
46	2071	1906.04	1934.0	1576	2118	542	108.44	-0.88	2.94	1959	0.61	0.38	22.09	1278
47	21967	2231.14	2258.0	1717	2677	960	169.33	-0.24	2.44	2294	0.54	0.58	22.45	941
48	21307	2127.81	2201.0	1455	2520	1065	254.37	-1.09	3.34	2251	0.63	0.35	27.59	926
49	8870	2247.47	2273.0	1830	2497	667	141.09	-0.54	2.43	2311	0.63	0.46	26.18	986
50	6390	2166.69	2222.0	1727	2424	697	171.29	-0.76	2.39	2257	0.63	0.33	20.07	1118
51	3937	2050.34	2100.0	1802	2393	591	179.22	-0.05	1.47	2152	0.42	0.37	23.57	1161
52	3825	2261.94	2257.0	1885	2593	708	124.89	0.13	3.16	2284	0.53	0.98	26.32	1095
53	549	2247.95	2256.0	2132	2336	204	50.05	-0.45	2.21	2269	0.57	0.51	26.67	964
54	1191	2153.76	2151.0	2048	2266	218	44.86	0.14	2.58	2164	0.49	0.87	20.82	928
55	309	2147.02	2148.0	2037	2229	192	36.45	-0.26	2.82	2159	0.57	0.68	25.19	895
56	123	2038.05	2036.0	1990	2089	99	24.30	0.16	2.12	2045	0.49	0.77	23.43	831

Glacier ID	Data Points	Mean Elevation (m)	Median Elevation (m)	Min Elevation (m)	Max Elevation (m)	Range of Elevation (m)	Standard Deviation of Elevation (m)	Skewness	Kurtosis	ELA	HI	AABR	Mean Slope (degrees)	Slope Accumulation Proxy
57	4057	1841.65	1847.0	1460	2225	765	130.38	-0.08	2.93	1883	0.50	0.68	31.88	311
58	746	1902.72	1870.0	1686	2201	515	132.36	0.70	2.46	1890	0.42	1.91	38.54	311
59	1494	1650.39	1643.0	1487	1935	448	77.66	0.45	2.95	1666	0.36	0.94	28.40	406
60	2122	2043.41	2058.0	1795	2201	406	76.39	-0.66	3.11	2075	0.61	0.50	26.22	247
61	234	1871.48	1838.5	1818	2054	236	55.97	1.00	2.92	1855	0.23	3.26	28.67	436
62	415	2033.33	2042.0	1913	2115	202	40.94	-0.46	2.28	2052	0.60	0.46	18.40	253
63	395	2065.56	2070.0	1957	2132	175	28.96	-0.85	4.61	2075	0.62	0.63	17.21	247
64	149	1613.93	1602.0	1554	1721	167	36.39	0.58	2.77	1634	0.36	0.41	21.16	481
65	110	1446.44	1443.5	1412	1514	102	23.68	0.91	3.39	1447	0.34	1.58	21.77	481
66	68	1743.66	1736.5	1700	1818	118	28.47	0.93	2.99	1742	0.37	1.76	34.30	481
67	71	1707.83	1705.0	1684	1752	68	16.16	0.57	2.44	1711	0.35	0.97	29.50	481
68	31	1851.94	1840.0	1804	1904	100	26.36	0.61	2.22	1849	0.48	2.08	35.76	367
69	570	2024.64	2019.0	1884	2200	316	66.91	0.26	2.29	2038	0.45	0.94	32.09	367
70	80	2125.26	2144.0	1995	2177	182	51.73	-1.05	3.02	2159	0.72	0.17	40.63	311
71	396	1581.56	1579.5	1330	1834	504	146.36	-0.05	1.78	1627	0.50	0.73	33.14	406
72	63	1986.16	1989.0	1950	2017	67	17.90	-0.15	1.74	1995	0.54	0.46	24.27	517
73	194	1486.45	1473.5	1426	1627	201	43.01	0.72	2.80	1489	0.30	1.35	26.22	466
74	38	1838.26	1837.5	1790	1886	96	22.81	-0.02	2.67	1841	0.50	1.13	33.22	575
75	126	1898.33	1895.5	1829	1980	151	38.77	0.21	1.92	1908	0.46	0.86	47.52	575
76	230	1399.99	1395.0	1353	1497	144	31.15	0.92	3.59	1401	0.33	1.40	25.08	583
77	17	1890.76	1891.0	1877	1901	24	6.16	-0.41	2.65	1892	0.57	0.86	23.62	575
78	369	1832.10	1831.0	1736	1939	203	44.49	0.24	2.69	1840	0.47	1.03	29.50	500
79	196	1885.24	1883.0	1788	1986	198	36.62	-0.09	3.04	1894	0.49	0.83	34.04	743
80	312	1930.09	1927.5	1806	2048	242	49.72	0.04	2.73	1946	0.51	0.69	26.58	743
81	170	1903.54	1889.0	1790	2041	251	69.45	0.20	1.64	1918	0.45	0.95	32.17	661
82	77	1883.25	1867.0	1834	1972	138	41.28	0.79	2.16	1877	0.36	2.15	30.77	661
83	129	1921.47	1923.0	1841	2012	171	42.32	-0.12	2.05	1932	0.47	0.84	25.48	579
84	113	1877.67	1887.0	1766	1964	198	55.66	-0.47	2.13	1898	0.56	0.60	33.51	583
85	118	1918.14	1922.0	1859	1975	116	28.99	-0.31	2.04	1933	0.51	0.45	28.50	743
86	548	1927.25	1913.0	1811	2076	265	60.63	0.48	2.33	1925	0.44	1.66	29.55	743
87	257	2091.43	2095.0	1967	2184	217	51.89	-0.36	2.49	2108	0.57	0.67	30.57	763
88	141	2103.77	2087.0	2031	2210	179	44.81	0.81	2.62	2097	0.41	2.22	30.87	763
89	232	1947.94	1946.0	1868	2047	179	49.15	0.08	1.89	1965	0.45	0.67	26.99	743
90	125	1923.90	1928.0	1852	2036	184	39.73	0.23	2.46	1939	0.39	0.58	30.57	743
91	130	2047.09	2045.5	1974	2122	148	36.33	-0.05	2.44	2054	0.49	0.94	32.70	741
92	132	1816.82	1831.5	1662	1913	251	57.87	-1.14	3.68	1837	0.62	0.52	47.49	546
93	147	1769.76	1776.0	1667	1861	194	49.08	-0.34	2.48	1782	0.53	0.82	39.16	546
94	59	1451.19	1440.0	1390	1518	128	35.57	0.27	1.76	1461	0.48	0.85	27.69	598
95	367	2382.78	2381.0	2301	2467	166	48.80	-0.07	1.63	2403	0.49	0.57	22.68	1111
96	257	2106.37	2090.0	2025	2257	232	51.74	1.30	3.72	2093	0.35	3.55	32.08	973
97	22	2103.14	2104.0	2076	2123	47	12.67	-0.38	2.34	2106	0.58	0.83	30.57	883
98	434	2312.43	2319.5	2100	2494	394	96.98	-0.33	2.14	2350	0.54	0.58	35.86	933
99	457	2125.85	2123.0	2029	2304	275	60.66	0.44	2.54	2147	0.35	0.66	32.00	852
100	4490	2060.77	2050.0	1747	2543	796	122.38	0.78	4.02	2073	0.39	1.17	28.38	815
101	1630	2066.90	2123.0	1611	2360	749	193.30	-0.63	2.33	2161	0.61	0.40	32.71	815
102	875	2111.40	2100.0	1839	2399	560	119.77	0.38	3.10	2119	0.49	1.27	35.45	775
103	582	1929.39	1940.5	1691	2161	470	107.44	-0.12	2.23	1959	0.51	0.77	34.17	765
104	197	2330.86	2339.0	2197	2412	215	36.73	-0.37	3.14	2346	0.62	0.52	32.33	916
105	253	2262.41	2258.0	2154	2370	216	48.12	-0.12	2.23	2279	0.50	0.66	26.24	916
106	434	1764.14	1735.5	1550	2044	494	129.42	0.23	1.84	1792	0.43	0.93	41.23	955
107	773	1869.70	1869.0	1709	2071	362	74.67	0.31	2.87	1883	0.44	0.96	36.63	955
108	445	1967.77	1969.0	1846	2055	209	49.82	-0.37	2.26	1985	0.58	0.66	22.11	635
109	218	1656.52	1651.5	1560	1792	232	58.85	0.44	2.32	1665	0.42	1.06	28.46	604
110	987	1858.67	1835.0	1612	2216	604	121.73	0.51	2.42	1869	0.41	1.23	35.52	718
111	592	1716.73	1715.0	1597	1866	269	60.83	0.29	2.38	1731	0.45	0.86	31.10	718
112	1828	1663.43	1664.0	1489	1920	431	75.85	0.23	3.03	1681	0.40	0.85	29.33	691
113	228	1616.47	1610.0	1539	1718	179	36.92	0.50	2.61	1618	0.43	1.36	27.37	691
114	68	1629.38	1624.0	1573	1686	113	28.39	0.00	2.29	1633	0.50	1.12	28.45	631
115	62	1741.60	1746.0	1672	1783	111	32.22	-0.65	2.45	1757	0.63	0.42	26.46	650
116	21	1293.33	1289.0	1270	1320	50	16.53	0.30	1.55	1296	0.47	1.15	24.49	580
117	244	1728.71	1721.5	1627	1837	210	46.54	0.28	2.15	1737	0.48	1.00	28.40	591
118	1037	1828.51	1810.0	1658	2041	383	80.54	0.60	2.66	1835	0.45	1.23	24.25	591
119	377	1739.88	1740.0	1663	1827	164	36.69	0.00	2.03	1751	0.47	0.76	25.58	591
120	833	1720.12	1747.0	1517	1883	366	104.22	-0.40	1.76	1772	0.55	0.41	25.94	481
121	416	1894.47	1900.0	1775	1999	224	49.24	-0.43	2.53	1910	0.53	0.67	30.35	477
122	2352	1921.59	1925.0	1605	2129	524	97.63	-0.33	2.97	1950	0.60	0.73	26.33	591
123	195	1870.92	1865.0	1764	1970	206	51.56	0.06	2.03	1879	0.52	1.04	20.85	575
124	170	1856.88	1876.0	1733	1933	200	42.01	-0.79	2.88	1879	0.62	0.31	21.43	575

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125	212	1890.58	1892.0	1738	1979	241	46.06	-0.62	3.24	1907	0.63	0.60	27.89	575
126	317	1574.65	1574.0	1486	1721	235	64.08	0.34	1.89	1597	0.38	0.67	24.77	517
127	259	1671.65	1674.0	1581	1792	211	44.76	0.26	2.49	1682	0.43	0.86	30.25	517
128	516	1778.46	1760.5	1623	1992	369	84.26	0.61	2.60	1785	0.42	1.25	28.17	517
129	451	1941.85	1948.0	1845	2052	207	48.71	-0.03	2.21	1961	0.47	0.57	28.72	517
130	649	1758.96	1755.0	1627	1884	257	57.06	0.02	2.20	1771	0.51	0.92	26.97	372
131	192	1757.54	1757.5	1646	1874	228	45.29	0.19	3.08	1766	0.49	0.93	32.47	372
132	992	1848.40	1862.0	1532	2086	554	135.76	-0.51	2.50	1903	0.57	0.53	31.74	372
133	173	1759.77	1746.0	1665	1888	223	54.21	0.64	2.40	1760	0.42	1.53	43.18	326
134	160	1992.34	1987.5	1967	2040	73	16.80	1.00	3.28	1991	0.35	1.84	19.47	578
135	2128	1861.71	1864.5	1596	2084	488	93.80	-0.09	2.37	1888	0.54	0.76	25.05	585
136	2443	1712.01	1723.0	1453	1876	423	82.66	-0.59	2.78	1748	0.61	0.49	30.72	703
137	850	1691.33	1705.0	1474	1857	383	76.03	-0.53	2.64	1722	0.57	0.52	34.76	363
138	713	1561.26	1555.0	1433	1725	292	65.18	0.27	2.35	1573	0.44	0.99	29.11	351
139	827	1568.60	1571.0	1456	1676	220	44.76	-0.05	2.90	1577	0.51	0.91	26.91	349
140	1966	1671.70	1643.0	1455	1940	485	114.71	0.35	1.92	1697	0.45	0.92	24.57	392
141	1491	1608.54	1620.0	1417	1808	391	79.51	-0.10	2.43	1640	0.49	0.55	24.50	362
142	3142	1977.48	1990.0	1697	2218	521	113.83	-0.42	2.51	2021	0.54	0.57	26.05	321
143	1501	1983.81	1981.0	1588	2188	600	103.10	-0.44	3.96	2000	0.66	1.01	17.94	333
144	1241	2142.02	2137.0	2002	2336	334	74.92	0.58	2.76	2152	0.42	1.10	23.07	350
145	464	1905.70	1902.0	1772	2055	283	64.51	0.32	2.42	1922	0.47	0.83	24.35	321
146	2680	1952.08	1969.0	1748	2113	365	77.03	-0.56	2.47	1986	0.56	0.46	24.69	321
147	254	1961.48	1960.0	1902	2056	154	36.40	0.37	2.32	1971	0.39	0.87	26.14	321
148	3226	1733.82	1722.5	1481	1995	514	102.71	0.31	2.63	1742	0.49	1.24	22.49	360
149	998	1862.05	1854.5	1768	2006	238	54.44	0.44	2.50	1871	0.40	1.04	23.52	360
150	778	1674.90	1689.0	1364	1955	591	156.89	-0.11	1.88	1733	0.53	0.61	34.09	686
151	991	1841.31	1828.0	1698	2045	347	76.37	0.46	2.26	1853	0.41	1.06	27.91	585
152	640	1675.41	1672.0	1573	1802	229	41.85	0.33	2.98	1683	0.45	0.95	23.28	551
153	77	1609.04	1608.0	1583	1665	82	18.21	1.09	3.92	1609	0.32	1.66	22.57	578
154	316	1716.33	1722.0	1633	1809	176	30.24	-0.10	3.26	1725	0.47	0.76	17.62	578
155	283	1968.53	1966.0	1889	2039	150	33.26	0.03	2.55	1975	0.53	0.95	25.14	656
156	1111	1623.31	1606.0	1430	1946	516	112.15	0.99	3.54	1633	0.37	1.21	32.89	657
157	680	1759.88	1763.0	1506	2086	580	105.98	0.48	3.08	1786	0.44	0.82	40.12	846
158	105	1687.18	1721.0	1466	1777	311	80.99	-1.49	3.88	1725	0.71	0.24	41.13	776
159	2671	2118.21	2106.0	1868	2320	452	92.91	-0.06	2.12	2150	0.55	0.68	23.52	929
160	337	2144.72	2160.0	1964	2284	320	83.17	-0.41	2.03	2182	0.56	0.47	28.05	900
161	452	2206.41	2214.5	1987	2325	338	84.65	-1.12	3.68	2239	0.65	0.49	26.20	900
162	715	1974.76	2006.0	1762	2126	364	95.22	-0.46	1.93	2031	0.58	0.30	34.50	960
163	5518	1869.68	1839.0	1537	2279	742	158.63	0.39	2.37	1894	0.45	1.04	34.84	1053
164	475	1352.36	1353.0	1256	1586	330	65.25	0.63	3.46	1373	0.29	0.70	21.45	1053
165	1426	2096.79	2102.0	1895	2261	366	82.39	-0.22	2.11	2129	0.55	0.59	30.80	929
166	4351	1983.24	1975.0	1755	2249	494	86.69	0.30	3.57	1990	0.46	1.22	19.85	805
167	3015	2050.35	2061.0	1791	2201	410	81.48	-0.75	3.12	2088	0.63	0.44	23.90	817
168	2553	2197.58	2223.0	1776	2465	689	160.09	-0.55	2.50	2264	0.61	0.52	29.90	995
169	556	2120.15	2113.5	1957	2280	323	69.68	0.36	2.30	2130	0.51	1.09	30.96	1002
170	1678	1723.89	1711.0	1449	2080	631	118.55	0.65	3.31	1740	0.44	1.07	36.45	1016
171	1464	1834.07	1791.0	1589	2255	666	138.04	1.05	3.32	1821	0.37	1.93	30.22	1016
172	617	1766.19	1731.0	1562	2023	461	127.98	0.53	2.08	1773	0.44	1.32	41.90	898
173	681	1814.94	1813.0	1629	1993	364	71.28	0.11	2.58	1828	0.51	0.96	28.41	902
174	1079	1980.01	1982.0	1862	2079	217	49.63	-0.10	1.96	1996	0.54	0.70	26.50	884
175	1657	1695.72	1687.0	1545	1868	323	66.61	0.29	2.39	1709	0.47	0.94	30.65	932
176	203	1658.53	1657.0	1565	1740	175	41.42	-0.06	1.96	1677	0.53	0.53	25.89	950
177	326	1448.03	1446.5	1397	1578	181	35.98	0.82	3.60	1459	0.28	0.81	20.58	981
178	205	1733.87	1735.0	1669	1831	162	35.32	0.38	2.54	1747	0.40	0.67	27.84	826
179	676	1522.53	1507.0	1462	1817	355	57.07	2.49	11.53	1525	0.17	1.37	24.47	925
180	205	1360.96	1357.0	1327	1460	133	23.64	1.59	6.01	1362	0.26	1.38	22.31	677
181	368	1778.75	1782.0	1644	1912	268	50.03	-0.19	2.93	1791	0.50	0.80	32.57	781
182	454	1619.82	1610.0	1482	1855	373	82.92	0.91	3.52	1628	0.37	1.21	31.11	781
183	333	1947.96	1963.0	1743	2033	290	58.65	-1.09	4.14	1975	0.71	0.41	31.34	781
184	704	1783.25	1775.5	1703	1916	213	51.15	0.78	2.88	1789	0.38	1.17	20.43	828
185	361	1433.47	1435.0	1346	1556	210	50.27	0.03	1.86	1453	0.42	0.61	23.21	891
186	1195	1942.42	1931.0	1799	2181	382	100.61	0.55	2.12	1956	0.38	1.10	25.51	964
187	307	1911.48	1910.0	1811	1981	170	38.74	-0.22	1.91	1932	0.59	0.41	26.48	898
188	166	1911.88	1911.5	1819	1983	164	37.82	-0.07	2.24	1923	0.57	0.75	34.10	891
189	202	1703.39	1698.0	1643	1770	127	24.46	0.45	2.72	1703	0.48	1.55	21.21	891
190	215	1651.05	1661.0	1529	1773	244	62.19	-0.18	2.08	1675	0.50	0.57	28.76	886
191	602	1930.06	1929.0	1772	2104	332	70.93	0.26	2.34	1949	0.48	0.81	35.36	964
192	1074	1953.33	1927.0	1658	2275	617	153.89	0.13	1.86	2011	0.48	0.65	32.27	964

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193	4739	1887.57	1881.0	1600	2084	484	93.25	-0.06	2.36	1914	0.59	0.77	22.09	649
194	542	1941.87	1953.0	1858	2014	156	38.43	-0.63	2.22	1961	0.54	0.37	17.68	781
195	41	1759.88	1752.0	1745	1798	53	14.77	0.89	2.52	1757	0.28	2.52	25.22	891
196	308	2001.67	2007.0	1888	2059	171	34.39	-0.70	3.09	2018	0.66	0.43	26.25	781
197	547	1564.33	1557.0	1502	1707	205	42.08	0.76	3.17	1564	0.30	1.57	20.78	529
198	1007	1721.29	1721.0	1613	1832	219	51.34	-0.07	2.28	1736	0.49	0.76	23.30	529
199	2328	1788.32	1786.5	1660	1930	270	47.71	0.24	3.13	1799	0.48	0.86	18.45	728
200	436	2055.32	2046.0	1972	2129	157	43.31	0.18	1.72	2064	0.53	0.99	20.94	717
201	286	1696.81	1676.0	1631	1822	191	56.95	0.66	2.07	1694	0.34	1.69	22.11	572
202	279	1718.28	1732.0	1576	1818	242	72.43	-0.07	1.50	1752	0.59	0.51	18.61	718
203	4798	1914.52	1884.0	1718	2130	412	88.38	0.71	2.50	1907	0.48	1.88	18.10	718
204	735	1595.48	1595.0	1564	1648	84	11.52	0.50	4.72	1597	0.37	1.21	13.91	648
205	3640	1820.36	1806.0	1607	1993	386	72.85	0.35	2.70	1824	0.55	1.34	17.43	728
206	4404	1851.31	1870.0	1548	2098	550	125.16	-0.20	1.99	1902	0.55	0.55	21.73	728
207	623	1740.88	1736.0	1594	1872	278	68.72	0.08	2.30	1752	0.53	1.05	27.74	572
208	172	1753.06	1754.0	1671	1798	127	22.51	-0.60	3.98	1758	0.65	0.89	26.11	572
209	397	1839.72	1837.0	1755	1926	171	45.51	0.16	1.98	1848	0.50	1.02	22.76	728
210	447	1761.54	1780.0	1609	1848	239	60.67	-0.66	2.23	1793	0.64	0.36	24.54	718
211	1277	1846.05	1875.0	1670	2022	352	102.00	-0.15	1.75	1890	0.50	0.52	24.63	677
212	356	1856.11	1854.5	1805	1922	117	24.86	0.43	2.35	1863	0.44	0.81	24.28	826
213	198	1631.55	1630.0	1518	1727	209	47.14	-0.13	2.41	1644	0.54	0.79	29.72	871
214	1828	1748.08	1750.5	1582	1939	357	62.42	0.08	2.21	1770	0.47	0.66	27.07	727
215	444	1548.98	1548.0	1431	1685	254	56.15	0.37	2.59	1562	0.46	0.86	28.93	690
216	700	1545.57	1541.0	1428	1745	317	82.18	0.22	1.82	1574	0.37	0.68	29.74	690
217	25	1310.04	1309.0	1272	1354	82	22.67	0.03	2.10	1315	0.46	0.88	43.07	910
218	942	1774.14	1756.5	1525	1984	459	115.27	0.02	1.99	1808	0.54	0.77	32.20	954
219	1067	1785.92	1821.0	1453	2007	554	139.70	-0.51	2.12	1866	0.60	0.32	34.52	910
220	272	1468.24	1480.5	1318	1561	243	61.00	-0.96	3.15	1496	0.62	0.41	33.24	954
221	443	1504.24	1495.0	1425	1645	220	44.92	0.90	3.44	1507	0.36	1.30	24.84	998
222	796	1940.86	1942.0	1824	2028	204	47.62	-0.17	2.04	1957	0.57	0.68	24.58	902
223	406	1694.16	1695.0	1578	1811	233	46.65	-0.19	2.79	1707	0.50	0.75	32.53	938
224	24	1354.63	1351.0	1302	1437	135	37.36	0.41	2.19	1363	0.39	0.99	30.68	938
225	155	1851.11	1848.0	1760	1932	172	33.24	0.10	3.35	1854	0.53	1.20	30.22	989
226	3265	2046.70	2047.0	1845	2266	421	87.35	0.03	2.15	2076	0.48	0.68	24.42	1216
227	902	2094.86	2100.0	1938	2224	286	72.25	-0.07	1.84	2126	0.55	0.54	25.44	1131
228	406	1696.01	1687.0	1662	1771	109	21.81	1.52	4.66	1692	0.31	2.68	15.82	1216
229	819	2052.32	2056.0	1912	2193	281	69.40	0.05	1.99	2077	0.50	0.65	27.37	1131
230	1094	1849.25	1865.0	1584	2002	418	88.70	-0.55	2.51	1888	0.63	0.47	27.60	1143
231	963	1583.36	1578.0	1287	2002	715	178.84	0.34	2.08	1643	0.41	0.69	49.14	1143
232	486	1568.07	1566.0	1504	1646	142	32.79	0.27	2.21	1576	0.45	0.85	26.06	1111
233	405	2028.84	2031.0	1951	2119	168	38.96	0.12	2.20	2041	0.46	0.72	22.34	1222
234	454	1989.01	1994.5	1822	2099	277	59.37	-0.37	2.55	2011	0.60	0.61	23.22	1222
235	382	1488.42	1488.0	1391	1659	268	58.85	0.28	2.51	1507	0.36	0.71	27.28	1216
236	458	1372.52	1362.0	1256	1694	438	76.95	1.28	5.43	1381	0.27	1.15	36.03	1216
237	1463	1760.57	1753.0	1601	1998	397	86.84	0.34	2.48	1771	0.40	1.13	30.44	1131
238	889	2004.04	1999.0	1776	2207	431	82.74	0.23	2.30	2023	0.53	0.88	29.36	1217
239	428	2032.32	2041.0	1928	2111	183	49.54	-0.40	2.14	2053	0.57	0.54	20.52	1018
240	492	1748.58	1726.5	1615	1880	265	77.39	0.20	1.54	1774	0.50	0.73	40.06	831
241	1006	1960.99	1958.0	1821	2109	288	61.04	0.13	2.61	1971	0.49	1.00	27.54	836
242	269	1944.71	1939.0	1870	2055	185	38.81	0.54	2.88	1949	0.40	1.19	32.78	836
243	481	2010.20	2021.0	1810	2176	366	85.35	-0.26	2.38	2040	0.55	0.63	44.21	994
244	969	2020.40	2015.0	1848	2183	335	79.07	0.10	2.04	2038	0.51	0.89	37.76	986
245	1853	1970.56	1976.0	1681	2232	551	115.55	-0.25	2.44	2005	0.53	0.72	32.53	960
246	921	2093.62	2097.0	1916	2266	350	80.49	0.11	2.08	2118	0.51	0.73	25.65	749
247	1492	1755.69	1719.0	1573	2132	559	119.08	1.07	3.26	1741	0.33	2.09	32.52	750
248	352	1990.89	1988.0	1969	2061	92	14.91	0.95	4.13	1993	0.24	1.11	16.73	961
249	572	1975.31	1972.5	1801	2122	321	69.32	0.00	2.33	1994	0.54	0.80	37.54	875
250	271	2010.97	2017.0	1823	2220	397	110.14	0.19	1.78	2049	0.47	0.69	34.61	875
251	194	1909.03	1909.0	1808	2064	256	46.29	0.52	3.54	1918	0.39	0.92	33.68	875
252	603	1910.75	1916.0	1720	2143	423	97.57	0.04	1.86	1954	0.45	0.52	30.54	961
253	754	1945.30	1939.0	1754	2167	413	90.08	0.25	2.25	1968	0.46	0.84	31.86	961
254	765	2006.57	2000.0	1843	2155	312	64.30	0.12	2.71	2016	0.52	1.08	30.64	1039
255	2191	2273.18	2250.0	2153	2538	385	86.19	0.87	3.13	2276	0.31	1.40	20.16	916
256	1911	2104.71	2098.0	1918	2341	423	92.84	0.44	2.69	2126	0.44	0.87	28.97	982
257	370	2224.61	2227.0	2071	2353	282	55.75	-0.29	2.61	2245	0.54	0.60	28.04	982
258	147	1686.38	1683.0	1604	1772	168	39.42	0.14	2.32	1693	0.49	1.00	27.67	982
259	840	2081.62	2082.5	1826	2410	584	142.80	0.08	2.13	2116	0.44	0.84	33.56	919
260	1101	2225.73	2276.0	1886	2434	548	159.59	-0.56	1.94	2319	0.62	0.30	35.12	933

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261	893	2365.16	2377.0	2182	2485	303	68.04	-0.45	2.12	2394	0.60	0.51	29.12	883
262	2431	2182.28	2181.0	1941	2426	485	99.47	-0.04	2.35	2209	0.50	0.79	27.78	1126
263	1427	1997.25	1992.0	1668	2326	658	99.77	0.11	3.39	2014	0.50	0.98	41.13	1145
264	1210	2286.73	2278.0	2040	2547	507	127.97	0.14	2.17	2306	0.49	1.05	31.94	1126
265	485	2291.83	2263.0	2029	2563	534	146.90	0.32	1.97	2331	0.49	0.82	29.96	1194
266	247	2160.39	2146.0	2006	2337	331	71.23	0.65	2.98	2158	0.47	1.63	31.22	1007
267	1923	2371.74	2367.0	2105	2685	580	140.63	0.12	2.03	2406	0.46	0.85	31.88	1007
268	298	2387.97	2395.0	2275	2474	199	49.62	-0.45	2.44	2406	0.57	0.59	29.45	1007
269	699	2194.67	2185.0	1895	2400	505	79.15	-0.19	3.21	2209	0.59	0.97	32.92	1111
270	891	2307.29	2307.0	2160	2418	258	53.13	-0.03	2.04	2326	0.57	0.66	24.26	1146
271	460	2075.21	2077.0	1944	2199	255	54.25	-0.12	2.53	2094	0.51	0.63	45.29	933
272	352	1804.20	1774.0	1667	2024	357	101.39	0.43	1.72	1803	0.38	1.54	37.99	933
273	327	1593.67	1576.0	1473	1865	392	83.87	1.29	4.64	1592	0.31	1.60	27.73	980
274	348	1759.21	1738.0	1599	2049	450	85.38	1.13	4.00	1757	0.36	1.61	36.81	980
275	2200	2006.53	2012.0	1748	2262	514	107.44	-0.05	2.16	2042	0.50	0.68	28.63	980
276	269	2082.37	2095.0	1940	2184	244	62.67	-0.51	2.34	2109	0.58	0.50	23.93	1271
277	300	2099.23	2107.0	1875	2238	363	70.53	-0.71	3.34	2118	0.62	0.73	31.12	1540
278	372	2245.71	2259.0	2068	2364	296	76.28	-0.54	2.60	2271	0.60	0.64	32.94	982
279	1398	2199.86	2204.5	1978	2383	405	105.54	-0.04	1.83	2239	0.55	0.63	32.52	933
280	593	1989.66	1995.0	1796	2173	377	62.98	-0.14	3.29	2007	0.51	0.75	29.52	831
281	961	2035.11	2042.0	1885	2137	252	64.37	-0.27	1.82	2065	0.60	0.49	27.40	887
282	2310	2254.28	2249.0	2041	2423	382	83.86	-0.11	2.14	2283	0.56	0.67	25.59	1027
283	436	2107.46	2112.5	1946	2213	267	54.25	-0.56	3.20	2120	0.60	0.85	23.18	1003
284	754	2066.65	2067.0	1858	2199	341	59.55	-0.45	4.18	2077	0.61	0.98	21.87	1118
285	897	2125.44	2117.0	2025	2223	198	47.09	0.24	1.90	2134	0.51	1.00	23.32	1118
286	730	2069.18	2093.5	1827	2261	434	112.73	-0.46	2.16	2119	0.56	0.46	34.16	1222
287	190	1941.92	1928.0	1881	2047	166	50.00	0.62	2.02	1937	0.37	1.90	29.33	1121
288	1969	2181.12	2229.0	1716	2451	735	182.68	-0.97	2.89	2254	0.63	0.46	29.89	1222
289	251	2258.98	2257.0	2213	2323	110	23.76	0.23	2.12	2267	0.42	0.70	21.68	1160
290	892	2098.85	2081.5	1886	2385	499	116.19	0.43	2.38	2121	0.43	0.96	43.50	1187
291	248	2222.53	2230.5	2110	2325	215	55.02	-0.07	1.85	2242	0.52	0.64	27.28	1187
292	94	2371.10	2369.5	2313	2425	112	24.47	-0.03	2.37	2376	0.52	0.96	29.64	1187
293	377	1637.11	1625.0	1542	1864	322	72.67	1.11	3.66	1639	0.30	1.40	33.20	1139
294	1221	1985.80	2000.0	1758	2155	397	97.63	-0.36	2.17	2030	0.57	0.47	37.29	884
295	363	1831.58	1827.0	1667	2009	342	78.46	0.16	2.25	1845	0.48	1.00	32.75	940
296	3426	1950.59	1960.0	1656	2210	554	127.58	-0.25	2.13	1998	0.53	0.61	32.24	940
297	507	1829.52	1821.0	1698	1987	289	73.59	0.37	1.92	1842	0.46	1.05	24.35	940
298	697	1890.58	1900.0	1702	2045	343	67.57	-0.70	3.26	1915	0.55	0.56	27.03	1356
299	308	1694.88	1691.5	1566	1855	289	71.73	0.11	2.24	1711	0.45	0.89	36.31	1170
300	425	1823.90	1813.0	1710	1997	287	63.69	0.56	2.51	1830	0.40	1.25	31.96	1018
301	344	2130.33	2134.0	2003	2224	221	45.34	-0.32	2.86	2145	0.58	0.68	24.91	884
302	279	2138.21	2145.0	1986	2214	228	44.58	-0.79	3.83	2153	0.67	0.63	23.60	884
303	675	2193.38	2195.0	2002	2372	370	71.83	-0.11	2.46	2217	0.52	0.68	26.81	982
304	3197	2241.29	2255.0	1900	2478	578	118.48	-0.46	2.51	2286	0.59	0.56	25.95	965
305	2183	2177.84	2207.0	1853	2493	640	138.07	-0.53	2.57	2231	0.51	0.54	33.55	982
306	150	2221.42	2221.0	2030	2392	362	97.63	-0.11	2.09	2251	0.53	0.72	56.70	906
307	581	1931.76	1913.0	1726	2237	511	118.75	0.35	2.09	1956	0.40	0.94	40.80	776
308	1116	1969.13	1975.5	1845	2088	243	63.20	-0.14	1.90	1995	0.51	0.56	26.80	743
309	343	2042.74	2038.0	1920	2163	243	62.23	-0.16	2.29	2058	0.51	0.83	23.65	753
310	191	2038.15	2033.0	1952	2104	152	29.49	0.56	2.73	2039	0.57	1.41	26.42	794
311	21	1980.19	1976.0	1954	2005	51	16.08	0.10	1.66	1989	0.51	0.46	26.87	831
312	75	2124.84	2126.0	2019	2305	286	84.33	0.33	1.94	2146	0.37	0.84	42.68	1639
313	115	2259.31	2255.0	2132	2406	274	80.17	0.09	1.72	2286	0.46	0.73	43.55	1639
314	218	2144.18	2119.0	2057	2286	229	63.93	0.69	2.18	2136	0.38	2.05	39.25	1607
315	1316	2135.43	2138.0	1957	2375	418	76.13	0.00	3.00	2155	0.43	0.78	24.34	1802
316	72	2100.31	2103.5	2064	2116	52	11.55	-1.26	3.95	2105	0.70	0.41	21.80	1802
317	88	1985.30	1980.0	1952	2030	78	22.80	0.29	1.63	1992	0.43	0.79	29.88	1793
318	1426	2047.57	2027.5	1830	2462	632	141.62	0.93	3.35	2056	0.34	1.30	30.58	1551
319	6740	2243.55	2269.0	1778	2604	826	155.60	-0.63	2.77	2309	0.56	0.50	22.16	1551
320	669	2151.29	2150.0	1968	2317	349	73.65	-0.01	2.68	2165	0.53	0.95	26.20	1551
321	353	2159.48	2174.0	2062	2273	211	48.94	-0.30	2.07	2181	0.46	0.49	25.41	1716
322	128	2082.55	2057.5	2007	2232	225	67.60	0.51	1.81	2101	0.34	0.86	34.58	1232
323	248	2070.33	2082.0	1956	2196	240	63.24	-0.24	2.04	2100	0.48	0.47	48.11	1232
324	148	2181.33	2161.0	2101	2318	217	58.18	0.69	2.25	2189	0.37	1.12	38.80	1382
325	331	2352.57	2353.0	2270	2448	178	42.52	-0.03	2.05	2366	0.46	0.71	24.07	1382
326	225	2102.36	2100.0	2008	2215	207	50.05	0.32	2.35	2114	0.46	0.89	47.96	1409
327	85	2323.32	2330.0	2277	2381	104	29.37	-0.08	1.75	2336	0.45	0.57	21.63	1361
328	128	2053.40	2056.0	1991	2095	104	21.46	-0.34	2.66	2062	0.60	0.55	25.50	1440

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329	1999	2140.93	2127.0	1940	2450	510	105.85	0.54	2.76	2157	0.39	1.05	30.28	1478
330	3490	2245.53	2248.5	1971	2548	577	107.32	0.05	2.52	2273	0.48	0.80	28.45	1462
331	311	1960.19	1957.0	1884	2122	238	52.39	0.47	2.53	1979	0.32	0.65	29.96	1539
332	222	2161.68	2184.5	2017	2252	235	69.15	-0.60	2.12	2194	0.62	0.43	35.64	1478
333	59	2026.46	2029.0	1973	2065	92	22.71	-0.48	2.44	2035	0.58	0.59	47.03	1630
334	2863	2324.60	2311.0	2147	2719	572	91.85	0.85	4.12	2338	0.31	1.05	33.56	1460
335	486	2130.33	2118.0	2038	2296	258	55.27	0.98	3.51	2132	0.36	1.41	31.96	1462
336	434	2174.49	2171.0	2055	2314	259	56.00	0.24	2.52	2194	0.46	0.65	32.20	1401
337	1049	2168.85	2111.0	1954	2616	662	164.73	1.10	3.19	2143	0.32	2.29	36.74	1462
338	109	1965.50	1958.0	1851	2144	293	73.25	0.38	2.05	1991	0.39	0.69	33.91	1401
339	216	2136.35	2135.0	2052	2229	177	43.13	-0.05	1.97	2151	0.48	0.71	26.00	1383
340	116	2157.26	2158.0	2064	2197	133	25.61	-1.15	4.99	2164	0.70	0.76	23.63	1399
341	155	2136.77	2137.0	2077	2196	119	25.96	-0.29	2.50	2145	0.50	0.68	25.90	1399
342	184	2110.96	2109.0	2018	2259	241	51.52	0.19	2.52	2123	0.39	0.87	28.21	1383
343	1042	2036.39	2044.5	1807	2251	444	94.32	-0.20	2.21	2065	0.52	0.71	34.34	1568
344	331	2079.87	2090.0	1878	2243	365	99.50	-0.26	1.89	2122	0.55	0.55	50.95	1568
345	100	1864.02	1852.5	1827	1973	146	36.74	1.14	3.52	1859	0.25	2.14	32.65	1440
346	173	2157.72	2163.0	2046	2288	242	77.32	-0.04	1.48	2202	0.46	0.40	37.43	1440
347	103	1961.05	1964.0	1815	2059	244	57.17	-0.40	2.54	1983	0.60	0.57	56.62	1333
348	102	2156.64	2155.5	2079	2242	163	43.87	0.06	1.78	2173	0.48	0.63	43.40	1440
349	669	2222.80	2197.0	2026	2439	413	131.33	0.24	1.57	2259	0.48	0.82	40.09	1440
350	168	2217.33	2205.0	2079	2364	285	77.14	0.23	1.70	2241	0.49	0.76	53.21	1313
351	3729	2219.59	2215.0	1842	2571	729	145.28	0.15	2.61	2257	0.52	0.81	26.13	1267
352	928	2205.21	2202.0	2066	2369	303	62.70	0.05	2.43	2222	0.46	0.80	29.34	1226
353	1372	2114.87	2106.0	1935	2285	350	66.72	0.22	2.48	2126	0.51	1.02	28.52	1267
354	1804	2351.51	2356.0	2072	2681	609	167.37	0.11	1.84	2408	0.46	0.68	32.35	1284
355	4383	2425.71	2436.0	1996	2633	637	103.43	-0.70	3.83	2453	0.67	0.74	20.04	1248
356	808	2047.51	2075.0	1792	2271	479	141.69	-0.21	1.63	2123	0.53	0.39	34.73	1268
357	756	2182.28	2185.5	1992	2404	412	90.04	-0.05	2.18	2210	0.46	0.72	34.63	1284
358	438	2236.53	2242.5	2068	2414	346	76.47	-0.05	2.59	2256	0.49	0.78	36.67	1268
359	797	2135.63	2149.0	1919	2262	343	76.48	-0.58	2.63	2166	0.63	0.53	29.62	1268
360	342	2019.94	2007.5	1910	2187	277	63.18	0.85	2.99	2024	0.40	1.29	33.96	1043
361	106	2257.97	2260.0	2232	2289	57	9.81	-0.48	3.47	2262	0.46	0.52	14.89	1064
362	504	1915.43	1901.0	1800	2192	392	74.65	0.98	4.09	1920	0.29	1.32	35.42	994
363	714	2071.22	2057.0	1941	2269	328	69.47	0.39	2.27	2079	0.40	1.16	30.41	994
364	3600	2235.12	2256.0	1854	2719	865	145.36	-0.20	3.50	2284	0.44	0.61	29.78	1155
365	234	2460.81	2458.0	2336	2586	250	66.93	-0.02	1.90	2482	0.50	0.72	39.34	1155
366	403	2061.08	2058.0	1932	2200	268	55.00	0.05	2.66	2073	0.48	0.91	38.03	1064
367	592	2177.66	2173.0	2092	2302	210	45.16	0.40	2.47	2184	0.41	1.07	32.21	1208
368	776	2384.99	2395.5	2099	2678	579	169.89	0.00	1.67	2466	0.49	0.48	48.86	1382
369	90	2413.36	2407.5	2322	2510	188	43.44	0.24	2.40	2420	0.49	1.04	46.45	1382
370	225	2132.34	2120.0	1977	2304	327	89.34	0.22	1.88	2155	0.48	0.84	40.39	1349
371	102	2226.35	2223.5	2191	2285	94	22.40	0.91	3.33	2227	0.38	1.50	25.62	1243
372	257	2245.70	2245.0	2146	2437	291	60.54	0.43	2.63	2267	0.34	0.65	31.45	1543
373	495	2362.06	2344.0	2209	2595	386	102.23	0.48	2.01	2368	0.40	1.33	35.21	1543
374	233	2224.62	2223.0	2077	2386	309	91.09	0.11	1.62	2249	0.48	0.82	32.59	1686
375	517	2398.82	2395.0	2235	2547	312	76.41	-0.12	2.07	2418	0.53	0.83	32.23	1686
376	736	2465.39	2460.0	2298	2642	344	93.88	0.20	1.80	2484	0.49	0.95	32.36	1686
377	110	2322.81	2315.5	2266	2408	142	35.75	0.59	2.42	2324	0.40	1.44	39.65	1672
378	57	1998.56	1996.0	1970	2055	85	16.44	1.49	5.64	1997	0.34	2.29	24.68	1703
379	70	2234.87	2243.0	2132	2282	150	32.77	-1.22	4.13	2251	0.69	0.35	40.48	1652
380	162	2243.76	2254.5	2111	2354	243	57.34	-0.51	2.41	2267	0.55	0.54	47.29	1652
381	75	2253.96	2263.0	2145	2367	222	58.76	-0.07	1.97	2277	0.49	0.57	50.57	1652
382	109	2248.64	2251.0	2065	2366	301	59.82	-0.33	2.73	2271	0.61	0.61	59.66	1851
383	30	2277.33	2271.5	2241	2337	96	22.80	0.77	2.89	2281	0.38	1.02	46.06	1699
384	186	2381.85	2368.0	2320	2507	187	48.63	0.66	2.30	2385	0.33	1.30	24.17	2165
385	33	2287.33	2287.0	2260	2325	65	20.83	0.10	1.60	2296	0.42	0.59	27.89	2091
386	166	2084.10	2075.5	1948	2235	287	82.94	0.18	1.89	2104	0.47	0.87	30.98	1639
387	143	2039.02	2036.0	1997	2094	97	26.73	0.31	1.78	2046	0.43	0.84	32.05	1639
388	234	1913.32	1908.0	1784	2046	262	63.42	-0.05	2.17	1933	0.49	0.75	40.01	995
389	474	1719.67	1708.5	1564	1946	382	77.60	0.66	3.19	1725	0.41	1.27	36.55	1045
390	182	1823.57	1824.5	1725	1927	202	44.89	-0.04	2.29	1839	0.49	0.66	37.26	1045
391	377	1867.75	1875.0	1677	2033	356	110.80	-0.07	1.59	1920	0.54	0.50	47.31	1045
392	468	2076.69	2093.5	1808	2284	476	122.21	-0.31	2.00	2126	0.56	0.56	36.43	1029
393	2023	2000.36	1965.0	1776	2431	655	128.31	1.16	3.98	1994	0.34	1.71	38.65	1295
394	809	2225.43	2192.0	1927	2545	618	160.26	0.51	2.22	2233	0.48	1.35	38.88	1295
395	307	1912.41	1913.0	1710	2141	431	107.20	0.11	2.20	1944	0.47	0.75	46.82	1155
396	183	1672.77	1666.0	1522	1858	336	85.48	0.60	2.78	1675	0.45	1.41	37.10	1155

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397	107	2087.47	2099.0	1994	2152	158	42.80	-0.78	2.55	2107	0.59	0.42	30.61	1359
398	297	2192.01	2194.0	2076	2301	225	54.89	-0.18	2.26	2207	0.52	0.76	26.76	1295
399	715	2321.04	2311.0	2180	2569	389	75.92	0.69	3.20	2333	0.36	1.03	34.87	1811
400	3943	1996.34	2041.0	1531	2414	883	211.53	-0.49	2.19	2091	0.53	0.45	27.61	1202
401	1206	2035.23	2014.0	1771	2341	570	160.14	0.35	1.95	2064	0.46	0.99	33.03	1198
402	314	2062.67	2062.5	1977	2169	192	41.29	-0.07	2.40	2080	0.45	0.54	23.14	1284
403	259	2095.53	2107.0	1949	2192	243	59.76	-0.81	2.86	2124	0.60	0.40	24.73	1161
404	362	2135.22	2139.5	1968	2363	395	75.14	0.32	3.75	2150	0.42	0.88	34.73	1178
405	308	2178.77	2183.0	2096	2255	159	36.66	-0.06	2.29	2193	0.52	0.57	29.34	1178
406	76	2078.78	2072.0	2036	2150	114	25.16	0.76	2.86	2081	0.38	1.24	33.16	1178
407	171	1900.61	1906.0	1811	1992	181	42.41	-0.37	2.68	1913	0.50	0.70	27.87	1045
408	234	2125.51	2125.0	2030	2264	234	53.14	0.67	3.18	2136	0.41	0.91	25.45	1247
409	236	2230.49	2238.0	2161	2319	158	36.96	-0.03	2.21	2246	0.44	0.53	25.53	1247
410	110	2169.99	2173.0	2080	2245	165	41.15	-0.37	2.19	2186	0.55	0.57	34.11	1099
411	632	2172.79	2169.0	2062	2375	313	57.62	0.73	3.79	2177	0.35	1.28	26.84	974
412	297	2182.37	2191.0	2041	2294	253	62.91	-0.57	2.51	2206	0.56	0.59	25.84	957
413	8381	1906.53	1901.0	1607	2202	595	108.09	0.07	2.41	1929	0.50	0.92	14.89	957
414	1483	2044.48	2051.0	1830	2195	365	77.59	-0.25	2.21	2075	0.59	0.58	28.15	930
415	1245	1807.70	1820.0	1649	2014	365	107.68	0.00	1.37	1878	0.43	0.30	19.96	873
416	197	1758.25	1753.0	1705	1812	107	22.98	0.36	2.21	1762	0.50	1.07	23.77	873
417	121	1652.49	1653.0	1612	1700	88	20.69	0.00	2.08	1661	0.46	0.62	21.39	826
418	115	1700.73	1695.0	1634	1777	143	37.17	0.25	1.92	1709	0.47	0.90	29.78	953
419	306	1853.99	1845.0	1788	1964	176	42.37	0.50	2.11	1859	0.37	1.16	24.11	953
420	291	1896.59	1885.0	1766	2056	290	77.93	0.30	1.83	1915	0.45	0.89	31.17	953
421	39	1556.59	1554.0	1539	1580	41	10.59	0.59	2.41	1558	0.43	1.16	20.43	992
422	182	1732.02	1712.0	1641	1845	204	49.96	0.66	2.32	1729	0.45	1.72	34.45	776
423	2619	1913.71	1947.0	1566	2131	565	140.28	-0.53	2.27	1980	0.62	0.43	30.26	747
424	448	1637.85	1635.0	1545	1758	213	45.82	0.24	2.33	1646	0.44	0.98	27.91	737
425	328	1708.63	1696.0	1584	1891	307	80.16	0.59	2.37	1716	0.41	1.21	27.85	737
426	479	1686.85	1693.0	1545	1837	292	56.30	-0.16	2.46	1704	0.49	0.71	29.60	737
427	177	1845.46	1835.0	1717	1943	226	62.24	0.00	1.75	1868	0.57	0.66	26.26	786
428	5154	1943.72	1944.0	1750	2132	382	83.10	0.06	2.22	1969	0.51	0.73	25.40	786
429	879	1961.43	1956.0	1801	2122	321	79.52	0.04	1.94	1988	0.50	0.69	23.93	842
430	247	2071.44	2078.0	1976	2133	157	44.41	-0.38	1.83	2094	0.61	0.41	27.80	842
431	1281	2029.77	2018.0	1810	2209	399	78.75	0.30	2.25	2048	0.55	0.87	23.90	874
432	3297	1990.13	2039.0	1632	2197	565	155.26	-0.83	2.55	2068	0.63	0.35	26.42	872
433	3	1556.67	2039.0	1544	1570	26	0.00	0.00	0.00	1556	0.00	nan	51.02	789
434	1075	2008.53	2018.0	1848	2164	316	71.82	-0.20	1.99	2039	0.51	0.53	25.01	777
435	53	1945.64	1947.0	1922	1966	44	11.41	-0.24	2.00	1951	0.54	0.50	21.48	785
436	150	1835.75	1830.0	1741	1941	200	57.50	0.16	1.86	1844	0.47	1.08	25.91	785
437	170	2100.21	2101.0	2044	2175	131	28.71	0.16	2.47	2107	0.43	0.84	24.72	825
438	282	1946.07	1937.5	1877	2065	188	41.98	0.58	2.42	1946	0.37	1.52	23.17	842
439	1393	1778.90	1769.0	1742	1887	145	26.69	1.45	4.48	1777	0.25	1.86	13.04	786
440	1548	1709.28	1725.0	1480	1892	412	108.70	-0.30	1.87	1771	0.56	0.35	22.83	633
441	432	1826.22	1837.0	1633	1885	252	45.14	-1.56	5.53	1846	0.77	0.38	31.18	633
442	43	1836.40	1837.0	1827	1849	22	6.18	0.28	2.09	1837	0.43	1.21	13.45	636
443	68	1936.59	1940.5	1899	1967	68	17.66	-0.23	1.90	1946	0.55	0.39	24.36	636
444	499	1932.69	1933.0	1822	2043	221	43.64	-0.02	2.74	1942	0.50	0.89	25.72	747
445	673	2039.33	2040.0	1952	2131	179	38.23	-0.15	2.23	2053	0.49	0.65	20.24	847
446	478	2048.18	2051.0	1962	2111	149	38.34	-0.53	2.48	2060	0.58	0.68	19.05	847
447	2893	1839.49	1839.0	1556	2135	579	109.42	-0.03	2.51	1869	0.49	0.78	31.67	847
448	291	2029.46	2027.0	1952	2116	164	34.58	0.10	2.80	2036	0.47	0.94	27.97	921
449	138	1866.12	1868.5	1800	1948	148	41.78	0.07	1.76	1884	0.45	0.57	30.28	1001
450	84	1657.15	1654.0	1637	1705	68	12.94	1.30	4.97	1656	0.30	1.98	18.13	1001
451	262	1938.48	1937.5	1832	2053	221	50.41	0.23	2.07	1956	0.48	0.67	23.33	1007
452	1063	1942.54	1941.0	1770	2135	365	70.13	0.07	2.52	1960	0.47	0.83	27.04	921
453	92	1720.50	1714.0	1691	1798	107	26.96	1.42	4.29	1718	0.28	1.92	22.40	1057
454	237	1958.26	1958.0	1834	2077	243	43.41	-0.08	2.91	1971	0.51	0.75	29.22	1087
455	145	2137.54	2140.0	2084	2195	111	29.35	-0.08	1.81	2152	0.48	0.45	27.58	1087
456	327	2098.87	2101.0	1957	2252	295	72.22	0.07	1.95	2124	0.48	0.66	32.56	1241
457	3659	2062.98	2080.0	1715	2385	670	110.66	-0.38	3.13	2104	0.52	0.57	29.30	1244
458	340	1797.18	1804.0	1673	1955	282	71.79	0.14	2.01	1821	0.44	0.67	35.36	1154
459	150	1949.93	1937.0	1926	2042	116	25.75	1.51	4.79	1944	0.21	2.86	16.96	1199
460	106	2176.55	2176.5	2138	2209	71	16.56	0.04	2.40	2180	0.54	0.98	23.90	1244
461	177	2151.82	2151.0	2121	2200	79	16.69	0.66	3.10	2154	0.39	1.27	15.30	1235
462	154	2286.56	2285.5	2246	2336	90	19.38	0.13	2.22	2292	0.45	0.85	21.07	1266
463	422	2079.15	2064.0	1962	2266	304	68.99	0.84	2.96	2072	0.39	1.97	27.34	1255
464	112	2181.44	2180.0	2097	2253	156	38.97	-0.25	2.50	2188	0.54	0.98	29.55	1266

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465	4445	2346.78	2339.0	2043	2641	598	101.58	-0.24	2.94	2373	0.51	0.79	22.94	1300
466	488	2364.81	2370.0	2176	2485	309	69.06	-0.38	2.40	2386	0.61	0.70	28.44	1284
467	348	2158.21	2164.0	2013	2263	250	50.28	-0.30	2.57	2176	0.58	0.63	30.93	1294
468	441	2261.46	2271.0	2064	2371	307	66.82	-0.34	2.09	2287	0.64	0.59	31.82	1294
469	1526	2229.78	2234.0	2050	2371	321	70.33	-0.61	2.79	2263	0.56	0.44	20.62	1294
470	288	2101.38	2086.5	1991	2240	249	56.28	0.55	2.54	2103	0.44	1.40	26.90	820
471	984	1989.63	1980.0	1902	2158	256	51.02	0.86	3.11	1991	0.34	1.44	24.03	818
472	703	2100.34	2101.0	1991	2189	198	56.94	-0.13	1.68	2127	0.55	0.51	24.03	818
473	607	1921.57	1875.0	1700	2235	535	146.03	0.67	2.18	1901	0.41	2.13	36.74	1262
474	570	2013.55	2017.0	1868	2185	317	68.32	0.10	2.32	2032	0.46	0.77	37.86	1340
475	850	1677.46	1672.0	1573	1866	293	72.83	0.46	2.40	1693	0.36	0.93	28.83	1349
476	191	2114.63	2106.0	2063	2177	114	33.20	0.42	1.76	2118	0.45	1.21	14.67	1306
477	173	2280.95	2286.0	2218	2355	137	32.01	-0.28	2.10	2293	0.46	0.58	19.61	1306
478	339	2027.27	2026.0	1877	2217	340	60.26	0.17	2.88	2039	0.44	0.95	38.12	1295
479	366	2137.94	2126.0	1925	2323	398	111.41	0.01	1.71	2170	0.54	0.79	42.40	1063
480	597	2113.95	2085.0	1822	2456	634	169.59	0.27	1.92	2157	0.46	0.84	44.47	1020
481	511	2107.03	2113.0	1809	2361	552	178.22	-0.04	1.62	2174	0.54	0.63	35.43	992
482	14506	2131.36	2144.0	1660	2479	819	180.35	-0.39	2.49	2179	0.58	0.77	18.93	1035
483	1739	2309.73	2315.0	1944	2457	513	92.52	-0.80	3.78	2347	0.71	0.54	27.07	1060
484	364	2172.39	2183.0	2051	2302	251	65.64	-0.14	1.75	2205	0.48	0.44	29.07	992
485	407	2128.22	2118.0	1984	2297	313	77.90	0.24	2.14	2144	0.46	0.95	34.44	992
486	10542	2195.21	2192.0	1810	2473	663	138.69	0.03	2.22	2232	0.58	0.80	18.95	1035
487	1443	2190.56	2188.0	2113	2295	182	42.69	0.26	2.21	2200	0.43	0.91	19.05	992
488	6620	2623.56	2637.0	2089	3044	955	199.59	-0.31	2.42	2693	0.56	0.63	23.02	1115
489	4012	2515.47	2539.0	2192	2852	660	124.41	-0.34	2.63	2559	0.49	0.60	19.62	1115
490	9759	2479.46	2429.0	1807	3202	1395	318.32	0.40	2.44	2503	0.48	1.26	24.60	1140
491	4031	2304.88	2301.0	1928	2724	796	185.59	0.06	2.13	2358	0.47	0.76	24.51	1243
492	5678	2485.73	2490.5	2008	3040	1032	237.94	0.17	2.06	2566	0.46	0.67	24.79	1223
493	626	2173.04	2183.0	1995	2320	325	62.86	-0.42	3.06	2195	0.55	0.60	22.49	1131
494	5345	2298.89	2269.0	1924	2699	775	181.80	0.34	2.27	2324	0.48	1.08	22.35	1223
495	3517	2243.54	2244.0	1928	2546	618	159.61	-0.06	1.76	2304	0.51	0.63	22.57	1131
496	5853	2519.65	2503.0	1885	3120	1235	286.53	-0.06	2.29	2583	0.51	0.88	27.93	1192
497	2827	2428.77	2378.0	1793	3110	1317	327.61	0.16	1.83	2508	0.48	0.87	30.24	1192
498	134	2308.95	2304.0	2234	2410	176	38.50	0.70	3.21	2309	0.43	1.57	30.44	987
499	1628	2669.22	2665.5	2363	2969	606	110.55	0.28	3.01	2695	0.51	0.85	27.21	1078
500	1512	2291.03	2294.0	2095	2498	403	95.62	0.04	2.15	2321	0.49	0.70	24.12	987
501	424	2718.40	2718.0	2611	2826	215	46.53	-0.01	2.12	2733	0.50	0.73	29.19	1062
502	375	2060.95	2063.0	1959	2161	202	50.87	-0.07	1.89	2086	0.50	0.46	26.55	979
503	3652	2156.35	2162.0	1991	2319	328	73.60	-0.06	2.20	2179	0.50	0.72	15.82	1114
504	556	1977.87	1970.0	1838	2146	308	67.08	0.62	3.03	1978	0.45	1.51	26.73	762
505	188	2016.71	2017.0	1964	2070	106	27.24	-0.08	1.99	2028	0.50	0.57	26.97	1038
506	3437	2205.03	2204.0	1895	2500	605	118.29	-0.09	2.69	2230	0.51	0.89	25.81	1124
507	946	1827.53	1825.0	1790	1958	168	19.58	2.47	12.25	1827	0.22	1.65	16.14	997
508	226	1859.31	1850.0	1823	1939	116	30.82	0.68	2.27	1863	0.31	1.15	26.82	919
509	31	1877.90	1881.0	1845	1901	56	16.82	-0.46	1.98	1885	0.59	0.54	25.17	982
510	490	1787.96	1786.0	1672	1905	233	44.58	0.41	2.93	1797	0.50	0.92	26.21	697
511	278	1686.77	1688.0	1561	1804	243	44.31	-0.09	3.33	1698	0.52	0.80	25.91	806
512	103	1724.00	1732.0	1659	1793	134	36.35	-0.09	1.89	1741	0.49	0.46	31.87	884
513	376	1819.24	1818.0	1729	1900	171	39.31	-0.14	2.20	1832	0.53	0.70	20.56	884
514	28	1630.82	1631.5	1603	1657	54	12.65	-0.13	2.99	1634	0.52	0.79	22.67	727
515	82	1751.88	1727.0	1677	1895	218	54.28	0.92	2.65	1744	0.34	2.12	31.57	915
516	350	1748.58	1744.5	1601	1899	298	73.72	0.01	1.98	1780	0.50	0.55	31.99	915
517	3	1385.33	1744.5	1383	1387	4	0.00	0.00	0.00	1385	0.00	nan	15.46	915
518	105	1556.63	1547.0	1523	1640	117	26.03	1.40	4.40	1550	0.29	3.21	24.51	800
519	1636	1485.45	1461.0	1304	1799	495	104.89	0.74	2.88	1484	0.37	1.57	23.11	764
520	2259	1584.48	1559.0	1384	1966	582	114.81	1.09	3.71	1584	0.34	1.53	21.59	707
521	253	1582.64	1578.0	1470	1719	249	59.80	0.03	1.81	1605	0.45	0.64	27.39	720
522	415	1809.07	1801.0	1556	2012	456	117.14	-0.07	1.96	1842	0.55	0.79	29.85	720
523	210	1913.79	1928.5	1796	2018	222	55.92	-0.32	2.23	1937	0.53	0.52	26.66	782
524	303	1964.71	1968.0	1867	2063	196	47.29	-0.06	2.41	1978	0.50	0.74	28.12	726
525	2916	1940.04	1925.0	1659	2238	579	123.03	0.34	2.47	1962	0.49	0.99	28.54	732
526	206	1786.75	1772.5	1591	1951	360	103.46	0.03	1.49	1837	0.54	0.51	43.13	670
527	695	1705.37	1706.0	1542	1857	315	71.17	-0.09	2.17	1727	0.52	0.73	27.77	670
528	450	1571.47	1570.5	1474	1714	240	43.15	0.11	2.51	1583	0.41	0.80	27.75	670
529	397	1961.62	1955.0	1876	2085	209	44.46	0.94	3.54	1963	0.41	1.38	27.56	764
530	475	1799.72	1799.0	1688	1939	251	55.88	0.28	2.52	1809	0.45	0.99	29.09	678
531	1339	1442.25	1435.0	1230	1741	511	123.82	0.31	2.16	1470	0.42	0.89	30.99	670
532	340	1777.71	1760.0	1667	1975	308	62.01	0.97	3.47	1775	0.36	1.72	39.68	670

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533	748	1818.44	1805.0	1699	1958	259	67.57	0.43	2.05	1819	0.46	1.49	26.98	683
534	1285	1884.72	1894.0	1720	2038	318	67.43	-0.55	2.94	1907	0.52	0.63	23.94	609
535	238	1453.98	1440.5	1404	1615	211	45.23	1.30	4.37	1452	0.24	1.68	25.25	683
536	256	1724.64	1719.0	1639	1903	264	50.63	1.01	4.44	1735	0.32	0.88	30.84	707
537	1204	1875.95	1885.0	1617	2038	421	97.67	-0.60	2.65	1917	0.62	0.51	31.99	424
538	544	1596.66	1594.0	1469	1698	229	39.31	-0.19	3.60	1602	0.56	1.07	27.12	445
539	2965	1671.33	1665.0	1467	2021	554	117.49	0.35	2.38	1708	0.37	0.73	25.98	425
540	658	1807.56	1837.5	1576	1963	387	109.02	-0.54	2.00	1875	0.60	0.26	30.93	428
541	712	1437.02	1411.0	1307	1613	306	97.36	0.19	1.33	1499	0.42	0.35	28.45	428
542	748	1464.70	1407.0	1104	2069	965	278.05	0.44	2.02	1540	0.37	0.82	45.02	485
543	219	1862.99	1861.0	1818	1918	100	20.12	0.01	2.45	1869	0.45	0.79	17.72	572
544	175	1957.39	1957.0	1923	1992	69	18.83	0.09	1.84	1963	0.50	0.77	23.77	572
545	329	2006.19	2014.0	1880	2085	205	46.82	-0.66	2.64	2027	0.62	0.47	30.02	609
546	3413	1577.52	1587.0	1395	1724	329	60.36	-0.76	3.44	1599	0.55	0.59	17.54	633
547	401	1892.43	1903.0	1785	1976	191	42.73	-0.33	2.26	1909	0.56	0.58	25.63	707
548	252	2015.99	2014.0	1948	2102	154	32.35	0.46	2.94	2019	0.44	1.18	31.11	633
549	353	2080.04	2096.0	1970	2151	181	42.92	-0.77	2.56	2105	0.61	0.27	23.57	633
550	622	1279.00	1266.0	1243	1453	210	33.36	1.61	5.98	1277	0.17	1.79	20.24	633
551	212	1483.81	1471.5	1451	1555	104	29.18	0.77	2.38	1486	0.32	1.26	18.27	707
552	423	1894.52	1901.0	1776	1997	221	60.43	-0.28	1.91	1921	0.54	0.51	23.75	742
553	2281	2187.00	2208.0	1913	2373	460	103.53	-0.48	2.36	2229	0.60	0.53	25.30	736
554	144	1921.35	1928.5	1834	2059	225	40.10	0.33	3.36	1932	0.39	0.79	32.01	736
555	974	1785.84	1773.0	1582	2014	432	66.76	0.10	3.35	1787	0.47	1.44	22.41	691
556	2754	2105.20	2129.0	1861	2302	441	120.00	-0.35	2.00	2158	0.55	0.49	25.61	691
557	399	2054.17	2042.0	1948	2190	242	61.68	0.55	2.32	2060	0.44	1.22	27.88	690
558	2545	2041.04	2035.0	1690	2220	530	108.17	-0.50	3.17	2065	0.66	0.87	24.96	690
559	420	1714.72	1704.0	1670	1819	149	37.50	0.73	2.42	1716	0.30	1.43	25.06	561
560	619	1733.53	1739.0	1618	1867	249	58.28	-0.09	1.87	1758	0.46	0.56	28.08	638
561	1498	2024.20	2036.0	1836	2179	343	81.50	-0.33	2.20	2054	0.55	0.60	25.71	702
562	490	1797.29	1780.0	1710	1923	213	51.66	0.65	2.26	1796	0.41	1.63	27.66	722
563	236	1916.35	1926.0	1786	2043	257	62.49	-0.21	2.02	1941	0.51	0.56	40.43	661
564	1172	1849.79	1828.0	1681	2121	440	95.36	0.96	3.32	1848	0.38	1.60	29.95	769
565	706	1704.31	1690.5	1522	1942	420	110.37	0.25	2.11	1723	0.43	1.02	30.82	661
566	45	1907.82	1904.0	1892	1948	56	14.14	1.14	3.54	1907	0.28	1.74	18.28	1012
567	503	1996.49	2007.0	1789	2108	319	69.14	-1.25	4.13	2021	0.65	0.51	26.70	954
568	708	1929.36	1933.0	1799	2108	309	76.27	0.06	2.35	1950	0.42	0.78	29.00	1050
569	276	1681.92	1695.0	1397	2001	604	146.29	-0.10	2.18	1725	0.47	0.72	31.27	980
570	892	1939.67	1932.0	1816	2114	298	63.65	0.62	2.94	1946	0.42	1.19	31.15	980
571	1272	1929.13	1933.5	1735	2130	395	70.96	-0.07	2.66	1951	0.49	0.69	29.96	835
572	621	1701.50	1692.0	1618	1835	217	57.01	0.65	2.39	1708	0.38	1.15	28.09	778
573	931	2094.37	2087.0	1959	2183	224	41.31	0.01	3.38	2093	0.60	1.69	23.59	769
574	291	1480.44	1480.0	1434	1608	174	26.56	0.76	4.59	1488	0.27	0.80	24.79	778
575	365	1923.36	1920.0	1825	2018	193	48.68	0.07	1.91	1937	0.51	0.78	30.29	675
576	350	2194.87	2189.0	2060	2338	278	74.97	0.09	1.76	2206	0.49	1.08	26.99	766
577	2346	2170.11	2189.0	1808	2380	572	126.63	-0.52	2.31	2228	0.63	0.46	27.53	766
578	592	1967.79	1964.5	1876	2095	219	46.18	0.30	2.56	1980	0.42	0.81	24.88	728
579	193	2071.41	2072.0	2006	2117	111	21.94	-0.61	3.22	2079	0.59	0.62	21.84	742
580	351	2203.72	2191.0	2100	2299	199	50.40	0.01	1.92	2227	0.52	0.52	29.07	728
581	223	2290.80	2276.0	2192	2423	231	58.05	0.61	2.32	2291	0.43	1.52	42.05	1634
582	369	2396.75	2383.0	2273	2557	284	71.54	0.38	1.99	2410	0.44	0.99	34.50	1483
583	26	2058.77	2051.0	2016	2129	113	34.26	0.68	2.25	2056	0.38	1.96	33.13	1569
584	596	2432.47	2443.0	2308	2527	219	54.54	-0.71	2.58	2457	0.57	0.45	23.29	1569
585	465	2405.40	2402.0	2319	2573	254	67.81	0.42	2.00	2442	0.34	0.42	21.65	1605
586	108	2552.72	2544.5	2516	2615	99	25.90	0.71	2.43	2553	0.37	1.47	29.35	1552
587	622	2451.58	2442.5	2330	2610	280	76.45	0.19	1.73	2476	0.43	0.73	33.84	1552
588	376	2306.32	2337.0	1950	2487	537	116.03	-1.09	3.78	2352	0.66	0.47	45.67	1516
589	272	2226.62	2181.0	2079	2519	440	116.63	0.90	2.63	2214	0.34	1.98	42.05	1516
590	303	2189.63	2189.0	2011	2479	468	124.10	0.14	1.66	2232	0.38	0.69	47.43	1483
591	430	2270.45	2272.0	1945	2492	547	125.70	-0.33	2.55	2307	0.59	0.75	46.17	1473
592	311	2404.55	2399.0	2152	2584	432	89.63	-0.30	2.82	2433	0.58	0.69	41.29	1473
593	627	2334.59	2309.0	2057	2638	581	135.61	0.26	2.10	2362	0.48	0.94	49.07	1473
594	292	2284.73	2277.0	2180	2404	224	60.72	0.43	2.09	2294	0.47	1.08	35.70	1473
595	502	2272.44	2275.0	2165	2387	222	55.10	0.06	2.32	2291	0.48	0.66	26.95	936
596	75	1847.47	1844.0	1819	1885	66	14.17	0.65	2.78	1846	0.43	1.95	24.45	843
597	364	2002.94	2007.5	1908	2130	222	53.52	-0.07	1.76	2033	0.43	0.38	27.59	880
598	166	2017.53	2010.0	1963	2082	119	28.32	0.53	2.24	2022	0.46	1.08	36.06	880
599	153	2008.35	2008.0	1936	2082	146	40.39	0.11	1.82	2021	0.50	0.75	32.73	857
600	227	2018.82	2030.0	1859	2123	264	60.73	-0.62	2.62	2041	0.61	0.57	25.69	818

Glacier ID	Data Points	Mean Elevation (m)	Median Elevation (m)	Min Elevation (m)	Max Elevation (m)	Range of Elevation (m)	Standard Deviation of Elevation (m)	Skewness	Kurtosis	ELA	HI	AABR	Mean Slope (degrees)	Slope Accumulation Proxy
601	158	2062.23	2067.0	1974	2142	168	47.69	-0.12	1.67	2087	0.53	0.44	35.13	994
602	229	2098.54	2098.0	2015	2227	212	44.64	0.59	3.43	2107	0.39	0.95	33.57	982
603	769	2104.19	2113.0	1924	2347	423	74.70	-0.24	3.33	2132	0.43	0.55	27.82	982
604	178	1983.80	1989.0	1874	2074	200	55.55	-0.19	1.62	2018	0.55	0.32	29.11	959
605	4456	2232.60	2228.0	2076	2466	390	88.64	0.01	2.52	2256	0.40	0.79	15.26	1142
606	570	2159.04	2158.0	2104	2235	131	29.49	0.47	2.58	2165	0.42	0.99	20.23	1163
607	884	2364.79	2365.0	2196	2453	257	55.98	-0.53	2.72	2385	0.66	0.61	22.73	1087
608	151	2169.23	2155.0	2095	2323	228	48.28	0.79	3.08	2176	0.33	1.15	36.09	1035
609	4409	2193.89	2184.0	1861	2465	604	162.30	0.00	1.66	2272	0.55	0.49	26.51	1296
610	370	2155.11	2160.0	2043	2246	203	44.37	-0.28	2.25	2173	0.55	0.55	28.21	1263
611	5510	2220.95	2235.0	1763	2529	766	148.98	-0.42	2.60	2281	0.60	0.54	26.66	1263
612	197	1896.17	1892.0	1780	2035	255	64.28	0.23	1.98	1910	0.46	0.90	39.92	1122
613	211	1962.05	1965.0	1902	2036	134	32.96	0.03	1.89	1978	0.45	0.48	22.43	1122
614	2816	2168.92	2149.0	1977	2466	489	108.72	0.52	2.54	2184	0.39	1.08	21.74	1122
615	5736	2206.41	2235.0	1842	2502	660	139.34	-0.46	2.24	2266	0.55	0.49	27.11	1122
616	944	2292.70	2287.5	2135	2402	267	63.51	-0.11	2.10	2310	0.59	0.80	25.66	1061
617	534	2450.54	2448.5	2410	2517	107	17.83	0.28	2.76	2455	0.38	0.86	14.08	1142
618	356	1885.52	1862.0	1663	2307	644	149.41	0.76	2.91	1894	0.35	1.31	57.08	1285
619	680	2207.60	2213.5	2064	2319	255	52.44	-0.41	2.45	2222	0.56	0.75	19.09	1192
620	870	2204.92	2231.0	1983	2455	472	125.25	-0.12	1.75	2266	0.47	0.45	39.93	1142
621	1625	2076.78	2054.0	1860	2327	467	120.11	0.28	1.87	2103	0.46	0.92	37.57	1160
622	323	2023.97	2039.0	1880	2224	344	96.63	-0.12	1.52	2090	0.42	0.25	23.71	1277
623	406	2269.80	2272.0	2187	2376	189	46.55	0.03	2.04	2281	0.44	0.86	20.49	1606
624	202	2093.85	2079.5	1948	2263	315	88.46	0.26	2.00	2110	0.46	1.00	36.13	1510
625	246	2138.89	2133.5	2038	2265	227	59.98	0.24	1.89	2154	0.44	0.85	37.84	1510
626	253	2005.56	2017.0	1853	2210	357	94.22	0.12	2.04	2033	0.43	0.74	46.19	1540
627	244	2191.80	2198.0	2084	2305	221	51.42	-0.29	2.11	2215	0.49	0.49	22.49	1540
628	238	2207.50	2201.0	2148	2310	162	40.28	0.37	2.13	2221	0.37	0.71	23.80	1620
629	146	2247.29	2271.0	2125	2324	199	52.76	-0.91	2.40	2278	0.61	0.22	23.14	1413
630	1088	2254.63	2262.5	2133	2371	238	62.90	-0.24	1.95	2281	0.51	0.54	25.03	1413
631	465	2291.41	2295.0	2194	2375	181	38.44	-0.17	2.39	2306	0.54	0.59	26.44	1386
632	925	2237.16	2214.0	2082	2499	417	99.86	1.00	3.20	2235	0.37	1.61	33.26	1413
633	1046	1892.48	1895.0	1758	2079	321	74.72	0.04	2.15	1913	0.42	0.77	23.02	1383
634	109	2196.18	2178.0	2073	2310	237	62.72	0.30	2.20	2194	0.52	1.67	31.72	1651
635	375	2288.26	2298.0	2143	2447	304	82.60	-0.13	1.91	2319	0.48	0.60	28.29	1763
636	96	2148.82	2145.0	2122	2204	82	17.86	0.70	2.76	2149	0.33	1.49	23.19	1752
637	639	2414.94	2418.0	2295	2508	213	52.70	-0.24	2.15	2431	0.56	0.72	27.32	1386
638	513	2211.81	2190.0	2001	2446	445	116.84	0.02	1.94	2237	0.47	0.91	33.13	1512
639	161	2105.30	2119.0	1932	2228	296	73.21	-0.27	1.93	2144	0.59	0.40	58.36	1430
640	383	2447.74	2438.0	2250	2677	427	127.79	0.19	1.72	2483	0.46	0.81	37.23	1512
641	718	2199.93	2192.5	2000	2441	441	117.73	0.14	2.14	2227	0.45	0.87	28.34	1380
642	137	2182.07	2177.0	2114	2270	156	35.51	0.44	2.58	2184	0.44	1.30	23.67	1442
643	605	2396.45	2406.0	2271	2485	214	49.43	-0.42	2.27	2420	0.59	0.45	24.28	1415
644	14	1923.43	1920.0	1905	1959	54	17.03	0.83	2.52	1922	0.34	2.23	40.54	1435
645	183	2032.95	2033.0	1953	2139	186	43.98	0.07	2.29	2046	0.43	0.73	32.75	1435
646	370	2182.95	2157.5	2022	2406	384	99.56	0.61	2.42	2182	0.42	1.54	35.68	1423
647	160	2421.23	2433.0	2293	2482	189	42.23	-1.13	3.83	2439	0.68	0.42	34.43	1442
648	471	2052.51	2035.0	1930	2315	385	87.39	0.95	3.31	2059	0.32	1.25	32.39	1387
649	1220	1920.95	1916.0	1801	2119	318	62.94	0.56	3.15	1932	0.38	0.98	23.66	1387
650	1144	2303.72	2294.0	2123	2508	385	77.10	0.33	2.52	2313	0.47	1.13	32.22	1386
651	462	2291.87	2294.5	2188	2372	184	43.01	-0.22	2.16	2308	0.56	0.59	19.11	1347
652	397	2110.66	2099.0	2005	2274	269	68.86	0.52	2.33	2129	0.39	0.81	39.79	1390
653	1656	2486.02	2485.0	2345	2680	335	62.79	0.22	2.31	2502	0.42	0.82	25.59	1308
654	3294	2332.21	2329.0	1945	2657	712	112.87	0.15	3.08	2361	0.54	0.80	26.88	1308
655	363	2350.84	2359.0	2257	2467	210	66.85	-0.01	1.59	2377	0.45	0.60	25.73	1047
656	142	2190.06	2189.5	2108	2294	186	41.29	0.35	2.63	2197	0.44	1.07	29.65	1047
657	4446	2240.96	2227.0	1819	2724	905	161.20	0.26	3.05	2275	0.47	0.90	32.01	1047
658	842	2346.34	2345.5	2249	2474	225	41.84	0.31	2.67	2358	0.43	0.76	23.67	1109
659	317	2181.21	2173.0	2129	2314	185	41.15	1.03	3.69	2183	0.28	1.34	30.39	1548
660	200	2036.79	2028.0	1923	2190	267	72.86	0.41	2.07	2050	0.43	0.99	31.99	1499
661	2600	2190.16	2159.0	1898	2494	596	129.60	0.45	2.26	2198	0.49	1.31	33.60	1081
662	1182	2218.08	2215.0	2085	2369	284	58.57	0.09	2.56	2232	0.47	0.84	27.30	1347
663	33	2160.06	2160.0	2092	2233	141	34.63	0.08	2.60	2163	0.48	1.23	32.88	1291
664	120	2106.78	2112.5	2044	2142	98	24.98	-0.83	2.80	2120	0.64	0.34	25.94	934
665	1413	1691.93	1681.0	1601	1975	374	62.33	0.85	3.20	1700	0.24	1.12	26.34	820
666	337	1851.26	1845.0	1800	1954	154	24.80	1.22	5.49	1852	0.33	1.47	20.96	844
667	1098	2214.74	2218.5	2077	2336	259	58.65	-0.28	2.33	2240	0.53	0.50	20.80	1294
668	348	1669.33	1642.0	1570	1929	359	84.17	1.07	3.03	1653	0.28	2.63	23.26	1280

Glacier ID	Data Points	Mean Elevation (m)	Median Elevation (m)	Min Elevation (m)	Max Elevation (m)	Range of Elevation (m)	Standard Deviation of Elevation (m)	Skewness	Kurtosis	ELA	HI	AABR	Mean Slope (degrees)	Slope Accumulation Proxy
669	153	1657.67	1654.0	1633	1708	75	17.33	0.58	2.35	1661	0.33	1.03	13.06	1300
670	1221	2232.02	2234.0	2062	2398	336	71.32	-0.03	2.25	2255	0.51	0.69	27.31	1300
671	45	2090.91	2086.0	2004	2196	192	40.34	0.55	3.29	2095	0.45	1.16	33.12	1266
672	437	2160.23	2152.0	2009	2326	317	76.68	0.17	2.23	2173	0.48	1.04	42.09	1300
673	173	2245.21	2247.0	2170	2306	136	32.32	-0.28	2.17	2258	0.55	0.57	22.82	1300
674	19002	2128.38	2136.0	1543	2671	1128	214.67	-0.25	2.85	2188	0.52	0.74	24.48	1300
675	6432	2100.94	2090.5	1768	2413	645	114.31	-0.03	2.35	2138	0.52	0.70	23.66	1266
676	3533	2177.91	2189.0	1845	2418	573	132.36	-0.23	1.98	2234	0.58	0.54	25.38	1266
677	229	2135.35	2147.0	2042	2196	154	40.86	-0.64	2.33	2157	0.61	0.37	24.71	1241
678	252	2044.73	2045.0	1935	2163	228	51.31	0.31	3.13	2052	0.48	1.02	27.15	1131
679	155	1901.92	1885.0	1862	2015	153	36.66	1.01	3.03	1896	0.26	2.32	26.22	1057
680	160	1893.72	1881.0	1868	1999	131	30.59	1.69	4.90	1883	0.20	5.30	16.83	1077
681	292	1991.90	1985.0	1845	2162	317	66.23	0.07	2.34	2009	0.46	0.81	28.91	989
682	409	2266.28	2263.0	2086	2393	307	71.43	-0.32	2.50	2293	0.59	0.61	29.99	989
683	450	2055.96	2056.5	1916	2222	306	87.48	0.10	1.72	2081	0.46	0.79	32.20	989
684	1100	2122.67	2119.0	1952	2261	309	72.34	-0.08	1.99	2154	0.55	0.54	26.34	992
685	44	1628.02	1627.5	1608	1678	70	14.88	0.99	4.28	1631	0.29	1.06	32.18	1025
686	80	1903.19	1900.0	1872	1970	98	20.37	1.16	4.51	1902	0.32	2.09	23.11	1025
687	553	2094.65	2098.0	1955	2185	230	48.33	-0.34	2.28	2116	0.61	0.52	24.95	1025
688	6961	2189.65	2206.0	1772	2438	666	143.39	-0.40	2.12	2260	0.63	0.44	21.68	992
689	914	2073.41	2088.0	1893	2272	379	78.37	-0.16	2.70	2102	0.48	0.58	26.88	1099
690	119	1997.52	1992.0	1962	2046	84	24.06	0.37	1.80	2003	0.42	0.96	23.85	1194
691	560	2130.82	2115.5	2047	2300	253	53.12	1.21	3.83	2126	0.33	1.94	26.20	1251
692	820	2173.50	2182.5	1985	2323	338	78.00	-0.40	2.57	2204	0.56	0.54	26.54	1252
693	201	1889.20	1894.0	1852	1941	89	23.07	-0.18	1.75	1902	0.42	0.38	21.99	1252
694	392	1864.58	1849.0	1601	2076	475	126.79	-0.20	1.82	1946	0.55	0.31	37.45	1204
695	936	2023.19	2023.5	1789	2179	390	85.65	-0.22	2.37	2045	0.60	0.81	29.35	1204
696	1319	2041.02	2052.0	1776	2227	451	92.23	-0.40	2.57	2075	0.59	0.60	32.84	1204
697	151	2148.01	2153.0	2083	2205	122	37.71	-0.12	1.54	2168	0.53	0.42	22.79	1202
698	222	1899.03	1894.5	1820	1992	172	37.36	0.22	2.42	1903	0.46	1.15	33.60	1202
699	433	1620.34	1610.0	1547	1723	176	40.32	0.35	2.04	1627	0.42	1.03	20.60	1204
700	445	1337.37	1328.0	1263	1596	333	48.67	1.44	7.09	1341	0.22	1.27	20.30	1204
701	171	1180.50	1163.0	1108	1327	219	63.73	0.49	1.88	1192	0.33	1.04	40.76	1204
702	43	2000.93	1990.0	1965	2058	93	29.73	0.48	1.72	2001	0.39	1.52	24.08	1221
703	111	1973.56	1966.0	1863	2069	206	43.07	0.57	3.14	1975	0.54	1.40	29.86	1303
704	457	1815.49	1805.0	1592	1950	358	82.44	-0.25	2.20	1853	0.62	0.52	22.72	1303
705	456	1942.22	1958.0	1738	2109	371	91.47	-0.39	2.31	1979	0.55	0.53	45.17	1332
706	1132	2079.80	2049.0	1807	2343	536	175.22	0.04	1.35	2192	0.51	0.32	32.04	1303
707	683	1469.44	1484.0	1263	1688	425	139.60	-0.09	1.53	1538	0.49	0.47	23.75	1177
708	290	1557.80	1543.0	1487	1711	224	55.91	1.13	3.20	1552	0.32	2.08	19.34	1036
709	132	1969.89	1972.5	1893	2040	147	36.56	-0.14	2.32	1980	0.52	0.75	29.19	1177
710	344	1855.35	1864.0	1746	1986	240	56.97	-0.15	1.90	1880	0.46	0.52	29.55	1177
711	960	1771.06	1841.0	1391	2052	661	192.60	-0.53	1.87	1884	0.57	0.29	30.03	1036
712	394	1975.78	1986.0	1774	2211	437	91.15	-0.12	2.55	2004	0.46	0.69	44.64	1036
713	1358	1944.03	1940.0	1787	2098	311	61.90	0.19	2.47	1956	0.50	0.95	24.58	1036
714	986	2384.78	2378.0	2254	2577	323	67.48	0.28	2.27	2400	0.40	0.90	25.05	1189
715	1977	2203.15	2198.0	2008	2395	387	78.16	0.21	2.24	2221	0.50	0.89	26.88	1191
716	140	2216.37	2215.0	2137	2289	152	34.22	-0.10	2.27	2228	0.52	0.67	28.24	1197
717	521	2284.15	2306.0	2140	2364	224	56.37	-0.90	2.63	2318	0.64	0.22	19.02	1228
718	249	2126.22	2125.0	2084	2215	131	27.74	0.50	2.73	2132	0.32	0.91	14.19	1241
719	120	2317.80	2319.0	2254	2390	136	36.07	0.26	1.95	2327	0.47	0.83	25.39	1241
720	230	2153.27	2161.0	2064	2200	136	25.52	-1.16	4.30	2165	0.66	0.38	27.56	1241
721	194	1898.22	1894.0	1742	2042	300	63.99	-0.14	2.51	1911	0.52	0.94	44.88	1228
722	260	1902.54	1845.5	1776	2202	426	112.86	1.06	2.80	1870	0.30	3.30	44.05	1228
723	120	2121.78	2135.5	1976	2170	194	43.71	-1.45	4.67	2141	0.75	0.38	38.78	1216
724	1168	2032.27	2020.0	1912	2241	329	62.00	0.95	3.66	2033	0.37	1.49	28.24	1216
725	1283	2343.42	2348.0	2102	2583	481	112.29	-0.14	2.12	2376	0.50	0.75	33.17	1216
726	1131	2235.82	2209.0	2027	2467	440	123.19	0.16	1.50	2280	0.47	0.69	31.60	1115
727	101	2204.07	2192.0	2151	2287	136	30.50	1.04	3.52	2207	0.39	1.20	22.85	1295
728	222	2294.74	2276.0	2220	2447	227	60.50	0.96	2.86	2290	0.33	1.82	34.43	1295
729	178	2355.53	2357.0	2311	2455	144	26.53	0.24	2.95	2365	0.31	0.65	22.52	1359
730	44	1881.61	1876.0	1865	1973	108	21.26	2.73	10.74	1878	0.15	2.92	21.14	1243
731	72	2167.92	2168.0	2151	2204	53	13.10	0.52	2.36	2173	0.32	0.63	17.19	1374
732	315	2058.15	2036.0	1958	2237	279	72.23	0.76	2.61	2064	0.36	1.24	37.66	1374
733	77	1983.82	1982.0	1960	2023	63	13.02	0.56	3.05	1985	0.38	1.32	21.25	1374
734	55	2122.45	2121.0	2089	2171	82	24.29	0.31	1.81	2129	0.41	0.81	27.87	1629
735	84	2030.18	2027.5	1981	2090	109	31.00	0.18	1.75	2041	0.45	0.73	30.01	1629
736	515	2108.74	2105.0	1987	2255	268	61.25	0.14	1.84	2122	0.45	0.91	35.34	1629

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737	474	2179.76	2170.5	2043	2326	283	67.12	0.36	2.23	2187	0.48	1.17	30.29	1534
738	1068	2180.78	2208.5	1967	2323	356	97.74	-0.73	2.38	2230	0.60	0.37	24.86	1534
739	689	2312.26	2299.0	2210	2436	226	54.44	0.23	1.99	2321	0.45	1.07	26.05	1534
740	70	2244.06	2241.0	2206	2330	124	29.49	0.74	2.75	2249	0.31	1.07	31.54	1534
741	20123	2250.99	2227.0	1256	3193	1937	403.99	-0.17	2.81	2322	0.51	0.96	23.79	443

Appendix B

PYTHON SCRIPTS FOR HYPSOMETRIC DERIVATIVES

```python
# Statistics- Mean, Max, Min, Range, Standard Deviation, Skewness, Kurtosis

from math import sqrt

infile = open ("/ast06_00x_non.csv", "r")
outfile = open ("/ast06_00x_arraystats.csv", "w")
for line in infile:
    indata = line.split("\r")
    #indata = infile.readlines() # for MS Access CSVs
l = len(indata)
count = 0
old_gl = 0
datalist = [0.0 for x in range(40000) ] # 40000 = maxcount from avg_elevation.py

for k in range(1):
    line = indata[k]
    ls = len(line.split(","))
    if ls < 5:
        print k, ls, line
    GL_ID = int (line.split(",")[2])

    if GL_ID != old_gl:
        print old_gl, count
        avg = sum(datalist[0:count]) / count # mean elevation ## see a)
        max_GC = max(datalist[0:count])
        min_GC = min(datalist[0:count])
        range_GC = max_GC - min_GC

        sum_2 = 0.0
        sum_3 = 0.0
        sum_4 = 0.0

        for s in range(count):
            sum_2 += (datalist[s] - avg) **2 # sum of squares
            sum_3 += (datalist[s] - avg) **3
            sum_4 += (datalist[s] - avg) **4

        if count < 5:
            SD = 0.0
            G1 = 0.0
            G2 = 0.0
        else:

            SD = sqrt(sum_2 / count) # SD = standard deviation
            G1 = (sum_3 / count) / (sum_2 / count)**(1.5) # G1 = skewness
            G2 = (sum_4 / count) / (sum_2 / count)**2 # G2 = kurtosis

        output = str(old_gl) + ',' + str(easting) + ',' + str(northing) + ',' + \
            str(avg) + ',' + str(max_GC) + ',' + str(min_GC) + ',' + str(range_GC) \
            + ',' + str(SD) + ',' + str(G1) + ',' + str(G2) + ',' + str(count)


        print output, count
        print >> outfile, output

        count = 0
        old_gl = GL_ID

    GC = float (line.split(",")[1]) # GC = data value for elevation (grid code)
    easting = line.split(",")[3]
    northing = line.split(",")[4]

    datalist[count] = GC
    count += 1

# print last glacier point

print old_gl, count
avg = sum(datalist[0:count]) / count # mean elevation ## see a)
max_GC = max(datalist[0:count])
min_GC = min(datalist[0:count])
range_GC = max_GC - min_GC

sum_2 = 0.0
sum_3 = 0.0
sum_4 = 0.0

for s in range(count):
    sum_2 += (datalist[s] - avg) **2 # sum of squares
    sum_3 += (datalist[s] - avg) **3
    sum_4 += (datalist[s] - avg) **4

if count < 5:
    SD = 0.0
    G1 = 0.0
    G2 = 0.0
else:

    SD = sqrt(sum_2 / count) # SD = standard deviation
    G1 = (sum_3 / count) / (sum_2 / count)**(1.5) # G1 = skewness
    G2 = (sum_4 / count) / (sum_2 / count)**2 # G2 = kurtosis

output = str(old_gl) + ',' + str(easting) + ',' + str(northing) + ',' + \
    str(avg) + ',' + str(max_GC) + ',' + str(min_GC) + ',' + str(range_GC) \
    + ',' + str(SD) + ',' + str(G1) + ',' + str(G2) + ',' + str(count)

print output, count
print >> outfile, output

# a) slice the list [0:count-1] because count < 40000 for each glacier
```

Figure B1 **Python Script: array_stats.py.** Numbers in grey vertical lines count the lines of code within the script. Two columns of code are provided to view the entire script.

```
# Statistics 2- Median, Quartiles, Equilibrium Line Altitude

infile = open ("/ast06_00x_non.csv", "r")
outfile = open ("/ast06_00x_arraystats2.csv", "w")
for line in infile:
    indata = line.split("\r")
    #indata = infile.readlines() # for MS Access CSVs
l = len(indata)
count = 0
#n = 0
old_gl = 0
datalist = [0.0 for x in range(40000) ]

for k in range(1):
    line = indata[k]
    GL_ID = int (line.split(",")[2])


    if GL_ID != old_gl:
        # sort array (lowest GC - highest GC)

        new_list = sorted(datalist[0:count]) #-1
        count = len(new_list)

        if count < 5:
            lower_q = 0.0
            upper_q = 0.0
            IQR = 0.0
            ELA = 0.0
        else:
        # median
            if count % 2 == 1:  # odd number of GC (% = remainder operator)
                median = new_list[(count+1)/2 - 1]
            else: # even number of GC
                lower = new_list[count/2 - 1]
                upper = new_list[count/2]
                median = (float(lower+upper)) / 2.0

            lower_q = new_list[(count+1)/4 - 1]  # lower quartile
            upper_q = new_list[(count+1)*3/4 - 1]  # upper quartile
            IQR = upper_q - lower_q  # interquartile range
            ELA = new_list[(count+1)*6/10 - 1] # equilibrium line altitude

            avg = sum(datalist[0:count]) / count # mean elevation Test

        output = str(old_gl) + ',' + str(easting) + ',' + str(northing) + ',' + \
            str(median) + ',' + str(lower_q) + ',' + str(upper_q) + ',' + str(IQR) + \
            ',' + str(ELA) + ',' + str(count) + ',' + str(avg)

        print output
        print >> outfile, output
```

```

        count = 0
        old_gl = GL_ID
        #n += 1

    GC = float (line.split(",")[1])
    easting = line.split(",")[3]
    northing = line.split(",")[4]

    datalist[count] = GC
    count += 1

# print last glacier point

new_list = sorted(datalist[0:count])
count = len(new_list)

if count < 5:
    lower_q = 0.0
    upper_q = 0.0
    IQR = 0.0
    ELA = 0.0
else:
    # median
    if count % 2 == 1:  # odd number of GC (% = remainder operator)
        median = new_list[(count+1)/2 - 1]
    else: # even number of GC
        lower = new_list[count/2 - 1]
        upper = new_list[count/2]
        median = (float(lower+upper)) / 2.0

    lower_q = new_list[(count+1)/4 - 1]  # lower quartile
    upper_q = new_list[(count+1)*3/4 - 1]  # upper quartile
    IQR = upper_q - lower_q  # interquartile range
    ELA = new_list[(count+1)*6/10 - 1] # equilibrium line altitude

    avg = sum(datalist[0:count]) / count # mean elevation Test

output = str(old_gl) + ',' + str(easting) + ',' + str(northing) + ',' + \
    str(median) + ',' + str(lower_q) + ',' + str(upper_q) + ',' + str(IQR) + \
    ',' + str(ELA) + ',' + str(count)


print output
print >> outfile, output
```

Figure B2 **Python Script: array_stats_2.py.** Numbers in grey vertical lines count the lines of code within the script. Two columns of code are provided to view the entire script.

```
# Area-Altitude Balance Ratio

import numpy as np

infile = open ("/input06AABR00xnon.csv",'r')
outfile = open ("/ast06_00x_aabr.csv","w")

header = str("GL_ID")+','+str("Z_ab")+','+str("Z_ac")+','+str("AABR")
print >> outfile, header

n = 0
count = 0
datalist = [0.0 for x in range(40000)]
ELA_array = [0.0 for x in range(40000)]

inline = infile.readlines()
inlist = inline[0].split("\r")

for line in inlist:
    GL_ID = int (line.split(",")[2])
    GC = float (line.split(",")[1])
    ELA = float (line.split(",")[12])

    if GL_ID > n:
        AC_array = np.zeros(count)
        AB_array = np.zeros(count)
        AB_area = 0
        AC_area = 0

        for k in range(count):
            if datalist[k] <= ELA_array[k]:
                AB_array[k] = ELA_array[k] - datalist[k]
                AB_area += 1
            else:
                AC_array[k] = datalist[k] - ELA_array[k]
                AC_area += 1

        z_ab = sum(AB_array) / AB_area
        z_ac = sum(AC_array) / AC_area
        AABR = z_ac / z_ab

        data = str(n)+','+str(z_ab)+','+str(z_ac)+','+str(AABR)

        print >> outfile, data

        n += 1
        count = 0

    datalist[count] = GC
    ELA_array[count] = ELA
    count += 1
```

Figure B3 **Python Script: aabr.py.** Numbers in grey vertical lines count the lines of code within the script. One column of code is provided to view the entire script.

```
# Hypsometric Curve and Integral

infile = open("/ast06_00x_arraystats.csv",'r')
outfile = open("/ast06_00x_hypsometry.csv",'w')

for line in infile:
    GL_ID = int(line.split(',')[0])
    easting = line.split(',')[1]
    northing = line.split(',')[2]
    mean_GC = float(line.split(',')[3])
    max_GC = float(line.split(',')[4])
    min_GC = float(line.split(',')[5])
    count = float(line.split(',')[10])

    if count < 5:
        HI = 0
    else:
        if max_GC == min_GC:
            HI = 1
        else:
    # HI Values
            HI = (mean_GC - min_GC) / (max_GC - min_GC)

    output = str(GL_ID)+','+str(easting)+','+str(northing)+','+str(HI)+','+str(count)

    print output
    print >> outfile, output
```

Figure B4 **Python Script: hypsometry.py.** Numbers in grey vertical lines count the lines of code within the script. One column of code is provided to view the entire script.