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Outcrop Structural Data From Parts of the Petersburg and Sumdum 1:250,000-scale Quadrangles, Southeastern Alaska

by

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Abstract

This report presents a compilation of 4203 measurements of outcrop structures from part of the Petersburg 1:250,000-scale quadrangle in southeastern Alaska. We collected 1966 measurements, and an additional 2237 unpublished measurements were compiled from field notebooks a from a field mapping effort in the late 1970's and early 1980's. These data are listed in spreadsheet and derivative formats. The data includes the latitude and longitude of each measurement, the type of measurement and its orientation.

Introduction

Outcrop-scale structural data is vital for understanding the structural history of rocks as well as for engineering and geotechnical purposes. Raw structural data is typically not available for additional structural analysis or display on maps, and thus we publish it here. A further analysis of these data is in review (Haeussler et al., in review). This report presents a compilation of structural data from early Paleozoic to late Tertiary rocks from central southeastern Alaska in the parts of the USGS Petersburg and Sumdum 1:250,000-scale quadrangles. Outcrop data come from fieldwork conducted by Haeussler and Karl in the summer of 1998, and additional structural attitudes were compiled from field notebooks archived in the Alaska Technical Data center at the USGS in Anchorage, Alaska. These data were collected during a Petersburg quadrangle mapping project (Brew and others, 1984).

Data Sources

The data come from outcrops from within the Wrangell geophysical survey area, which was a USGS project focussed on a geophysical survey in part of the Petersburg 1:250,000-scale quadrangle (Fig. 1; Karl and others, 1999). There are two sources of data: 1) Fieldwork conducted in 1998. All the data were collected by Peter Haeussler and Susan Karl. The locations of the stations where data were collected were digitized from 1:63,360-scale (1 inch = 1 mile) paper maps used in the field. 2) Fieldwork conducted between 1978 and 1982 during the Petersburg AMRAP (Alaska Minerals Resource Assessment Project), which produced the first 1:250,000-scale geologic map of the quadrangle (Brew and others, 1984). Ten geologists made structural observations at outcrops. Haeussler read through all the field notes from the project and collated the structural data. Some recorded structural data was not included in the database because the type of measured could not be determined. In particular, “lineations” were commonly measured, but it was not specified as to if these were bedding and cleavage intersection lineations, mineral lineations, stretching lineations, or another kind of lineation. The latitude and longitude of the field stations were determined by the field geologist using a graticule and recorded in the field notebooks. These field notebooks are archived in the Alaska Technical Data Unit, U.S. Geological Survey, 4200 University Dr., Anchorage, AK 99508, attention Jill Schneider, phone (907) 786-7457.

Data was compiled from the following1:63,360-scale quadrangles: Petersburg A-2, A-3, B-1, B-2, B-3, B-4, B-5, B-6, C-1, C-3, C-4, C-5, C-6, D-4, D-5, D-6, and in the Sumdum A-5, A-6, A-7 quadrangles on the south side of Frederick Sound. This is a broader area than the 1998 study area. We also note that a few stations lie outside of the quadrangles within which the geologist recorded their location. We assume the recorded quadrangle name is wrong, and that the recorded latitude and longitude is correct. Data far outside the boundary of the entire study area were removed, but data within a few miles of the boundaries of the study area were retained. The ‘new’ (1998), and the ‘old’ (Petersburg AMRAP) data were merged.

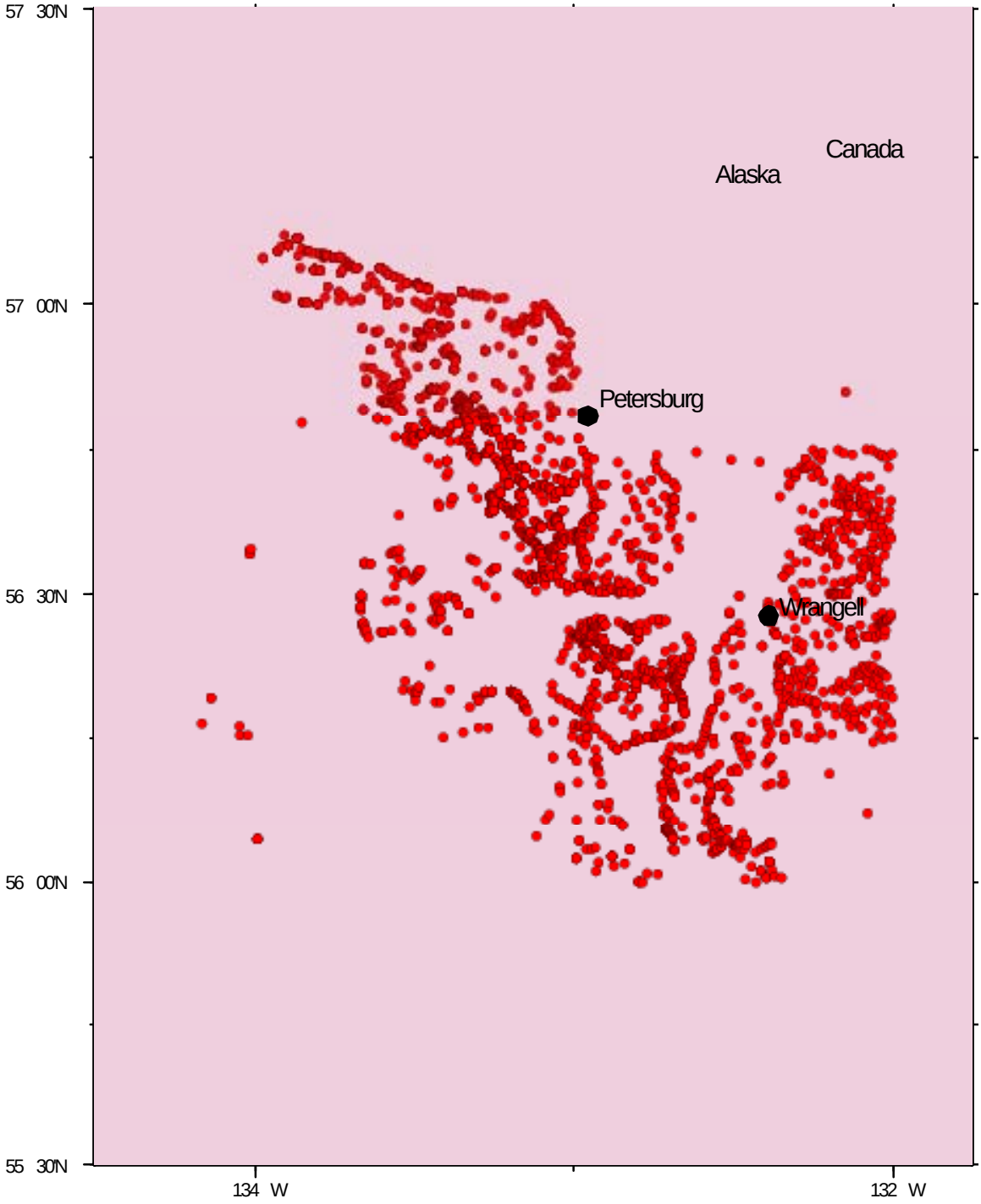

Figure 1. Map showing location of data compiled for this report, in southeastern Alaska.

Additional structural data within the study area are reported in McClelland and Gehrels (1989), and Haeussler (1991, 1992). However, these data were not compiled.

Explanation of Data Table

The data table has the following headings. ‘station’ refers to the station number where the measurement was made, or a reference to the original source of the data. The Haeussler and Karl data was collected in the year 1998, thus the ‘98’ at the front of the station number, and ‘PH’ refers to Peter Haeussler’s stations, and ‘SK’ refers to Sue Karl’s measurements. There are additional two digit abbreviations for the collector of data from pre 1998 fieldwork. For the remaining columns, ‘latitude’ refers to latitude in degrees and decimal degrees, and ‘longitude’ refers to longitude in degrees and decimal degrees. For the Haeussler and Karl data, the latitude and longitude were determined by handheld GPS measurement or by use of a graticule on a topographic map. The explanation of abbreviations used in the ‘structure type’ column is listed in a separate section, below. The next two columns are strike and dip or trend and plunge. Both strikes and trends vary between 0° and 360°, and dip and plunge range from 0° to 90°. The strike and dip of planar data is listed according to the ‘right-hand rule’ or, as one looks along the strike direction, the surface dips to the right. In addition, a D1, D2, D3 deformational hierarchy was not worked out or assumed, with the exception of where refolding relationships could be observed. Thus, crenulation axes are a local small-scale F2 fold, and F2 fold characteristics were measured where it was clear structures belonging to a local F1 fold were refolded.

Structures Types Compiled

The following is a list of 57 structure types measured. Some of these divisions can be grouped for easy of manipulating the data, but we considered it best to present as many different divisions of the data, and leave it to the researcher to lump these together as needed.

Below is an extended description of the abbreviation in the ‘structure type’ column in the table followed by the number of measurements in each category.

boudin – trend and plunge of a boudin neck (n=32)
boudin, in fault zone – trend and plunge of boudin in a fault zone (n=3)
boudin, qtz vein – trend and plunge of boudin of a quartz vein (n=18)
C plane – strike and dip of C plane in S-C structure (n=2)
dike, felsic – strike and dip of pre-Tertiary felsic dike (n=100)
dike, intermediate – strike and dip of pre-Tertiary intermediate composition dike (n=88)
dike, mafic – strike and dip of mafic dike, probably pre-Tertiary (n=184)
dike, predefm – strike and dip of ductilly deformed dike (n=9)
dike, T – strike and dip of dikes and sills, usually mafic in composition, considered by their pristine nature to be Tertiary in age (n=76)
ext qtz vein – strike and dip of quartz vein perpendicular to layering (n=26)
F1 axial surface – strike and dip of axial surface of F1 fold (n=61)
F1 axis – trend and plunge of F1 fold axis (n=34)

F1 axis, ccw – trend and plunge of F1 fold axis with noted counterclockwise asymmetry (n=3)
F1 axis, cw – trend and plunge of F1 fold axis with clockwise asymmetry (n=9)
F2 axis – trend and plunge of F2 fold axis (n=5)
F2 axis, cw – trend and plunge of F2 fold axis with noted clockwise asymmetry (n=2)
F2 crenulation – trend and plunge of F2 crenulation axes (n=102)
fault related fold, cw – trend and plunge of fold axis in a fault zone with clockwise asymmetry (n=1)
fault, generic – strike and dip of a discrete fault with unknown sense of offset (n=66)
fault, left-lateral – strike and dip of left-lateral fault (n=15)
fault, normal – strike and dip of normal fault (n=11)
fault, reverse – strike and dip of reverse, including thrust, fault (n=33)
fault, right-lateral – strike and dip of right-lateral fault (n=23)
fault, strike-slip – strike and dip of a strike-slip fault (n=10)
fol, high T, magmatic – strike and dip of high temperature magmatic foliation in an intrusion defined by orientation of mafic enclaves, schlieren, or planar minerals (n=20)
fol, igneous, old data – strike and dip of "igneous" foliations from the old (Petersburg ARMRAP) data set. This data probably includes high-temperature magmatic foliations, but may include some "low-temperature sub-magmatic" foliations that formed after solidification of the magma, i.e. a foliation related to subsequent deformation of the intrusive (n=238)
fol, low T, submagmatic – strike and dip of low temperature submagmatic foliation in an intrusion (n=14)
fractures – strike and dip of fractures, only measured where notably strong (n=12)
kink fold axial surf – strike and dip of fold of kink band axial surface (n=2)
kink fold axis – trend and plunge of kink band fold axis (n=2)
kink fold axis, cw – trend and plunge of kink band fold axis with noted clockwise asymmetry (n=2)
kink-like fold axis – trend and plunge of "kink-like" fold axes. This term was used to describe open chevron-like folds that looked like a large version of kink folds, but limbs were generally several 10's of centimeters in length (n=10)
mineral lineation – trend and plunge of mineral lineations measured during 1998 fieldwork (n=9)
mineral lineation, old data – trend and plunge of mineral lineations measured during Petersburg AMRAP. The vast number of mineral lineations measured suggests that perhaps some of these lineations are not mineral lineations, but rather another type of lineation (n=40)
mylonitic fol – strike and dip of mylonitic fault zone (n=6)
mylonitic lineation – trend and plunge of mylonitic lineation (n=6)
paleocurrent, in situ – trend and plunge of in situ paleocurrent direction (n=4)
qtz or cal vein – strike and dip of dominantly quartz and a few calcite veins (n=24)
qtz vein fold axis, ccw – trend and plunge of fold axis of folded quartz vein, with noted counterclockwise asymmetry (n=2)
qtz vein fold axis, cw - trend and plunge of fold axis of folded quartz vein, with noted clockwise asymmetry (n=3)

quartz fibers - trend and plunge of quartz fibers (n=5)
s0 – strike and dip of bedding, facing direction unknown (n=871)
s0 overturned – strike and dip of overturned bedding (n=46)
s0 upright – strike and dip of upright bedding (n=115)
s0, T basalt – strike and dip of late Tertiary basalt (n=1)
s0/s1 – trend and plunge of intersection lineation between bedding and cleavage (n=241)
s1 – strike and dip of foliation or cleavage (n=1507)
s2 – strike and dip of S2 foliation (n=9)
shear foliation – strike and dip of shear foliation, not micaceous (n=3)
shear zone – strike and dip of shear zone, e.g., a plane of intense ductile shear (n=9)
slickenlines, generic – trend and plunge of slickenlines, sense of offset unknown (n=5)
slickensides, left-lateral – trend and plunge of slickensides on a left-lateral fault (n=7)
slickensides, normal – trend and plunge of slickensides on a normal fault (n=7)
slickensides, reverse – trend and plunge of slickensides on a reverse or thrust fault (n=15)
slickensides, right-lateral – trend and plunge of slickensides on a right-lateral fault (n=10)
slickensides, strike-slip – trend and plunge of slickensides on a strike-slip fault (n=6)
stretching lin – trend and plunge of a stretching lineation (n=66)

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