Supplementary Figure Captions

Figure S1. Detailed map of area north and west of New Chaplino (by Wright and Wyld, with assistance from Michael Quinn, Mikhail Gelman, and Julia Apt). Location of geochemistry sample localities shown.

Figure S2. Geochemical discrimination diagrams for Chaplino-Provideniya area igneous rocks. (A) K_20 + Na_20 versus SiO_2 diagram after Le Bas and Streckeisen (1991). (B) K_20 versus SiO_2 diagram after Peccerillo and Taylor (1976). (C) Th/Yb versus Ta/Yb diagram after Pearce (1982). (D) Rb versus Yb + Ta diagram for granitic rocks after Pearce et al. (1984). (E) La/Yb versus Yb diagram after Hildebrand and Whalen (2014). WP, within-plate; OR, ocean ridge; VA, volcanic arc; synCOL, syn-collisional. Overall the data support an arc origin for these samples. Major element values measured by XRF at Washington State University; trace and rare earth element values measured by ICP-MS at Washington State University (see supplementary tables).

Figure S3. Rare earth element data from Chaplino-Provideniya area igneous rocks. Enrichment of LREE over HREE favors a subduction-related arc environment. Data normalized to chondrite values of McDonough and Sun (1995).

Figure S4. Multielement data from Chaplino-Provideniya area igneous rocks (after Pearce et al., 1984). Data normalized to ORG (ocean ridge granite) values of Pearce et al. (1984). Data most closely matches those of volcanic arc granitic igneous rocks of Pearce et al. (1984). K_20 values used are normalized to volatile-free. Other elements are in ppm. Major element values measured by XRF at Washington State University; trace and rare earth element values measured by ICP-MS at Washington State University (see supplementary tables).

References Cited

Hildebrand, R.S., and Whalen, J.B., 2014, Arc and Slab-Failure Magmatism in Cordilleran Batholiths II – The Cretaceous Peninsular Ranges Batholith of Southern and Baja California: Geoscience Canada 41, 399-458, http://dx.doi.org/10.12789/geocanj.2014.41.059

Le Bas, M.J., and Streckeisen, A.L., 1991, The IUGS systematics of igneous rocks**:** Journal of the Geological Society, London, v.148, p. 825-833.

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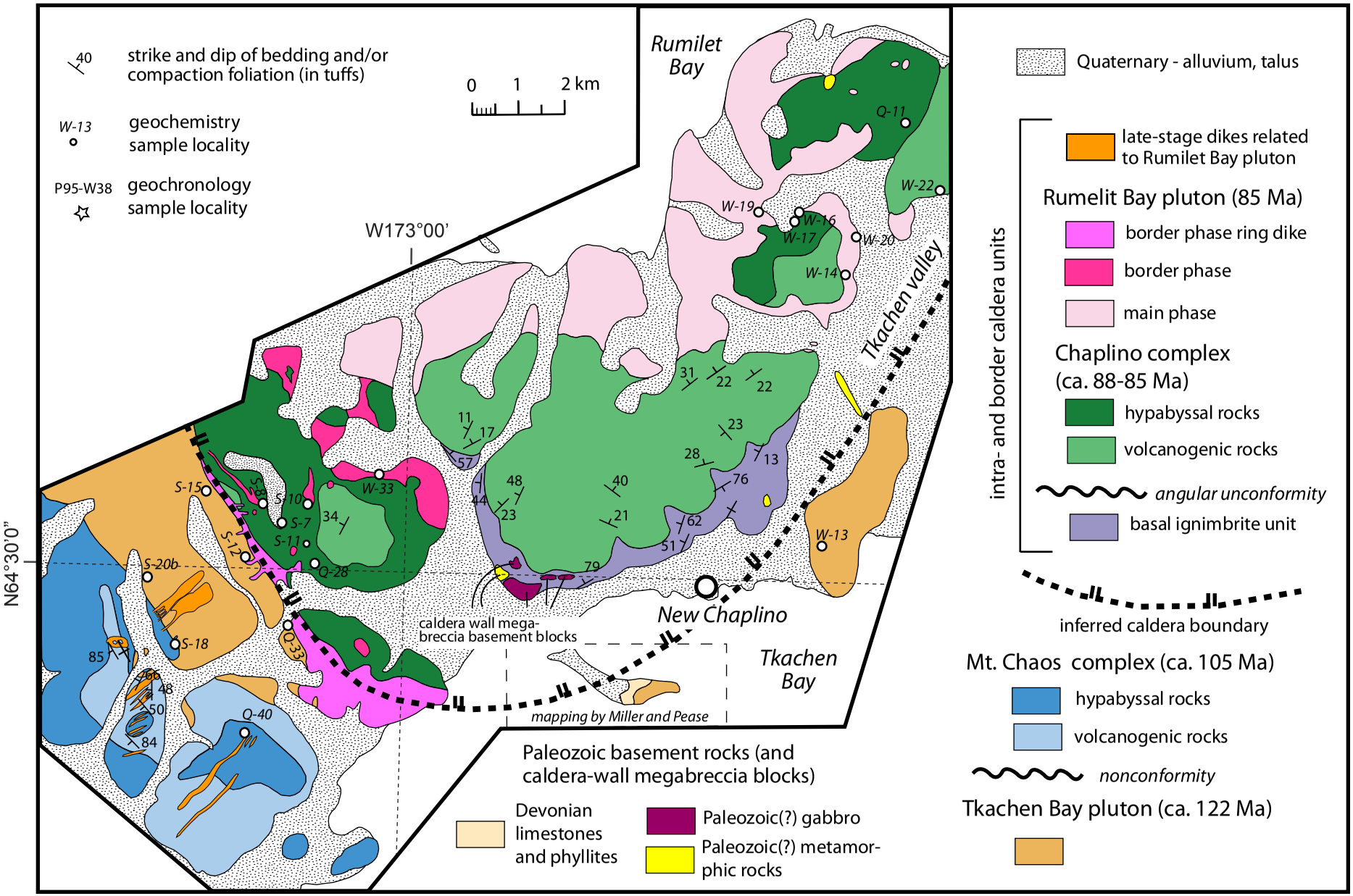
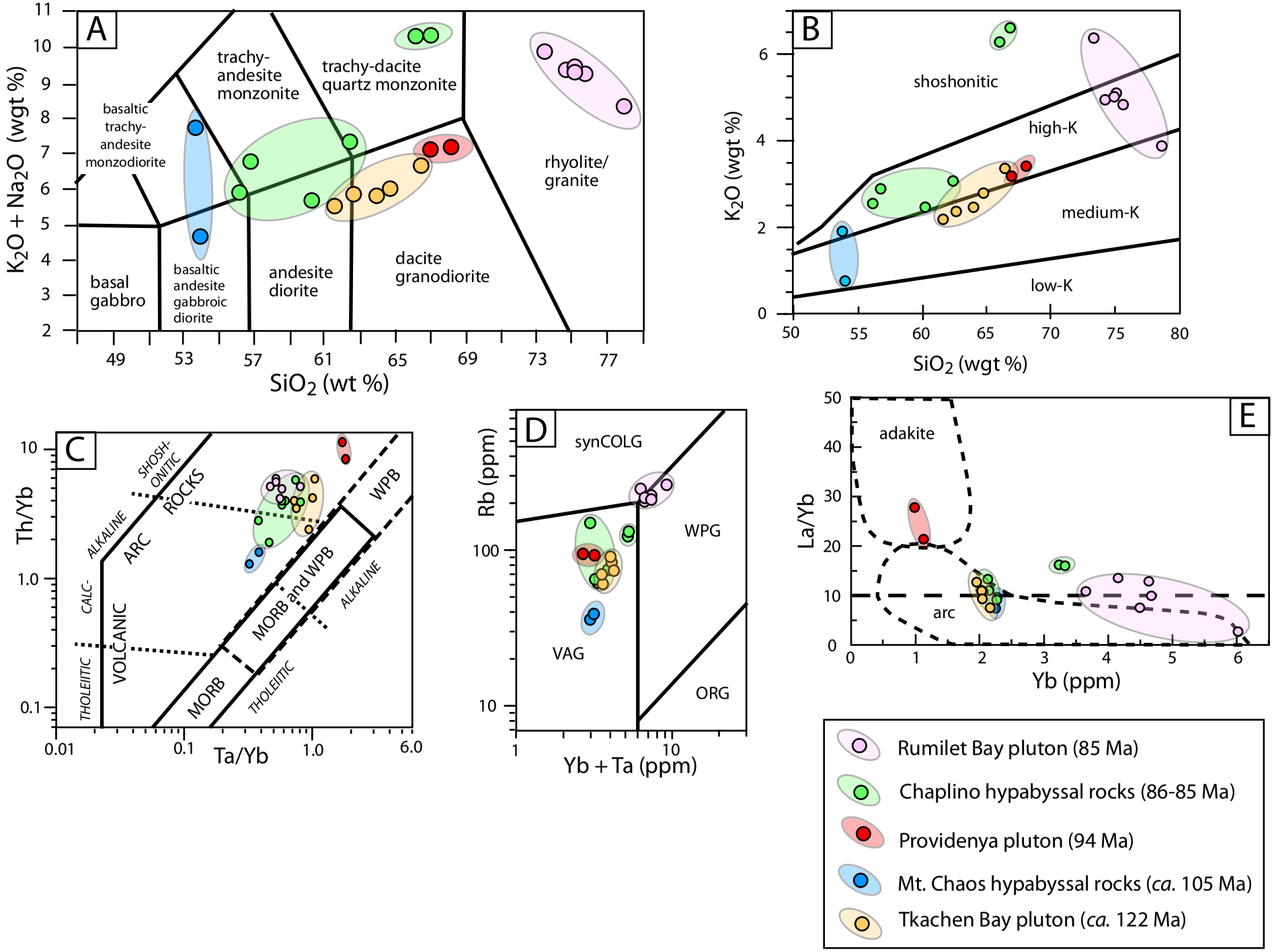
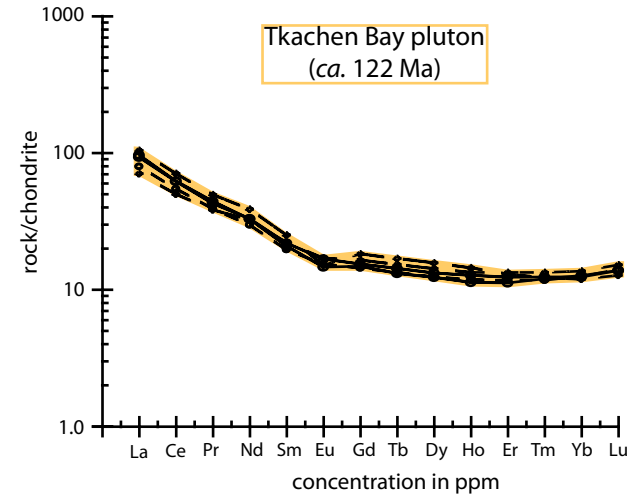
Pearce, J.A., 1982, Trace element characteristics of lavas from destructive plate boundaries: *in* Andesites: Orogenic Andesites and Related Rocks, *ed.* Thorpe, R.S., 525-548.

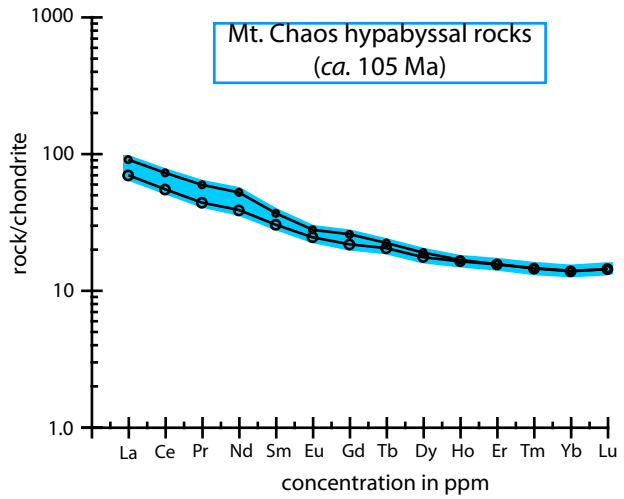
Pearce, J.A., Harris, N.B.W., and Tindle, A.G., 1984, Trace element discrimination diagrams for the tectonic interpretation of granitic rocks: Journal of Petrology 25, 956-983.

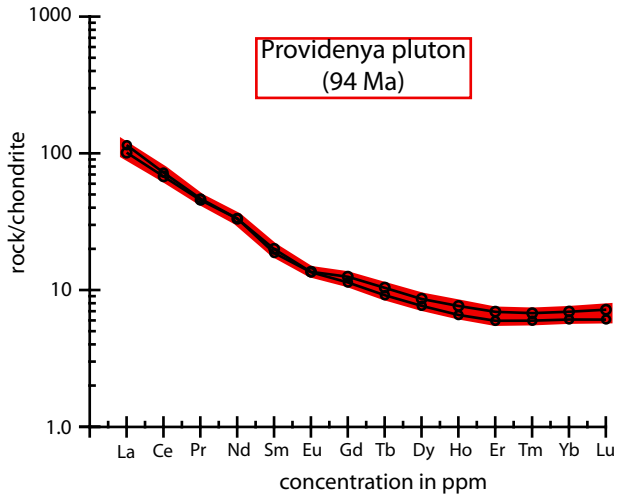
Peccerillo, A., and Taylor, S.R., 1976, Geochemistry of the Eocene calc-alkaline volcanic rocks from Kastamonu area, northern Turkey: Contributions to Mineralogy and Petrology 58, 63-81.

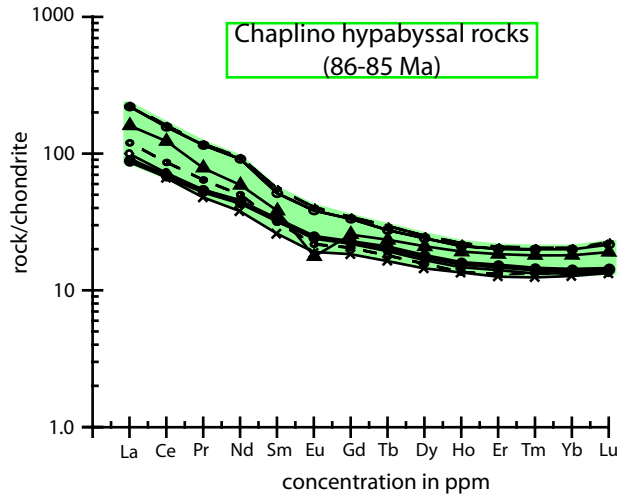

strike and dip of bedding and/or compaction foliation (in tuffs)
W-13
geochemistry sample locality
P95-W38
geochronology sample locality
0 1 2 km
W173°00'
N64°30'0"
Rumilet Bay
Tkachen valley
New Chaplino
Tkachen Bay
caldera wall mega-breccia basement blocks
mapping by Miller and Pease
Paleozoic basement rocks (and caldera-wall megabreccia blocks)
Devonian limestones and phyllites
Paleozoic(?) gabbro
Paleozoic(?) metamorphic rocks
Quaternary - alluvium, talus
intra- and border caldera units
late-stage dikes related to Rumilet Bay pluton
Rumelit Bay pluton (85 Ma)
border phase ring dike
border phase
main phase
Chaplino complex (ca. 88-85 Ma)
hypabyssal rocks
volcanogenic rocks
angular unconformity
basal ignimbrite unit
inferred caldera boundary
Mt. Chaos complex (ca. 105 Ma)
hypabyssal rocks
volcanogenic rocks
nonconformity
Tkachen Bay pluton (ca. 122 Ma)

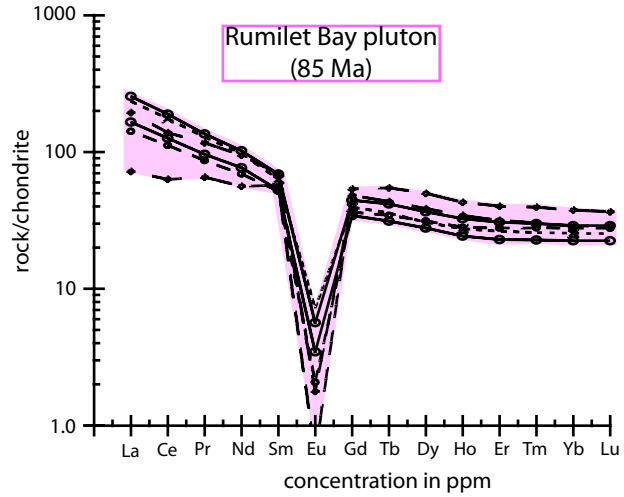

A
basaltic trachy-andesite monzodiorite
trachy-andesite monzonite
trachy-dacite quartz monzonite
rhyolite/ granite
basal gabbro
basaltic andesite gabbroic diorite
andesite diorite
dacite granodiorite
K2O + Na2O (wgt %)
SiO2 (wt %)
B
shoshonitic
high-K
medium-K
low-K
K2O (wgt %)
SiO2 (wgt %)
C
SHOSH-ONITIC
ROCKS
ALKALINE
ARC
CALC-
VOLCANIC
THOLEIITIC
MORB and WPB
WPB
MORB
THOLEIITIC
ALKALINE
Th/Yb
Ta/Yb
D
synCOLG
WPG
VAG
ORG
Rb (ppm)
Yb + Ta (ppm)
E
adakite
arc
La/Yb
Yb (ppm)
Rumilet Bay pluton (85 Ma)
Chaplino hypabyssal rocks (86-85 Ma)
Providenya pluton (94 Ma)
Mt. Chaos hypabyssal rocks (ca. 105 Ma)
Tkachen Bay pluton (ca. 122 Ma)

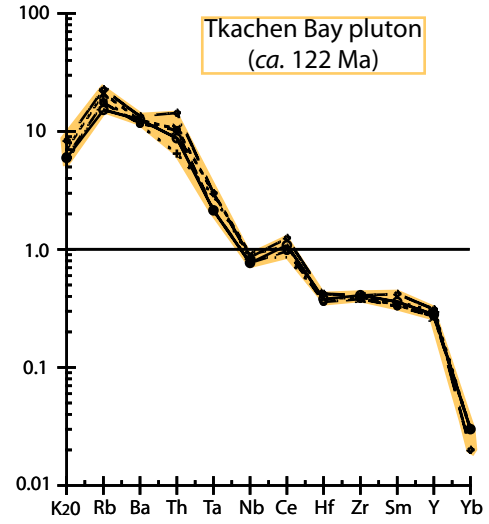

Tkachen Bay pluton
(ca. 122 Ma)
rock/chondrite
1000
100
10
1.0
La Ce Pr Nd Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
concentration in ppm

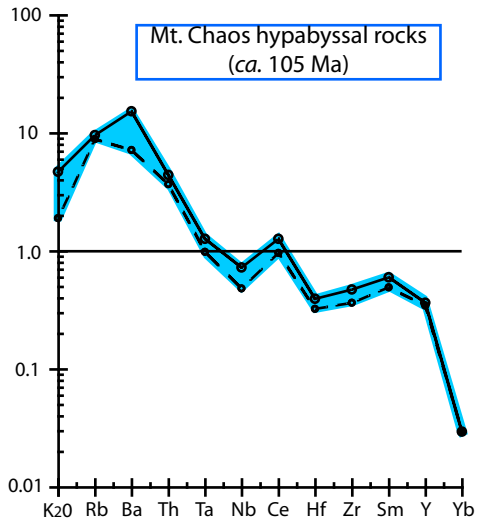

Mt. Chaos hypabyssal rocks
(ca. 105 Ma)
rock/chondrite
1000
100
10
1.0
La Ce Pr Nd Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
concentration in ppm

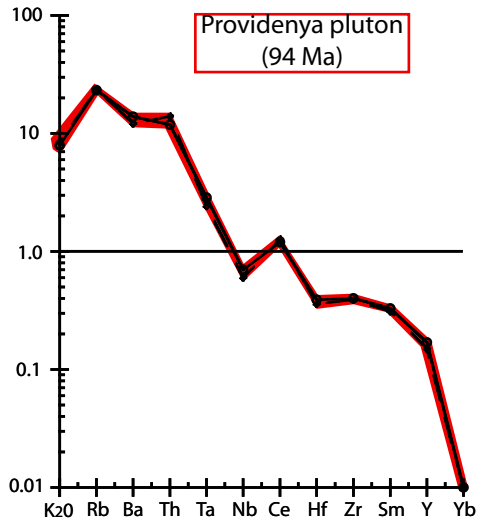

Providenya pluton
(94 Ma)
rock/chondrite
1000
100
10
1.0
La Ce Pr Nd Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
concentration in ppm

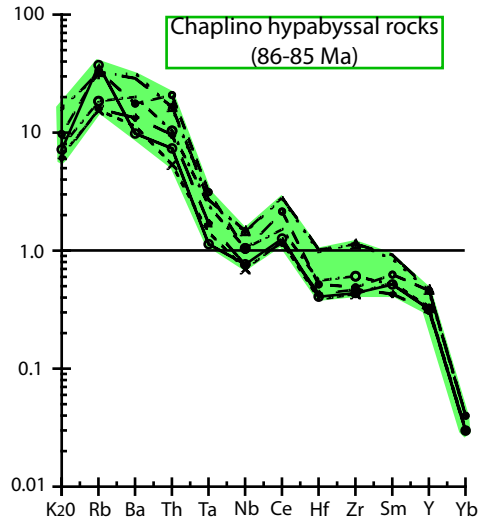

Chaplino hypabyssal rocks
(86-85 Ma)
rock/chondrite
1000
100
10
1.0
La Ce Pr Nd Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
concentration in ppm

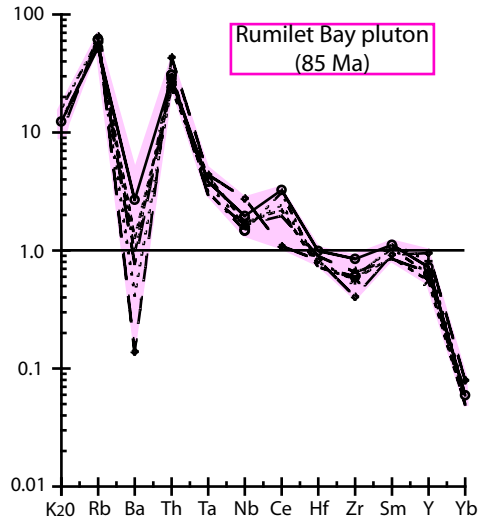

Rumilet Bay pluton
(85 Ma)
rock/chondrite
1000
100
10
1.0
La Ce Pr Nd Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
concentration in ppm


Tkachen Bay pluton
(ca. 122 Ma)
100
10
1.0
0.1
0.01
K20 Rb Ba Th Ta Nb Ce Hf Zr Sm Y Yb


Mt. Chaos hypabyssal rocks
(ca. 105 Ma)
100
10
1.0
0.1
0.01
K20 Rb Ba Th Ta Nb Ce Hf Zr Sm Y Yb


Providenya pluton
(94 Ma)
100
10
1.0
0.1
0.01
K20 Rb Ba Th Ta Nb Ce Hf Zr Sm Y Yb


Chaplino hypabyssal rocks
(86-85 Ma)
100
10
1.0
0.1
0.01
K20 Rb Ba Th Ta Nb Ce Hf Zr Sm Y Yb


Rumilet Bay pluton
(85 Ma)
100
10
1.0
0.1
0.01
K20 Rb Ba Th Ta Nb Ce Hf Zr Sm Y Yb