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MAP AND TABLE SHOWING METAMORPHIC ROCKS OF ALASKA

[References for information are given either in text or in appropriate regional metamorphic facies map (shown in Fig. 2)]

Unit No.	Metamorphic unit [1,3]	Lithotectonic terrane(s) in which unit occurs[2]	Inclusive age range[3] and protoliths[4]	Metamorphic rock types[5] key metamorphic minerals[6,7]; structural characteristics if relevant	Direct evidence for age of metamorphism(s)[3,6]	Maximum age of metamorphism(s) and evidence used[3,6]	Minimum age of metamorphism(s) and evidence used[3,6]
	NORTHERN ALASKA						
	Western and central Brooks Range						
1	AMP (Z) + ┌GNH → L (KJ)	AAH	Z and older?; cont. seds., carb., maf. vol., int. & maf. plut.	Qz-mica schist, qtzite, marble, metabasite, metaplut.; M_1: bt, gt, hb; M_2: ch, ac, bar amph, gl, ph	M_1: Z; K-Ar mu and hb ages between 729±22 and 594±18 Ma and Rb-Sr mineral-whole rock isochron age of 686±116 Ma	M_2: mJ; same evidence as for unit 3	M_2: mK; same evidence as for unit 3
2	AMP (DP̶) + └GNH → L (KJ)	AAH, AAC	mD and older; same protoliths as those given for unit 1	Same rock types as those given for unit 1; M_1: ac, bt, gt, hb; M_2: ab, ch, ac, ep, bt; more structurally complex than adjacent unit 3	----	M_1: P̶; metamorphism in some areas affected rocks whose protoliths may be · in age. M_2: mJ; same evidence as for unit 3	M_1: D; metamorphism in some areas may have accompanied Devonian plutonism. M_2: mK; same evidence as for unit 3
3	GNH → L (KJ)	AAH, AAD AAE	Z(?)-[illegible]; cont. seds., carb., fel. and maf. vol.	Qz-mica schist, calc-schist, marble, fel. metavol., metabasite. phyl.; early part of high-P phase: lw, jdpx, gl; late part of high-P phase: gl, gt, ep, pa, ctd, ac, bar amph; intermediate- or low-P phase: ab, ch, ac, bt; polydeformed, isoclinally folded	----	mJ; K-Ar ages of about 172-154 Ma on hb from gt amphibolite at sole of ultramafic klippen interpreted as cooling ages following tectonic shuffling prior to emplacement of oceanic terrane (Ju, units 8 and 7(?)) onto unit 3	mK; age of conglomerate to south that records uplift and progressive erosion of overthrust oceanic rocks and underlying rocks of unit 3 and K-Ar cooling ages on mica from unit 3 of about 120-90 Ma
4	LPP (KJ)	AAN	Є-T̄R; cont. seds., vol., carb.	Metaseds., argil., phyl., metacarb., metabasite, metacarb.; pu, ch, ze; constitutes structural window beneath unit 3; structures in this unit appear to correlate with those in unit 3	----	mJ; same evidence as for unit 3	mK; same evidence as for unit 3
5	GNS (KJ)	AAN	Є-D; cont. seds., vol., carb.	Same rock types as those given for unit 4; wm, ac, sti; same structural characteristics as those given for unit 4	----	mJ; same evidence as for unit 3	mK; same evidence as for unit 3
6	LPP (K)	AAD, AAE	D-eK; cont. seds., carb., chert, maf. dikes & sills	Metaseds., metacarb., metachert, metabasite; wm, pu, ch, ac	----	eK; age of youngest protolith	mK; probable correlation of metamorphic history with that of unit 3
7	GNS (K)	AAE	D-M; cont. seds., carb.	Phyl., qtzite, metacarb., metaseds.; wm	----	eK; correlation of metamorphic history with that of unit 6	mK; correlation of metamorphic history with that of unit 3
8	LPP $(KJ)_1$?	AM	D-J; maf. vol. & plut., oc. seds., chert	Metabasite, metachert, argil., metacarb.; ch, pu, pr, ep, ac; lower contact fault-bounded; relict igneous textures best preserved in upper parts of sheets	----	mJ; same evidence as for unit 3	mK; age of overlying conglomerate that records progressive erosion of units Ju, 8, 9, and 3
9	GNS $(KJ)_1$?	AM, RB VEN(?)	D-T̄R; seds., carb., chert	Metagraywacke, phyl., metacarb., metachert; ch, ab, wm, rarely bt; singly deformed, semipenetrative cleavage	----	mJ; same evidence as for unit 3	mK; same evidence as for unit 8
10	LPP/GNS (TK)	K	lK; cont. seds., vol.	Metaseds., slate, phyl., metabasite; wm, ch, ep, bt(?); highest plate of structural stack; NE-trending stretching lineation; kinematic indicators indicate down-to-the-S movement of this plate along low-angle, S-dipping normal faults; degree of recrystallization and shearing increases near faults suggesting metamorphism accompanied faulting	----	lK; age of protoliths; correlation of extensional faulting with uplift of Brooks Range	eT; correlation of extensional faulting with right-lateral movement on Kobuk fault zone
	Eastern Brooks Range						
11	LPP (MD) ?	AAN	P̶-m(?)D; cont. seds., carb., vol.	Semischist, phyl., argil., metacarb., metavol.; pr, pu, ch, wm, ab, sti, rarely ep; metamorphic grade increases to S	----	m(?)D; age of youngest protoliths	M; age of unconformably overlying unmetamorphosed rocks
12	GNS (MD)	AAN	Same age range and protoliths as those of unit 11	Same rock types as those of unit 11; ac, ch, wm, ab, sti, ctd	----	m(?)D; same evidence as for unit 11	M; same evidence as for unit 11
13	GNS (D) ?	AAN	P̶(?)-lD; cont. seds., maf. vol.	Pelitic schist, slate, qtzite, mafic schist, phyl., greenstone; metamorphism increases from ch-zone assemblages to bt-gt-zone assemblages with decreasing distance from crosscutting Late Devonian plutons	lD; increase in metamorphic grade toward crosscutting pluton of that age suggests meta. was associated with and slightly preceded plutonism	lD; age of youngest protoliths	lD; age of crosscutting (late-metamorphic?) pluton
14	LPP (KT̄R)	AAE, AAN, VEN, TZ, SHE	D-T̄R; seds., carb., chert, maf. vol.	Argil., metaseds., metatuff, metachert, metabasite; ch, pr, pu, wm	----	T̄R; age of youngest protoliths	eK; age of overlying unmetamorphosed conglomerate
15	LPP $(KJ)_2$	TZ	P̶(?) in southern two areas, lJ-eK in northern area; cont. seds.	Phyl., qtzite, slate; wm, ch	----	lJ; older limit on age range of youngest protolith	eK; younger limit on age range of youngest protolith
	Seward Peninsula						
16	GNH → I (KJ)	SD	P̶-D; cont. seds., carb., maf. and fel. igneous rocks	Pelitic schist, qtzite, marble, mafic schist, metabasite, orthogneiss; early part of high-P phase: lw, gl, ph, jdpx; late part of high-P phase: gl, ep, gt, ac, pa, ab, ph; intermediate-P phase: bar amph, ch, ac, ab, ep; ductilely deformed, shallow-dipping transposition foliation	High-P part of cycle: m-lJ; Rb-Sr whole-rock-mica isochron and K-Ar mineral ages of about 160 Ma; intermediate-P part of cycle: lJ-eK; Rb-Sr and K-Ar ages between about 160-100 Ma	----	----
17	GNH (KJ)	SD	mPz(?)-J(?); maf. vol., ultramafic rocks	Metabasite and minor serpentinite; cr, lw, pu in N; cr, ep, ac in S; metabasite typically has relict igneous grains and mylonitic fabric; unit comprises narrow, fault-bounded belt	----	mJ; possible correlation of metamorphic history with that of unit 8	eK; possible correlation of metamorphic history with that of unit 8
18	AMI (K)	SD	P̶-ePz; cont. seds., carb., maf. and fel. igneous rocks	Pelitic, calcareous, and quartzofeldspathic schist, marble, qtzite, amphibolite; gt, ky, st, sil, hb, cpx; locally metamorphic minerals and structures of unit 16 are preserved in this unit	e-lK; 100- to 80-Ma K-Ar ages on plutons that probably were emplaced during and following this metamorphic episode	eK; approximate 100-Ma upper age limit for previous intermediate-P phase of metamorphism of unit 16	lK; 80-Ma K-Ar ages on plutons whose contact metamorphic effects overprint the fabric and mineral assemblages of this unit
19	2PX (K)	SD	P̶-ePz; same protoliths as those of unit 18	Bt gneiss, marble, pelitic, quartzofeldspathic, and mafic gneiss, gt lherzolite partially recrystallized to sp lherzolite, migmatite; bt, sil, kf, hb, cpx, opx, gt, ol, sp; relict ky included within gt indicates this episoded followed metamorphism of unit 18	lK; 80-Ma K-Ar age of plutons thought to be associated with this metamorphic episode	----	----
20	GNS (KPz)	?	mPz(?); cont. seds., carb., vol.	Qz-mica schist, qtzite, metacarb., calcareous, graphitic, and amphibolitic schist	----	mPz; probable age of protolith of metacarb.	K; age of post-metamorphic granitoids in the region
21	AMP (KP̶)	?	P̶(?)-Pz(?); cont. seds., carb., vol.	Hb gneiss, pelitic gneiss, calc-silicate gneiss, marble; hb, cpx, gt, sil, sc, kf, ol	----	P̶; possible age of protoliths	K; age of plutons whose contact metamorphic effects overprint the fabric and mineral assemblages of this unit
	CENTRAL ALASKA						
22	GNS (pO)	NX	Z-pO; fel., and maf. vol., cont. seds.	Metavol., pelitic schist, calc. schist, semischist, qtzite, phyl., argil., marble; ch, ctd, ep, ac, ab, and rarely bt and (or) gt	Є(?); 514 Ma oldest K-Ar age on mica from ch schist	Z; protolith age	O; age of oldest overlying, unmetamorphosed strata
23	AMP (PzY) + GNS (PzY)	NX	Y-pO; cont. seds. maf. and fel. vol., plut.	Pelitic schist, calc-schist, semischist, qtzite, phyl., metavol., metaplut.; M_1 in pelitic schist: bt, gt, st, co; M_2 in pelitic schist: ctd, ch, wm, ab, ep; locally developed mylonitization may have accompanied M_2	M_1: Y(?); 921-Ma K-Ar age on bt from metaquartz diorite; M_2: Z(?), 663-Ma K-Ar age on mu from mylonitic border of metaquartz diorite	Y; 1265-Ma U-Pb upper intercept age (protolith age) on zircon from metavol.	mPz; 390±40-Ma U-Pb lower intercept age (metamorphic age?) on zircon from metavol.
24	GNS,AMP (pK) ?	RB, NX, BRY	P̶(?)-mPz; cont. seds., vol., carb., chert, fel. plut.	Pelitic, quartzofeldspathic, calcareous, and mafic schist, qtzite, metacarb., phyl., semischist, greenstone, metachert; wm, ab, ch, ctd, ep, ac, bt, rarely anda and co; metamorphic grade is lowest adjacent to unit 9 and highest in core of unit 24; distribution of highest grade rocks not directly related to proximity to eK plutons	----	mPz(?); probable age of youngest protoliths	eK; 110-Ma K-Ar and U-Pb approximate age of crosscutting, unmetamorphosed plutons
25	AMP (pK) ?	RB	P̶(?)-m(?)Pz; cont. seds., plut., vol.	Pelitic schist, qtzite, felsic orthogneiss, mafic metavol.; bt, gt, st, sil; ky in central area; co in southern area	----	mPz(?); same evidence as for unit 24	eK; same evidence as for unit 24
26	AMP (pK) ? + ┌GNS (KJ)	RB	P̶(?)-D; cont. seds., maf. igneous rocks, fel. plut., carb.	Quartzofeldspathic paragneiss, augen gneiss, pelitic schist, qtzite, metabasite, amphibolite, calcareous schist and gneiss, marble, phyllonite. M_1: bt, gt, anda(?); synkinematic with ductile deformation and isoclinal folding. M_2: ch, wm, ctd, and gl at one locality; synkinematic with second generation folding with axial planar cleavage parallel to that in zones of intense cataclasis	M_2: lT̄R-eK; probable association of this episode with obduction of either volcanic unit 8 from the NW or volcanic unit 29 from the SE and the inclusive age range of the obduction of those units	D; age of youngest protolith	eK; 104-Ma K-Ar age of crosscutting unmetamorphosed pluton
27	AMI (pK) ? + AMP (KJ) ?	RB	Same age range protoliths as those of unit 26	Pelitic schist, biotite gneiss, qtzite, marble, calc-silicate rock, amphibolite, granitoid gneiss; pelitic rocks contain mu, bt, gt, sil, ky, kf; all rock types except granitoid gneiss may be polymetamorphosed and polydeformed; metamorphism of granitoid gneiss (mu, bt, gt) may correspond with M_2 of other rocks whose foliation it crosscuts; unit may form an E-NE-trending gneiss dome	----	M_1: pD(?); predates probable D intrusive age of protolith of granitoid gneiss; M_2: D(?); probable age of protolith of granitoid gneiss	eK; 111-Ma K-Ar age of crosscutting, post-metamorphic pluton
28	GNI,H (KJ)	RB	P̶(?)-D; cont. seds., carb., maf. vol., chert	Pelitic schist, qtzite, phyl., slate, metabasite, metacarb., metachert; wm, ch, ctd, ep, and minor gl in upper parts of unit; bt and gt occur rarely	lT̄R-eK; same evidence as for unit 26	D; age of youngest protoliths	eK; same evidence as for unit 27
	CENTRAL ALASKA (Continued)						
29	LPP $(KT̄R)_1$	TZ, IN	lD-lT̄R; maf. vol. and plut., chert, oc. seds., carb.	Greenstone, metadiabase, metachert, argil., slate, metagraywacke, metacarb., metatuff; ab, pr, ch, pu, ac, ep; gl occurs at base of unit in one area; kinematic indicators in Tanana quad. indicate this unit was thrust from the SE	lT̄R-eK; probable association of metamorphism with obduction of this unit from the SE	lT̄R; age of youngest protoliths	eK; age of oldest post-metamorphic plutons that intrude the region
30	AMP (KX) ?	RB	X; maf. igneous, fel. plut., cont. seds.	Amphibolite, orthogneiss, including augen gneiss, pelitic schist, qtzite; bt, mu, hb, ep	Y and eK; K-Ar ages of 1.22 Ga, 1.08 Ga, and 126 Ma on hb from amphibolite and 133 Ma on bt from amphibolite	X; U-Pb zircon protolith age of orthogneiss	eK; youngest K-Ar age from amphibolite
	SOUTHWESTERN ALASKA						
31	AMP (X) + GNS (KJ)	KIL	X; plut., cont. seds., maf. vol., carb.	Orthogneiss, pelitic schist, amphibolite, rare marble; bt, hb, gt, cpx, kf, and ky at one locality; proposed polymetamorphic history based solely on isotopic evidence; NE strike of foliation and trend of lineation approximately parallel to trend of unit	M_1: X; 1.77-Ga U-Pb age of sph from orthogneiss, K-Ar age of hb from amphibolite, and Rb-Sr whole-rock isochron. M_2: lJ-eK; 150- to 120-Ma K-Ar age range for this unit	X; age of protoliths	M_1: Y; 1.2-Ga $^{40}Ar/^{39}Ar$ plateau age of hb from gt amphibolite. M_2: eK; age of overlying unmetamorphosed strata
32	GNS (JT̄R)	GD	P̶(?)-lT̄R(?); vol., oc. sed., maf. and rare ultramafic igneous rocks, carb.	Metabasite, metavol., metaseds., metacarb., serpentinite; ch, ep, ab, ac, wm, pu; schistose fabric developed in metaseds. and metavol.	----	lT̄R; probable age of youngest protolith	mJ; age of crosscutting, post-metamorphic plutons
33	GNH (JT̄R)	GD	P̶(?)-lT̄R(?); same protoliths as those given for unit 32	Same rock types as those given for unit 32; ch, lw, pu, gl, ac, ep; primary textures and minerals partly preserved; complex deformation; local melange-like fabric	lT̄R(?); 231±7-Ma K-Ar age on amph from schist	lT̄R; same evidence as for unit 32	mJ; same evidence as for unit 32
34	GNI,H (KT̄R)	GD	O(?)-lJ(?); basalt, tuff, chert, limestone, oc. seds.	Mafic schist, metachert, metalimestone, phyl., quartzose, graphitic, and calcareous schist; ch, ep, ac, and locally gl	mJ(?)-eK(?); 146±15-Ma K-Ar age on ac from mafic schist	lT̄R(?); maximum age for low-grade metamorphism in the region	eK; minimum of age range for 146±15-Ma K-Ar age on ac from mafic schist
35	LPP (pK)	GD, NY, TG, TK, RB, KY	ePz-eK; maf. igneous, vol., oc. seds., chert, limestone	Metabasite, metavol., metaseds., metachert, metalimestone; ch, ep, ab, pr, pu, wm, amph, lau; well-preserved primary fabrics; locally rocks are slaty, schistose, or highly sheared and disrupted	None; metamorphic age may differ in various parts of unit	----	eK; age of unmetamorphosed rocks that contain pr-pu-bearing clasts derived from this unit
	EAST- AND SOUTH-CENTRAL ALASKA						
	Yukon-Tanana upland						
36	AMH (O-Є) + AMP,GNS (K)	YT	P̶(?)-ePz(?); seds., maf. igneous	Eclogite, mafic, calc-magnesian, quartzitic, and pelitic schist, impure marble; eclogite: gt, jdpx, bar amph, ph, gl, amph, ab, ep; pelitic schist: ky, st, gt; polymetamorphism suggested by local overprinting of above minerals by hbl, ab, ep, bt, and ch; unit occurs as two klippen; M_1 associated with NW-trending folds and M_2 with NE-trending folds	M_1: Є(?)-O(?); 470±35-Ma K-Ar age on amph from eclogite. M_2: eK(?); 115- to 103-Ma K-Ar ages on mica from schist	----	eK; 115- to 103-Ma K-Ar ages on mica from schist
37	AMI (JT̄R)	YT (but perhaps is better related to ST)	Pz-lT̄R(?); seds., maf. vol., limestone	Bt gneiss and schist, amphibolite, marble, qtzite, pelitic schist; gt, hb, ep, bt, mu, st, ky; well foliated and deformed into NE-trending isoclinal folds and later N-trending open folds	lT̄R-eJ; 213±2-Ma $^{40}Ar/^{39}Ar$ plateau age on amph from amphibolite; 209±3-Ma $^{40}Ar/^{39}Ar$ plateau age on amph from synmetamorphic pluton (JT̄Rg)	----	----
38	LPP/GNS (JT̄R)	YT, SV	P-T̄R; maf. vol., oc. seds. and vol., limestone, chert; associated with ultramafic rocks	Greenstone, argil., metatuff, quartzose schist, qtzite, metalimestone, metachert, metagraywacke; pr, pu, ab, ep, ch, wm, ac, and gl at one locality; consists of thrust remnants which are internally broken by thrust faults	eJ; 201±5-Ma $^{40}Ar/^{39}Ar$ plateau age on ac from greenstone	lT̄R; Triassic age of youngest protolith	----
39	GNS $(JT̄R)_1$?	YT	Pz(?); maf., int. and fel. vol., seds.	Quartzose mafic, calcareous, and pelitic schist, phyl., qtzite; ch, wm, ab, ac, ep; well foliated, lineated, and multiply deformed; commonly mylonitic and blastomylonitic	lT̄R(?)-eJ(?); 175±14-Ma K-Ar age on mu and 202±11-Ma Rb-Sr whole-rock age from correlative(?) Klondike Schist in Canada	----	----
40	LPP (KD)	MNK, WS, LG, WHM, MN, NX, CZ	Є(?), O-D; seds., carb., vol., chert	Argil., slate, semischist, qtzite, metacarb., metavol., metachert; wm, ch, ab, ep, ac; pr, pu, and ac coexist in one sample, and gl occurs in another; primary textures preserved; locally mylonitic or highly folded	----	D; age of youngest protoliths	lK; 91-Ma age on unmetamorphosed pluton that probably intrudes this unit
41	GNI (KPz)	YT	P̶(?)-Pz; cont., seds., vol., minor carb.	Qtzite, pelitic, feldspathic, and mafic schist, calc-silicate rock, rare marble; SE-ward increase in metamorphic grade from ch zone (ch, wm, ac, ep) to gt zone (gt, bt, ctd, sti); polydeformed; mylonitic textures widespread and particularly well developed near the NW contact, shown as a thrust fault	eK(?); 138- to 100-Ma K-Ar ages on mica from greenschist	Pz; probable age of youngest protoliths	eK; 115- to 90-Ma approximate age of oldest plutons that postdate metamorphism throughout the Yukon-Tanana region
42	AMI (KPz)	YT	Z-M; cont. seds., vol., plut., carb.	Pelitic schist and gneiss, qtzite, augen gneiss, orthogneiss, calc-silicate rock, amphibolite, marble; SE-ward increase in metamorphic grade from st zone (st, bt, mu, ky, gt, sil) to sil-kf zone; anda coexists with ky at one locality near S margin; pre- and post-metamorphic thrusting; polydeformed	eK(?); 115-Ma U-Pb age on monazite from orthogneiss, and 124-Ma K-Ar age on mu from gt gneiss	Pz; probable age of youngest protoliths. M(?); protolith age of augen gneiss that may have been metamorphosed during this episode	eK; same evidence as for unit 41
43	LPP (KPz)	YT	P̶(?)-Pz(?); cont. seds., carb.	Carbonaceous qtzite and argil., phyl., semischist, metacarb.; wm, ch; clastic textures well preserved	----	Pz; probable age of youngest protoliths	eK; same evidence as for unit 41
44	LPP,GNS (KPz)	YT	P̶(?)-Pz(?); same protoliths as those given for unit 43	Same rock types as those given for unit 43; wm, ch, and rarely bt, gt, and ep; parts of unit are thermally upgraded near contact with Tertiary plutons	eK(?); 125-Ma K-Ar whole-rock age on mu-schist and 140-Ma K-Ar age on hb from calc-schist	Pz; probable age of youngest protoliths	eK; same evidence as for unit 41
45	GNS $(KPz)_1$	YT	Pz; vol., seds., carb.	Qz-ch-wm schist, mylonitic schist, semischist, qtzite, marble, greenstone, phyl.; wm, ch, ep, and rarely gt and (or) bt; most rocks are foliated and folded; mylonitic textures are common and well developed in some areas	----	Pz; probable age of youngest protoliths	eK; same evidence as for unit 41
46	AML/I (K)	YT	P̶(?)-M; seds., vol., plut., minor carb.	Qz-mica schist, bt and hb gneiss, augen gneiss, qtzite, amphibolite, minor marble, calc-schist, felsic gneiss; ep, bt, mu, gt, st, ky, anda, sil, kf, hb, cpx; polydeformed and generally mylonitic; augen gneiss forms batholithic concordant sheets	eK; 134-Ma U-Pb age on sph from augen gneiss, 115-Ma Rb-Sr mineral isochron for augen gneiss; 128- to 107-Ma K-Ar ages on bt and hb from schist and amphibolite; limited structural and isotopic data suggest a possible M episode as well, synchronous with the intrusion of the augen gneiss protolith	M; 342-Ma U-Pb age on zircon from augen gneiss which dates the intrusive age of the youngest known protolith	eK; 115-Ma U-Pb age on zircon from the oldest unmetamorphosed pluton that intrudes this unit
	Alaska Range north of the McKinley and Denali faults						
47	GNS (KD) + ┌GNS (K)	YT, PN, MK	D and older; lT̄R, in one area; vol., seds., maf. and fel. plut., minor carb. and chert(?)	Pelitic schist, qtzite, phyl., calc-phyl., mafic schist, greenstone, marble, metadiorite, metagabbro, metaseds. M_1: metamorphic grade increases N-ward; ch, wm, ep, ac, sti, bt, gt. M_2: ab, ch, ep, wm, ph. Metadiorite, metagabbro, and possibly Triassic metaseds. singly deformed and metamorphosed; all other rock types polydeformed and possibly polymetamorphosed; metamorphic history of unit poorly known and may have differed in various parts	M_2(?): eK; 107-Ma K-Ar age on mu from phyl.	M_1: D age of youngest protolith known to have been metamorphosed during M_1. M_2: lT̄R; maximum possible age of protoliths of singly(?) metamorphosed rocks	M_1: eK (in east); tentative correlation with metamorphism of unit 46; J(?) (in west) oldest (194 Ma) K-Ar age on hb from gt amphibolite in unit 48. M_2: eK; oldest K-Ar age (100 Ma) on mica from unit 48; lK; age of crosscutting undeformed pluton in SE Mt. Hayes quad.
48	AMP (KD) + └GNS (K)	YT	D and older; vol., seds., fel. plut.	Pelitic schist, qtzite, amphibolite, granitic gneiss. M_1: ep, bt, mu, gt, hb; NW-ward increase in metamorphic grade; associated with NW-trending folds. M_2: ab, ch, ep, bt, ac, ph; associated with NE-trending folds	----	D; age of youngest protolith	M_1: same ages and evidence as for unit 47; M_2: eK; oldest K-Ar age (100 Ma) on mica from schist
49	LPP/GNL (K) ?	YT	O(?)-M; seds., vol., carb.	Quartzose and quartzofeldspathic semischist, metafelsite, metabasite, carbonaceous schist, phyl., slate, metalimestone, metaconglomerate; wm, ab, ch, pr, ep, ac; associated with NE-trending folds	eK(?) 108±3-Ma K-Ar whole-rock age on metarhyodacite	M; age of youngest protolith	----
50	LPP/GNS (K) ?	PN, MK, DL, WY	mPz-mK; seds., carb., maf. vol., chert	Phyl., metaseds., metalimestone, greenstone, metachert; wm, ch, ep; bt and amph occur in SW end of unit	----	mK; age of youngest protolith	eT; Paleocene age of overlying unmetamorphosed Cantwell Fm.
51	GNL/I (K) ?	ML	J-K; seds., int. and fel. vol., carb., gabbro	Phyl., qtzite, metaconglomerate, metavol., metalimestone, greenstone; wm, ab, ch, sti, ep, ac	----	eK; proposed age of youngest protolith	eT; same evidence as for unit 50
52	AML/I $(K)_1$?	ML	T̄R-K; seds., carb., inter. plut., maf. igneous	Pelitic schist, calc-schist, marble, qtzite, amphibolite, weakly metamorphosed granitic rocks; E-ward increasing metamorphic progression: mu, gt, bt, st, sil in pelitic rocks and bt, ep, hb, gt, cpx in amphibolite; anda+sil occurs at two localities; late development of greenschist facies minerals near major faults and within weakly metamorphosed granite pluton	eK(?); 105-Ma $^{40}Ar/^{39}Ar$ plateau age on hb from syn- or postmetamorphic batholith; metamorphism waned by lK (70-Ma U-Pb protolith age on zircon from weakly metamorphosed granite pluton)	----	----
53	GNS (KD)	YT	P̶(?)-Pz(?); seds., vol.	Slate, phyl., semischist, qtzite, metavol.; wm, ch, ab, ep, ac	----	D; age of youngest known protolith in nearby units 47, 48 whose metamorphic history may, in part, correlate with that of this unit	K; minimum or actual age of metamorphic units 47, 48 whose metamorphic history may, in part, correlate with that of this unit
54	GNS $(KD)_1$	WY, MK?	Pz(?), mD; seds., int. and maf. vol., carb.	Phyl., metaconglomerate, pelitic, calcareous, and mafic schist, qtzite, metalimestone, greenstone; wm, bt, ch, ab, ac, ep; isoclinally folded; axial plane schistosity deformed by later kink bands	lK(?); 94- to 89-Ma K-Ar ages on unmetamorphosed(?) plutons whose locally developed foliation and concordancy with the structural grain in wallrocks suggest they may be synmetamorphic	mD; age of youngest protolith	lK; age of plutons discussed in "Direct evidence..." column
	AREA OF SOUTHERN ALASKA BETWEEN THE McKINLEY AND DENALI FAULTS AND THE BORDER RANGES FAULT SYSTEM						
55	AMP,GNS (J)	PE	Pz(?), lT̄R(?)-eJ(?); int. and maf. vol. and plut., seds., carb., chert	Metavolc. and metaplut., especially amphibolite, metadiorite, and greenstone, qtzite or metachert, pelitic and calcareous schist, marble; ac, ch, ep, hb, bt, gt, cpx; anda occurs in pelitic schist from two localities on Alaska Peninsula; metamorphic fabrics range from imperfectly schistose to mineral-segregation banded; metamorphic grade increases toward J-age batholiths whose contacts and foliation near their margins parallel that within this metamorphic unit	m-lJ; 177- to 155-Ma K-Ar ages of batholiths interpreted as synkinematic or late kinematic with this metamorphic episode	eJ; proposed age of youngest protoliths (based on correlation with unmetamorphosed presumed equivalents)	m-lJ(?); 177- to 155-Ma K-Ar ages of batholiths assuming plutonism postdated and was not associated with metamorphism
56	AMP (J) + GNS (TK)	PE	Pz(?)-J(?); oc.(?) seds.	Retrograded pelitic schist; M_1: bt, gt, hb. M_2: mu, ab, ch	M_1: m-lJ(?); assumed correlation with metamorphism of unit 55. M_2: eK-eT(?); associated with eK plutonism and possible metamorphism in unit 61 and (or) with K and eT underthrusting of units 72 and 77 of the Chugach terrane	----	eT; Paleocene age of overlying unmetamorphosed strata
57	GNS (J)	PE	lPz(?), eJ(?); int. and maf. vol., seds., carb., int. plut.	Ch schist, greenstone, metaseds., marble, metagranodiorite, metaquartz diorite; ac, ch, ep, ab, mu; metaseds. and metavolc. strike E-W and area steeply dipping; steeply dipping, mylonitic schistosity locally developed parallel to strike of beds and major faults that bound the complex	lJ; 148- to 142-Ma K-Ar ages on bt and 148- to 146-Ma ages on mu from metagranodiorite and metaquartz diorite	----	----
58	GNS,AMP (J) + ┌GNS (TK)	PE (more likely WR)	IP; maf. to int. vol., oc. seds., chert, int. plut.	Metavol., metadiorite, metagabbro, metatrondhjemite, amphibolite, metaseds., marble, lenses of metachert. M_1: ep, ac, hb, gt, bt, wm, cpx; near horizontal E-W-striking stretching lineation in near-vertical E-W-striking mylonitic foliation; metamorphism spacially related to foliated lJ plutons. M_2: (early phase) ab, ep, wm, ch, ac, bt; (late phase) ch, sti; evolved from ductile to brittle conditions	M_1: lJ(?); 154-Ma $^{40}Ar/^{39}Ar$ plateau age of hb from metadiorite that dates either, or both, the intrusive or metamorphic age of the synmetamorphic pluton; or eJ(?); 220- to 200-Ma U-Pb age on sph from IP metagranodiorite. M_2: eK-eT; correlation of retrograde metamorphism with lK-eT N-directed underthrusting and metamorphism of Chugach terrane flysch, and, perhaps additionally, with eK and (or) eT (Eocene) thermal episodes	----	eT; Eocene age of post-metamorphic plutons
59	GNS,AMP (J) + └LPP (TK)	WR	eIP, P, lT̄R; seds., maf. and int. vol., marble, chert	Schist, phyl., amphibolite, marble, metavol., metachert, metaplut. M_1: ac, ch, ep, wm, hb, bt, gt; metamorphic grade generally decreases N-ward. M_2: pr, ep, ch, rare pu or lau. Unit strongly foliated, multiply deformed, and locally sheared and mylonitized	M_1: m(?)-lJ; age of plutons interpreted to be syn- to late-kinematic with regional metamorphism and deformation, and 185-Ma K-Ar age on bt from gt-bearing schist. M_2: lK-eT; correlation of retrograde metamorphism with N-directed underthrusting and metamorphism of Chugach terrane flysch	M_1: lT̄R; age of youngest protoliths. M_2: m(?)-lJ plutons of that age affected by this episode	eT; Eocene age of post-metamorphic plutons in the region
60	GNS,AMP (J)	WR	IP; int. to maf. vol. and plut., minor oc. seds., chert	Greenschist, metagabbro, metaquartz diorite, orthogneiss, amphibolite, pelitic and quartzofeldspathic schist, metachert; ab, ch, ac, ep, bt, hb, gt; fabrics of metaigneous rocks range from massive to gneissic and locally mylonitic; rocks intensely folded and faulted	lJ; 150-Ma concordant U-Pb age on sph from IP granodiorite; 152±6-Ma K-Ar age on hb from metagabbro	----	----
61	GNS,AMP (KJ) ?	PE	IP (?), P, Mz(?); oc. seds., chert, maf. and int. vol., carb.	Argillite, metachert, quartzose or mafic schist, amphibolite, calc-silicate rock, marble, blocks of metachert and metabasite in a foliated argillaceous matrix; ch, ep, hb, bt, mu, gt, cpx; variable metamorphic grade; foliated rocks occur as discrete bodies, as slices in a disrupted zone, and as roof pendants of J-age plutons	e-mJ and (or) eK; age of plutons whose spatial association and shared deformation with this unit may indicate that they were intruded during either or both an e-mJ and an eK synkinematic metamorphic episode	P; protolith age of marble	eK; age of youngest crosscutting plutons
62	AMP (TPz)	?	Pz(?)-Mz(?); int. to fel. plut., maf. vol.(?), seds.	Metagranitic and metadioritic rocks, amphibolite, schist, phyl.; bt, hb, gt; unit occurs within the Denali fault zone and probably is a slice far removed from the rest of the complex that may have been part of the Wrangellia or Alexander terrane	----	Pz possible age of youngest protoliths assuming a correlation with basement of the nearby Wrangellia or Alexander terrane	lT; 20- and 17-Ma K-Ar ages on metamorphic amph and bt (most likely are reset ages due to movement along the fault)
63	GNS,AMP (TT̄R)	PE?	O(?)-lT̄R; siliciclastic and calcareous seds., maf. to int. plut. and vol., chert, ultramafic rocks	Pelitic and calcareous schist, phyl., qtzite, metabasite, metachert, mafic schist, metavol., pyroxenite, metaserpentinite; ch, mu, bt, gt, cum, amph, ep, cpx; heterogeneous polyphase deformation; steeply dipping, isoclinally folded penetrative fabrics; most internal contacts are faults; little lateral continuity due to tectonic mixing; degree of metamorphism (mostly greenschist facies with some amphibolite facies and pr-pu facies) differs between nearby fault blocks indicating postmetamorphic juxtaposition; unit crops out within and adjacent to belt of lK and T batholiths	----	lT̄R; age of youngest protoliths (other maximum ages possible if a single episode is not assumed)	lK-eT; metamorphism predates (or was associated with?) the intrusion of lK to Paleocene or late Eocene to Oligocene plutons
64	GNS $(KPz)_2$	AXC	Є(?)-D(?), lPz; limestone, seds., int. to maf. vol., int. plut.	Marble, mica schist, phyl., greenschist, minor amphibolite, weakly metamorphosed dioritic to tonalitic plutonic rocks; ac, ab, ep, wm, ch, and rarely bt and gt; metamorphic grade decreases NE-ward; rocks are multiply folded and most are schistose; kink banding and slip cleavage locally developed	lJ(?)-eK(?); in Canada, the younger of 150- to 130-Ma plutons appear to postdate metamorphism and the older ones (elongate parallel with the regional wall rock fabric) may be synmetamorphic	lPz; age of youngest protoliths (of weakly metamorphosed plutons) in this unit. Alternatively, lT̄R(?); probable age of youngest protolith within continuation of this unit in Canada	eK; age of postmetamorphic plutons
65	LPP,GNS (KJ)	WR, CW	IP-eJ; int. and maf. vol., limestone, oc. seds., chert, weakly metamorphosed plut.; also includes J-K seds. near N edge of unit	Metavol., including greenstone, metalimestone, argil., metachert, metaplut.; ch, pr, pu, ab, ep, wm, ac; most rocks massive with well-preserved primary textures; weakly phyllitic, schistose, or intensely folded and sheared near N (fault) boundary	J(?); eJ K-Ar ages on hb and bt from metadiorite in NE part of unit, and, in S part of unit, possible association of metamorphism with intrusion of lJ synkinematic plutons within units 58 to 60. mK(?); 112-Ma K-Ar whole rock isochron age for greenstone in S part of unit	eJ(?); youngest protolith in all areas but N edge of unit. Metamorphism of J-K seds. near N edge may postdate metamorphism of rest of unit	mJ(?)-eK(?) for E part of unit; age of oldest overlying, apparently unmetamorphosed seds.
66	LPP (TT̄R)	PE	lT̄R; maf. vol., volcaniclastic seds.	Greenstone, metaseds.; pr, pu	----	lT̄R; age of protoliths; J(?) if alteration in crosscutting J plutons that cut this unit was caused by this metamorphic episode	eT; 60-Ma K-Ar ages from unmetamorphosed dikes that intrude this unit
67	LPP (TK) ?	KH, CH, WF, BP, SU	lJ-mK; flyschoid seds.; lD-J; tectonic fragments of ultramafic and maf. vol., oc. seds., limestone, and chert, tectonically interleaved within the flysch	Metagraywacke, semischist, argil., metachert, greenstone, metalimestone, volcaniclastic metaseds.; wm, ch, ab, pu; most metaseds. show only incipient flattening of grains, but semischistose or protomylonitic fabrics present locally	m-lK; probable association of metamorphism (of at least flyschoid rocks) with accretion of Wrangellia terrane and proposed timing for that event	mK; Cenomanian age of youngest protolith	eT; Paleocene and Eocene ages of overlying unmetamorphosed seds. and vol. and eT age of unmetamorphosed crosscutting plutons
68	LPP $(TK)_1$	KH	JK; flyschoid seds., gabbro	Argil., metagraywacke, metaconglomerate, metagabbro, volcaniclastic metaseds.; pr, pu, ch, wm, ep, ac; primary depositional features generally preserved; slaty cleavage in highest grade (N-most) rocks; penetrative deformation near faults; unit forms lowest grade part of N-dipping inverted metamorphic sequence (Maclaren metamorphic belt)	lK-eT; evidence consists of relations present in highest grade part of sequence (see unit 70)	----	----
69	GNI (TK)	ML, KH, NN	T̄R-K; flyschoid seds., carb., maf. igneous	Phyl., metagraywacke, carbonaceous marble, qtzite, metapelite, greenstone; ab, ch, wm, and locally bt; penetratively deformed and isoclinally folded; S area of unit forms intermediate grade part of N-dipping, inverted metamorphic sequence (Maclaren metamorphic belt)	lK-eT; evidence consists of relations present in highest grade part of sequence (see unit 70)	----	----
70	AMI (TK)	ML, KH, NN	T̄R-K; flyschoid seds., carbonaceous shale, sandstone, maf. igneous, int. plut.	Pelitic schist, gneiss, amphibolite; intruded by foliated synkinematic and synmetamorphic int. plutons (unit TKg with "+") also considered to be part of this metamorphic sequence; bt, mu, gt, st, ky, sil; anda occurs near outer ends of belt; unit forms highest grade part (core) of N-dipping, inverted metamorphic sequence (Maclaren metamorphic belt); abrupt increase in metamorphic grade, due to tectonic shortening, between unit 69 and S margin of this unit and within this unit adjacent to S (lower) margins of the plutons	lK-eT; 70±7-Ma U-Pb age (intrusive) on zircon from synmetamorphic quartz diorite of the East Susitna batholith; 56-Ma U-Pb age on sph and K-Ar age on bt from same quartz diorite sample date end of prolonged plutonic-metamorphic episode	----	----
	AREA OF SOUTHERN AND SOUTHEASTERN ALASKA THAT LIES SOUTH OF THE BORDER RANGES FAULT ZONE						
71	GNI/H (J)	CG	J(?) and older; basalt, chert, oc. seds., limestone	Transitional and (or) intercalated intermediate-P and high-P metabasalt, metachert, and minor pelitic schist, marble, qtzite, and metaseds.; blueschist-facies rocks contain ch, ab, cr, lw, ep, wm, ph, ac (except lw absent on SE side of Cook Inlet, gl present in Kodiak Isl. area, and gt also present in Chugach Mtns.); sti present in greenschist-facies rocks in Chugach Mtns.; unit commonly fault bounded and internally imbricated	J; 204±8-Ma U-Pb sph-wm-ab-amph isochron age and 196-Ma Rb-Sr whole rock-ph isochron age for blueschist from Kodiak Isl. area; 185-Ma $^{40}Ar/^{39}Ar$ age on cr and ph in Chugach Mtns.; 190- to 152-Ma K-Ar ages on wm, cr, and ac from most areas	----	----
72	LPP (TJ)	CG, KK	lT̄R-mK (age of chert interpreted as melange matrix) and older (probably lPz-eMz); flyschoid seds., basalt, tuff, chert, and minor limestone and maf. and ultramafic plut.	Sheared matrix of argil., tuffaceous argil., or metachert, that encloses aligned blocks of metagraywacke, greenstone, metatuff, metachert, minor amounts of metalimestone, maf. metaplut., serpentinite, and slices of exotic metamorphic rocks that locally contain blueschist-facies minerals; pr, pu, ab, ch, ep, lau; unit occurs as fault-bounded, tectonic melange	eK(?); assumption that metamorphism accompanied underthrusting of unit 72 and eK age of trondjhemitic plutons near Anchorage that are interpreted to have intruded during underthrusting. mK(?); K-Ar ages from melange of unit 73 whose metamorphism may correlate with that of unit 72	eJ; possible accretionary and metamorphic age for oldest (innermost) parts of melange	eT; underthrusting and metamorphism of unit 72 predates the lK-eT underthrusting and metamorphism of units 76-78
73	LPP,GNS (TJ)	CG	lJ-eK (age of blocks within melange sequence and age of melange matrix), and K(?) (probable age of bedded sequence); both sequences are composed of flyschoid seds., basalt, tuff, chert, limestone	Much of unit made up of melange like that described in unit 72; SW (outer) part of unit comprises moderately deformed and disrupted bedded sequence of metagraywacke, phyl., argil., metavol., greenstone, and metaconglomerate; bedded rocks: ch, wm, ab, ep, pr; blocks in melange: ch, wm, ep, ac, pr, pu, rare bl amph or bar amph; wide range in metamorphic grade and textural grade between blocks	e-mK(?); 106-91 Ma K-Ar ages on ac and wm from metaseds. and metavol. of melange unit	lJ-eK; Tithonian age of matrix and blocks from oldest part of melange; maximum metamorphic age of youngest parts of melange postdates the Valanginian to Hauterivian age of the youngest matrix and the presumed K age of the outboard bedded sequence	eT; metamorphic assemblages overprinted by thermal metamorphism associated with Eocene plutons (M_2 of units 74 and 75)
74	LPP,GNS (TJ) + ┌GNL (T)	CG	Same age range and protoliths as those of unit 73	Polymetamorphosed metagraywacke, slate, amphibolite, phyl., and schist; M_1: same as that described for unit 73; occurs as relict cataclastic foliation in some areas. M_2: ep, ch, ab, mu, bt; on southern Baranof Isl., M_2 caused both intensification of M_1 foliation and the development of a new foliation, lineation, and folds; the M_2 structures in that area may have been produced during emplacement of an inferred large subsurface Eocene pluton	M_1: e-mK(?); same evidence as for unit 73. M_2: eT; increase in metamorphic grade toward Eocene plutons (48- to 43-Ma K-Ar ages) that intrude this unit and unit 75	lJ-eK; same evidence as for unit 73	----
75	LPP,GNS (TJ) + └AML (T)	CG	Same age range and protoliths as those of unit 73	Polymetamorphosed metagraywacke, slate hornfels, bt schist and gneiss, amphibolite, qtzite; M_1: same as that described for unit 73; relict cataclastic foliation (indistinct in areas where M_2 highest). M_2: gt, co, anda, st, sil, and cpx develop sequentially toward exposed and inferred shallow plutons; strong lineation and schistosity developed on southern Baranof Isl. as explained for unit 74	M_1: e-mK(?); same evidence as for unit 73. M_2: eT; same evidence as for unit 74	lJ-eK; same evidence as for unit 73	----
76	LPP $(TK)_2$	CG	lK; flyschoid seds.	Metasandstone, slate, phyl., metaconglomerate; pr, lau, ab, wm, ch; pervasive slaty cleavage; rocks deformed into tight large-scale isoclinal folds and locally into broken formation; metamorphism and deformation highest in shear zones related to duplex structures formed at base of unit; metamorphism associated with S-vergent structures	----	lK; Maastrichtian age of protoliths	eT; 63-Ma K-Ar age of crosscutting postmetamorphic pluton on Kodiak Island
77	GNL (TK)	CG	lK; flyschoid seds. and vol.	Metagraywacke, slate, phyl., semischist, metaconglomerate, metatuff, greenstone, mafic schist; wm, ch, ep, ab, ac, and locally ctd, sti, and bt; general E-ward increase in metamorphic grade, especially adjacent to contact with correlative unit 78; relict sedimentary structures preserved in all but highest grade areas; relict volcanic textures preserved in W part; metamorphism associated with N-dipping, S-vergent structures that probably formed during accretion of the CG terrane	----	lK; same evidence as for unit 76	eT; Paleocene to middle Eocene (about 60-50 Ma) intrusion of crosscutting plutons
78	GNL (TK) + ┌AML (T)	CG	lK; flyschoid sed. and vol.	Pelitic schist, gneiss, migmatite (metamorphic grade increases toward core of elongate belt); M_2: bt, mu, gt, sil, st, anda, co, hb; granoblastic textures formed during M_2 predominate and overprint M_1 dynamothermal structures; M_2 genetically related to syntectonic intrusion of tonalitic sills and stocks of Eocene age; M_1 associated with S-vergent structures; M_2 overlapped with development of N-vergent structures	M_2: eT; Paleocene to middle Eocene (about 60-50 Ma) age of intrusions associated with metamorphism	M_2: lK; same evidence as for unit 76	M_1: eT; predates Paleocene to middle Eocene age of M_2
79	LPP $(TK)_3$	YA	lK; flyschoid sed.; lJ-eK; tectonically interleaved blocks of chert, seds., vol., diorite	Metasandstone, argil., metalimestone, metaconglomerate, mafic metavol., metadiorite; lau, pr, ch, wm, pu	lK-eT; correlation of metamorphic history with that of units 76-78; 65-Ma K-Ar age on hb from amphibolite within presumed higher grade equivalent (unit 81)	lK; age of youngest protoliths	eT; Eocene (about 50 Ma) age of syn(?)- or postmetamorphic plutons; locally mK, where deformed melange is crosscut by pluton that gives an 89-Ma K-Ar age on hb
80	GNL $(TK)_1$	YA	Same age range and protoliths as those of unit 79	Slate, phyl., semischist; wm, ch, ep, locally bt; primary sedimentary features generally preserved	lK-eT; same evidence as for unit 79	lK; same evidence as for unit 79	eT; same evidence as for unit 79
81	AML (TK)	YA	Same age range and protoliths as those of unit 79	Mafic metavol., quartzofeldspathic and pelitic schist, amphibolite, metaconglomerate, marble; bt, ep, hb, gt, and locally anda and st; semigranoblastic texture suggests metamorphism was predominantly of thermal origin	lK-eT; correlation of metamorphic history with that of units 76-78; 65-Ma K-Ar ages on hb from amphibolite; metamorphic texture and steep thermal gradient suggests metamorphism may have been associated with intrusion of 50-Ma plutons	lK; same evidence as for unit 79	eT; same evidence as for unit 79
82	GNS/AMP (TK)	CG	lK; flyschoid sed. and vol. (same as those of units 77, 78)	Semischist, bt schist, ac schist, amphibolite; lower grade areas: wm, ch, ac, ep, bt, gt; higher grade areas: hb, gt; fabrics range from granoblastic to well foliated and lineated	lK(?); 67-Ma K-Ar age on hb from amphibolite. m-lT(?); 23- to 19-Ma K-Ar ages on hb and bt from metamorphic rocks north of latitude 59°	lK; probable age of protoliths	mT (south of latitude 59°); Oligocene (28±8-Ma, $^{40}Ar/^{39}Ar$) age of crosscutting, post metamorphic gabbroic plutons
83	AMP (TK)	CG, SE	lK; flyschoid sed. and vol. (same as those of units 77, 78, 82)	Bt gneiss, hb schist, amphibolite; bt, hb, gt; ky+sil occurs at one locality in northern block; rocks well foliated and locally lineated; unit comprises two fault blocks separated by right-lateral movement	lK(?); evidence described for related, lower grade part of sequence (unit 82)	lK and (or) m-lT(?); same evidence as for unit 82	mT; same evidence as for unit 82
84	LPP (T)	PW, GR	eT; Paleocene, early and middle(?) Eocene flyschoid seds., minor maf. vol. and plut., limestone; melange includes some eK material	Metagraywacke, argil., metalimestone, greenstone, maf. schist; pr, pu, ch, ep, wm; isoclinally folded; zones of tectonic melange; general N-ward increase in metamorphic grade in main part of unit (astride Prince William Sound)	eT; assumed association of metamorphism with accretion of unit	eT; early and middle(?) Eocene age of youngest protoliths	eT; age of late(?) or postkinematic plutons that young to the E (62 Ma on Kodiak Isl.; 52-47 Ma S of Chugach Mtns.)
85	LPP (T) + └AML (T)	PW	eT; Paleocene, early and middle(?) Eocene flyschoid seds., minor maf. vol.	Metagraywacke, maf. schist; M_2: bt, co, anda, gt	M_1: eT; same as for unit 84. M_2: eT; associated with intrusion of tonalite with K-Ar ages on bt and hb of 51 Ma	M_1 and M_2: eT; same as for unit 84	M_1: eT; predates intrusion of 51-Ma tonalite
	SOUTHEASTERN ALASKA						
	Prince of Wales Island and adjacent islands						
86	GNS (O-Є) + ┌LPP (DS)	AXC	Z and (or) Є; maf. to inter. vol. and plut., seds., limestone, diorite	Greenschist, greenstone, pelitic schist, phyl., marble, metaplut.; ch, ab, ep, ac, wm; penetratively deformed; only local preservation of protolith features; M_2 is inferred because it is recorded in the adjacent rocks of unit 88	lЄ-eO; established by minimum and maximum age constraints and suggested by 483-Ma K-Ar ages from this unit	m-lЄ; protolith age of metaplut.	M_1: latest eO-mO; depositional age of overlying, weakly metamorphosed rocks included in unit 88
87	AMP (O-Є) + └LPP (DS)	AXC	Z and (or) Є; seds., maf. to fel. vol., limestone	Schist and gneiss; M_1: mu, bt, gt, sil, hb; penetratively deformed; M_2 is inferred because it is recorded in the adjacent rocks of unit 89	lЄ-eO; correlation of metamorphic history with that of unit 86	m-lЄ; assumed age of youngest protolith based on correlation with unit 86	M_1: latest eO-mO; depositional age of overlying, weakly metamorphosed rocks included in unit 89
88	LPP (DS)	AXC	eO-eS; seds., maf. to fel. vol., chert, limestone, plut.	Metaseds., metavol., metachert, metalimestone, metaplut.; ch, ab, ep; relict sedimentary and volcanic textures common; not penetratively deformed	----	eS; age of youngest protoliths	middle eD; age of overlying, unmetamorphosed strata
89	GNS (DS)	AXC	eO-S; seds., vol., limestone, plut.	Greenschist, semischist, phyl., slate, metalimestone, metaplut., N-ward decrease in metamorphic grade	----	S; age of youngest protoliths	lS-eD; 408±10-Ma age of crosscutting, undeformed pyroxenite
90	GNS (DS) + ┌GNS (K)	AXN	O-lS; vol., seds., int. plut., limestone	Greenstone, greenschist, qz-rich schist, qtzite, phyl., marble, metadiorite, metatrondhjemite; ch, wm, ab, ep, amph, bt; evidence of ch-grade M_2 retrograde metamorphism apparent in higher grade parts of unit; cataclastic textures common; generally only weakly foliated, but schistose locally	M_1; lS intrusive age of late-metamorphic trondhjemite dikes	M_2: K; age of youngest protoliths in overlying unit 101, also metamorphosed during this episode	M_1: middle eD; age of overlying strata that only records M_2 metamorphism. M_2: 177-Ma K-Ar age on bt from metadiorite
	Area of Glacier Bay and Chichagof, Baranof, and Admiralty Islands						
91	GNS (KT̄R)	TUN (more likely WR)	lT̄R; basalt, oc. seds., limestone	Metabasalt, argil., metasandstone, metasiltstone, metalimestone; ch, ac, ep, ab, wm	----	lT̄R; Carnian(?) age of protoliths	late eK; age of crosscutting plutons
92	GNS $(KT̄R)_1$	AXC	S(?)-P(?); maf. vol., tuff, seds., limestone, plut.	Ch schist, mica schist, phyl., slate, marble, qtzite; ch, mu, ab, bt, ep, gt; amphibolite-facies orthogneiss and amphibolite present in N part of unit; complexly deformed and folded	lJ(?)-eK(?); older plutons in 150- to 130-Ma age range that intrude the apparent continuation of this unit in Canada are commonly elongate parallel to the regional structural grain but locally crosscut it, suggesting syn- to post-metamorphic intrusion	lT̄R; age of metamorphosed strata in Canada that probably unconformably overlie (and were metamorphosed along with) the Paleozoic rocks in apparent continuation of this unit	eK; younger plutons in 150- to 130-Ma age range that intrude the apparent continuation of this unit in Canada postdate metamorphism and deformation
93	LPP $(KJ)_3$	AXC	S(?), D-P, eJ(?); seds., limestone, maf. and int. vol., chert	Metaseds., argil., phyl., metalimestone, metavol., metachert; ch, ep, ab, wm	----	eJ(?); probable age of youngest protoliths	late eK; age of crosscutting plutons
94	AMP (KPz)	WR	pre-m-lJ; maf. vol., marine seds., limestone	Amphibolite, gneiss, hb schist, bt schist, marble, calc-silicate granofels; bt, hb, gt, cpx; in one area direction of increasing metamorphic grade unrelated to distance from crosscutting m-lJ plutons, but in another area, this unit is reported to grade into the plutons from this same belt	----	Pz; maximum reasonable age of protoliths	eK; youngest age of age range for belt of mJ-eK syn- or post-metamorphic plutons that intrude this unit
	Area of Glacier Bay and Chichagof, Baranof, and Admiralty Islands (Continued)						
95	AMP (K) ?	AXC	S-D; seds., vol., limestone	Pelitic schist and gneiss, marble, amphibolite, and minor lower grade greenstone and greenschist; ch, hb, bt, kf, cpx; in most areas rocks are well foliated, but locally they are granofels	eK; presumed association of metamorphism with intrusion of 120- to 110-Ma plutons on the basis of parallelism between metamorphic structures, foliate fabric of plutons, and pluton-wall-rock contacts	----	----
96	LPP $(K)_1$	AXA, GN, TUN	O, P-eK; seds., int. and maf. vol., chert, limestone	Argil., slate, metased., metavol., metachert, metalimestone, phyl.; ch, wm, ab, ep, pr; predominant W-ward increase in metamorphic grade into units 97 and 98; metamorphism in some parts of E margin of unit may have occurred during metamorphism of unit 105	eK; correlation of metamorphism with plutonism of that age on the basis of evidence described for units 97 and 98	eK; age of youngest protoliths	eT; Paleocene to Miocene age of overlying, unmetamorphosed seds.
97	GNS $(K)_1$	AXA, GN	O-T̄R; seds., vol., limestone, qz diorite	Phyl., greenstone, slate, marble, metaquartz diorite, migmatite, schist; ch, ab, wm, ep, amph	eK; 120- to 110-Ma age of plutons toward which metamorphic grade of this unit and higher grade equivalent, unit 98, apparently increases and whose contact aureoles merge with the dynamothermally metamorphosed rocks	lK; age of youngest protoliths	eT; Paleocene age of overlying unmetamorphosed seds.
98	GNS,AMP (K)	AXA	Same age range and protoliths as those of unit 97	Mafic schist and hornfels, mica schist, metachert, marble, slate, phyl., amphibolite, cpx±gt schist, migmatite; greenschist-facies rocks: ab, ch, ep, bt; amphibolite-facies rocks: bt, hb, gt, cpx, kf	eK; same evidence as for unit 97; spatial association between unit 98 and the 120- to 110-Ma plutons	Same evidence as for unit 97	Same evidence as for unit 97
99	LPP/GNS (TT̄R)	WR	Pz(?)-lT̄R(?); basalt, limestone, oc. seds. and vol., chert	Greenstone, greenschist, metalimestone, metatuff, metaseds.; ch, ab, ep, ac, pr, wm	----	lT̄R; age of youngest protoliths	eT(?); probable age of postmetamorphic plutons
	Kupreanof, Etolin, and Revillagigedo Islands and Cleveland Peninsula area						
100	LPP/GNS $(K)_1$	GN, TUS	ePz, lPz(?), lT̄R-mK; seds., int. and maf. vol., limestone, chert	Greenschist, greenstone, fine- to coarse-grained metaseds., metavol., semischist, metalimestone, metachert; ab, wm, ch, ep, ac; cleavage well developed in fine-grained metaseds.; relict pyroxene phenocrysts locally abundant in greenschist and greenstone	----	mK; postdates Albian or Cenomanian age of youngest protolith	mK; predates intrusion of zoned mafic-ultramafic bodies that give 110- to 100-Ma K-Ar ages
101	GNS $(K)_2$?	TUS, AXN	D, P, mT̄R-eK; flyschoid seds., int. or maf. vol., int. or maf. plut., limestone	Phyl., semischist, pelitic schist, greenschist, marble, slate, argil., metaconglomerate, metabasite, metatuff; wm, ch, ep, bt, mu, ac; apparent NE-ward increase in metamorphic grade; gt locally present in highest grade areas	----	eK; age of youngest protoliths	mK; predates syn- to late(?)-kinematic intrusion of 101- to 90-Ma plutons
102	LPP/GNS (K) + ┌GNL→I (K)	TUS	lJ-mK; seds., maf. and int. vol.	Greenschist, phyl., semischist, greenstone, metavol., metagraywacke, slate; M_1: ch, wm, ep, rarely bt; M_2 minerals in aureoles of 90-Ma plutons include anda that, in most areas, is partly to totally replaced by static ky (indicating an increase in P), and elsewhere is replaced by st and wm; other M_2 minerals: gt, bt, st, and sil (fibrolite) in aureoles, and bt, ep, ac, and wm away from aureoles; degree of metamorphism generally decreases away from plutons	M_2: lK; 90-Ma K-Ar age for plutons associated with this metamorphic episode	M_1: mK; same evidence as for unit 100	M_1: mK; same evidence as for unit 100
103	AMI (K)	TUS	P(?), T̄R(?), J(?)-K(?); seds., int. and maf. vol., limestone, int. plut.	Pelitic schist, quartzofeldspathic schist and gneiss, amph schist and gneiss, marble, calc-schist, metadiorite, migmatite; pelitic schist contains bt, mu, gt, st, ky, sil; relict anda that is replaced by ky occurs at two localities in N part of unit, indicating that P was originally lower in the N and that it increased with time	lK; spatial association of highest grades of metamorphism with 90-Ma plutons	----	----
	Mainland belt						
104	GNL → I (K) + ┌GNI (TK)	TUS	P(?), lT̄R, J(?)-K(?); seds., maf. and int. vol. and plut., limestone	Pelitic schist, semischist, phyl., slate, marble, calc. ch-amph granofels; M_1: ky occurs along with, and replaces, anda in aureoles of 90-Ma plutons; away from aureoles, M_1 minerals probably were the same as M_2 minerals (ch, trem, bt, gt)	M_1: lK; same evidence as for unit 103 and M_2 of unit 102; M_2: lK-eT; same evidence as for units 106, 107, and 108	----	----
105	LPP $(TK)_4$	GN	e(?)K and older(?); maf. vol., seds., int. plut.	Basaltic metatuff breccia, metagraywacke, metapelite, int. metaplut.; ab, wm, ch, pu, ep, ac, pr, sti; E-ward increase in metamorphic grade into unit 106; unit forms lowest grade part of Barrovian metamorphic sequence	lK-eT; evidence consists of relations present in highest grade part of sequence (see unit 107)	----	----
106	GNI $(TK)_1$	TUN, TUC TUS	Same age range and protoliths as those in unit 104	Phyl., slate, semischist, greenschist, mica schist, greenstone; ab, wm, ch, ep, ac, bt, gt; NE-ward increase in metamorphic grade and degree of penetrative deformation; bt and gt isograds parallel those in unit 107; unit forms intermediate grade part of Barrovian metamorphic sequence; E boundary of unit with higher grade equivalent (unit 107) is defined by isograd marking first appearance of either bt+st, bt+ky, or bt+sil; this isograd dips to NE and hence is inverted	lK-eT; evidence consists of relations present in highest grade part of sequence (see unit 107)	----	----
107	AMI $(TK)_1$	TA, ST	Same age range and protoliths as those in unit 104	Pelitic, semipelitic, and quartzofeldspathic schist and gneiss, hb schist, amphibolite, qtzite, marble, calc-silicate, migmatite; mu, bt, gt, st, ky, sil, kf in pelitic rocks; hb, bt, gt, as well as cpx (in highest grade) in mafic rocks; NE-ward increase in metamorphic grade defined by isograds marking first appearance of st, ky, and sil; isograds trend N-NE parallel to elongate, synmetamorphic tonalite sill (unit TKg with "+"); isograds vertical or inverted; unit forms highest grade part of Barrovian metamorphic sequence	lK-eT; 69- and 62-Ma U-Pb ages on zircon from the elongate tonalite sill within this metamorphic unit whose intrusion was syn- to late-kinematic with metamorphism; evidence consists of increase in metamorphic grade toward sill, parallelism between isograds, sill contacts, metamorphic foliation, lineation of sill, and structural elements in metamorphic sequence	----	----
108	AMI,L (TK)	TA, ST	Pz(?)-eK; seds., fel., int., and maf. vol., int. plut., limestone, chert(?)	Orthogneiss, migmatite, pelitic schist, paragneiss, calc-silicate gneiss, qtzite, amphibolite; mu, bt, gt, sil, co, cum, kf, hb, cpx	lK-eT; same evidence as for unit 107, except that the U-Pb ages on zircon from the parts of the tonalite sill intruding this unit are 58-55 Ma and no isograds have been mapped within this unit	----	----
109	GNS (TJ)	ST	P(?), lT̄R-eJ; granodiorite, int. vol. and volcaniclastic seds., flyschoid seds., limestone	Metatuff breccia, semi-schist, phyl., marble, metagranodiorite; ch, ac, ab, ep; relict volcanic and plutonic textures are common; unit generally not penetratively deformed; cataclastic or mylonitic fabric locally developed in metamorphosed pluton	----	lJ; field relations in adjoining area in B.C., Canada, suggest that metamorphism post-dates deposition of strata of presumed m-lJ age	eT; contact aureoles of Eocene plutons overprint metamorphic fabric in metagranodiorite

1 See Sheet 1 and text for explanation of unit names. Brackets join units that were, or may have been, metamorphosed during the same episode. Query denotes high degree of uncertainty about correlation of metamorphic episodes. Subscripts are used to differentiate between units that have the same metamorphic grade and age but have different protoliths and are believed to have different metamorphic histories.

2 Lithotectonic terranes of Jones and others (1987) west of the 141st Meridian, and Monger and Berg (1987) east of it. These references are listed at the end of this report. Abbreviations used:

Postaccretion cover deposits
K Upper Cretaceous deposits

Postamalgamation overlap assemblage
GN Gravina-Nutzotin belt

Accreted terranes
Arctic Alaska terrane
AAC Coldfoot subterrane
AAD DeLong Mountains subterrane
AAE Endicott Mountains subterrane
AAH Hammond subterrane
AAN North Slope subterrane
AM Angayucham terrane
Alexander terrane
AXA Admiralty subterrane
AXC Craig subterrane
AXN Annette subterrane
BP Broad Pass terrane
BRY Baldry terrane
CG Chugach terrane
CH Chulitna terrane
CW Clearwater terrane
CZ Crazy Mountains terrane
DL Dillinger terrane
GD Goodnews terrane
GR Ghost Rocks terrane
IN Innoko terrane
KH Kahiltna terrane
KK Kachemak terrane
KIL Kilbuck terrane
KY Koyukuk terrane
LG Livengood terrane
MK McKinley terrane
ML MacLaren terrane
MN Minchumina terrane
MNK Minook terrane
NN Nenana terrane
NX Nixon Fork terrane
NY Nyac terrane
PE Peninsular terrane
PN Pingston terrane
PW Prince William terrane
RB Ruby terrane
SD Seward terrane
SE Saint Elias terrane
SHE Sheenjek terrane
ST Stikinia terrane
SU Susitna terrane
SV Seventymile terrane
TA Tracy Arm terrane
TG Togiak terrane
TK Tikchik terrane
TUC Taku terrane (central)
TUN Taku terrane (northern)
TUS Taku terrane (southern)
TZ Tozitna terrane
VEN Venetie terrane
WF West Fork terrane
WHM White Mountains terrane
WR Wrangellia terrane
WS Wickersham terrane
WY Windy terrane
YA Yakutat terrane
YT Yukon-Tanana terrane

3 Symbols p, e, m, or l before age abbreviation respectively denote pre-, early, middle, or late. Standard abbreviations for protolithic and metamorphic ages are: T, Tertiary; K, Cretaceous; J, Jurassic; T̄R, Triassic; Mz, Mesozoic; P, Permian; IP, Pennsylvanian; M, Mississippian; D, Devonian; S, Silurian; O, Ordovician; Є, Cambrian; Pz, Paleozoic; P̶, Proterozoic; Z, Late Proterozoic; Y, Middle Proterozoic.

4 Abbreviations used: carb., carbonate rocks; cont., continental; seds., sedimentary rocks; fel., felsic; int., intermediate; maf., mafic; oc., oceanic; plut., plutonic rocks; vol., volcanic rocks.

5 Abbreviations used: argil., argillite; calc., calcareous; qtzite, quartzite; metacarb., metacarbonate rocks; metaplut., metaplutonic rocks; metased., metasedimentary rocks; metavol., metavolcanic rocks; orthogn., orthogneiss; phyl., phyllite.

6 M_1 and M_2 refer to the first and second episodes of a polymetamorphic history.

7 P, pressure; T, temperature. Mineral abbreviations used: ab, albite; ac, actinolite; amph, amphibole; anda, andalusite; bar amph, barroisitic amphibole; bl amph, blue amphibole; bt, biotite; ch, chlorite; co, cordierite; cpx, clinopyroxene; cr, crossite; ctd, chloritoid; cum, cummingtonite; ep, epidote group; gl, glaucophane; gt, garnet; hb, hornblende; jd, jadeite; jdpx, jadeitic pyroxene; kf, potassium feldspar; ky, kyanite; lau, laumontite; lw, lawsonite; mu, muscovite; ol, olivine; opx, orthopyroxene; pa, paragonite; ph, phengite; pr, prehnite; pu, pumpellyite; qz, quartz; sc, scapolite; sil, sillimanite; sp, spinel; sph, sphene; st, staurolite; sti, stilpnomelane; trem, tremolite; wm, fine-grained white mica; ze, zeolite.

MAP AND TABLE SHOWING METAMORPHIC ROCKS OF ALASKA

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