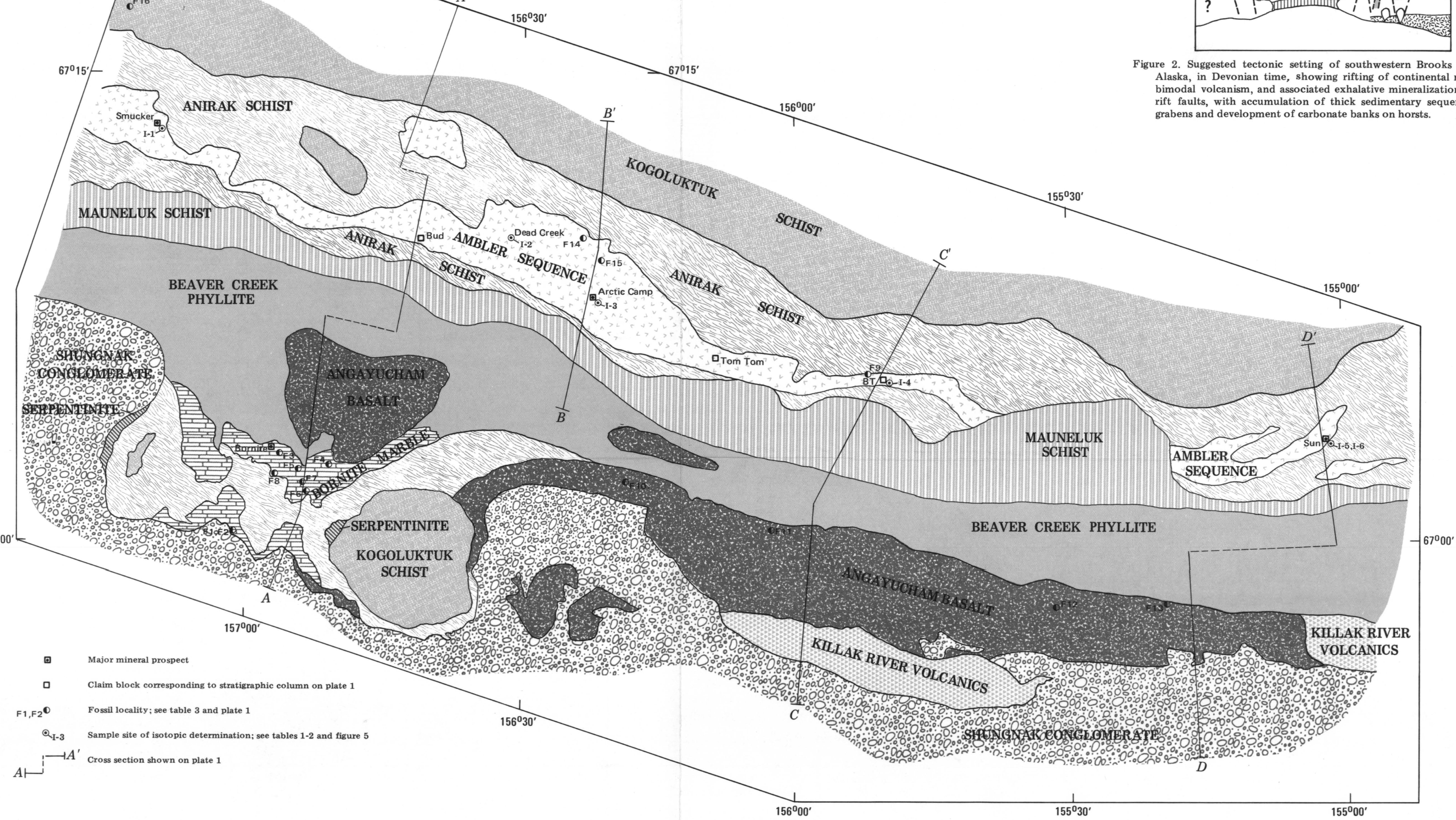


Figure 1. Index map of major geologic provinces and locations, Ambler district, Alaska

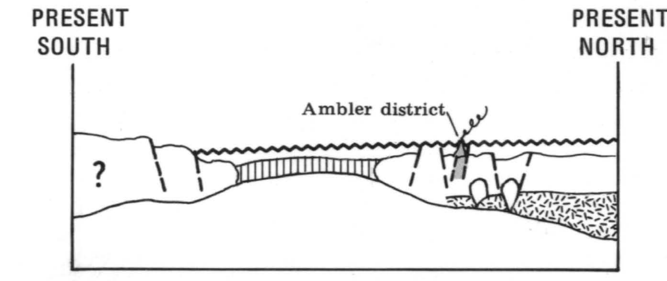
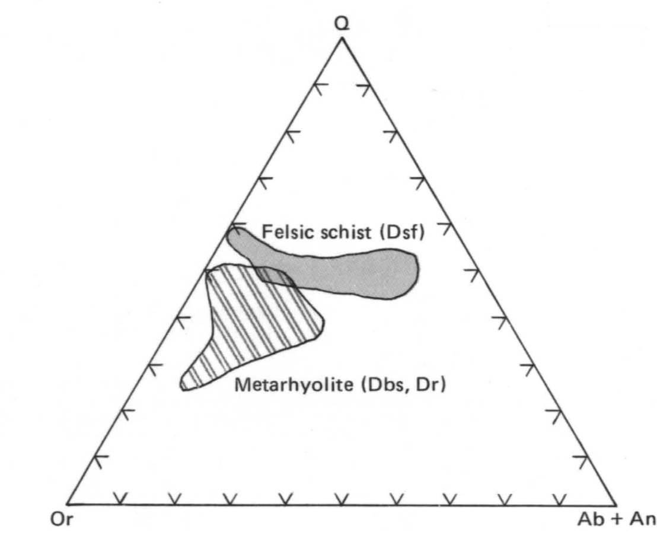
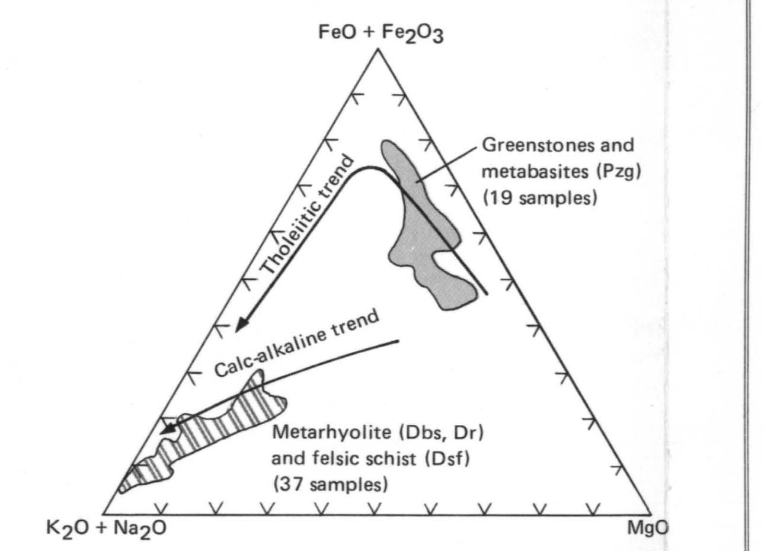


Figure 2. Suggested tectonic setting of southwestern Brooks Range, Alaska, in Devonian time, showing rifting of continental margin, bimodal volcanism, and associated exhalative mineralization along rift faults, with accumulation of thick sedimentary sequences in grabens and development of carbonate banks on horsts.



Normative Q-Or-Plag plots of metarhyolites (Dbs, Dr) and felsic schist (Dsf) from Ambler district (31 samples).



Alk-F-M trends of metavolcanic and metavolcaniclastic rocks, Ambler district.

	Rhyolite porphyry (Dbs)		Sparsely porphyritic, aphanitic rhyolite (Dr)		Felsic schist (Dsf)		Greenstone and metabasite (Pzg)	
	Average of 14 samples	Standard deviation(δ)	Average of 12 samples	Standard deviation(δ)	Average of 11 samples	Standard deviation(δ)	Average of 19 samples	Standard deviation(δ)
SiO_2	75.07	2.73	76.07	2.05	75.41	5.80	49.3	1.39
TiO_2	0.40	0.09	0.34	0.10	0.33	0.19	1.55	0.68
Cr_2O_3	- -	- -	- -	- -	- -	- -	0.02	0.02
Al_2O_3	12.12	1.15	11.79	1.10	11.94	2.50	13.84	1.41
Total Fe as FeO	1.53	0.56	1.15	0.40	1.97	1.08	12.56	2.62
MnO	0.02	0.01	0.01	0.01	0.03	0.02	0.19	0.04
MgO	0.71	0.48	0.32	0.24	1.23	0.82	6.71	1.47
CaO	0.20	0.25	0.09	0.13	0.37	0.45	8.99	2.13
Na_2O	1.35	0.63	1.15	0.65	1.75	1.23	2.22	1.04
K_2O	7.24	1.00	7.84	1.34	4.08	2.34	0.37	0.49
P_2O_5	0.05	0.02	0.04	0.01	0.06	0.05	0.16	0.09
BaO	- -	- -	- -	- -	- -	- -	0.06	0.10
SrO	- -	- -	- -	- -	- -	- -	0.01	0.01
LOI	1.00	0.34	0.70	0.32	1.57	0.72	3.13	1.41
Total	99.69		99.50		98.74		99.11	

LOI - Loss on ignition
- - - Not analyzed

Figure 3. Average major-element composition of metavolcanic and metavolcaniclastic rocks, Ambler district, Alaska (Schmidt, 1981).

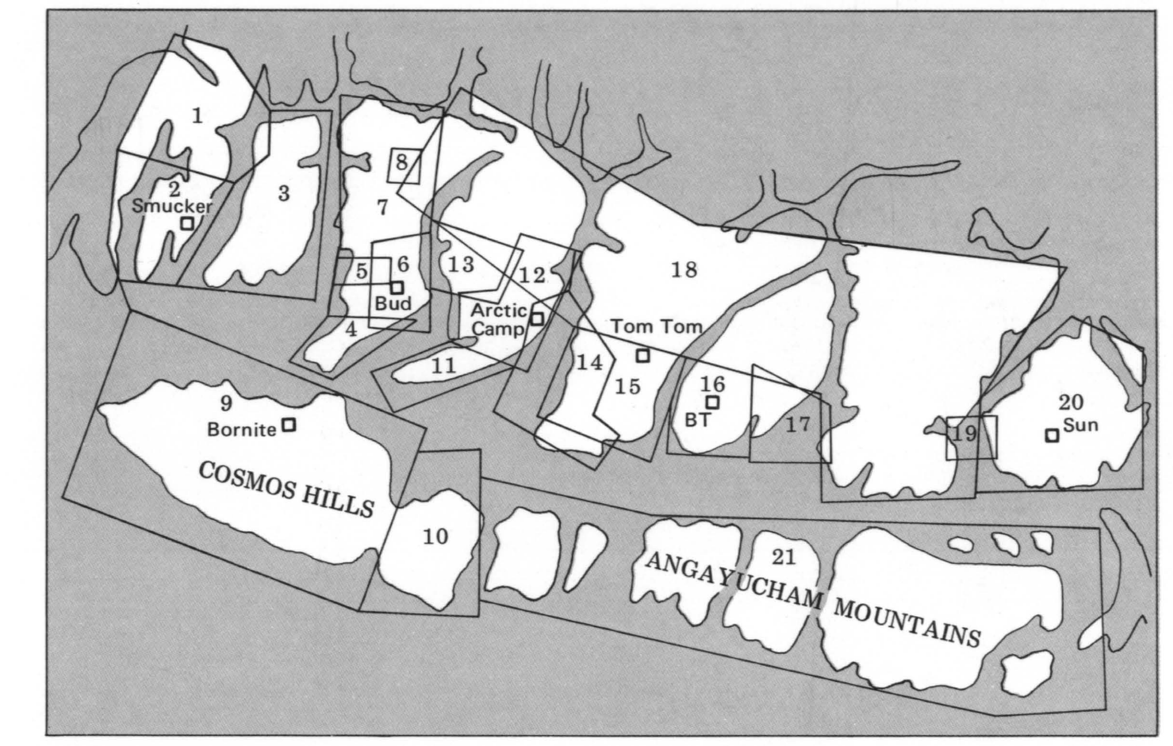


Figure 4. Sources of data

1. Proffett and Hitzman, 1979
2. Proffett and McClave, 1976; Smith, 1978b
3. Smith, 1976a, 1978c
4. Smith, 1978d
5. Crafford, 1976
6. Sumner, 1978; Smith, 1978a; Marrs, 1979
7. Smith, 1978a
8. Smith, 1976b; Ellis, 1977
9. Hitzman, 1980a,b
10. Fritts, 1970
11. Jackson, 1978
12. Proffett, 1979
13. Jackson, 1978b; Heatwole, 1976
14. Schmidt, 1978
15. Proffett, 1976
16. Hitzman, 1977, 1978
17. Dobson, 1977
18. Seklemian, 1976
19. Marrs, 1978
20. Smith, 1977
21. Fritts, 1972

Table 1. *Isotopic age data for zircons from porphyritic rhyolite (Dbs), Arctic Camp, Ambler district, northwest Alaska (from Dillon and others, 1980).*

Map number*	Lat (N)	Long (W)	Petrology Devonian volcanic rocks	Zircon description	Concentration (ppm) ^{238}U	Concentration (ppm) ^{206}Pb†	Isotopic ratio ‡ $^{208}Pb/^{206}Pb$	$^{207}Pb/^{206}Pb$	$^{206}Pb/^{204}Pb$	^{206}Pb†/^{238}U	^{207}Pb†/^{235}U	Age (m.y.)** ^{206}Pb†/^{238}U	^{207}Pb†/^{235}U	^{207}Pb†/^{206}Pb	Weight (mg)
I-3(D)	67°11'00"	156°22'30"	Button schist; blastoporphyritic K-feldspar, quartz, and biotite in coarse-grained, garnet-epidote-chlorite-plagioclase matrix.	Honey brown to reddish brown; five percent have dark inclusions; many are zoned. All are euhedral with small euhedral zircon inclusions; only crystals with a complete prism, one termination, and no large inclusions were dated.	886	40.1	0.1657	0.07649	650	0.05233	0.3901	329	334	373	6.5
I-3(M)	67°11'00"	156°22'30"			928	41.8	0.1586	0.07160	820	0.05205	0.3860	327	332	364	5.7

*Separates (M, magnetic; D, diamagnetic).
†Radiogenic Pb corrected for common Pb. Isotopic composition of common Pb used for calculation is $^{204}Pb/^{206}Pb = 18.8$ and $^{207}Pb/^{204}Pb = 15.65$.
‡Isotopic ratios corrected for mass fractionation of 0.1 ± 0.03 percent per mass unit on basis of replicate analyses of U.S. National Bureau of Standards Pb standards SRM 981-983. Ratios are not corrected for contamination from $^{205}Pb/^{235}U$ mixed spike. Isotopic composition of Pb and U in mixed spike is $^{208}Pb/^{206}Pb = 3.765$; $^{207}Pb/^{206}Pb = 0.8665$; $^{205}Pb/^{206}Pb = 649$; $^{204}Pb/^{208}Pb = 0.089$; $^{235}U/^{238}U = 4200$.
**Constants used in age calculation: $\lambda^{238}U = 1.5513 \times 10^{-10}$; $\lambda^{235}U = 9.848 \times 10^{-10}$; $^{238}U/^{235}U = 137.88$. Analytical uncertainty on U/Pb ages estimated less than 1 percent of age; in Pb-Pb ages, less than 2 percent of age

Table 2. *Lead-isotope ratios and analyses for galena samples from massive-sulfide deposits in Ambler district, northwest Alaska. Ratios are plotted on figure 5.*

		I-1 SMUCKER (drill core)	I-2 DEAD CREEK	I-3 ARCTIC CAMP	I-4 "BT"	I-5 SUN 10 (drill core)	I-6 SUN 12 (drill core)
Atom percentage	^{204}Pb	1.365	1.367	1.369	1.364	1.374	1.377
	^{206}Pb	25.112	25.080	25.107	25.088	25.067	25.062
	^{207}Pb	21.377	21.309	21.302	21.348	21.381	21.367
	^{208}Pb	52.146	52.244	52.222	52.200	52.178	52.194
Isotope ratio	$^{206}Pb/^{204}Pb$	18.397	18.347	18.340	18.393	18.244	18.200
	$^{207}Pb/^{204}Pb$	15.661	15.558	15.560	15.651	15.561	15.517
	$^{208}Pb/^{204}Pb$	38.202	38.218	38.146	38.270	37.975	37.904

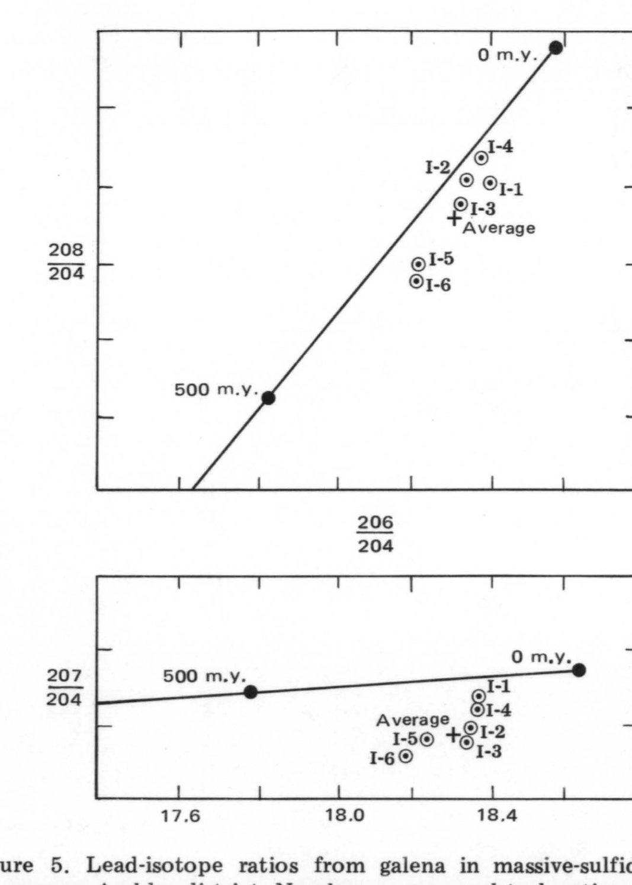


Figure 5. Lead-isotope ratios from galena in massive-sulfide occurrences, Ambler district. Numbers correspond to locations on plate 1. Range of apparent model ages is 200-350 million years. Single-stage curves assume $U^{238}/Pb^{204} = 8.9$ and $Th^{232}/U^{238} = 4.0$.

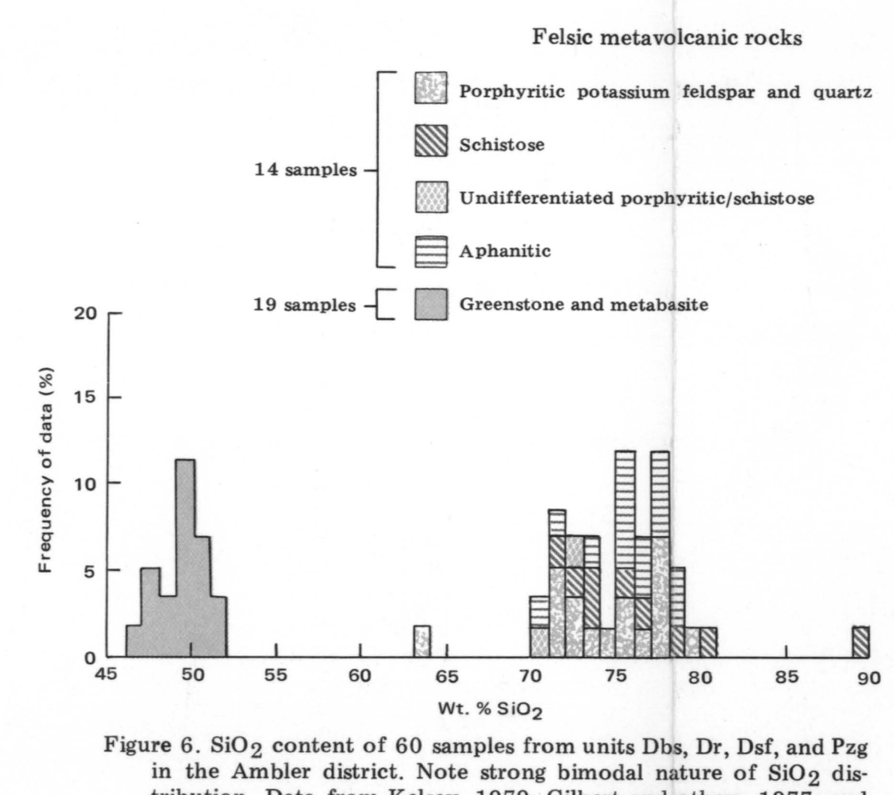


Figure 6. SiO_2 content of 60 samples from units Dbs, Dr, Dsf, and Pzg in the Ambler district. Note strong bimodal nature of SiO_2 distribution. Data from Kelsey, 1979; Gilbert and others, 1977; and unpublished U.S. Geological Survey and Bear Creek Mining Company data.

Table 3. *Invertebrate fossils, Ambler district, Alaska.*

Map location number	General location	STROMATOPOROIDS: *Amphipora* sp.	Massive stromatoporoids	Amphiporoids	Ramose	TABULATE CORALS: *Alveolites* sp.	*Aulocystis* sp.	*Aulapora* sp.	*Cladopora* sp.	*Favosites* sp.	*Syringopora* sp.	*Taimyrophyllum* sp.	*Thamnopora* sp.	Thamnoporoids	Favositids	*Coenites* sp.	RUGOSE CORALS: *Billingsastraea* sp. 1	*Billingsastraea* sp. 2	*Siphonophrentis* sp. 1	*Buschophyllum* sp.	Phaceloid	Indeterminate	BRACHIOPODS: *Spinatrypa* sp.	Indeterminate	BRYOZOANS: *Hederella* sp.	*Reptaria* sp.	Indeterminate	CRINOIDS: *Laudonomphalus* sp.	*Platycrinites* sp.	Indeterminate	GASTROPODS: *Euomphalopterus* sp.	Bellerophontacean	Indeterminate	STROMATOLITES: Indeterminate	ICHNOFOSSIL: Indeterminate	References
F1	Cosmos Hills		●							●				●																						Patton and others, 1968; Armstrong, 1980; Blodgett, 1980
F2	Cosmos Hills																					●														Blodgett, 1980
F3	Cosmos Hills		●							●	●			●								●		●						●			●			Patton and others, 1968; Armstrong, 1980
F4	Cosmos Hills								●															●						●			●			Patton and others, 1968; Hitzman, 1980b
F5	Cosmos Hills													●																						Patton and others, 1968
F6	Cosmos Hills		●			●	●	●	●	●	●	●	●	●			●	●	●				●							●	●		●			Patton and others, 1968; Blodgett, 1980
F7	Cosmos Hills																		●				●													Patton and others, 1968
F8	Cosmos Hills		●							●	●			●								●								●						Blodgett, 1980
F9	Ambler schist belt														●	?				?				●	?	?		●	●	●					●	Webster, 1977; Smith and others, 1978
F10	Angayucham Mts.			●	●				●					●								●		●			●			●			●			Fritts, 1972
F11	Angayucham Mts.	●																			●												●			Patton and others, 1968; Fritts, 1972
F12	Angayucham Mts.					Fossils noted in outcrop, but not collected																														Fritts, 1972
F13	Angayucham Mts.					Fossils noted in outcrop, but not collected																														Fritts, 1972
F14	Arctic Camp																					●														Blodgett, 1981
F15	Arctic Camp																															●	●			Blodgett, 1981
F16	Cross Creek																																	●		Proffett and Hitzman, 1979; Proffett, 1982
F17	Cross Creek																																	●		Proffett and Hitzman, 1979; Proffett, 1982

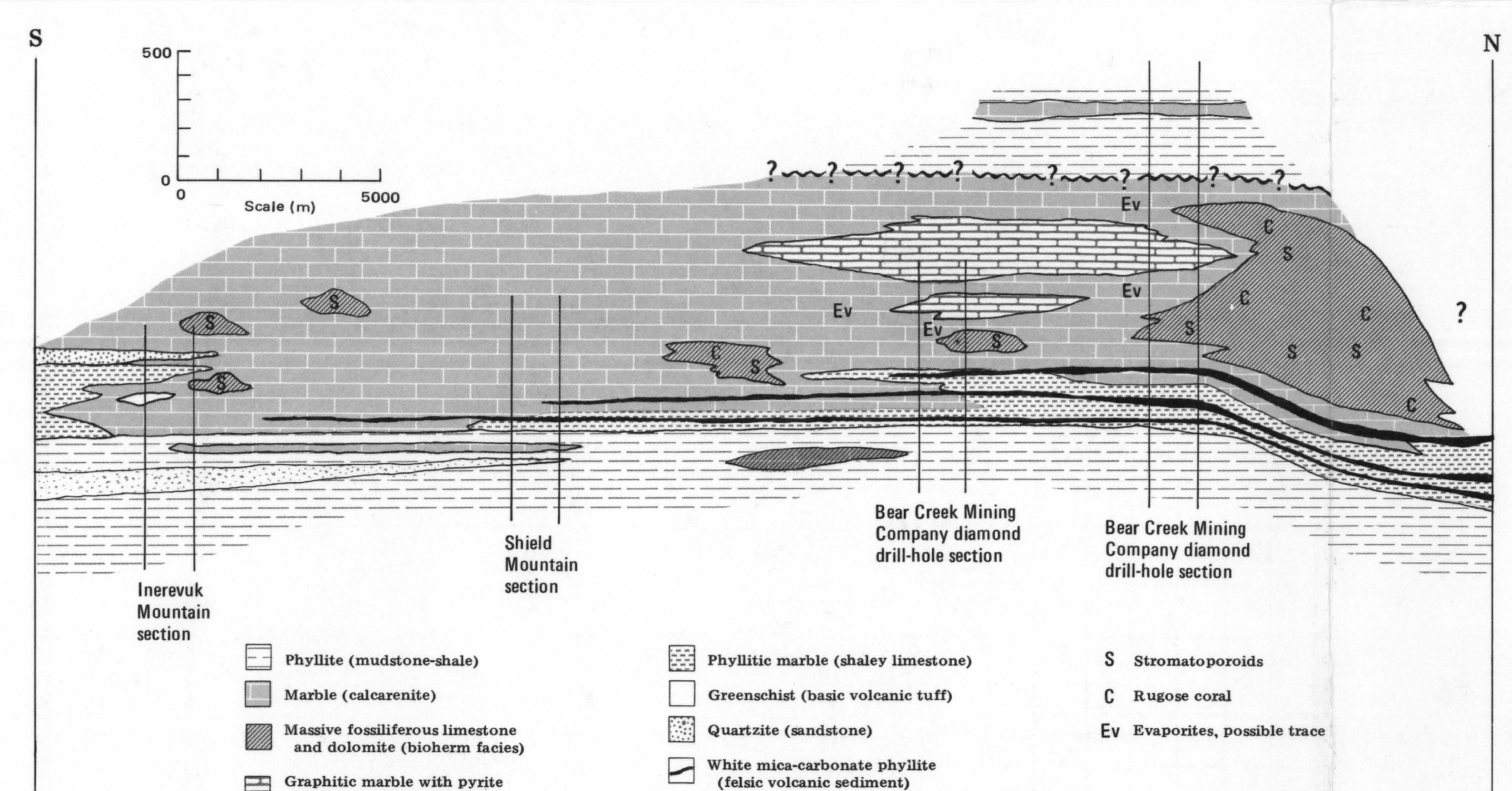


Figure 7. Details of facies relationships in carbonate rocks (primary units Dbm and Dbd), Cosmos Hills, Ambler district, Alaska.

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SUPPLEMENTAL DATA FOR BEDROCK GEOLOGIC MAP OF THE AMBLER DISTRICT, SOUTHWESTERN BROOKS RANGE, ALASKA