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GEOCHEMICAL DATA FOR JURASSIC DIABASE ASSOCIATED WITH EARLY
MESOZOIC BASINS IN THE EASTERN UNITED STATES:
EASTERN NEWARK BASIN, NEW YORK AND NEW JERSEY

By

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EASTERN NEWARK BASIN, NEW YORK AND NEW JERSEY

Thirty-six (36) whole rock samples of diabase from two New Jersey localities in the Palisades sheet were collected by David Shirley (1987; 1989) and subsequently analyzed for selected elements by the U.S. Geological Survey. Samples labeled 80-1 to 80-B-1 were collected along roadcuts of Interstate 95, and samples labeled W-2 to W-19 were collected near Weehawken about 10 km to the south.

The palladium (Pd) and platinum (Pt) abundances and ratios in the chilled margins of the Palisades sheet are typical of those in the high Ti, quartz normative (HTQ) magmas throughout the province. Platinum contents are greater than palladium in the olivine and orthopyroxene cumulate zones, and Pd is greater than Pt in the late-stage differentiates, especially in the anomalous zone of ferrogabbro (samples 80-33 and 80-34). The Pd enrichment has been discussed in Talkington and others (1987), as well as the distribution of Pd and Pt throughout the Palisades sheet.

References

- Shirley, D.N., 1987, Differentiation and compaction in the Palisades Sill, New Jersey: *Journal of Petrology*, v. 28, part 5, p. 835-865.
- _____, 1989, Effects of post cumulus fractionation in the Palisades sheet: further evidence from Weehawken, New Jersey, *in* Froelich, A.J., Robinson, G.R., Jr., eds., *Studies of the early Mesozoic basins of the Eastern United States: U.S. Geological Survey Bulletin 1776*, p. 135-140.
- Talkington, R., Gottfried, D., Lipin, B.R., Rait, N., Puffer, J.H., and Shirley D.N., 1987, The distribution of platinum-group elements in the Palisades sill, New Jersey and New York, *in* Paper P-7, *Abstracts Geoplatinum '87 Symposium*, The Open University, Milton Keynes, United Kingdom.

EXPLANATION FOR PLATE 1

Geochemical sample locality



Shirley, 1987,; 1989

EASTERN NEWARK BASIN, NEW YORK AND NEW JERSEY

SAMPLE NO.	MAGMA TYPE	DESCRIPTION OF SAMPLE
		<u>Palisades sheet</u> - Table 1a, 1b, 1c (Shirley, 1987; I-95 section)
80-B-1	High Ti, quartz normative	Chilled diabase (lower)
80-B-3	"	Cumulate
80-B-5	"	"
80-B-6	"	"
80-B-8	"	"
80-B-9	"	"
80-B-10	"	"
80-B-11	"	"
80-B-17	"	"
80-29	"	Ferrogabbro
80-30	"	"
80-31	"	"
80-32	"	"
80-33	"	"
80-34	"	"
80-35	"	"
80-36	"	"
80-37	"	Granophyre
80-38	"	Diabase
80-39	"	"
80-40	"	"
80-41	"	"
80-42	"	"
80-43	"	Ferrogabbro
80-44	"	Diabase
80-1	"	Chilled diabase (upper)
80-3	"	"
		<u>Palisades sheet</u> - Table 2 (Shirley, 1989; Weehawken section)
W-2	High Ti, quartz normative	Ferrogabbro
W-3	"	"
W-4	"	"
W-5	"	"
W-6	"	Granophyre
W-7	"	"
W-13	"	"
W-16	"	Cumulate
W-19	"	Diabase

Table 1a. Eastern Newark basin, New York and New Jersey. Palisades sheet, I-95 section.

	W-235426	W-235427	W-235428	W-235429	W-235430	W-235431	W-235432	W-235433	W-235434	W-235435
	80B-1	80B-3	80B-5	80B-6	80B-8	80B-9	80B-10	80B-11	80B-17	80-29
Lat.	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N
Long.	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W
SiO ₂ (%)	52.00	50.20	52.70	49.60	52.60	50.90	52.20	52.20	52.40	60.10
TiO ₂	1.20	0.86	0.85	0.84	0.98	0.88	0.86	0.87	0.89	1.60
Al ₂ O ₃	14.10	11.80	12.60	10.70	12.80	11.20	11.50	11.00	13.60	11.10
Fe ₂ O ₃	1.30	1.20	1.30	1.40	1.60	1.30	1.30	1.40	0.84	2.90
FeO	8.70	9.60	7.90	9.50	8.20	8.30	8.90	8.70	8.20	10.00
MnO	0.17	0.18	0.17	0.18	0.17	0.18	0.18	0.19	0.16	0.17
MgO	7.50	11.90	9.30	13.70	8.90	10.90	11.80	11.50	9.10	1.30
CaO	10.20	9.50	10.20	9.50	10.30	10.30	10.10	9.90	11.10	3.90
Na ₂ O	2.00	1.50	1.80	1.70	1.90	1.80	1.80	1.60	1.80	3.10
K ₂ O	0.89	0.70	0.52	0.60	0.68	0.69	0.69	0.68	0.48	2.70
P ₂ O ₅	0.18	0.12	0.13	0.10	0.13	0.08	0.10	0.13	0.13	0.51
H ₂ O ⁺	1.10	0.70	0.90	0.91	0.90	0.72	0.98	0.96	0.98	1.40
H ₂ O ⁻	0.09	0.20	0.19	0.09	0.31	0.12	0.04	0.20	0.14	0.44
CO ₂	0.04	0.03	0.01	<0.01	0.02	0.03	0.01	0.03	0.03	<0.01
S	0.03	0.03	0.02	0.04	0.03	0.03	0.04	0.02	0.03	0.05
F	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.09
Cl	0.02	0.12	0.03	0.01	0.02	0.04	0.01	0.12	0.02	0.46
Σ	99.55	98.66	98.63	98.88	99.57	97.49	100.53	99.52	99.91	99.82
Ni (ppm)	93	230	109	277	105	176	191	217	123	<5.0
Cu	100	90	86	73	92	83	71	55	76	370
Zn	80	84	70	66	68	70	73	69	73	138
Rb	34	29.0	28.0	12.0	24.0	29.0	15.0	34	23.0	109
Sr	196	164	165	133	166	153	150	152	170	186
Ag	0.061	0.082	0.057	0.054	0.170	0.140	0.98	0.100	0.076	0.130
Ba	204	130	145	132	163	166	122	145	158	560
Y	26.0	17.0	18.0	15.0	20.0	20.0	18.0	23.0	23.0	71
Zr	108	75	78	74	88	87	80	81	86	330
Nb	6.9	5.0	5.7	5.4	6.1	5.9	5.2	5.3	5.4	24.0
Pd (ppb)	10.0	9.5	4.6	8.6	7.9	7.0	6.3	7.8	6.5	<0.50
Pt	12.0	19.0	15.0	19.0	15.0	17.0	20.0	18.0	16.0	<0.50
Rh	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Table 1b. Palisades sheet, I-95 section.

	W-235436	W-235437	W-235438	W-235439	W-235440	W-235441	W-235442	W-235443	W-235444	W-235445
	80-30	80-31	80-32	80-33	80-34	80-35	80-36	80-37	80-38	80-39
Lat.	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N
Long.	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W
SiO ₂ (%)	62.50	56.60	55.30	53.80	54.90	50.80	51.50	51.80	51.40	51.70
TiO ₂	1.60	2.00	2.80	3.50	3.10	3.10	3.20	1.50	1.20	1.10
Al ₂ O ₃	11.60	11.40	11.40	11.50	11.50	11.40	12.60	16.70	16.10	16.40
Fe ₂ O ₃	3.20	2.90	3.90	3.80	3.20	3.30	6.80	2.20	1.90	1.60
FeO	8.50	11.70	11.90	12.30	9.80	13.50	8.60	8.70	8.20	7.90
MnO	0.13	0.23	0.23	0.25	0.18	0.17	0.22	0.17	0.16	0.16
MgO	1.20	1.70	1.70	2.50	2.80	2.90	4.00	3.90	5.60	5.90
CaO	3.40	5.40	4.50	6.40	6.80	7.10	8.00	8.30	9.70	10.00
Na ₂ O	4.40	2.80	2.80	2.70	4.50	2.60	2.50	3.10	2.50	2.40
K ₂ O	2.50	2.40	2.40	1.90	0.49	1.70	1.50	1.60	1.80	0.86
P ₂ O ₅	0.45	0.43	0.43	0.37	0.35	0.35	0.26	0.17	0.14	0.16
H ₂ O ⁺	1.00	1.30	1.50	1.00	0.90	0.70	0.75	0.94	0.86	0.76
H ₂ O ⁻	0.18	0.23	0.55	0.65	0.70	0.46	0.45	0.39	0.37	0.28
CO ₂	0.04	0.01	0.08	0.04	0.06	0.01	<0.01	0.04	0.03	0.03
S	0.05	0.05	0.08	0.04	0.04	0.04	0.03	0.02	0.04	0.02
F	0.10	0.07	0.07	0.06	0.08	0.04	0.04	0.04	0.03	0.03
Cl	0.37	0.36	0.40	0.34	0.15	0.40	0.30	0.23	0.03	0.05
Σ	101.22	99.59	100.04	101.14	99.54	98.58	100.76	99.79	100.06	99.35
Ni (ppm)	<5.0	<5.0	6.0	13.0	11.0	16.0	28.0	39	55	58
Cu	203	420	560	278	173	205	189	181	115	102
Zn	88	175	138	126	100	108	141	81	71	68
Rb	86	94	85	63	38	65	47	61	26.0	30
Sr	126	213	211	205	187	217	200	275	219	218
Ag	0.066	0.38	0.60	0.120	0.130	0.110	0.280	0.190	0.250	0.150
Ba	360	540	510	410	310	380	310	299	188	198
Y	77	59	66	48	48	53	33	28.0	28.0	25.0
Zr	380	287	268	218	242	204	154	133	110	106
Nb	29.0	22.0	22.0	22.0	21.0	16.0	13.0	9.6	7.1	7.0
Pd (ppb)	<0.50	<0.50	<0.50	150	190	14.0	13.0	12.0	11.0	8.3
Pt	<0.50	<0.50	2.40	5.6	5.9	2.70	3.1	4.3	5.7	6.8
Rh	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Table 1c. Palisades sheet, I-95 section.

	W-235446 80-40	W-235447 80-41	W-235448 80-42	W-235449 80-43	W-235450 80-44	W-235451 80-1	W-235452 80-3
Lat.	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N	40°51'N
Long.	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W	73°57'W
SiO ₂ (%)	52.10	51.00	51.60	—	52.00	50.70	51.70
TiO ₂	0.97	0.98	0.88	—	0.99	1.10	1.10
Al ₂ O ₃	16.40	14.60	14.40	—	16.00	13.70	14.50
Fe ₂ O ₃	1.50	1.30	1.10	—	1.70	1.30	2.30
FeO	7.80	8.00	7.80	—	7.70	8.60	8.60
MnO	0.16	0.16	0.16	—	0.15	0.17	0.18
MgO	6.00	7.40	8.00	—	5.50	7.30	7.30
CaO	10.40	11.00	11.10	—	7.80	10.30	10.00
Na ₂ O	2.30	2.00	2.00	—	2.50	2.30	2.00
K ₂ O	0.72	0.72	0.58	—	2.30	0.57	0.53
P ₂ O ₅	0.14	0.12	0.15	—	0.17	0.13	0.20
H ₂ O ⁺	0.73	0.82	0.76	—	1.40	0.64	0.60
H ₂ O ⁻	0.28	0.32	0.27	—	0.40	0.16	0.19
CO ₂	0.04	0.04	0.03	—	0.03	0.04	0.04
S	0.04	0.02	0.04	—	0.03	0.03	0.02
F	0.03	0.02	0.02	—	0.03	0.03	0.03
Cl	0.02	0.02	0.02	—	0.02	0.08	0.01
Σ	99.62	98.52	98.91	—	98.72	97.14	99.30
Ni (ppm)	54	80	97	109	51	101	79
Cu	103	93	89	71	93	102	96
Zn	71	64	72	66	71	82	75
Rb	23.0	21.0	21.0	40	93	29.0	21.0
Sr	213	187	187	186	380	197	189
Ag	0.052	0.038	0.030	0.038	0.070	0.055	0.110
Ba	181	151	147	190	310	144	165
Y	22.0	28.0	23.0	21.0	22.0	27.0	22.0
Zr	102	90	84	78	107	105	100
Nb	7.5	6.7	6.0	5.7	8.1	7.3	8.0
Pd (ppb)	9.0	8.3	7.1	6.5	10.0	8.2	9.4
Pt	9.0	15.0	14.0	18.0	8.2	12.0	12.0
Rh	<0.50	0.70	<0.50	<0.50	<0.50	<0.50	1.00

Table 2. Palisades sheet, Weehawken section.

	W-235455	W-235456	W-235457	W-235458	W-235459	W-235460	W-235461	W-235462	W-235463
	W-2	W-3	W-4	W-5	W-6	W-7	W-13	W-16	W-19
Lat.	40°46'N	40°46'N	40°46'N	40°46'N	40°46'N	40°46'N	40°46'N	40°46'N	40°46'N
Long.	74° 1'W	74° 1'W	74° 1'W	74° 1'W	74° 1'W	74° 1'W	74° 1'W	74° 1'W	74° 1'W
SiO ₂ (%)	53.80	58.70	53.10	51.80	53.40	52.70	53.70	52.60	51.80
TiO ₂	1.50	1.70	2.50	2.00	1.80	1.20	0.79	0.96	1.10
Al ₂ O ₃	14.40	11.10	10.90	9.60	14.60	16.00	20.30	12.70	14.50
Fe ₂ O ₃	2.20	2.60	2.60	2.60	3.80	1.50	1.60	1.30	0.76
FeO	9.50	11.20	11.20	14.00	9.80	8.90	6.40	8.40	9.40
MnO	0.18	0.22	0.19	0.20	0.19	0.17	0.06	0.18	0.18
MgO	4.80	1.40	2.10	3.10	3.10	5.20	5.00	9.80	7.80
CaO	8.90	5.20	9.00	7.80	7.10	9.40	1.00	9.80	10.30
Na ₂ O	2.60	2.70	4.00	3.10	3.20	2.50	5.20	1.90	1.90
K ₂ O	1.00	2.70	1.50	1.90	2.10	1.30	5.50	0.51	0.42
P ₂ O ₅	0.20	0.66	1.10	0.69	0.24	0.18	0.11	0.15	0.17
H ₂ O ⁺	0.75	1.30	0.88	1.10	1.30	0.90	1.70	1.00	0.71
H ₂ O ⁻	0.20	0.22	0.07	0.23	0.15	0.08	<0.04	0.31	0.15
CO ₂	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.01	0.04
S	0.03	0.05	0.07	0.14	0.04	0.04	0.07	0.03	0.04
F	0.04	0.10	0.11	0.10	0.05	0.04	0.23	0.02	0.02
Cl	0.03	0.42	0.16	0.18	0.33	0.20	0.09	0.01	0.04
Σ	100.13	100.27	99.48	98.54	101.21	100.33	101.76	99.67	99.33
Ni (ppm)	34	<5.0	7.0	12.0	18.0	47	47	118	94
Cu	145	320	370	88	141	138	<2.00	83	97
Zn	74	191	116	56	84	81	153	72	78
Rb	29.0	99	46	64	67	47	268	24.0	15.0
Sr	222	202	202	158	254	225	470	158	173
Ag	0.053	0.220	0.110	0.033	0.032	0.072	0.044	0.037	0.045
Ba	254	600	300	320	410	260	1700	138	170
Y	27.0	68	65	61	32	26.0	21.0	25.0	21.0
Zr	137	320	249	226	165	119	106	89	97
Nb	12.0	23.0	21.0	20.0	15.0	10.0	21.0	6.5	6.5
Pd (ppb)	11.0	<0.50	<0.50	<0.50	18.0	18.0	<0.50	7.0	7.6
Pt	2.60	<0.50	<0.50	<0.50	3.3	3.3	<0.50	11.0	8.8
Rh	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50