DR2003015 Taxonomic positions, oxygen isotopic compositions and calculated (paleo)temperatures for analyzed specimens.

Taxonomy				$\delta^{18}O$ (‰, VPDB)	$\delta^{13}C$ (‰, VPDB)
Ammonoidea	Phylloceratina	Phylloceratidae	*Hypophylloceras subramosum* 1	0.16	3.60
				0.12	1.90
				-0.07	-0.39
				-0.47	1.76
				0.07	1.78
			Hypophylloceras subramosum 2	-0.71	0.80
				-0.79	1.16
				-0.78	0.39
				-0.57	1.32
			Phylopachyceras ezoense 1	-0.43	-3.34
				-0.42	-4.59
				-0.22	-0.27
				-0.53	-2.76
				-0.30	-3.16
				-0.02	-4.18
				-0.34	-3.35
				-0.47	-4.54
				-0.30	-4.19
				-0.24	-5.59
			Phylopachyceras ezoense 2	-0.26	2.03
				-0.82	-5.63
				-0.68	4.55
				-0.39	1.67
				-0.34	1.13
				-0.32	0.98
				-0.17	1.77
				-0.42	0.98
				-0.31	-1.67
				-0.38	1.07
	Lytoceratina	Tetragonitidae	*Tetragonites glabrus*	-0.43	-5.79
				-0.76	-3.70
				-0.45	-3.43
				-0.76	-2.76
				-0.85	-2.28
				-0.33	-3.07
				-0.42	-2.40
				-0.41	-3.24
				-0.53	-2.69
				-0.98	-0.12
				-1.12	-0.44
		Gaudryceratidae	*Gaudryceras tenuiliratum* 1	-0.87	-2.45
				-0.28	0.66
				-0.49	0.58
				-0.31	0.61
				-0.27	0.56
				-1.08	0.33
				-0.49	0.45
				-0.09	0.56
				-0.34	0.77
				-0.09	1.03
				-0.41	0.67
				-0.77	0.18
				-0.71	0.28
				-0.37	0.69
				-0.17	0.40
			Gaudryceras tenuiliratum 2	-0.44	-0.89
				-0.57	-1.50
				-0.73	-0.30
				-0.63	-3.42
				-0.39	-0.36
				-0.77	-2.40
				-0.84	-1.72
				-0.69	0.34
				-0.54	0.65
	Ammonitina	Desmoceratidae	*Damesites damesi*	-0.75	-2.18
				-0.80	-1.37

				-0.84	-2.19
				-0.79	-1.66
				-0.78	-2.01
				-1.05	-0.97
				-1.26	-1.46
				-1.12	-1.61
				-0.86	-1.58
			Hauericeras angustum	-0.79	0.94
				-0.63	1.08
				-0.68	1.40
				-0.55	1.29
				-0.70	1.39
				-0.32	1.52
				-0.68	1.83
				-0.59	1.22
				-0.67	0.09
				-0.92	1.28
				-0.88	1.47
		Kossmaticeratidae	*Yokoyamaoceras ishikawai* 1	-0.71	-1.67
				-0.59	-1.74
				-0.59	-1.55
				-0.62	-1.56
			Yokoyamaoceras ishikawai 2	-0.96	-1.56
				-1.19	-1.01
				-1.22	-1.75
				-1.04	-1.86
				-1.15	-1.10
				-0.93	-1.53
				-1.08	-0.63
				-0.97	-0.61
				-0.97	-0.38
		Pachydiscidae	*Eupachydiscus* sp. 1	-0.43	-0.07
				-0.80	-1.52
				-0.72	-1.62
				-1.13	-1.99
				-0.38	-1.36
				-0.66	-1.57
				-0.59	-1.73
			Eupachydiscus sp. 2	-0.78	-2.35
				-0.70	-2.03
				-0.75	-2.54
				-0.81	-2.35
				-0.95	-2.35
	Ancyloceratina	Diolomoceratidae	*Polyptychoceras pseudogaultinum* 1	-0.38	2.92
				-0.34	3.42
				-0.25	2.85
				-0.53	3.53
				-0.52	3.73
				-0.71	3.77
				-0.58	3.45
				-0.46	3.76
				-0.48	3.73
				-0.60	3.41
				-0.39	3.40
			Polyptychoceras pseudogaultinum 2	-1.25	0.85
				-1.31	1.61
				-1.33	1.50
				-1.06	1.34
				-0.84	1.93
				-0.98	1.27
				-0.94	1.76
				-0.95	1.86
				-1.10	1.77
				-0.93	1.88
Bivalvia	Nuculoidea	Nuculidae	*Acila hokkaidoensis* 1	-0.26	1.15
				0.41	1.60
				0.06	1.57
				-0.28	1.38
				-0.02	1.52

			Acila hokkaidoensis 2	-0.71	3.46
				-0.28	2.17
				-0.52	2.71
				-0.48	2.54
				-0.43	2.29
				-0.35	2.64
			Acila hokkaidoensis 3	-0.36	1.95
				-0.22	1.53
				-0.35	0.65
				-0.22	2.40
				-0.30	1.28
				-0.40	0.43
				-0.41	0.85
				-0.42	1.46
				-0.30	1.73
				-0.25	2.25
Gastropoda	Vetigastropoda	Trochidae	*Margrites* sp. 1	-1.04	0.91
				-0.84	1.00
				-0.64	1.14
				-0.89	1.16
			Margrites sp. 2	-0.96	1.32
				-0.96	0.90
				-0.91	0.92
				-0.62	1.56
				-0.91	1.34
				-0.85	0.95
				-0.85	1.05
				-0.80	1.46
				-1.01	0.57
				-0.87	0.94
			Margrites sp. 3	-1.25	0.68
				-1.19	1.02
				-1.27	1.11
				-1.39	0.56
				-1.00	0.72
				-1.20	0.86
				-1.20	0.63
				-1.24	0.87
				-1.19	0.95
				-0.77	1.41
Foraminiferida	Buliminida	Gavelinellidae	*Gylloidinoides* sp.	-1.79	-1.99
		Vaginulinidae	*Lenticulina* spp.	-1.53	0.63
				-1.86	-1.14
		Stilostomellidae	*Nodogenerina alexanderi*	-0.80	0.36
	Globigerinina	Hedbergellidae	*Arhcaeoglobigerina blowi*	-3.31	1.18
			Arhcaeoglobigerina cretacea	-3.26	0.96
		Globotruncanidae	*Globotruncana arca*	-2.94	0.43
			Globotruncana linneiana	-2.97	1.02
Nautiloidea	Nautiloida	Nautilidae	*Nautilus pompilius* (septa)	0.49	2.00
				0.53	0.86
				0.51	0.03
				0.61	1.56
				0.58	0.46
				0.72	0.75
				0.70	0.37
				0.69	-0.03
				0.67	0.41
				0.62	0.25
				0.60	-0.43
				0.60	-0.30
				0.59	0.31
				0.55	-0.68
				0.66	-0.28
				0.59	-1.47
				0.70	-0.31
				0.71	-1.09
				0.64	-0.48
				0.49	-0.63
				0.65	-1.57

Nautilus pompilius (outer shell)	0.68	-0.94
	0.74	-0.58
	0.53	-1.30
	0.41	-0.91
	0.15	-1.32
	0.50	-1.07
	0.50	0.18
	0.06	-1.75
	0.47	-1.06
	0.32	-2.17
	0.41	-0.68
	0.41	-1.23
	0.15	-0.38
	0.41	0.10
	0.51	-1.13
	-0.30	0.13
	-0.77	0.93
	-0.36	1.53
	-0.29	1.10
	-0.35	0.94
	-0.83	-2.48
	-0.40	1.26
	0.03	0.02

Temperature (°C)
15.1
15.3
16.2
18.1
15.5
19.2
19.5
19.5
18.5
17.9
17.8
16.9
18.3
17.3
15.9
17.4
18.1
17.2
17.0
17.1
19.7
19.0
17.7
17.5
17.4
16.7
17.8
17.3
17.6
17.9
19.4
18.0
19.4
19.8
17.4
17.8
17.8
18.3
20.4
21.1
20.0
17.2
18.1
17.3
17.1
20.9
18.2
16.3
17.5
16.2
17.7
19.5
19.2
17.6
16.7
17.9
18.5
19.2
18.8
17.7
19.5
19.8
19.1
18.4
19.4
19.6

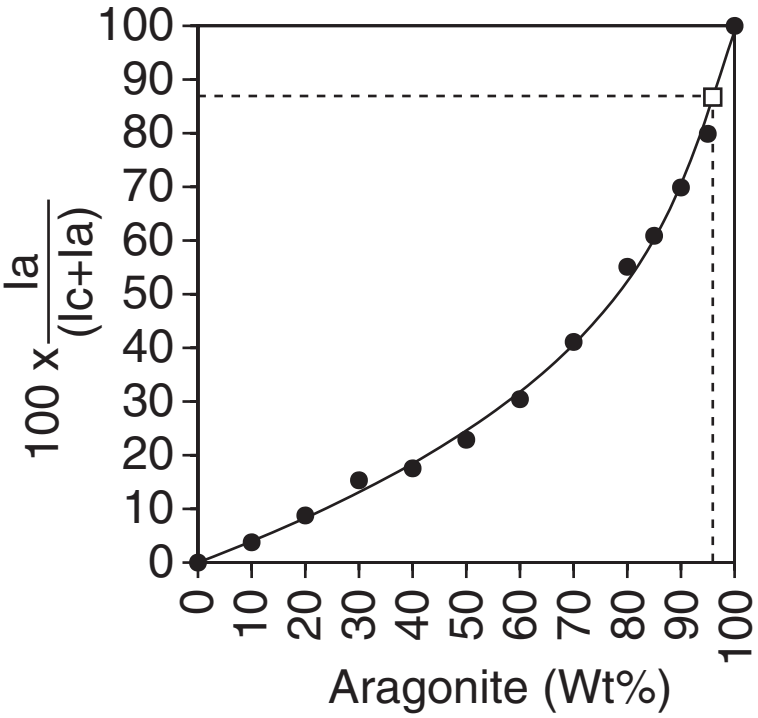
19.8
19.5
19.5
20.8
21.8
21.1
19.9
19.6
18.8
19.0
18.4
19.1
17.3
19.0
18.6
19.0
20.1
20.0
19.2
18.6
18.6
18.8
20.3
21.4
21.6
20.7
21.2
20.2
20.9
20.4
20.4
17.9
19.6
19.2
21.2
17.6
18.9
18.6
19.5
19.1
19.4
19.6
20.3
17.6
17.4
17.0
18.3
18.3
19.2
18.6
18.0
18.1
18.7
17.7
21.7
22.0
22.1
20.8
19.8
20.4
20.3
20.3
21.0
20.2
17.1
13.9
15.6
17.1
15.9

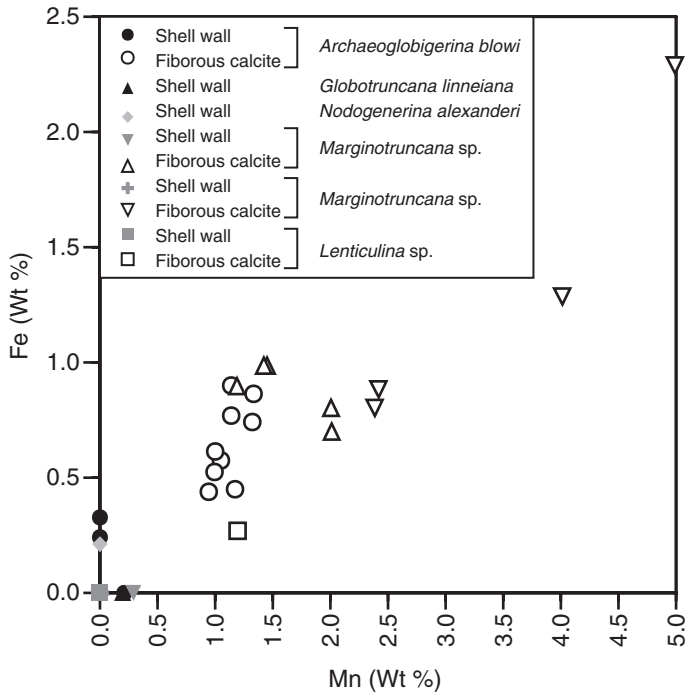
19.2
17.2
18.3
18.1
17.9
17.5
17.5
16.9
17.5
16.9
17.2
17.7
17.8
17.8
17.2
17.0
20.7
19.8
18.9
20.0
20.3
20.4
20.1
18.8
20.1
19.8
19.8
19.6
20.6
19.9
21.7
21.4
21.8
22.4
20.5
21.5
21.5
21.7
21.4
19.5
19.4
18.2
19.7
14.9
26.4
26.1
24.6
24.8
20.8
20.6
20.7
20.3
20.4
19.9
20.0
20.0
20.1
20.3
20.4
20.4
20.4
20.5
20.1
20.4
20.0
19.9
20.2
20.8
20.2

20.0
19.8
20.6
21.1
22.2
20.8
20.8
22.6
20.9
21.5
21.1
21.1
22.2
21.1
20.7
24.0
26.0
24.3
24.0
24.2
26.3
24.5
22.7

Figure DR1. A calibration curve for estimation of aragonite content showing weight percent aragonite for a typical sample used in this study. Plot for *Polyptychoceras pseudogaultinum* (ammonoid) is shown in open square. Calibration curve was made from analyses of quantified mixtures (solid circles) of powdered modern *Nautilus* shell (aragonite) and diagenetically altered ammonite shell (calcite), based on method of Davies and Hooper (1963).

Figure DR2. FeO and MnO contents of the foraminiferal shell wall and fibrous calcite filling in the chambers. Planktonic and benthic foraminifers embedded in epoxy resins were polished and subjected to analysis by electron probe microanalyzer. Solid symbols—shell wall. Open symbols—diagenetically produced fibrous calcite filling. Two groups of scattered plots represent different origin of these two calcites (shell wall and fibrous calcite).


100 x Ia/(Ic+Ia)
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
100
Aragonite (Wt%)


Shell wall
Fiborous calcite
Archaeoglobigerina blowi
Shell wall
Globotruncana linneiana
Shell wall
Nodogenerina alexanderi
Shell wall
Fiborous calcite
Marginotruncana sp.
Shell wall
Fiborous calcite
Marginotruncana sp.
Shell wall
Fiborous calcite
Lenticulina sp.
Fe (Wt %)
Mn (Wt %)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0