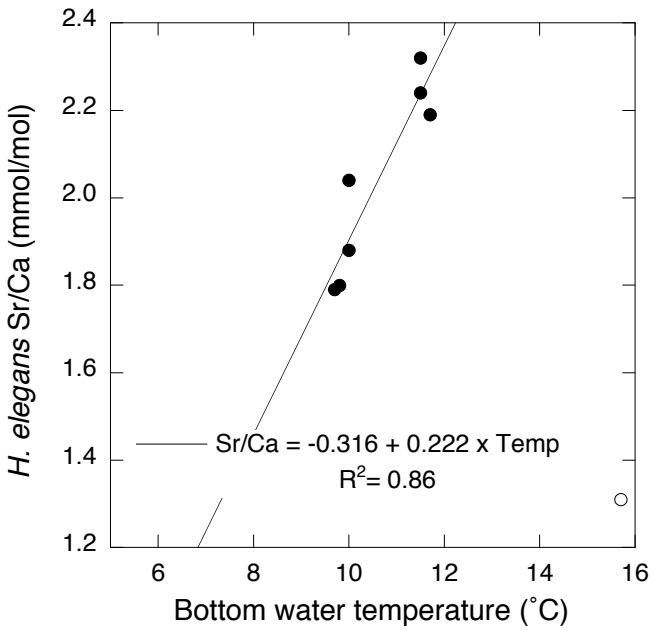
Data Repository Item

Aragonite Sr/Ca-temperature calibration

In order to construct a Sr/Ca-temperature calibration for Epistomina sp. we used core-top *Hoeglundina elegans* Sr/Ca from oversaturated ($[\Delta CO_3^{2-}]_{aragonite}$ > 15 $\mu molkg^{-1}$) waters of the Indonesian Seaway (data from Rosenthal et al., 2006; Figure DR1).

Rosenthal Y., Lear, C.H., Oppo, D.W., and B.K. Linsley, 2006, Temperature and carbonate ion effects on Mg/Ca and Sr/Ca ratios in benthic foraminifera: Aragonitic species Hoeglundina elegans: Paleoceanography, v. 21, PA1007, doi:10.1029/2005PA001158.

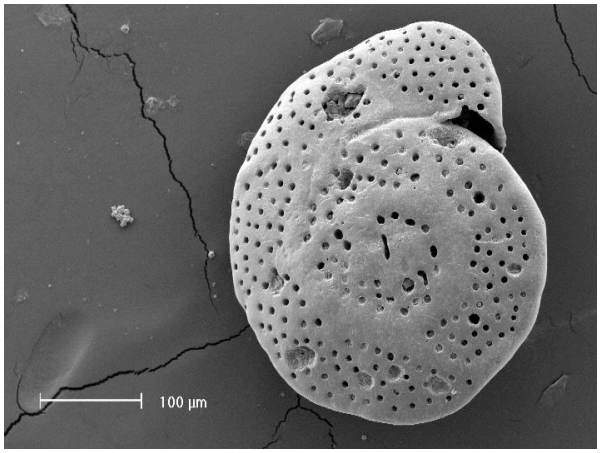
Figure DR1

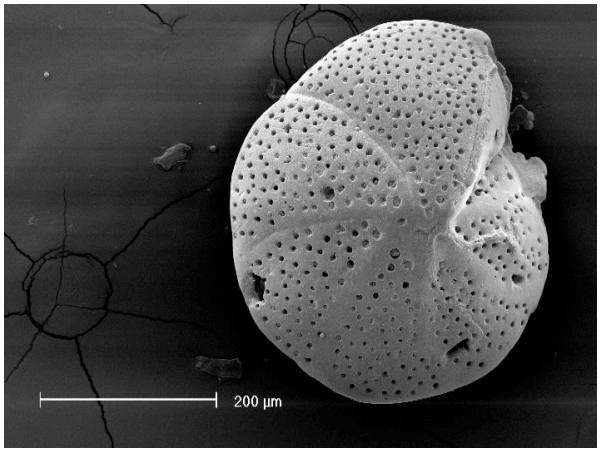


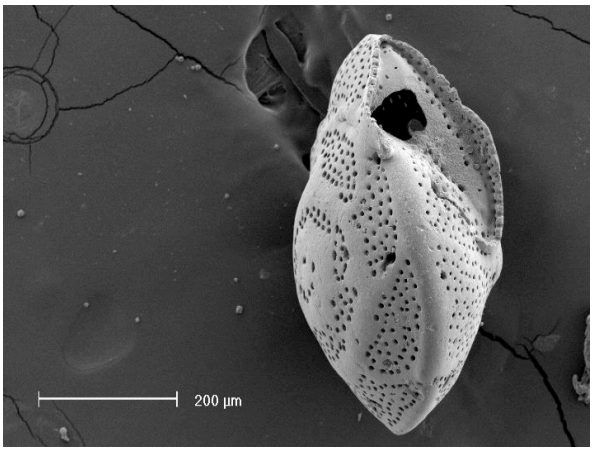
Sr/Ca of core-top *H. elegans* collected from oversaturated waters ($[\Delta CO_3^{2-}]_{aragonite}$ > 15 $\mu molkg^{-1}$) of the Indonesian Seaway versus bottom water temperatures (Rosenthal et al., 2006).

Figure DR2: Scanning Electron Microscope images of the *Cibicidoides* species used for Mg/Ca-temperatures.

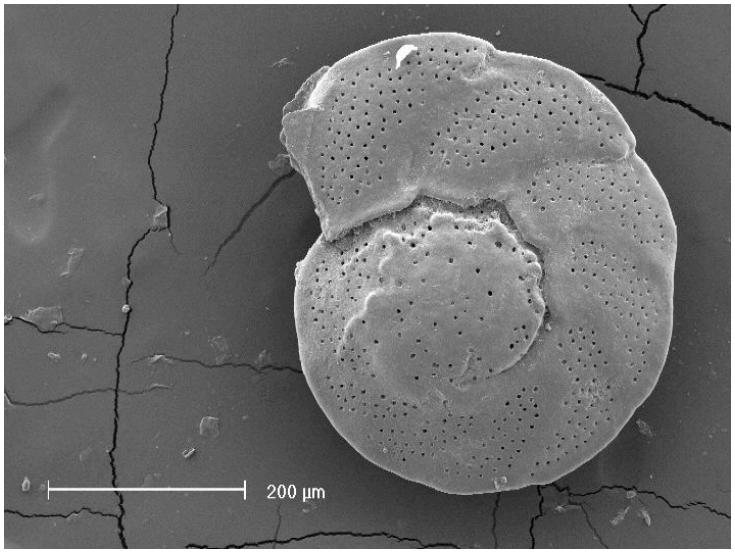
Cibicidoides sp. A

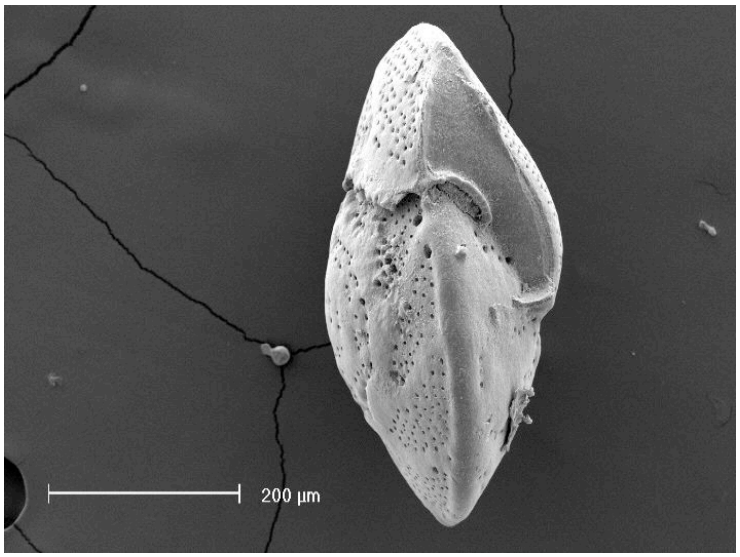




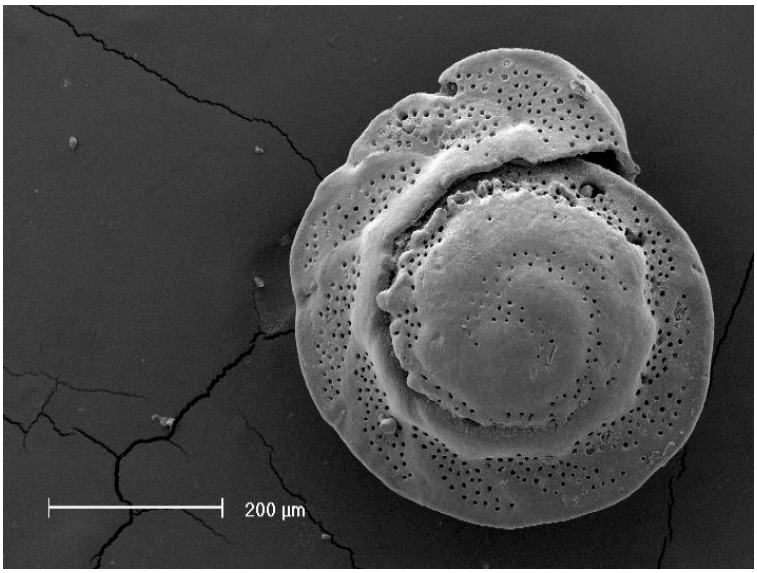


Cibicidoides sp. B





Cibicidoides sp. C



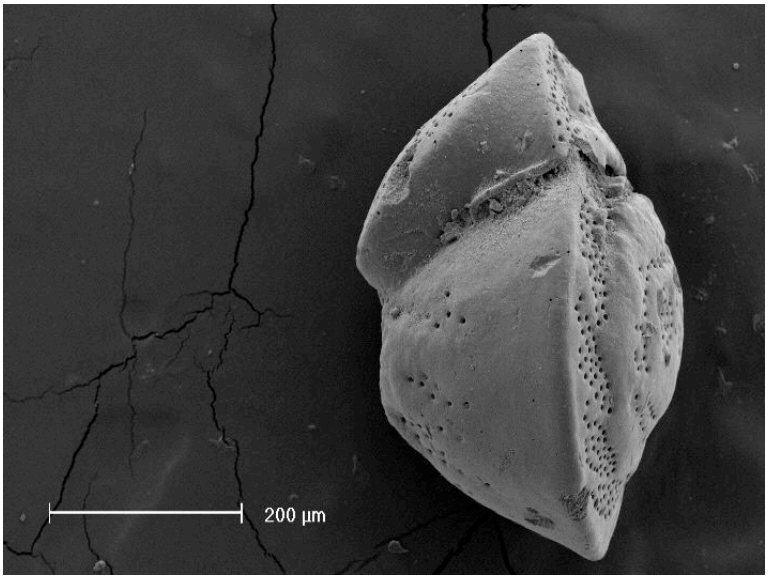


Table DR1

Cibicidoides spp. Mg/Ca ratios and calculated Mg/Ca-Temperatures

TDP12 Core ID	TDP12 depth	Composite depth TDP12 &17	Age CK95 (Ma)	Cibicidoides sp. A Mg/Ca (mmol/mol)	Cibicidoides sp. B Mg/Ca (mmol/mol)	Cibicidoides sp. C Mg/Ca (mmol/mol)	*Cibicidoides* (A+B+C) temperatures (°C)
12/7/2 40-47	24.4	82.4	33.374	5.94			19.4
12/7/3 30-37	25.3	83.3	33.381	6.52			20.3
12/8/1 22-30	26.22	84.22	33.389	6.40			20.1
12/8/2 57-66	27.57	85.57	33.400	6.94			20.8
12/8/3 67-75	28.67	86.67	33.410	6.04			19.5
12/9/2 23-36	30.28	88.28	33.423	6.57			20.3
12/14/1 14-22	44.14	102.14	33.689		5.91		19.4
12/14/1 92-100	44.92	102.92	33.711		6.08		19.6
12/14/2 90-100	45.9	103.9	33.736		5.80		19.2
12/15/1 8-17	47.08	105.08	33.765		5.82		19.2
12/18/3 65-76	58.65	116.65	33.885		5.49		18.7
12/20/1 41-50	62.41	120.41	33.917		8.04		22.2*
12/20/3 74-83	64.74	122.74	33.937		6.04		19.5
12/21/1 37-48	65.37	123.37	33.942			6.33	20.0
12/23/1 75-84	71.75	129.75	33.996			6.94	20.8
12/26/1 44-55	80.69	138.69	34.072		7.44		21.5
12/27/1 35-45	89.6	147.6	34.148		7.10		21.0
12/46/2 56-66	143.01	201.01	34.601			6.00	19.5
12/47/3 58-68	147.03	205.03	34.635		6.14		19.7

* sample marked with asterix is shown in Figure 1c but is not linked to other samples by dashed line

Table DR2 *Epistomina sp.* $\delta^{18}O$, Sr/Ca ratios and temperatures

TDP12 Core ID	TDP12 Depth (m)	Composite depth TDP12&17	Age CK95 (Ma)	$\delta^{18}O$ (‰)	*Epistomina sp.* Sr/Ca (mmol/mol)	Epistomina sp. bottom water temperature (°C)
12/7/2 40-47	24.4	82.4	33.374		3.69	21.5
12/7/2 40-47	24.4	82.4	33.374		3.53	20.6
12/7/2 40-47	24.4	82.4	33.374		3.64	21.2
12/7/3 30-37	25.3	83.3	33.381	-0.56	3.69	21.5
12/7/3 30-37	25.3	83.3	33.381		3.10	18.3
12/8/1 22-30	26.22	84.22	33.389	-0.49	3.64	21.2
12/8/2 57-66	27.57	85.57	33.400	-0.53	3.10	18.3
12/8/2 57-66	27.57	85.57	33.400		3.64	21.2
12/8/2 57-66	27.57	85.57	33.400		3.37	19.7
12/8/3 67-75	28.67	86.67	33.410	-0.48	3.24	19.0
12/9/2 23-36	30.28	88.28	33.423	-0.52	3.35	19.6
12/10/1 51-59	32.51	90.51	33.442	-0.40	3.37	19.7
12/10/3 47-56	34.47	92.47	33.458	-0.29	3.35	19.6
12/11/1 10-18	35.1	93.1	33.463	-0.49	3.35	19.6
12/11/2 7-13	36.07	94.07	33.471	-0.33	3.43	20.0
12/11/4 20-26	38.2	96.2	33.489	-0.27	3.37	19.8
12/12/1 23-31	38.23	96.23	33.489	-0.43	3.36	19.7
12/12/1 72-80	38.72	96.72	33.494	-0.31	3.40	19.9
12/12/2 5-12	39.05	97.05	33.496	-0.37	3.39	19.8
12/12/3 30-37	40.3	98.3	33.562	-0.27	3.37	19.7
12/13/1 59-67	41.59	99.59	33.615	-0.29	3.33	19.5
12/14/1 14-22	44.14	102.14	33.689	-0.22	3.00	17.7
12/14/1 92-100	44.92	102.92	33.711	-0.35	3.43	20.0
12/14/2 42-50	45.42	103.42	33.724	-0.40	3.19	18.8
12/14/2 90-100	45.9	103.9	33.736	-0.28	3.00	17.7
12/15/1 8-17	47.08	105.08	33.765		3.14	18.4
12/18/2 61-72	57.61	115.61	33.876	-0.23	3.05	18.0
12/18/3 65-76	58.65	116.65	33.885	-0.27	3.12	18.4
12/20/1 41-50	62.41	120.41	33.917	-0.61	3.14	18.5
12/20/3 74-83	64.74	122.74	33.937	-0.50	3.20	18.8
12/21/1 37-48	65.37	123.37	33.942	-0.27	3.23	18.9
12/23/1 75-84	71.75	129.75	33.996	-0.81	3.25	19.0
12/23/2 70-79	72.7	130.7	34.004	-0.70	3.33	19.5
12/24/1 42-50	74.72	132.72	34.022	-0.55	3.27	19.2
12/26/1 44-55	80.69	138.69	34.072	-0.77	3.53	20.6
12/27/1 35-45	89.6	147.6	34.148	-0.79	3.48	20.3
12/30/1 25-35	93.7	151.7	34.183		3.13	18.4
12/32/1 15-24	96.6	154.6	34.207	-0.52	3.18	18.7
12/33/1 31-41	98.46	156.46	34.223	-0.67	3.20	18.8
12/35/3 58-68	105.23	163.23	34.280	-0.42	3.08	18.1
12/38/2 88-100	114.73	172.73	34.361	-0.44	3.09	18.2
12/40/2 80-90	121.05	179.05	34.415	-0.54	2.98	17.6
12/41/2 68-78	124.93	182.93	34.448	-0.25	2.95	17.5

12/42/2	55-66	129	187	34.482		3.00	17.7
12/43/2	78-88	134.23	192.23	34.526	-0.23	2.96	17.5
12/44/1	51-61	135.96	193.96	34.541	-0.22	3.02	17.8
12/46/2	56-66	143.01	201.01	34.601	-0.25	3.00	17.7
12/47/3	58-68	147.03	205.03	34.635	-0.27	2.92	17.3

Table DR3 *T. ampliapertura* Mg/Ca data and calculated Mg/Ca-temperatures

TDP12 Core ID	TDP12 Depth (m)	Composite depth TDP12&17 (m)	Age CK95 (Ma)	T. ampliapertura (>250μm) Mg/Ca (mmol/mol)	Near surface Layer temperature (°C)	SST (°C)
12/7/3 30-37	25.3	83.3	33.381	3.63	27.2	29.2
12/8/1 22-30	26.22	84.22	33.389	3.76	27.6	29.6
12/8/2 57-66	27.57	85.57	33.400	3.92	28.0	30.0
12/8/3 67-75	28.67	86.67	33.410	3.46	26.7	28.7
12/9/1 15-23	29.15	87.15	33.414	3.50	26.8	28.8
12/9/2 23-36	30.28	88.28	33.423	3.15	25.6	27.6
12/10/1 51-59	32.51	90.51	33.442	3.20	25.8	27.8
12/10/3 47-56	34.47	92.47	33.458	3.77	27.6	29.6
12/11/1 10-18	35.1	93.1	33.463	3.33	26.2	28.2
12/11/4 20-26	38.2	96.2	33.489	3.50	26.8	28.8
12/12/1 23-31	38.23	96.23	33.489	3.62	27.2	29.2
12/12/1 72-80	38.72	96.72	33.494	3.90	28.0	30.0
12/12/2 5-12	39.05	97.05	33.496	3.26	26.0	28.0
12/14/1 14-22	44.14	102.14	33.689	3.27	26.0	28.0
12/14/1 92-100	44.92	102.92	33.711	3.44	26.6	28.6
12/14/2 42-50	45.42	103.42	33.724	3.63	27.2	29.2
12/14/2 90-100	45.9	103.9	33.736	3.17	25.7	27.7
12/15/1 8-17	47.08	105.08	33.765	3.38	26.4	28.4
12/18/3 65-76	58.65	116.65	33.885	3.44	26.6	28.6
12/20/1 41-50	62.41	120.41	33.917	3.28	26.0	28.0
12/20/3 74-83	64.74	122.74	33.937	3.34	26.3	28.3
12/21/1 37-48	65.37	123.37	33.942	3.93	28.1	30.1
12/23/1 75-84	71.75	129.75	33.996	3.87	27.9	29.9
12/23/2 70-79	72.7	130.7	34.004	3.86	27.9	29.9
12/24/1 42-50	74.72	132.72	34.022	3.80	27.7	29.7
12/24/3 0-10	76	134	34.032	4.02	28.3	30.3
12/26/1 44-55	80.69	138.69	34.072	4.10	28.6	30.6
12/27/1 35-45	89.6	147.6	34.148	3.79	27.7	29.7
12/30/1 25-35	93.7	151.7	34.183	3.68	27.3	29.3
12/32/1 15-24	96.6	154.6	34.207	3.79	27.7	29.7
12/35/3 58-68	105.23	163.23	34.280	3.58	27.0	29.0
12/40/2 80-90	121.05	179.05	34.415	4.35	29.2	31.2
12/41/2 68-78	124.93	182.93	34.448	4.14	28.6	30.6
12/43/2 78-88	134.23	192.23	34.526	3.52	26.8	28.8
12/44/1 51-61	135.96	193.96	34.541	4.06	28.4	30.4
12/46/2 56-66	143.01	201.01	34.601	3.75	27.6	29.6
12/47/3 58-68	147.03	205.03	34.635	3.91	28.0	30.0