

Supplementary Material

Table S1. AMS radiocarbon (^{14}C) and Uranium-series (U/Th) ages obtained from cold-water coral fragments collected from coral mounds of the Belgica coral mound province (PO Poseidon, LP Little Poseidon, CH Challenger, LH Lion's Head, GA Galway, TH Thérèse, PX Pollux; for position see Fig. 1B). Coral ages were obtained during this study (A) or previously published in (1) Schröder-Ritzrau et al. 2005, (2) Raddatz et al. 2014, (3a) Frank et al. 2005, (3b) Frank et al. 2009, (3c) Frank et al. 2011, (4) Eisele et al. 2008, and (5) Van der Land et al. 2014. U/Th ages with an initial $\delta^{234}\text{U}$ value of $146.8\text{‰} \pm 10\text{‰}$ (modern seawater; Andersen et al., 2010) are reliable (R; note that not reliable (NR) U/Th ages are given in italic). All AMS ^{14}C ages were corrected for ^{13}C and calibrated using the CALIB7.1 software (Stuiver and Reimer, 1993). The MARINE13 calibration curve was applied for calibration (Reimer et al., 2013) with a local reservoir age correction ΔR of 100 ± 100 years accounting for the observation of a Holocene thermocline reservoir age of $R=480 \pm 120$ years by Frank et al. (2004, 2005). Ages are ordered by coral mound, sample-ID and age. M: coral mound, WD: water depth, GR: grab sample, GC: gravity core, DR: dredge sample, DC: drill core, SD: sampling depth, Mo: *Madrepora oculata*, Lp: *Lophelia pertusa*, REF: reference.

No.	M	Sample ID	Latitude (N)	Longitude (W)	WD (m)	Gear	SD (cm)	Species	Method	Conv. $^{14}\text{C} \pm$ (yr BP)	$\delta^{234}\text{U(T)}$ (‰)	^{232}Th (ppb)	Age (yr BP)	\pm	REF
shallow coral mound chain															
1	PO	GeoB14535-2	51°27.33'	11°42.18'	675	GR	0	Mo	^{14}C	1,730	30		1,160	210	A
2	PO	GeoB14535-2	51°27.33'	11°42.18'	675	GR	0	Lp	^{14}C	2,060	30		1,530	230	A
3	PO	GeoB14535-2	51°27.33'	11°42.18'	675	GR	0	Mo	^{14}C	2,120	30		1,590	240	A
4	PO	GeoB14535-2	51°27.33'	11°42.18'	675	GR	0	Lp	^{14}C	2,170	30		1,640	250	A
5	PO	GeoB14535-2	51°27.33'	11°42.18'	675	GR	0	Mo	^{14}C	4,380	30		4,390	310	A
6	PO	GeoB14535-2	51°27.33'	11°42.18'	675	GR	0	Mo	^{14}C	8,090	40		8,470	260	A
7	PO	GeoB14546-1	51°27.64'	11°41.95'	699	GC	3	Mo	^{14}C	910	30		440	180	A
8	PO	GeoB14546-1	51°27.64'	11°41.95'	699	GC	58	Lp	^{14}C	7,250	30		7,630	200	A
9	PO	GeoB14547-1	51°27.48'	11°41.88'	681	GC	3	Mo	U/Th		142.3	5.179	7,887	30	R A
10	PO	GeoB14550-1	51°27.33'	11°42.18'	676	GC	6	Lp	^{14}C	7,480	35		7,830	210	A
11	PO	GeoB14550-1	51°27.33'	11°42.18'	676	GC	24	Lp	U/Th		135.1	1.544	199,017	1,840	NR A
12	PO	GeoB14550-1	51°27.33'	11°42.18'	676	GC	35	Lp	U/Th		148.4	16.334	252,907	3,070	R A

13	PO	GeoB14550-1	51°27.33'	11°42.18'	676	GC	124	Lp	U/Th		168.7	25.585	348,527	5,910	NR	A
14	PO	GeoB14550-1	51°27.33'	11°42.18'	676	GC	151	Lp	U/Th		175.2	18.545	411,047	11,000	NR	A
15	PO	GeoB14550-1	51°27.33'	11°42.18'	676	GC	228	Mo	U/Th		174.1	1.444	573,607	59,010	NR	A
16	PO	GeoB14550-1	51°27.33'	11°42.18'	676	GC	549	Lp	U/Th		243.8	4.246	649,557	-	NR	A
17	PO	3140	51°27.2	11°42.2	681	DR	0	Mo	U/Th		152.6	2.181	7,655	100	R	1
18	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Lp	¹⁴ C	3,370	30		3,090	260		A
19	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Mo	¹⁴ C	3,880	30		3,720	270		A
20	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Lp	¹⁴ C	6,980	30		7,380	190		A
21	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Mo	¹⁴ C	7,200	40		7,600	200		A
22	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Mo	¹⁴ C	7,210	30		7,610	200		A
23	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Lp	¹⁴ C	7,240	30		7,620	200		A
24	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Mo	¹⁴ C	7,460	40		7,810	210		A
25	LP	GeoB14539-1	51°26.90'	11°42.98'	686	GR	0	Mo	¹⁴ C	7,550	40		7,910	230		A
26	LP	GeoB14552-1	51°26.91'	11°41.99'	692	GC	221	Mo	U/Th		291.2	10.885	645,247	-	NR	A
27	LP	GeoB14552-1	51°26.91'	11°41.99'	692	GC	327	Lp	U/Th		227.5	2.457	634,687	-	NR	A
28	LP	GeoB14552-1	51°26.91'	11°41.99'	692	GC	456	Lp	U/Th		173.0	0.846	544,207	-	NR	A
29	LP	GeoB14552-1	51°26.91'	11°41.99'	692	GC	557	Lp	U/Th		199.7	0.161	595,627	-	NR	A
30	CH	IODP 1317	52°23'	11°43'	800	DC	10	Lp	U/Th		144.2	-0.120	1,176	30	R	2
31	CH	IODP 1317	52°23'	11°43'	800	DC	467	Lp	U/Th		124.0	-0.110	432,986	21,670	NR	2
32	CH	IODP 1317	52°23'	11°43'	800	DC	475	Lp	U/Th		140.9	4.867	104,686	730	R	2
33	CH	IODP 1317	52°23'	11°43'	800	DC	555	Lp	U/Th		114.3	0.220	371,206	13,250	NR	2
34	CH	IODP 1317	52°23'	11°43'	800	DC	775	Lp	U/Th		132.8	-3.190	460,216	65,440	R	2
35	CH	IODP 1317	52°23'	11°43'	800	DC	1070	Lp	U/Th		156.8	0.270	513,876	35,270	R	2
36	CH	IODP 1317	52°23'	11°43'	800	DC	2018	Lp	U/Th		43.9	0.070	386,306	25,280	NR	2
37	CH	IODP 1317	52°23'	11°43'	800	DC	2274	Lp	U/Th		43.4	1.770	425,926	37,420	NR	2
38	CH	IODP 1317	52°23'	11°43'	800	DC	2324	Lp	U/Th		50.7	1.640	351,886	15,260	NR	2
39	CH	IODP 1317	52°23'	11°43'	800	DC	2357	Lp	U/Th		48.6	2.060	367,496	19,310	NR	2
40	CH	IODP 1317	52°23'	11°43'	800	DC	2560	Lp	U/Th		103.7	-0.330	280,666	10,032	NR	2
41	CH	IODP 1317	52°23'	11°43'	800	DC	2612	Lp	U/Th		90.7	5.140	303,966	11,746	NR	2
42	CH	IODP 1317	52°23'	11°43'	800	DC	2692	Lp	U/Th		122.0	17.380	285,506	6,893	NR	2

43	CH	IODP 1317	52°23'	11°43'	800	DC	2841	Lp	U/Th		15.7	1.460	427,796	30,209	NR	2
44	CH	IODP 1317	52°23'	11°43'	800	DC	2896	Lp	U/Th		28.7	60.690	473,736	86,527	NR	2
45	CH	MD01-2451G	52°23'	11°46'	762	GC	0	Lp	U/Th		148.0	0.800	315	43	R	3a
46	CH	MD01-2451G	52°23'	11°46'	762	GC	6	Lp	U/Th		145.2	0.391	3,174	106	R	3b
47	CH	MD01-2451G	52°23'	11°46'	762	GC	27	Lp	U/Th		147.2	0.341	6,051	153	R	3b
48	CH	MD01-2451G	52°23'	11°46'	762	GC	31	Lp	U/Th		154.1	1.610	6,461	140	R	3b
49	CH	MD01-2451G	52°23'	11°46'	762	GC	223	Lp	U/Th		140.3	3.791	78,731	490	R	3b
50	CH	MD01-2451G	52°23'	11°46'	762	GC	248	Lp	U/Th		152.4	0.392	109,141	773	R	3b
51	CH	MD01-2451G	52°23'	11°46'	762	GC	326	Lp	U/Th		160.7	0.595	188,841	2,300	NR	3b
52	CH	MD01-2451G	52°23'	11°46'	762	GC	407	Lp	U/Th		190.7	1.153	230,341	2,900	NR	3b
53	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	600	35		170	170		A
54	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	830	30		330	200		A
55	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	830	30		330	200		A
56	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	880	30		420	190		A
57	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	1,030	30		510	180		A
58	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	1,160	30		650	180		A
59	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	1,500	30		950	230		A
60	LH	GeoB14511-1	51°20.39'	11°41.64'	707	GR	0	Mo	¹⁴ C	1,770	30		1,200	230		A
61	LH	GeoB14517-1	51°20.39'	11°41.56'	725	GC	32	Mo	U/Th		81.8	2.358	388,423	14,202	NR	A
62	LH	GeoB14517-1	51°20.39'	11°41.56'	725	GC	408	Lp	U/Th		27.7	2.799	467,815	45,549	NR	A
63	LH	GeoB14518-1	51°20.38'	11°41.64'	707	GC	3	Mo	U/Th		147.3	0.389	284	29	R	A
64	LH	GeoB14518-1	51°20.38'	11°41.64'	707	GC	33	Mo	¹⁴ C	2,680	30		2,270	300		A
65	LH	GeoB14518-1	51°20.38'	11°41.64'	707	GC	64	Mo	U/Th		148.7	0.329	4,134	36	R	A
66	LH	GeoB14518-1	51°20.38'	11°41.64'	707	GC	98	Mo	U/Th		148.8	0.663	6,430	52	R	A
67	LH	GeoB14518-1	51°20.38'	11°41.64'	707	GC	150	Lp	U/Th		147.3	0.334	7,747	160	R	A
68	LH	GeoB14518-1	51°20.38'	11°41.64'	707	GC	155	Mo	U/Th		151.1	0.471	8,556	61	R	A
69	LH	GeoB14519-1	51°20.33'	11°41.76'	794	GC	49	Lp	U/Th		152.0	13.377	98,158	997	R	A
70	LH	GeoB14519-1	51°20.33'	11°41.76'	794	GC	137	Lp	U/Th		157.5	0.379	139,476	994	R	A

deep coral mound chain

71	GA	GeoB9212-1	51°27.13'	11°44.99'	847	GC	63	Mo	¹⁴ C	3,330	40			3,050	270		A
72	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	13	Mo	¹⁴ C	3,230	30			2,950	240		A
73	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	51	Lp	U/Th			150.1	0.287	5,628	55	R	A
74	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	104	Lp	U/Th			148.6	0.252	6,577	45	R	A
75	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	143	Mo or Lp	¹⁴ C	7,820	45			8,170	210		4
76	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	150	Lp	U/Th			149.3	?	9,114	148	R	4
77	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	250	Lp	U/Th			150.3	0.875	9,195	71	R	A
78	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	378	Lp	U/Th			129.1	29.602	223,373	6,239	NR	5
79	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	385	Lp	U/Th			145.2	15.428	276,209	5,700	NR	5
80	GA	GeoB9213-1	51°27.09'	11°45.16'	793	GC	462	Lp	U/Th			158.1	?	299,267	11,732	NR	4
81	GA	GeoB9214-1	51°27.06'	11°45.28'	857	GC	20	Lp	¹⁴ C	1,430	30			880	220		A
82	GA	GeoB9214-1	51°27.06'	11°45.28'	857	GC	178	Mo or Lp	¹⁴ C	6,690	40			7,090	250		4
83	GA	GeoB9214-1	51°27.06'	11°45.28'	857	GC	180	Mo	U/Th			148.8	?	8,625	160	R	4
84	GA	GeoB9214-1	51°27.06'	11°45.28'	857	GC	213	Mo or Lp	¹⁴ C	8,130	45			8,560	280		4
85	GA	GeoB9214-1	51°27.06'	11°45.28'	857	GC	270	Mo	U/Th			147.7	0.473	10,292	87	R	5
86	GA	GeoB9214-1	51°27.06'	11°45.28'	857	GC	281	Lp	U/Th			151.8	1.640	128,630	1,265	R	5
87	GA	GeoB9214-1	51°27.06'	11°45.28'	857	GC	378	Lp	U/Th			165.6	?	268,627	8,827	NR	4
88	GA	GeoB9223-1	51°26.90'	11°45.10'	839	GC	168	Mo or Lp	¹⁴ C	5,200	35			5,460	240		4
89	GA	GeoB9223-1	51°26.90'	11°45.10'	839	GC	427	Lp	U/Th			153.1	3.484	99,985	1,106	R	5
90	GA	GeoB9223-1	51°26.90'	11°45.10'	839	GC	448	Lp	U/Th			149.0	5.650	125,796	907	R	5
91	TH	MD01-2463G	51°26'	11°46'	888	GC	0	Lp	U/Th			148.1	0.800	202	33	R	3b
92	TH	MD01-2463G	51°26'	11°46'	888	GC	10	Lp	¹⁴ C	?				851	99	R	3b
93	TH	MD01-2463G	51°26'	11°46'	888	GC	100	Lp	¹⁴ C	?				6,811	88	R	3b
94	TH	MD01-2463G	51°26'	11°46'	888	GC	141	Lp	U/Th			154.5	3.583	9,751	220	R	3b
95	TH	MD01-2463G	51°26'	11°46'	888	GC	179	Lp	U/Th			154.0	9.451	9,641	350	R	3b
96	TH	MD01-2463G	51°26'	11°46'	888	GC	244	Lp	U/Th			161.8	11.178	221,031	8,500	NR	3c
97	TH	MD01-2463G	51°26'	11°46'	888	GC	277	Lp	U/Th			162.5	7.614	221,041	13,000	NR	3c
98	TH	MD01-2463G	51°26'	11°46'	888	GC	300	Lp	U/Th			153.8	6.854	247,741	10,500	R	3b
99	TH	MD01-2463G	51°26'	11°46'	888	GC	304	Lp	U/Th			150.8	0.545	219,941	7,800	R	3c
100	TH	MD01-2463G	51°26'	11°46'	888	GC	357	Lp	U/Th			151.5	1.175	246,941	13,000	R	3c

101	TH	MD01-2463G	51°26'	11°46'	888	GC	365	Lp	U/Th			150.4	19.475	254,941	25,000	R	3c
102	TH	MD01-2463G	51°26'	11°46'	888	GC	390	Lp	U/Th			148.5	48.542	242,941	11,000	NR	3c
103	TH	MD01-2463G	51°26'	11°46'	888	GC	450	Lp	U/Th			175.3	10.021	263,941	16,000	NR	3c
104	TH	MD01-2463G	51°26'	11°46'	888	GC	516	Lp	U/Th			200.4	17.679	365,941	36,000	NR	3c
105	TH	MD01-2463G	51°26'	11°46'	888	GC	600	Lp	U/Th			165.3	38.105	339,941	33,000	NR	3c
106	TH	MD01-2463G	51°26'	11°46'	888	GC	750	Lp	U/Th			154.9	0.738	337,941	35,000	R	3c
107	TH	MD01-2463G	51°26'	11°46'	888	GC	900	Lp	U/Th			144.2	6.942	323,941	25,400	R	3c
108	TH	MD01-2463G	51°26'	11°46'	888	GC	1075	Lp	U/Th			191.2	1.125	553,941	160,000	NR	3c
109	PX	GeoB14530-1	51°24.89'	11°45.82'	950	GC	19	Lp	U/Th			148.4	0.516	953	46	R	A
110	PX	GeoB14530-1	51°24.89'	11°45.82'	950	GC	180	Lp	¹⁴ C	6,060	30			6,400	220		A
111	PX	GeoB14530-1	51°24.89'	11°45.82'	950	GC	347	Lp	U/Th			149.7	0.286	11,290	92	R	A
112	PX	GeoB14530-1	51°24.89'	11°45.82'	950	GC	380	Lp	U/Th			148.3	0.636	209,721	2,277	R	A
113	PX	GeoB14531-1	51°24.89'	11°45.77'	904	GC	13	Lp	U/Th			148.4	0.071	352	15	R	A
114	PX	GeoB14531-1	51°24.89'	11°45.77'	904	GC	98	Lp	U/Th			150.1	0.210	4,227	27	R	A
115	PX	GeoB14531-1	51°24.89'	11°45.77'	904	GC	207	Lp	¹⁴ C	5,920	30			6,210	240		A
116	PX	GeoB14531-1	51°24.89'	11°45.77'	904	GC	320	Lp	U/Th			150.6	0.213	9,319	44	R	A
117	PX	GeoB14531-1	51°24.89'	11°45.77'	904	GC	434	Lp	U/Th			150.9	0.787	8,859	59	R	A
118	PX	GeoB14532-2	51°24.88'	11°45.62'	926	GC	20	Lp	U/Th			148.9	0.481	4,838	89	R	A
119	PX	GeoB14532-2	51°24.88'	11°45.62'	926	GC	43	Lp	U/Th			149.8	0.262	5,571	43	R	A
120	PX	GeoB14532-2	51°24.88'	11°45.62'	926	GC	67	Lp	U/Th			149.1	0.454	2,924	31	R	A
121	PX	2419	51°24.8'	11°45.9'	1005	DR	0	Lp	U/Th			146.6	1.547	395	60	R	1
122	PX	2420	51°24.8'	11°45.9'	1005	DR	0	Lp	U/Th			148.3	17.100	985	190	R	1

Figure S1. Compilation of cold-water coral ages obtained from coral mounds of the Belgica coral mound province (green diamonds: shallow mounds; blue diamonds: deep mounds; note that the x-axis breaks between 14 and 71 ka BP). The data clearly show that mound formation in the Belgica coral mound province was mainly restricted to interglacial periods. Boundaries between Marine Isotopes Stages (MIS) 1-13 are based on "LR04 Global Pliocene-Pleistocene benthic $\delta^{18}\text{O}$ stack" by Lisiecki and Raymo (2005).

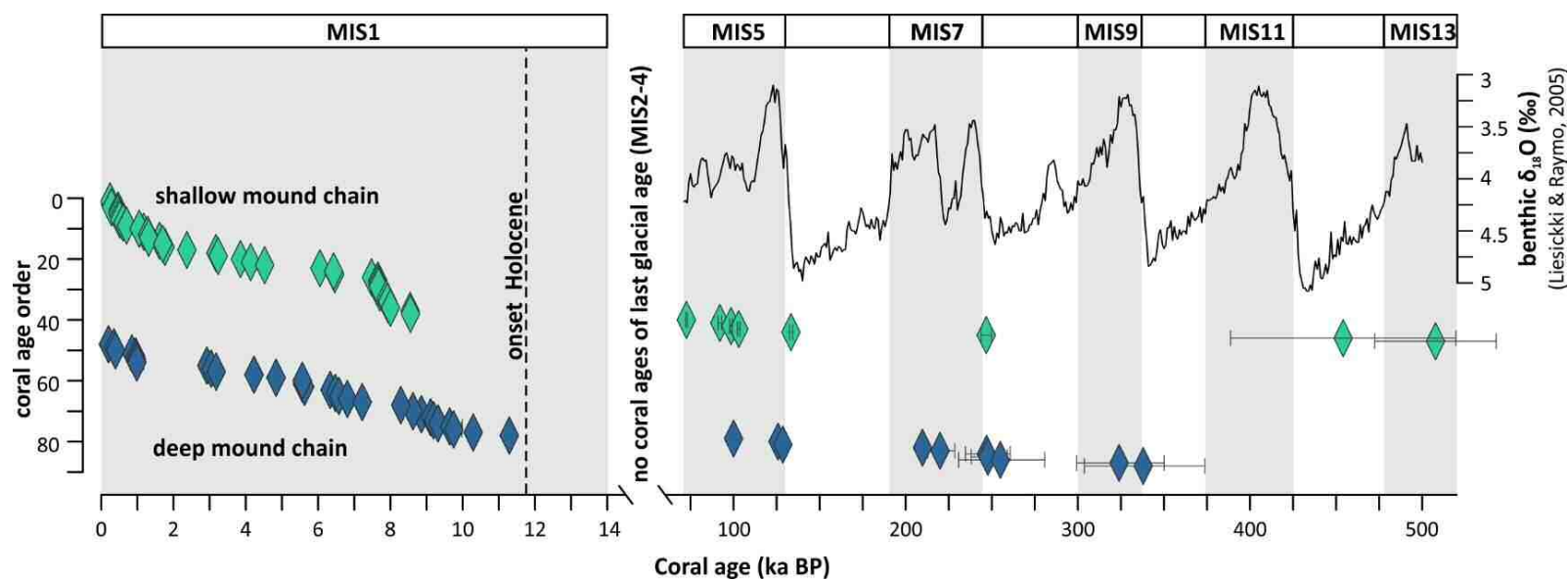


Figure S2. On-mound cores collected from shallow (green) and deep (blue) coral mounds of the Belgica coral mound province. Displayed are the Holocene and pre-Holocene (mainly MIS5 and 7) units, and the oldest Holocene and youngest pre-Holocene ages are indicated (reported in ka BP). For all cores, mound deposits of last glacial (MIS2-4) age are missing. Cores GeoB14518-1 (Lion's Head mound, shallow mound chain) and GeoB9214-1 and 14530-1 (Galway and Pollux mounds, both deep mound chain) nicely display unconformities between the Holocene and pre-Holocene sequences. Computertomograph (CT) data mentioned on the figure are available for cores GeoB14531-1, 9213-1, and 14518-1 and details on the analyses of the CT data are presented in Kremer (2013).

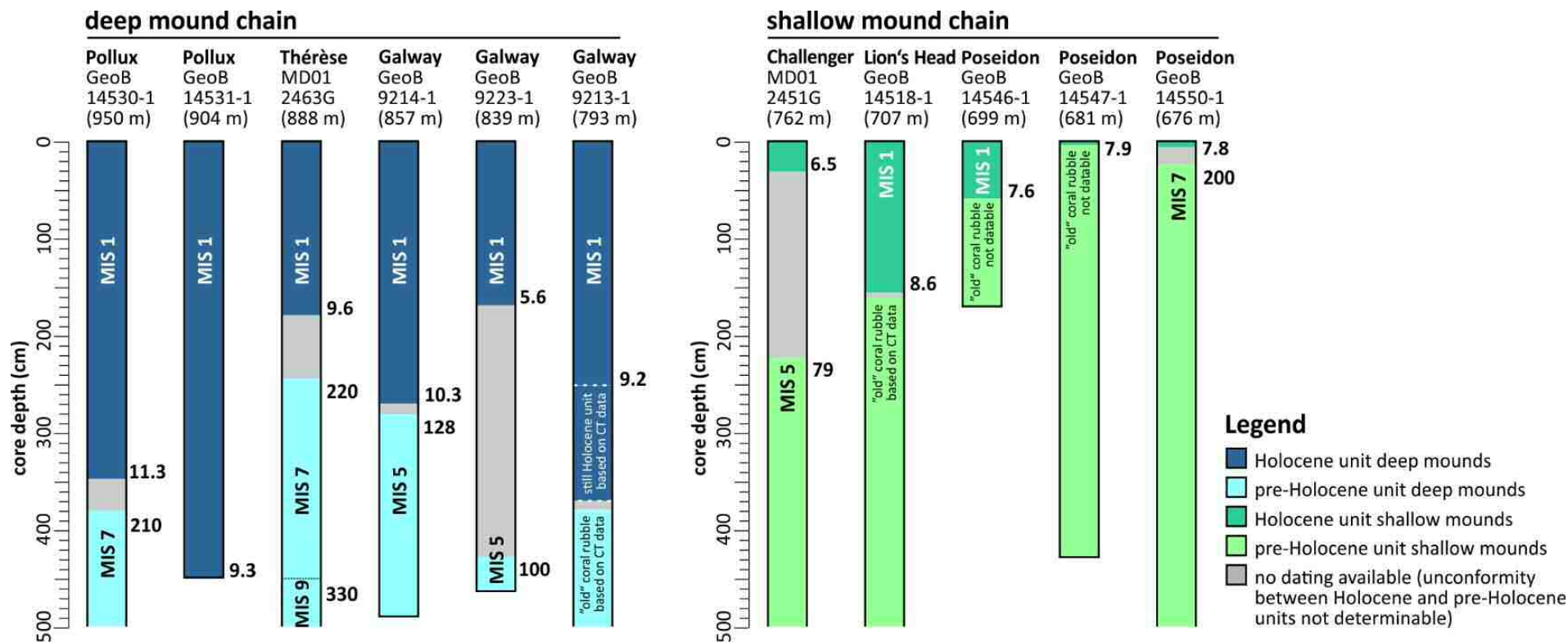
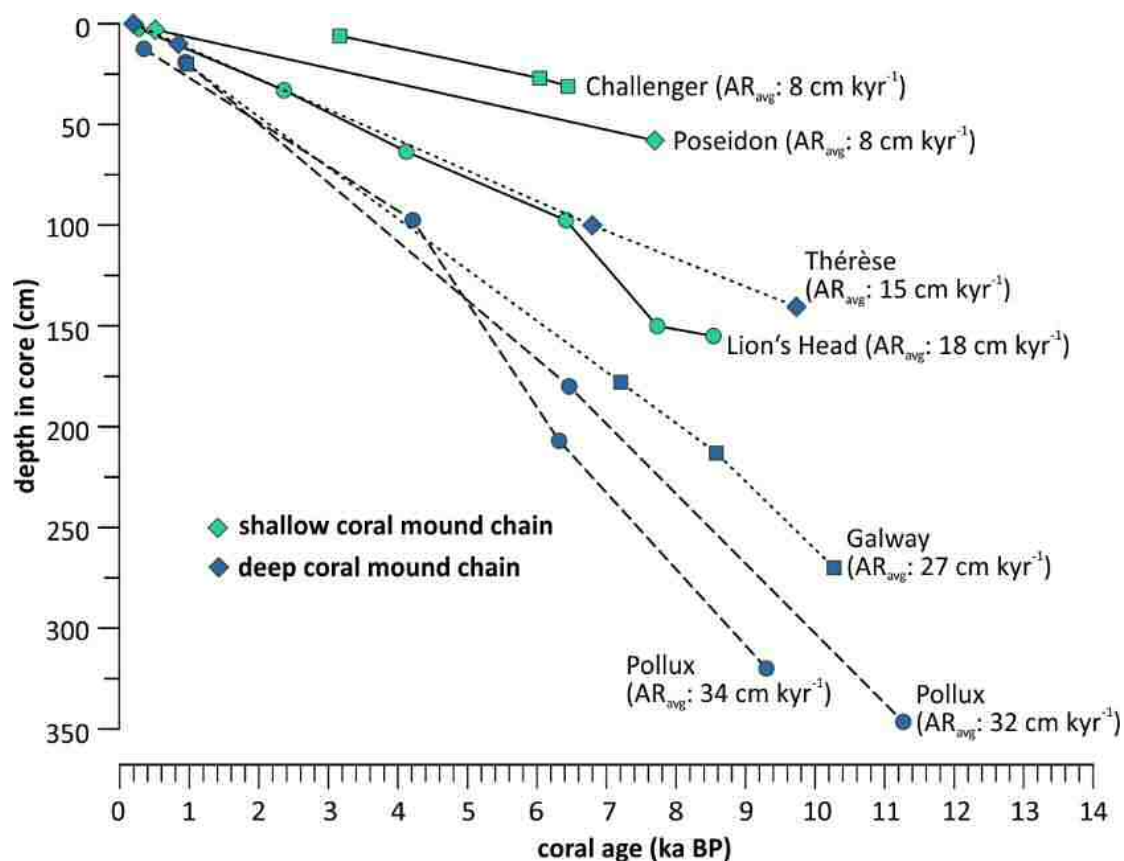


Figure S3. Holocene coral ages versus core depth and corresponding average Holocene coral mound aggradation rates (AR_{avg} ; reported in $cm\ kyr^{-1}$) calculated for core records obtained from shallow (green symbols) and deep (blue symbols) Belgica coral mounds. ARs were calculated for cores, for which more than one Holocene age was available. The oldest and youngest Holocene ages in relation to the maximum and minimum core depths of the respective core intervals were used for the calculation. The Holocene AR_{avg} clearly differ between the shallow and deep mounds. For three deep coral mounds (based on six core records), calculated mound aggradation rates range between 18 and 39 $cm\ kyr^{-1}$ (mean: $\sim 30\ cm\ kyr^{-1}$), while for three shallow mounds, aggradation rates of 8 – 18 $cm\ kyr^{-1}$ (mean: $\sim 11\ cm\ kyr^{-1}$) were obtained.



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