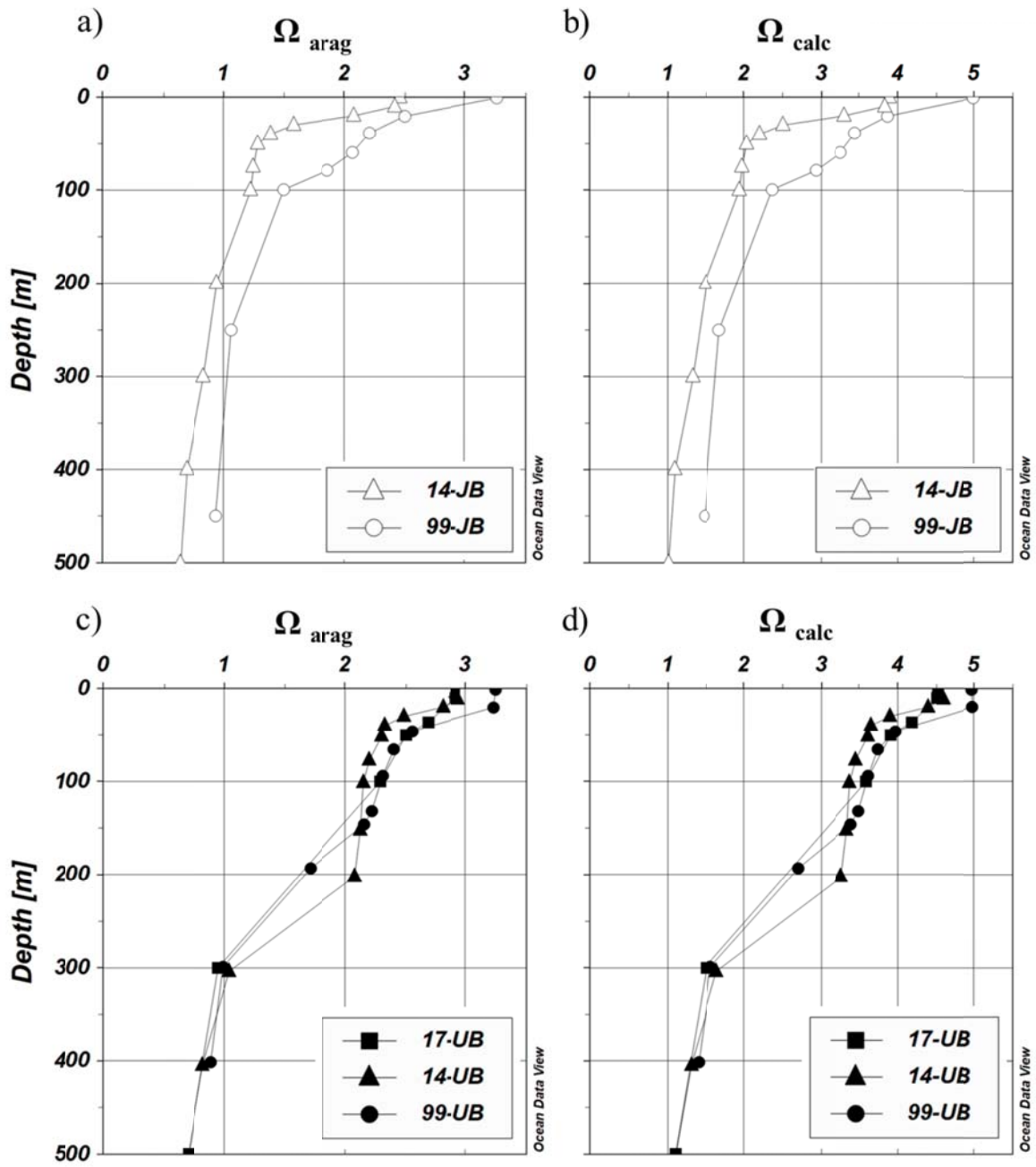


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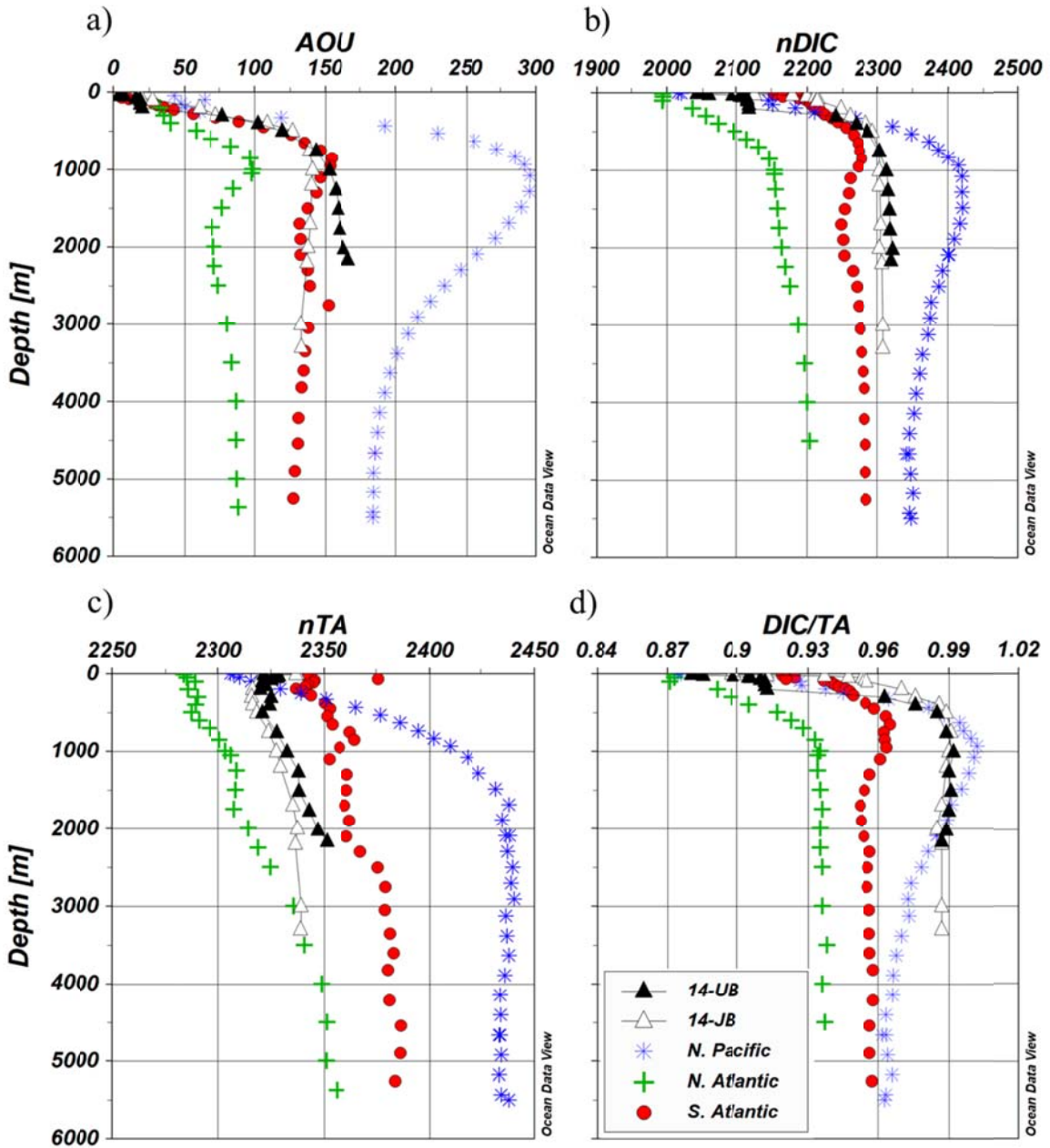
2 Figure S1. Vertical distribution of AOU (a, d), DIC (b, f), and TA (c, e) in $\mu\text{mol kg}^{-1}$. Data
 3 obtained in 1999 (upper panels, redrawn from Talley et al., 2004) and in 2014 and 2017
 4 (lower panels, this study) are shown for the layer deeper than 300 m.

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Figure S2. Aragonite (Ω_{arag}) and calcite (Ω_{calc}) saturation states in the upper 500 m in the Japan Basin (upper panels) and Ulleung Basin (lower panels).



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Figure S3. Vertical distribution of a) AOU, b) nDIC, c) nTA, and d) molar ratio of DIC/TA in the East Sea and at each site in the North Atlantic (St. 191; 31.95°N, 26.26°W), South Atlantic (St. 31; 47.00°S, 32.13°W), and North Pacific (St. 71; 37.98°N, 166.46°E).

17 Table S1. CO₂ parameters measured during the 2014 and 2017 cruises. DO, DIC, and TA are
 18 expressed in $\mu\text{mol kg}^{-1}$ and pH on the total hydrogen scale.

Station	Depth (m)	Potential T (°C)	Salinity	DO	DIC	TA	pH
14-JB (M13-2) (40.9°N, 132.4°E)	0	4.82	33.94	380	2033	2267	8.20
	10	4.82	33.94	381	2036	2266	8.20
	20	3.32	33.97	394	2064	2260	8.17
	30	1.86	33.96	343	2115	2256	8.07
	40	1.80	33.98	333	2135	2254	8.02
	50	1.54	33.99	321	2147	2254	8.00
	75	1.17	34.00	323	2152	2256	7.98
	100	1.11	34.02	315	2152	2254	7.95
	200	0.82	34.04	285	2185	2253	7.87
	300	0.74	34.05	273	2199	2253	7.85
	400	0.68	34.05	238	2222	2254	7.76
	500	0.60	34.06	220	2231	2256	7.72
	750	0.37	34.06	211	2241	2262	7.71
	1000	0.26	34.06	209	2241	2265	7.70
	1200	0.20	34.06	211	2241	2267	7.67
	1700	0.13	34.06	212	2243	2272	7.70
	2000	0.11	34.06	214	2241	2275	7.70
2200	0.10	34.06	215	2245	2274	7.67	
3000	0.09	34.06	219	2246	2276	7.66	
3300	0.09	34.06	219	2246	2276	7.62	
14-KP (M8) (38.5°N, 132.3°E)	0	14.50	34.42	262	2012	2280	8.12
	10	14.18	34.42	261	2010	2281	8.11
	20	13.03	34.35	267	2017	2279	7.91
	30	11.57	34.29	281	2031	2280	8.11
	40	11.01	34.28	287	2052	2276	8.09
	50	10.67	34.26	265	2059	2273	8.07
	80	9.54	34.20	262	2064	2273	8.09
	100	7.90	34.13	276	2140	2258	8.05
	150	3.79	33.96	267	2176	2258	7.98
	200	1.88	33.99	267	2194	2258	7.90
	300	0.91	34.03	257	2187	2260	7.83
	400	0.80	34.05	254	2224	2262	7.79
	500	0.70	34.06	240	2239	2267	7.91
	760	0.43	34.06	221	2242	2272	7.69
	1200	0.22	34.06	194	2248	2279	7.67
	1500	0.16	34.06	194	2249	2281	7.66
	1720	0.14	34.06	192	2248	2282	7.66
2030	0.11	34.06	191	2250	2285	7.65	
2230	0.10	34.06	192	2252	2286	7.65	
2540	0.09	34.06	191	2250	2286	7.62	

14-UB (M4) (37.0°N, 131.0°E)	0	14.20	34.30	269	2006	2276	8.10
	10	14.16	34.30	270	2002	2275	8.11
	20	12.56	34.22	298	2013	2276	8.13
	30	11.36	34.20	287	2045	2276	8.09
	40	11.16	34.21	266	2059	2274	8.08
	50	11.04	34.21	263	2062	2276	8.07
	80	10.83	34.21	256	2069	2273	8.06
	100	10.65	34.22	254	2069	2269	8.06
	150	10.54	34.22	254	2071	2271	8.09
	200	10.11	34.24	255	2072	2270	8.06
	300	2.39	33.98	254	2175	2258	7.89
	400	1.11	34.03	240	2206	2260	7.81
	500	0.83	34.05	225	2224	2258	7.75
	800	0.50	34.06	205	2241	2265	7.68
	1010	0.31	34.06	197	2251	2270	7.59
	1300	0.22	34.06	193	2253	2275	7.65
	1500	0.17	34.06	192	2255	2275	7.63
	1800	0.14	34.06	191	2256	2280	7.59
	2030	0.11	34.06	189	2259	2284	7.62
	2200	0.11	34.06	185	2258	2288	7.55
17-UB (OF3-5) (36.9°N, 130.6°E)	0	16.42	34.35	260	2020	2286	8.12
	10	16.42	34.35	260	2018	2285	8.13
	35	14.35	34.47	251	2039	2287	8.12
	50	13.03	34.37	255	2051	2283	8.11
	100	11.57	34.31	262	2067	2280	8.09
	300	1.32	34.01	261	2188	2258	7.87
	500	0.72	34.05	225	2226	2261	7.75
	1000	0.31	34.06	203	2249	2271	7.69
	2140	0.12	34.06	191	2259	2288	7.66