Chapter 1
Introduction

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The South China Sea (SCS) (Fig. 1.1) offers a special attraction for Earth scientists world-wide because of its location and its well-preserved hemipelagic sediments. As the largest one of the marginal seas separating Asia from the Pacific, the largest continent from the largest ocean, the SCS functions as a focal point in land-sea interactions of the Earth system. Climatically, the SCS is located between the Western Pacific Warm Pool, the centre of global heating at the sea level, and the Tibetan Plateau, the centre of heating at an altitude of 5,000 m. Geomorphologically, the SCS lies to the east of the highest peak on earth, Zhumulangma or Everest in the Himalayas (8,848 m elevation) and to the west of the deepest trench in the ocean, Philippine Trench (10,497 m water depth) (Wang P. 2004). Biogeographically, the SCS belongs to the so-called "East Indies Triangle" where modern marine and terrestrial biodiversity reaches a global maximum (Briggs 1999).

Among the major marginal sea basins from the west Pacific, the SCS presents some of the best conditions for accumulating complete paleoclimatic records in its hemipelagic deposits. These records are favorable for high-resolution paleoceanographic studies because of high sedimentation rates and good carbonate preservation. It may not be merely a coincidence that two cores from the southern SCS were among the first several cores in the world ocean used by AMS ^{14}C dating for high-resolution stratigraphy (Andree et al. 1986; Broecker et al. 1988). Unlike the Atlantic, the western Pacific bottom is bathed with more corrosive waters that weaken carbonate preservation even at relative shallow depths of 2,000–3,000 m. With a large area above CCD (∼3,500 m), however, the SCS is unique in the region to yield well-preserved sediment sequences suitable for paleoenvironmental reconstructions.

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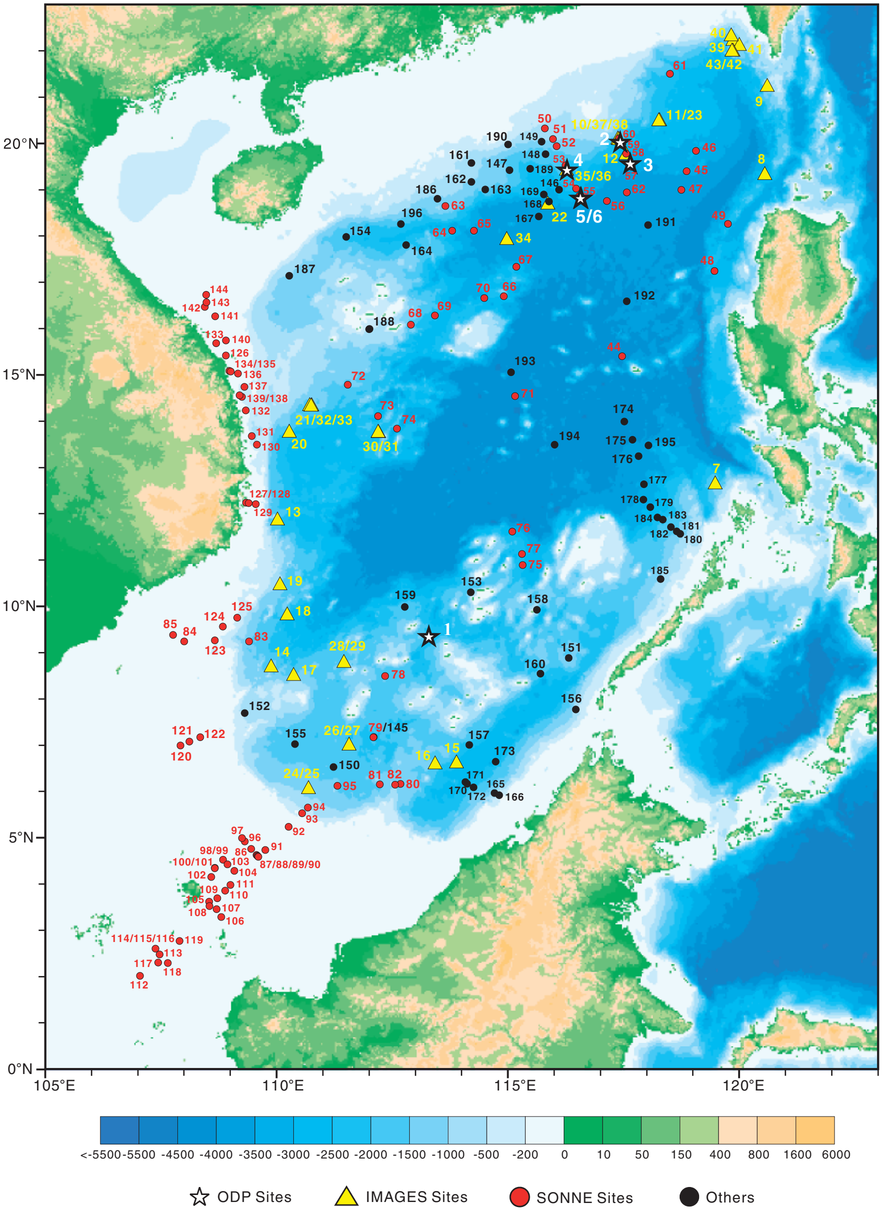

Fig. 1.1 Topography of the South China Sea (SCS) and surrounding areas is superimposed by locations of cores collected for paleoceanographic studies up to 2005. Map was compiled by Enqing Huang based on online topographic data from "http://siovizcenter.ucsd.edu/library.php" using softwares such as Fledermaus, Global Mapper and ArcGIS. Refer to Appendices for site details

Since the 1980s, Chinese geoscientists on both sides of the Taiwan Strait embarked on more active survey and research programs on the SCS mainly driven by petroleum exploration, resulting in a large number of publications mostly not accessible to the global community because of the language barrier and/or limited distribution (see review in Zhou et al. 1994). Several cruises to the SCS were also carried out by scientists from western countries, such as geophysical surveys by French R/V Jean-Charcot in 1984 (Rangin et al. 1988; Pautot and Rangin 1989; Pautot 1992) and by German R/V Sonne in 1987 and 1988 (Kudrass et al. 1992), over 10 years after the earlier expeditions by US marine geophysicists (e.g., Hayes and Ludwig 1967; Ludwig 1970).

In respect of sedimentology and paleoceanography, the SCS did not draw much international attention until the 1990s. Aside from piston coring and shallow profiling by the US R/V Vema and Conrad (e.g., Damuth 1979, 1980), extensive investigations were mainly performed by Chinese expeditions. More than a dozen volumes describing sediment patterns, coral reefs, and late Quaternary history, amongst other topics, were published in China, along with numerous journal papers written in Chinese. Noticeable contributions are serial reports from the Nansha Expeditions of the Chinese Academy of Science to the coral reef area in the southern SCS (Nansha Scientific Expedition 1989–1994), from expeditions of the Ministry of Geology to the Xisha area (He and Zhang 1986), from the South China Sea Institute of Oceanology (1982, 1985, 1987; Su et al. 1989), and from the State Oceanic Administration (1988; Zheng and Chen 1993). At the same time, the isotope-based paleoceanographic studies were first conducted in China (Wang P. et al. 1986; Wang C. et al. 1986), although substantial international publications from SCS studies did not begin until the early 1990s (e.g., Wang and Wang 1990; Wang P. 1990; Thunell et al. 1992; Schönfeld and Kudrass 1993; Miao et al. 1994).

Since the 1990s, the international scientific interest in the SCS has drastically increased. Numerous international expeditions were sent to the region to study topics ranging from climate and sea-level changes in Quaternary glacial cycles, monsoon evolution and variations, to volcanic ash distribution (Table 1.1). Of particular importance is the first paleoceanographic expedition, Sonne-95 cruise under the logo “Monitor Monsoon”, which collected 48 piston and gravity cores at 46 sites from the SCS (Sarnthein et al. 1994) and revealed the regional late Quaternary paleoceanographic history for the first time (Sarnthein and Wang 1999). Paleoceanographic expeditions to the SCS were culminated with Ocean Drilling Program (ODP) Leg 184 in the spring of 1999, the first scientific deep-sea drilling expedition off the China coast. A total of 17 holes at 6 sites were cored on the southern and northern continental slopes of the SCS, to explore the late Cenozoic history of the East Asian monsoon (Wang P. et al. 2000). ODP Leg 184 provides the best deep-water stratigraphic sequence in the western Pacific, which archives evidence of the low-latitude oceanic response to orbital forcing (Wang P. et al. 2003c). The growing interest in SCS paleoceanography continues after the ODP cruise, as seen from the joint French-Chinese “Marco Polo” cruise to the SCS in 2005 (Laj et al. 2005) and several other Chinese and international cruises after 2005.

Table 1.1 Major international geological cruises to the SCS since 1990 are listed to show their main themes

Cruise	Time	Theme	References
R/V Sonne, Germany			
SO 72a	Oct. 25–Nov. 18, 1990	Sedimentation	Wong (1993)
SO 95	Apr. 12–Jun. 05, 1994	Monitor Monsoon	Sarnthein et al. (1994)
SO 114	Nov. 20–Dec. 12, 1996	Pinatubo ash	Wiesner et al. (1997)
SO 115	Dec. 13–Jan. 16, 1997	Sunda Shelf	Stattegger et al. (1997)
SO 132	Jun. 17–Jul. 09, 1998	Sedimentation	Wiesner et al. (1998)
SO 140	Apr. 03–May 04, 1999	Sedimentation	Wiesner et al. (1999)
SO 177	Jun. 02–Jul. 02, 2004	Gas Hydrates	Suess (2005)
R/V JOIDES Resolution, USA			
ODP 184	Feb. 11–Apr. 12, 1999	Asian Monsoon	Wang P. et al. (2000)
R/V Marion Dufresne, France			
MD106 (IMAGES III)	Apr. 16–Jun. 30, 1997	"IPHIS"	Chen M. et al. (1998)
MD122 (IMAGES VII)	Apr. 30–Jun. 18, 2001	"WEPAMA"	Bassinot (2002)
MD147 (IMAGES XII)	May 15–Jun. 08, 2005	"Marco Polo 1"	Laj et al. (2005)

Up to 2005, about 200 sediment cores have been retrieved from the SCS primarily for paleoceanographic and sedimentologic studies (Fig. 1.1; Appendices). Except the ODP cores, most of these sediment cores are gravity or piston cores with only a few meters to tens of meters retrieved. However, together with industrial drilling, these sediment cores form a solid base for the picture of the SCS geological and paleoceanographic history to be drawn.

For the global scientific community, the SCS has become one of the hot spots in paleoceanographic and sedimentological studies mainly because of two reasons. First, the SCS now becomes the focus of monsoon studies in East Asia, like the Arabian Sea for South Asia. A series of large scale international field experiments and coring or drilling cruises have been conducted for better understanding the modern and ancient Asian monsoon systems in the two sea regions (see review in Wang P. et al. 2005), and such scientific endeavors continue to develop and expand. Second, the SCS is the major source for off-shore oil and gas in East Asia, a region currently experiencing rapid economic boom also seeking more energy resource to substantiate its growth. The hydrocarbon perspectives of the SCS have enhanced even further with the recent discovery of deep-water gas from the northern slope. Sedimentology of the SCS is a major concern for the petroleum industry not only for exploring source rocks and reservoirs, but also for ground stability of the offshore platforms. All these call for a monograph to summarize available knowledge of the SCS, especially its sedimentology and paleoceanography, two fields with significant progresses over the last two decades.

The present volume is a product of group efforts mainly by the State Key Laboratory of Marine Geology, Tongji University. We tried to pool together all data and research results scattered in various periodicals, in particular those using ODP Leg

Table 1.2 Geographic and basin names frequently referred to in this volume using Chinese "Ping-Yin" are listed to show their synonyms. Figures 2.1 and 2.17 show their localities

Name used in this volume	Synonym	Location
Strait		
Bashi Strait	Luzon Strait	Taiwan—Luzon (Philippines)
Gulf		
Beibuwan or Beibu Gulf	Gulf of Tonkin	Vietnam—China
River		
(Zhujiang)	Pearl River	Mainland China
(Honghe)	Red River	Indochina Peninsula
Reef/Island		
Dongsha	Pratas Islands	Northeastern SCS
Nansha	Spratly Islands and surround	Southern SCS
Yongshu Reef	Fiery Cross or N Investigator	Southern SCS
Meiji Reef	Mischief Reef	Southern SCS
Huanglu Reef	Royal Charlotte Reef	Southern SCS
Sanjiao Reef	Livock Reef	Southern SCS
Xian-e Reef	Alicia Anne Reef	Southern SCS
Xinyi Reef	First Thomas Shoal	Southern SCS
Zhubi Reef	Subi Reef	Southern SCS
Xisha	Paracel Islands	Northern SCS
Yongxin Island	Woody Island	Northern SCS
Shi Island	Rocky Island	Northern SCS
Chenhang Island	Duncan Island	Northern SCS
Dongdao Island	Lincoln Island	Northern SCS
Zhongsha	Macclesfield Bank	Northern SCS
Huangyandao	Scarborough Shoal	Northern SCS
Liyue	Reed Bank	Southern SCS
Nantong Reef	Louisa Reef	Southern SCS
Trench/Trough		
Xisha Trought	Palawan-Borneo Trough	Southern SCS
Basin		
Taixinan (Tainan) Basin	SW Taiwan Basin	Northeastern SCS
Zhujiangkou Basin	Pearl River Mouth Basin	Northern SCS
Qiongdongnan Basin	SE Hainan Basin	Northern SCS
Beibuwan Basin	Beibu Gulf Basin	Northwestern SCS
Yinggehai Basin	Song Hong Basin	Northwestern SCS
Zhongjiannan Basin	Nha Trang Basin	Northwestern SCS
Wan'an Basin	Nam Con Son Basin	W South China Sea
Zengmu Basin	E Natuna–Sarawak basins	Southern SCS

184 data and material and those written originally in Chinese. The volume includes 8 chapters. After this introductory chapter, we will briefly review in Chapter 2 the geomorphologic, oceanographic and tectonic features of the SCS. Chapter 3 provides an updated knowledge of Cenozoic stratigraphy and local sea level changes in the SCS. Distribution and variations of terrigenous, biogenic and volcanic sediments as well as coral reef carbonates are discussed in Chapter 4. Chapter 5 is devoted to evolution and variations of the East Asian monsoon, as recorded in SCS deep-sea sediment archives. Chapter 6 discusses the deep-water story based mainly on benthic faunas and isotopes. Chapter 7 is devoted to changes in productivity

and carbon cycling as a special contribution to biogeochemistry in this volume. Finally, the volume is concluded in Chapter 8 with a synthesis of the history of SCS sedimentology and paleoceanography.

Many geographic names using Chinese Pin-yin are frequently used in the Chinese literature. In this volume, we limit such practice only to a couple of straits, reef islands and basins as shown in Table 1.2.

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Appendix

Table A1.1 Coring data at ODP Leg 184 Sites are listed together with publications based on studies of relevant site/hole material (compiled by Enqing Huang 2008). Numbers correspond to site localities shown in Fig. 1.1

No.	Site/Hole	Lat. (N)	Long. (E)	W. d. (m)	Drilled (mbsf)	Recov. (m)	References
	ODP Leg 184 (General)				6123	5462	Wang P. et al. (1999, 2000, 2003a,b,d); Tamburini et al. (2003); Prell et al. (2006); Shao et al. (2007); Wang P. et al. (2007); Li Q. et al. (2008)
1	Site1143						Bühring et al. (2000); Li and Jian (2001); Liang et al. (2001); Liu and Cheng (2001); Wang P. et al. (2001, 2003c, 2004); Li J. et al. (2002); Liu et al. (2002, 2008); Tian et al. (2002, 2004a,b,c,d, 2005a,b, 2006); Yang et al. (2002); Huang W. et al. (2003); Liu Z. et al. (2003b, 2006); Nathan and Leckie (2003); Tamburini et al. (2003); Wang and Li (2003); Wehausen et al. (2003); Cheng et al. (2004a); Lee et al. (2004); Hess and Kuhnt (2005); Xu et al. (2005); Li B. et al. (2004, 2005); Jian et al. (2006); Kawagata et al. (2007); Luo and Sun (2007); Wan et al. (2006); Zhang et al. (2007)
	1143A	9°21.720′	113°17.102′	2771.0	400.0	378.28	
	1143B	9°21.717′	113°17.104′	2772.5	258.2	246.37	
	1143C	9°21.713′	113°17.119′	2773.5	500.0	477.54	
2	Site1144						Luo et al. (2001, 2005); Shao et al. (2001); Sun and Luo (2001); Tu et al. (2001); Boulay et al. (2003); Chen et al. (2003); Higginson et al. (2003); Solheid et al. (2003); Sun et al. (2003); Tamburini et al. (2003); Wei G. et al. (2003, 2004); Bühring et al. (2004); Lu et al. (2004); Wang and Lin (2004); Wang R. et al. (2004); Kienast et al. (2005); Zheng F. et al. (2004, 2005)
	1144A	20°3.180′	117°25.133′	2035.7	452.8	468.88	
	1144B	20°3.180′	117°25.143′	2038.5	452.0	445.83	
	1144C	20°3.182′	117°25.152′	2036.9	203.7	198.17	

Table A1.1 (continued)

No.	Site/Hole	Lat. (N)	Long. (E)	W. d. (m)	Drilled (mbsf)	Recov. (m)	References
3	Site 1145						Wehausen and Brumsack (2002); Boulay et al. (2005); Oppo and Sun (2005)
	1145A	19°35.040′	117°37.868′	3175.6	200.0	186.54	
	1145B	19°35.042′	117°37.858′	3174.4	200.0	179.44	
	1145C	19°35.039′	117°37.850′	3176.4	198.1	189.15	
4	Site 1146						Clemens and Prell (2003); Huang B. et al. (2003, 2007); Kissel et al. (2003); Liu Z. et al. (2003a,b); Nathan and Leckie (2003); Trentesaux et al. (2003); Wang P. et al. (2003); Zhu et al. (2003); Arnold (2004); Holbourn et al. (2004, 2005, 2007); Li B. et al. (2004); Su et al. (2004); Wang and Lin (2004); Zheng H. et al. (2004); Jian et al. (2006); Kawagata et al. (2007); Wan et al. (2007b)
	1146A	19°27.402′	116°16.363′	2091.1	607.0		
	1146B	19°27.401′	116°16.376′	2091.7	245.1	241.71	
	1146C	19°27.403′	116°16.385′	2091.7	603.5	606.66	
5	Site 1147						Cheng et al. (2004b); Mercer and Zhao (2004)
	1147A	18°50.108′	116°33.271′	3245.9	81.4	81.7	
	1147B	18°50.108′	116°33.280′	3245.4	85.5	85.5	
	1147C	18°50.109′	116°33.280′	3245.3	78.6	76.6	
6	Site 1148						Jian et al. (2001, 2003); Wang R. et al. (2001); Zhao et al. (2001a,b); Kuhnt et al. (2002); Clift et al. (2002); Huang W. et al. (2003); Jia et al. (2003); Li X. et al. (2003); Wu et al. (2003); Cheng et al. (2004b); Leventhal (2004); Li Q. et al. (2004, 2005, 2006, 2008); Mao et al. (2004, 2007); Mercer and Zhao (2004); Peng et al. (2004); Su et al. (2004); Zhao (2005); Clift (2006); Wei et al. (2006); Tian et al. (2008)
	1148A	18°50.167′	116°33.932′	3297.1	704.0	632.1	
	1148B	18°50.170′	116°33.946′	3291.8	853.2	364.4	

Table A1.2 Details of short piston cores retrieved from the SCS up to 2005 are listed together with publications based on studies of core material (compiled by Enqing Huang 2008). Numbers correspond to site localities shown in Fig. 1.1

No.	Site/Core	Latitude (N)	Longitude (E)	Water depth (m)	Recovery (m)	References
7	MD97-2142	12°41.133′	119°27.9′	1557	35.91	Chen M. et al. (2003); Wei et al. (2003)
8	MD97-2144	19°21.813′	120°32.05′	2680	35.24	Chen M. et al. (1998)
9	MD97-2145	21°15.94′	120°35.27′	1408	24.02	Chen M. et al. (1998)
10	MD97-2146	20°7.019′	117°23.08′	1720	38.69	Lin et al. (2006)
11	MD97-2147	20°31.74′	118°14.7′		49.4	Chen M. et al. (1998)
12	MD97-2148	19°47.804′	117°32.56′	2830	48.72	Chen Y.Y. et al. (1999)
13	MD97-2149	11°54.004′	110°0.56′	1870	27.18	Chen M. et al. (1998)
14	MD97-2151	8°43.73′	109°52.17′	1589	26.72	Lee et al. (1999); Zhao et al. (2006)
15	MD01-2389	6°39.19′	113°52.23′	2534	31.86	Chen M. et al. (1998)
16	MD01-2390	6°38.12′	113°24.56′	1545	43.72	Steinke et al. (2006)
17	MD01-2391	8°32.57′	110°20.94′	1351	42.38	Bassinot (2002)
18	MD01-2392	9°51.13′	110°12.64′	1966	43.2	Zheng et al. (2005)
19	MD01-2393	10°30.15′	110°3.68′	1230	41.793	Liu Z. et al. (2004)
20	MD01-2394	13°47.54′	110°15.56′	2097	39.04	Yu et al. (2006)
21	MD01-2395	14°21.68′	110°44.42′	1418	44.95	Bassinot (2002)
22	MD01-2396	18°43.48′	115°50.73′	3365	39.11	Bassinot (2002)
23	MD01-2397	20°31.64′	118°15.67′	2420	43.4	Bassinot (2002)
24	MD05-2892	6°6.12′	110°40.71′	1183	29.03	Laj et al. (2005)
25	MD05-2893	6°6.07′	110°40.72′	1183	4.52	Laj et al. (2005)
26	MD05-2894	7°2.25′	111°33.11′	1982	10.85	Laj et al. (2005)
27	MD05-2895	7°2.25′	111°33.11′	1982	43.14	Laj et al. (2005)
28	MD05-2896	8°49.5′	111°26.47′	1657	11.03	Laj et al. (2005)
29	MD05-2897	8°49.53′	111°26.51′	1658	30.98	Laj et al. (2005)
30	MD05-2898	13°47.39′	112°11.03′	2395	9.73	Laj et al. (2005)
31	MD05-2899	13°47.66′	112°10.89′	2393	36.68	Laj et al. (2005)
32	MD05-2900	14°22.23′	110°41.74′	1455	9.76	Laj et al. (2005)
33	MD05-2901	14°22.503′	110°44.6′	1454	36.49	Laj et al. (2005)
34	MD05-2902	17°57.7′	114°57.33′	3697	9.42	Laj et al. (2005)
35	MD05-2903	19°27.31′	116°15.06′	2047	11.18	Laj et al. (2005)
36	MD05-2904	19°27.32′	116°15.15′	2066	44.98	Laj et al. (2005)
37	MD05-2905	20°8.17′	117°21.61′	1198	11.98	Laj et al. (2005)
38	MD05-2906	20°8.16′	117°21.59′	1636	36.52	Laj et al. (2005)
39	MD05-2911	22°15.61′	119°51.08′	1085	25	Laj et al. (2005)
40	MD05-2912	22°21.5′	119°48.5′	1090	30.44	Laj et al. (2005)
41	MD05-2913	22°9.23′	119°59.26′	1091	12.68	Laj et al. (2005)
42	MD05-2914	22°1.55′	119°50.97′	1642	35.14	Laj et al. (2005)
43	MD05-2915	22°1.94′	119°50′	1641	3.9	Laj et al. (2005)
44	17922-2	15°25′	117°27.5′	4224	6.63	Sarnthein et al. (1994)
45	17924-2	19°24.7′	118°50.9′	3440	11.50	Sarnthein et al. (1994)
46	17925-3	19°51.2′	119°2.8′	2980	12.42	Sarnthein et al. (1994)
47	17926-3	19°0′	118°44′	3760	10.06	Sarnthein et al. (1994)
48	17927-2	17°15.1′	119°27.2′	2804	5.58	Wang L. et al. (1999a)
49	17928-3	18°16.3′	119°44.7′	2484	3.30	Huang B. et al. (2002)
50	17930-2	20°20′	115°46.9′	629	5.34	Sarnthein et al. (1994)
51	17931-2	20°6′	115°57.8′	1003	3.00	Sarnthein et al. (1994)
	17931-3	20°6′	115°57.8′	1001	4.31	Sarnthein et al. (1994)

Table A1.2 (continued)

No.	Site/Core	Latitude (N)	Longitude (E)	Water depth (m)	Recovery (m)	References
52	17932-2	19°57.1′	116°2.2′	1360	7.56	Sarnthein et al. (1994)
53	17933-3	19°32′	116°13.6′	1970	12.48	Sarnthein et al. (1994)
54	17934-2	19°1.9′	116°27.7′	2665	11.87	Sarnthein et al. (1994)
55	17935-3	18°52.7′	116°31.6′	3148	12.27	Sarnthein et al. (1994)
56	17936-2	18°46′	117°7.2′	3809	13.33	Sarnthein et al. (1994)
57	17937-2	19°30′	117°39.9′	3428	12.92	Wang L. et al. (1999)a
58	17938-2	19°47.2′	117°32.3′	2840	11.78	Wang L. et al. (1999a)
59	17939-2	19°58.2′	117°27.3′	2474	12.74	Wang L. et al. (1999a)
60	17940-2	20°7′	117°23′	1727	13.30	Wang L. et al. (1999a)
61	17941-2	21°31′	118°29′	2200	9.90	Sarnthein et al. (1994)
62	17943-2	18°57′	117°33.2′	919	11.74	Sarnthein et al. (1994)
63	17944-2	18°39.5′	113°38.2′	1217	8.92	Sarnthein et al. (1994)
64	17945-2	18°7.6′	113°46.6′	2403	10.21	Sarnthein et al. (1994)
65	17946-2	18°7.5′	114°15′	3464	11.34	Sarnthein et al. (1994)
66	17948-2	16°42.3′	114°53.8′	2855	13.09	Sarnthein et al. (1994)
67	17949-2	17°20.9′	115°10′	2197	13.34	Sarnthein et al. (1994)
68	17950-2	16°5.6′	112°53.8′	1865	9.91	Lin (2003)
69	17951-2	16°17.3′	113°24.6′	2341	11.97	Sarnthein et al. (1994)
70	17952-3	16°40′	114°28.4′	2883	12.04	Sarnthein et al. (1994)
71	17953-4	14°33′	115°8.6′	4306	12.49	Sarnthein et al. (1994)
72	17954-2	14°47.8′	111°31.5′	1520	11.52	Wang L. et al. (1999a); Huang B. et al. (2002)
	17954-3	14°47.7′	111°31.5′	1515	11.49	Wang L. et al. (1999a)
73	17955-2	14°7.3′	112°10.6′	2393	11.66	Wang L. et al. (1999a)
74	17956-2	13°50.9′	112°35.3′	3388	13.56	Wang L. et al. (1999a)
75	17957-2	10°53.9′	115°18.3′	2195	13.84	Jian et al. (2000)
76	17958-2	11°37.3′	115°4.9′	2581	10.73	Sarnthein et al. (1994)
77	17959-2	11°8.3′	115°17.2′	1959	13.93	Sarnthein et al. (1994)
78	17961-2	8°30.4′	112°19.9′	1968	10.30	Wang L. et al. (1999a); Bühring et al. (2000)
79	17962-2	7°10.9′	112°4.9′	1968	8.29	Sarnthein et al. (1994)
	17962-4	7°10.9′	112°4.9′	1969	8.81	Bühring et al. (2000)
80	17963-3	6°10′	112°40′	1232	8.57	Sarnthein et al. (1994)
81	17964-3	6°9.5′	112°12.8′	1556	9.12	Wang L. et al. (1999a)
82	17965-2	6°9.4′	112°33.1′	890	6.83	Sarnthein et al. (1994)
83	18252-3	9°15.007′	109°23.446′	1273	11.85	Kienast et al. (2001a)
84	18262-3	9°14.999′	107°59.307′	56	9.38	Hanebuth et al. (2000)
85	18265-2	9°23.249′	107°45.022′	47	2.40	Hanebuth et al. (2000)
86	18269-2	4°46.013′	109°26.321′	113	8.815	Hanebuth et al. (2003)
87	18271-2	4°38.33′	109°32.969′	122	5.62	Hanebuth et al. (2004)
88	18273-2	4°37.289′	109°33.931′	126	3.48	Hanebuth et al. (2003)
89	18274-2	4°36.318′	109°34.833′	118	5.61	Hanebuth et al. (2004)
90	18275-2	4°35.727′	109°35.536′	112	5.56	Hanebuth et al. (2004)
91	18276-2	4°44.897′	109°44.837′	116	7.21	Hanebuth et al. (2000, 2003)
92	18282-2	5°14.687′	110°14.605′	151	6.34	Hanebuth et al. (2003)
93	18284-3	5°32.51′	110°32.413′	151	6.34	Steinke et al. (2003)

Table A1.2 (continued)

No.	Site/Core	Latitude (N)	Longitude (E)	Water depth (m)	Recovery (m)	References
94	18287-3	5°39.781′	110°39.689′	598	5.66	Kienast et al. (2001b)
95	18294-4	6°7.809′	111°18.183′	849	6.94	Steinke et al. (2003)
96	18295-2	4°55.587′	109°17.865′	119	8.23	Hanebuth et al. (2004)
97	18296-2	4°59.754′	109°14.446′	118	2.44	Hanebuth et al. (2004)
98	18298-2	4°31.987′	108°49.508′	102	5.87	Hanebuth et al. (2004)
99	18299-1	4°32.004′	108°49.537′	102	5.8	Hanebuth et al. (2000)
100	18300-2	4°21.778′	108°39.215′	91	8.85	Hanebuth et al. (2000, 2003)
101	18301-2	4°21.308′	108°38.811′	93	5.82	Hanebuth et al. (2000)
102	18302-2	4°9.585′	108°34.535′	83	5.98	Hanebuth et al. (2000, 2003)
103	18303-2	4°26.425′	108°55.491′	107	7.36	Hanebuth et al. (2003)
104	18305-2	4°17.318′	109°4.599′	109	5.14	Hanebuth et al. (2000, 2003)
105	18307-2	3°37.626′	108°31.648′	100	9.43	Hanebuth et al. (2000)
106	18308-2	3°17.83′	108°47.143′	80	1.05	Hanebuth et al. (2000)
107	18309-2	3°27.959′	108°41.174′	83	5.97	Hanebuth et al. (2000)
108	18310-2	3°32.131′	108°32.131′	100	5.68	Hanebuth et al. (2000)
109	18312-2	3°42.351′	108°42.38′	101	6.67	Hanebuth et al. (2004)
110	18313-2	3°52.194′	108°52.226′	98	6.2	Hanebuth et al. (2003)
111	18314-2	3°59.469′	108°59.473′	100	3.7	Hanebuth et al. (2003)
112	18315-3	2°1.669′	107°2.041′	69	5.83	Hanebuth et al. (2003)
113	18316-2	2°29.263′	107°27.522′	71	5.97	Hanebuth et al. (2003)
114	18317-3	2°36.596′	107°22.515′	95	1.97	Hanebuth et al. (2003)
115	18318-3	2°36.609′	107°22.508′	87	4.06	Hanebuth et al. (2003)
116	18320-2	2°36.726′	107°22.491′	76	4.92	Hanebuth et al. (2003)
117	18321-2	2°18.453′	107°25.326′	109	5.69	Hanebuth et al. (2003)
118	18322-2	2°18.405′	107°37.881′	70	4.93	Hanebuth et al. (2003)
119	18323-2	2°47.03′	107°53.2′	92	5.4	Hanebuth et al. (2003)
120	18375-2	7°0.2′	107°54.87′	87	3.69	Schimanski and Stattegger (2005)
121	18376-2	7°5.27′	108°6.42′	89	4.82	Schimanski and Stattegger (2005)
122	18377-2	7°10.71′	108°20.28′	98	3.57	Schimanski and Stattegger (2005)
123	18389-3	9°16.45′	108°39.09′	109	2.76	Schimanski and Stattegger (2005)
124	18391-2	9°33.91′	108°49.6′	115	4.78	Schimanski and Stattegger (2005)
125	18393-3	9°45.61′	109°7.95′	155	5.4	Schimanski and Stattegger (2005)
126	18396-3	15°25.51′	108°53.27′	61	4.99	Schimanski and Stattegger (2005)
127	18397-2	12°14.71′	109°19.9′	45	5.32	Schimanski and Stattegger (2005)
128	18398-3	12°14.23′	109°22.8′	59	7.19	Schimanski and Stattegger (2005)
129	18401-3	12°12.9′	109°32.09′	134	7.07	Schimanski and Stattegger (2005)

Table A1.2 (continued)

No.	Site/Core	Latitude (N)	Longitude (E)	Water depth (m)	Recovery (m)	References
130	18404-3	13°30.13′	109°33.67′	169	3.85	Schimanski and Stattegger (2005)
131	18405-3	13°41.1′	109°27.02′	130	5.47	Schimanski and Stattegger (2005)
132	18408-3	14°14.34′	109°19.05′	108	7.54	Schimanski and Stattegger (2005)
133	18409-3	15°41.21′	108°40.79′	40	5.77	Schimanski and Stattegger (2005)
134	18414-3	15°5.83′	108°57.78′	21	4.48	Schimanski and Stattegger (2005)
135	18415-2	15°4.98′	109°0.03′	38	5.59	Schimanski and Stattegger (2005)
136	18416-2	15°2.23′	109°8.97′	66	5.06	Schimanski and Stattegger (2005)
137	18417-3	14°44.81′	109°17.61′	97	7.98	Schimanski and Stattegger (2005)
138	18419-3	14°32.23′	109°14.09′	82	6.41	Schimanski and Stattegger (2005)
139	18420-2	14°34.13′	109°11.36′	62	5.57	Schimanski and Stattegger (2005)
140	18422-3	15°44.92′	108°53.46′	84	5.68	Schimanski and Stattegger (2005)
141	18423-2	16°16.62′	108°39.59′	97	5.48	Schimanski and Stattegger (2005)
142	18424-2	16°28.61′	108°26.15′	90	5.75	Schimanski and Stattegger (2005)
143	18425-2	16°34.53′	108°28.31′	95	5.56	Schimanski and Stattegger (2005)
144	18426-2	16°44.42′	108°27.8′	92	5.13	Schimanski and Stattegger (2005)
145	V35-05	7°11′	112°5′	1953	16.25	Broecker et al. (1988)
146	V36-06-3	19°0.5′	116°5.6′	2809	12.15	Wang and Chen (1990)
147	V36-06-5	19°26′	115°1.1′	2332	10.70	Wang and Chen (1990)
148	V36-07	19°47′	115°48′	1585	11.60	Jian and Wang (1997)
149	V36-08	20°3′	115°43′	1304	12.68	Samodai et al. (1986)
150	RC12-350	6°32.5′	111°13′	1950	11.29	Jian (1992)
151	RC14-79	8°54′	116°18′	706	11.74	Jian and Wang (1997)
152	SCS-12	7°41.99′	109°17.95′	543	1.20	Jian and Wang (1997); Wang L. et al. (1997)
153	SCS-15B	10°19′	114°11′	1500	7.35	Wang and Chen (1990)
154	SCS90-36	17°59.7′	111°29.64′	2050	1.05	Huang et al. (1997)b
155	NS86-43	7°2′	110°23′	1763	3.04	Li et al. (1992)
156	NS87-8	7°47′	116°27′	835	5.14	MOET (1993)
157	NS87-11	7°1′	114°9′	2452	4.73	MOET (1993)
158	NS88-11	9°56′	115°37′	880	4.33	Li et al. (1992); MOET (1993)
159	NS93-5	9°59.94′	112°45.19′	1792	5.34	Chen M. et al. (2005)
160	SO27-91KL	8°33.45′	115°41.48′	2060	14.70	Schönfeld and Kudrass (1993)

Table A1.2 (continued)

No.	Site/Core	Latitude (N)	Longitude (E)	Water depth (m)	Recovery (m)	References
161	SO49-3KL	19°35.23′	114°11.64′	713	3.65	Schönfeld and Kudrass (1993)
162	SO49-8KL	19°11′	114°12′	1040	9.55	Wang and Chen (1990); Schöfeld and kudrass (1993)
163	SO49-12KL	19°1.2′	114°29.91′	1532	9.20	Schönfeld and Kudrass (1993)
164	SO49-37KL	17°49.04′	112°47.09′	2004	13.10	Schönfeld and Kudrass (1993); Mao and Rex (1993)
165	SO49-136KL	5°58.43′	114°41.85′	650	8.05	Schönfeld and Kudrass (1993)
166	SO49-137SL	5°55.77′	114°47.78′	220	1.15	Schönfeld and Kudrass (1993)
167	SO50-29KL	18°26.08′	115°39.22′	3766	9.93	Schönfeld and Kudrass (1993)
168	SO50-31KL	18°45.4′	115°52.4′	3360	3.02	Huang C. et al. (1997a); Chen M. et al. (1998)
169	SO50-37KL	18°54.6′	115°45.78′	2695	8.51	Schönfeld and Kudrass (1993); Winn et al. (1992)
170	SO58-100KL	6°10.73′	114°6.3′	2238	12.08	Schönfeld and Kudrass (1993)
171	SO58-109KL	6°12.73′	114°3.89′	2792	12.23	Schönfeld and Kudrass (1993)
172	SO58-114KL	6°5.88′	114°14.37′	1929	13.11	Schönfeld and Kudrass (1993)
173	SO58-133KL	6°39.41′	114°43.24′	2136	13.00	Schönfeld and Kudrass (1993)
174	GGC1	14°0.3′	117°29.9′	4203	2.75	Miao et al. (1994); Thunell et al. (1992)
175	GGC2	13°36.5′	117°40.5′	4010	1.27	Miao et al. (1994); Thunell et al. (1992)
176	GGC3	13°15.6′	117°48.4′	3725	2.93	Miao et al. (1994); Thunell et al. (1992)
177	GGC4	12°39′	117°55.6′	3530	2.82	Miao et al. (1994); Thunell et al. (1992)
178	GGC5	12°19′	117°55′	3185	2.58	Miao et al. (1994); Thunell et al. (1992)
179	GGC6	12°9.1′	118°3.9′	2975	2.64	Miao et al. (1994); Thunell et al. (1992)
180	GGC8	11°34.6′	118°42.6′	1305	2.47	Miao et al. (1994); Thunell et al. (1992)
181	GGC9	11°37.7′	118°37.9′	1465	2.13	Miao et al. (1994); Thunell et al. (1992)
182	GGC10	11°43.4′	118°30.5′	1605	2.27	Miao et al. (1994); Thunell et al. (1992)
183	GGC11	11°53.2′	118°19.9′	2165	2.03	Miao et al. (1994); Thunell et al. (1992)

Table A1.2 (continued)

No.	Site/Core	Latitude (N)	Longitude (E)	Water depth (m)	Recovery (m)	References
184	GGC12	11°55.9′	118°12.8′	2495	2.51	Miao et al. (1994); Thunell et al. (1992)
185	GGC13	10°36′	118°17.4′	990	2.49	Miao et al. (1994); Thunell et al. (1992)
186	HY4-901	18°49′	113°28′	1120		Li X. et al. (1996)
187	SA12-19	17°9.15′	110°15.42′	1300	6.67	Jiang and Liu (2003)
188	G38	16°0.3′	111°59.7′	1115	4.20	Li C. (1993); Mao and Rex (1993)
189	G76	19°28.05′	115°28.15′	2400		Mao and Rex (1993)
190	G77	19°59.5′	114°59.3′	600	3.15	Li C. (1993)
191	8328	18°15′	118°1′	3860	2.78	Li C. (1993); Mao and Rex (1993)
192	8338	16°36.1′	117°33.1′	3980		Mao and Rex (1993)
193	8345	15°4.083′	115°3.12′	3640		Mao and Rex (1993)
194	8355	13°30.033′	116°0.017′	4095		Mao and Rex (1993)
195	8357	13°29.2′	118°1.3′	3949	3.83	Li C. (1993)
196	KL41	18°16.083′	112°40.117′	2120		Mao and Rex (1993)

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