

**International Ocean Discovery Program
Expedition 378 Scientific Prospectus
Addendum**

South Pacific Paleogene Climate

Deborah J. Thomas
Co-Chief Scientist
College of Geosciences
Texas A&M University
USA

Ursula Röhl
Co-Chief Scientist
MARUM–Center for Marine Environmental Sciences
University of Bremen
Germany

Laurel B. Childress
Expedition Project Manager/Staff Scientist
International Ocean Discovery Program
Texas A&M University
USA

Publisher's notes

This publication was prepared by the *JOIDES Resolution* Science Operator (JRSO) at Texas A&M University (TAMU) as an account of work performed under the International Ocean Discovery Program (IODP). Funding for IODP is provided by the following international partners:

National Science Foundation (NSF), United States
Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan
European Consortium for Ocean Research Drilling (ECORD)
Ministry of Science and Technology (MOST), People's Republic of China
Korea Institute of Geoscience and Mineral Resources (KIGAM)
Australia-New Zealand IODP Consortium (ANZIC)
Ministry of Earth Sciences (MoES), India
Coordination for Improvement of Higher Education Personnel (CAPES), Brazil

Portions of this work may have been published in whole or in part in other IODP documents or publications.

This IODP *Scientific Prospectus Addendum* is based on precruise *JOIDES Resolution* Facility advisory panel discussions and scientific input from the designated Co-Chief Scientists on behalf of the drilling proponents. During the course of the cruise, actual site operations may indicate to the Co-Chief Scientists, the Expedition Project Manager/Staff Scientist, and the Operations Superintendent that it would be scientifically or operationally advantageous to amend the plan detailed in this prospectus. It should be understood that any substantial changes to the science deliverables outlined in the plan presented here are contingent upon the approval of the IODP JRSO Director and/or *JOIDES Resolution* Facility Board.

Disclaimer

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the participating agencies, TAMU, or Texas A&M Research Foundation.

Copyright

Except where otherwise noted, this work is licensed under the Creative Commons Attribution 4.0 International (CC BY 4.0) license (<https://creativecommons.org/licenses/by/4.0/>). Unrestricted use, distribution, and reproduction are permitted, provided the original author and source are credited.



Citation

Thomas, D.J., Röhl, U., and Childress, L.B., 2019. *Expedition 378 Scientific Prospectus Addendum: South Pacific Paleogene Climate*. International Ocean Discovery Program. <https://doi.org/10.14379/iodp.sp.378add.2019>

ISSN

World Wide Web: 2332-1385

Introduction

This addendum to the International Ocean Discovery Program (IODP) *Expedition 378 Scientific Prospectus* details changes to the expedition schedule including additional drilling depth approvals and updates to the operations plans that were presented in the original prospectus. In September 2018, Expedition 378 was rescheduled for 2020 to accommodate the construction and installation of two new propellers for the vessel with minimal disruption to the slate of expeditions scheduled in the Southern Ocean. The change in expedition timing resulted in a change of the port of origination from Lyttelton, New Zealand, to Lautoka, Fiji, and a change in the number of transit days. Consequently, the operations schedule has been revised.

The other development prompting an addendum to the *Expedition 378 Scientific Prospectus* was the approval by the Environmental Protection and Safety Panel (EPSP) to drill deeper at Deep Sea Drilling Project (DSDP) Site 277 than the previous approved maximum depth of 480 meters below seafloor (mbsf) (now approved to 670 mbsf).

Updated schedule for Expedition 378

Following changes to the R/V *JOIDES Resolution* schedule that resulted from necessary equipment repairs, the starting port and expedition dates were updated. At the time of publication of this addendum, the expedition is scheduled to start in Lautoka, Fiji, on 3 January 2020 and end in Papeete, Tahiti, on 4 March 2020 (Figure F1). A total of 61 days will be available for the initial port call, transit, drilling, coring, and downhole measurements described in this addendum. For the current detailed schedule, see <http://iodp.tamu.edu/scienceops>.

Updated operations plan and drilling strategy

Increased penetration at proposed Site DSDP 277

Based on a review by the EPSP, proposed Site DSDP 277 is now approved to 670 mbsf (with biostratigraphic monitoring), which is an increase of 190 m. The goal of this increase in approved penetration depth is to recover sediment from the uppermost Cretaceous (~68 Ma). We expect to recover carbonates in the lower Paleocene and uppermost Cretaceous based on regional/paleoceanographic considerations and the base of proposed Site DSDP 277 recovery

(Figure AF1). The lithology should be similar to the Upper Cretaceous–Paleocene Mead Hill Formation but likely with lower chert content (Hollis et al., 2003).

As originally planned at proposed Site DSDP 277, the first two holes will recover the upper 250 m of unlithified nannofossil ooze using the advanced piston corer (APC) system. As a result of EPSP approval to drill below the interval recovered during DSDP Leg 29, two subsequent holes will drill through the upper 240 m and the rotary core barrel (RCB) system will be used to deepen both holes to 670 mbsf, providing multiple copies of the uppermost Cretaceous.

Revised primary sites

The change of the initial port to Lautoka, Fiji, adds approximately 6.8 days to the transit from port call to the first planned site (DSDP 277), consequently reducing operations time for drilling, coring, and downhole measurement.

Our primary drilling and coring strategy remains to triple-hole APC core to basement, with orientation, at each site. However, we will now target five primary sites with four alternate sites to accommodate the reduction in operations time. The five primary sites included in the revised operations plan for Expedition 378 are proposed Sites DSDP 277, SP-1B, SP-2B, SP-13A, and SP-14A (Figure F2; Table T1). Proposed Sites SP-3B and SP-15A are now considered alternate sites (Table T2). The revised selection of five primary sites will still meet the major scientific goals of the expedition, including the recovery of two 56 Ma and two 36 Ma targets as well as Upper Cretaceous material from proposed Site DSDP 277.

References

- Hollis, C.J., Strong, C.P., Rodgers, K.A., and Rogers, K.M., 2003. Paleoenvironmental changes across the Cretaceous/Tertiary boundary at Flaxbourne River and Woodside Creek, eastern Marlborough, New Zealand. *New Zealand Journal of Geology and Geophysics*, 46(2):177–197. <https://doi.org/10.1080/00288306.2003.9515003>
- Shipboard Scientific Party, 1975. Site 277. In Kennett, J.P., Houtz, R.E., et al., *Initial Reports of the Deep Sea Drilling Project*, 29: Washington, DC (U.S. Government Printing Office), 46–120. <https://doi.org/10.2973/dsdp.proc.29.104.1975>
- Shipboard Scientific Party, 1999. Leg 181 summary: southwest Pacific paleoceanography. In Carter, R.M., McCave, I.N., Richter, C., Carter, L., et al., *Proceedings of the Ocean Drilling Program, Initial Reports*, 181: College Station, TX (Ocean Drilling Program), 1–80. <https://doi.org/10.2973/odp.proc.ir.181.101.2000>

Table T1. Operations and time estimates for primary sites, Expedition 378. EPSP = Environmental Protection and Safety Panel. APC = advanced piston corer, RCB = rotary core barrel, XCB = extended core barrel, APCT-3 = advanced piston corer temperature tool, FMS = Formation MicroScanner.

Site No.	Location (Latitude Longitude)	Seafloor Depth (m)	Operations Description	Transit (days)	Drilling/ Coring (days)	Logging (days)
Lautoka			Begin Expedition	3.0	Port Call Days	
Transit ~2298 nmi to Site DSDP 277 @ 10.5 knots				9.2		
DSDP 277	52° 13.4300' S	1214	Hole A: APC to 250 mbsf w/ orientation and APCT-3 measurements		1.4	
EPSP	166° 11.4800' E		Hole B: APC to 250 mbsf		1.1	
to 670 mbsf			Hole C: RCB 240 to 670 mbsf		3	
			Hole D: RCB 240 to 670 mbsf - Log with Triple Combo & FMS Sonic		3	1.1
Sub-Total Days On-Site:				9.6		
Transit 1140 nmi to Site SP-1B @ 10.5 knots				4.5		
SP-1B	50° 29.1400' S	4971	Hole A: APC/XCB to 247 mbsf w/ orientation and APCT-3 measurements		2.7	
EPSP	163° 16.7700' W		Hole B: APC to 245 mbsf		1.9	
to 247 mbsf			Hole C: APC to 245 mbsf - Log with Triple Combo & FMS Sonic		2.4	0.9
Sub-Total Days On-Site:				7.9		
Transit 249 nmi to Site SP-2B @ 10.5 knots				1.0		
SP-2B	49° 56.3150' S	5075	Hole A: APC/XCB to 147 mbsf w/ orientation and APCT-3 measurements		1.8	
EPSP	156° 50.5810' W		Hole B: APC to 145 mbsf		1.1	
to 147 mbsf			Hole C: APC to 145 mbsf		1.6	
Sub-Total Days On-Site:				4.4		
Transit 193 nmi to Site SP-13A @ 10.5 knots				0.8		
SP-13A	50° 46.6050' S	4772	Hole A: APC/XCB to 164 mbsf w/ orientation and APCT-3 measurements		1.8	
EPSP	151° 58.0220' W		Hole B: APC to 162 mbsf		1.2	
to 164 mbsf			Hole C: APC to 162 mbsf		1.6	
Sub-Total Days On-Site:				4.7		
Transit 740 nmi to Site SP-14A @ 10.5 knots				2.9		
SP-14A	47° 6.0350' S	4658	Hole A: APC/XCB to 181 mbsf w/ orientation and APCT-3 measurements		2	
EPSP	133° 59.9350' W		Hole B: APC to 179 mbsf		1.3	
to 181 mbsf			Hole C: APC to 179 mbsf		1.8	
Sub-Total Days On-Site:				5.1		
Transit ~1942 nmi to Papeete @ 10.5 knots				7.7		
Papeete			End Expedition	26.0	29.6	2.0

Port Call:	3.0	Total Operating Days:	57.7
Sub-Total On-Site:	31.7	Total Expedition:	60.7

Table T2. Alternate sites, Expedition 378. EPSP = Environmental Protection and Safety Panel. APC = advanced piston corer, XCB = extended core barrel.

Site No.	Location (Latitude Longitude)	Seafloor Depth (m)	Operations Description
SP-4B	46° 30.3720' S	5186	Hole A - APC/XCB to 60 mbsf
EPSP to 60 mbsf	139° 21.2100' W		Hole B - APC to 58 mbsf Hole C - APC to 58 mbsf
SP-5B	42° 45.2720' S	5210	Hole A - APC/XCB to 32 mbsf
EPSP to 32 mbsf	137° 9.3220' W		Hole B - APC to 30 mbsf Hole C - APC to 30 mbsf
SP-3B	49° 23.2420' S	4703	Hole A - APC/XCB to 85 mbsf
EPSP to 85 mbsf	141° 59.3440' W		Hole B - APC to 83 mbsf Hole C - APC to 83 mbsf
SP-15A	40° 0.6140' S	4778	Hole A - APC/XCB to 91 mbsf
EPSP to 91 mbsf	154° 2.5010' W		Hole B - APC to 89 mbsf Hole C - APC to 89 mbsf

Figure F1. Proposed drill sites, Expedition 378. Yellow circles = sites on 56 Ma crust, orange circles = sites on 40 Ma crust, black circle = DSDP Site 277, light blue circles = ports.

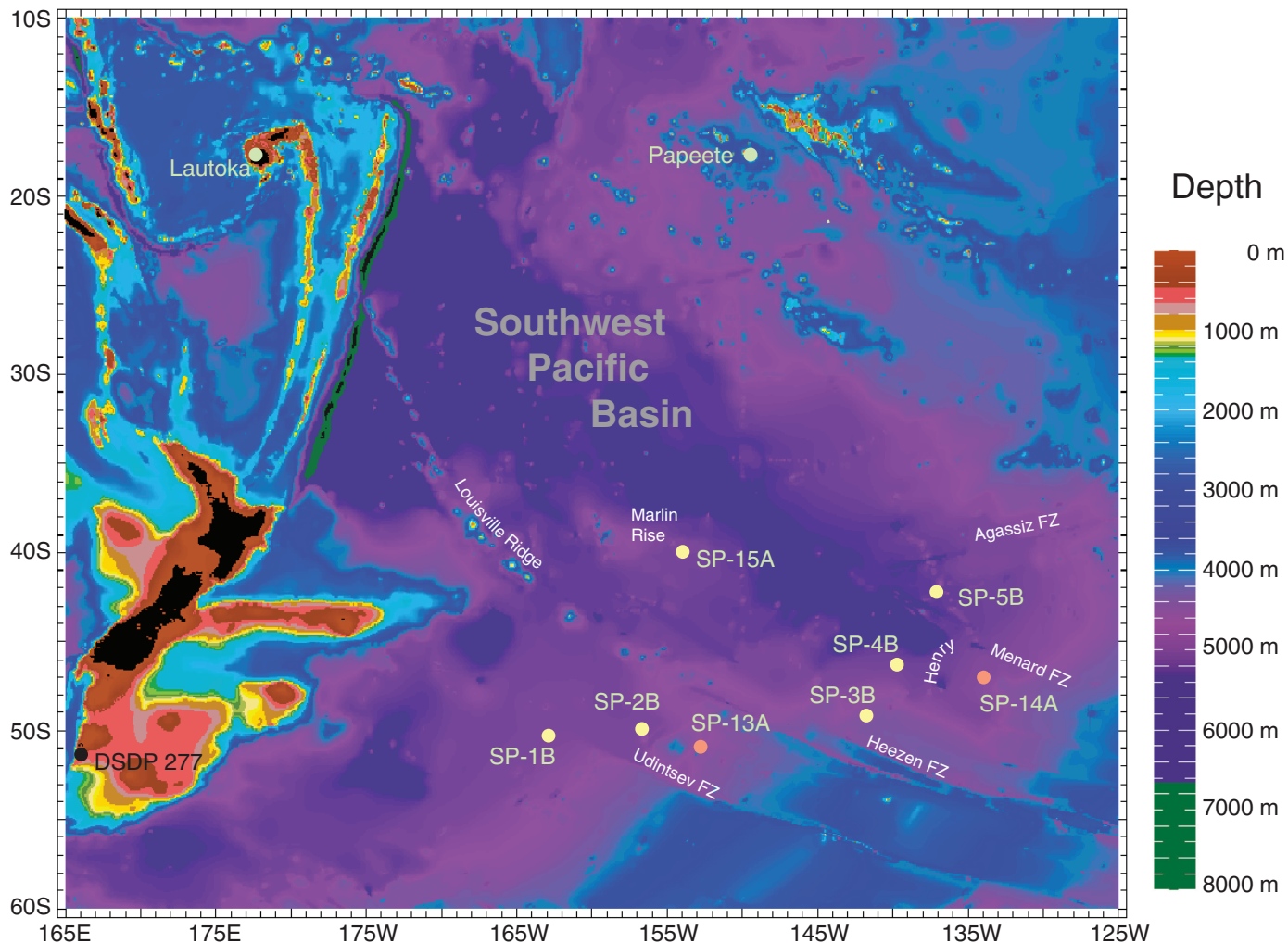
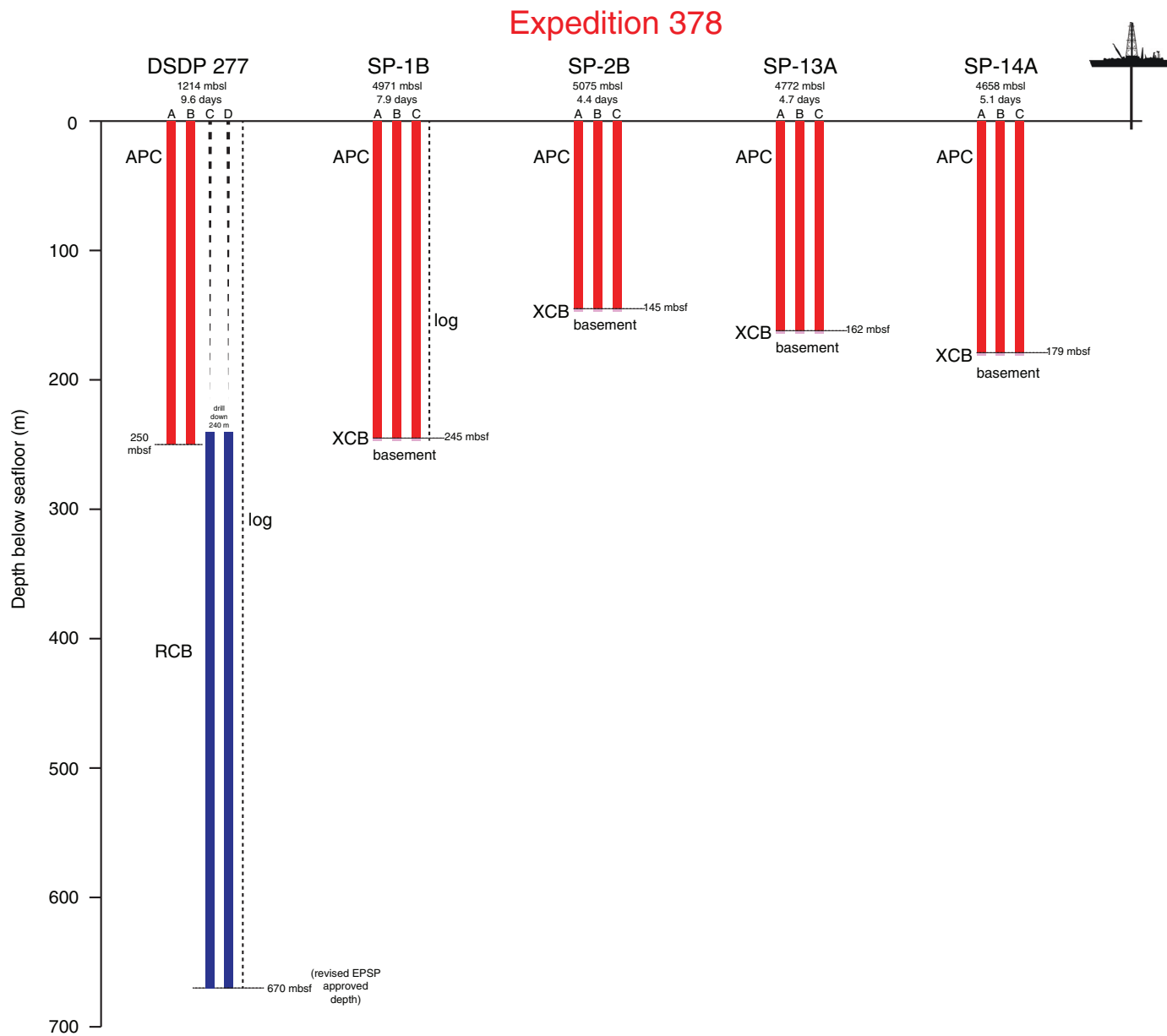


Figure F2. Planned drilling strategy, Expedition 378. mbsl = meters below sea level. APC = advanced piston corer system, RCB = rotary core barrel system, XCB = extended core barrel system. EPSP = Environmental Protection and Safety Panel.



Site summary

Figure AF1. Proposed Site DSDP 277. Top: Shallow subbottom profiler record from Shipboard Scientific Party (1975). Bottom: Map adapted from Ocean Drilling Program Leg 181 (Shipboard Scientific Party, 1999).

Site DSDP 277

Priority:	Primary
Position:	52°13.43' S, 166°11.48' E
Water depth (m):	1214
Target drilling depth (mbsf):	670
Approved maximum penetration (mbsf):	670
Survey coverage (track map; seismic profile):	Shallow subbottom profiler record from Shipboard Scientific Party (1975)
Objective(s):	Carbonate sedimentary record of Paleogene and Upper Cretaceous; complement to deeper sites of transect
Drilling program:	Double APC with orientation to 250 mbsf, RCB 240 to 670 mbsf
Logging/Downhole measurements program:	APCT-3 measurements in one hole; triple combo and FMS-sonic in 480 m hole
Nature of rock anticipated:	Pelagic carbonates; ooze–chalk transition at ~250 mbsf

