International Ocean Discovery Program Expedition 379 Scientific Prospectus Addendum

Amundsen Sea West Antarctic Ice Sheet History: development and sensitivity of the West Antarctic Ice Sheet tested from drill records of the Amundsen Sea Embayment

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Introduction

Concerns about sea ice cover in the Amundsen Sea mandated the inclusion of many alternate sites for Expedition 379 in the original *Scientific Prospectus* (Gohl et al., 2017). The extraordinary ice cover in the Amundsen Sea during austral summer 2017/18 has prompted consideration of all possible alternates in case extreme sea ice conditions occur again in early 2019. In response to this, the following actions have been taken:

1. Four new alternate sites on the continental rise farther away from the sea ice edge of season 2017/18 have been added to the science and operational plans to maximize the range of options in the Amundsen Sea. These are proposed Sites ASRE-07A, ASRE-08A, and ASRE-09A on the eastern Amundsen Sea rise and ASRW-02A on the western Amundsen Sea rise (Table **T1**; Figure **F1**; see **Site summaries**).
2. Permission was obtained to occupy a range of locations along the seismic lines at each proposed site to provide for greater operational flexibility in case local ice conditions require it. These are presented in Table **T2**.
3. Alternative drilling areas in regions adjacent to the Amundsen Sea have been added in case the Expedition 379 operations cannot take place as planned. These include sites approved as part of International Ocean Discovery Program (IODP) Proposal 732 offshore of the Antarctic Peninsula and in the Bellingshausen Sea sites and sites in Ross Sea not completed during Expedition 374 (Figures **F2**, **F3**) (see McKay et al., 2017a, 2017b, 2018). These are proposed Sites BELS-01A, BELS-02C, BELS-03B, PEN-01B, PEN-02C, PEN-03C, PEN-04B, and PEN-05D, as well as RSCR-10A, RSCR-15A, RSCR-18A, and RSCR-19A (see **Site summaries**).
4. Although unrelated to sea ice issues, the approved depth of penetration has been increased for the following two Amundsen Sea sites: proposed Site ASSW-01B is now approved to 700 m, and proposed Site ASSE-03B is now approved to 1000 m.

Scientific reasoning

The five primary scientific goals for Expedition 379 relate to the initial growth of the West Antarctic Ice Sheet in the Amundsen Sea sector, the subsequent history of advance and retreat of the ice sheet across the shelf, and the controls on those changes, including tectonics, global cooling, and oceanographic conditions. West Antarctica is currently a major contributor to global sea level rise and, more importantly, is considered to be one of the largest unknowns in understanding how sea level will rise in the future. Thus, determining how the ice sheets of this region have behaved in the past in response to different forcing mechanisms is critical for improved predictions of future behavior.

Like the Amundsen Sea, the Ross Sea is also a major outlet of ice from the West Antarctic Ice Sheet (McKay et al., 2017a, 2017b, 2018). Ice in both of these sectors is largely marine based, sitting on a foredeepened shelf and below sea level. Today, the Ross Sea is not losing ice volume to the same extent as the Amundsen Sea. Determining the detailed glacial history of each of these two embayments will allow discrimination of the role of forcing mechanisms active in the past in each sector.

The Antarctic Peninsula today is covered by a small ice sheet over a narrow spine of mountains. The margin of the ice sheet is characterized by marine-terminating glaciers and small ice shelves. The peninsula extends farther north than the rest of the West Antarctic, and there is a gradient toward warmer temperatures northward. Sediment drifts close to the West Antarctic continental margin in the Bellingshausen Sea and along the peninsula margin are composed mostly of material that was delivered to the shelf break by ice streams during glacial maxima and deposited under the influence of a weak bottom current flowing southwestward along the margin. Previous drilling during ODP Leg 178 showed that these drifts contain high-fidelity records of changes in the nearby ice sheets.

If drilling cannot be completed in the Amundsen Sea, undrilled targets from IODP Expedition 374 in the Ross Sea can achieve comparable objectives of targeting the record of long-term glacial change in a marine-based ice sheet; however, significant transit will be required for such a scenario. Drilling targets approved as part of IODP Proposal 732 offshore of the Antarctic Peninsula and in the Bellingshausen Sea will recover continuous, high-resolution records of West Antarctic Ice Sheet and Antarctic Peninsula Ice Sheet change through Pleistocene and Pliocene glacial–interglacial cycles at a resolution that is unprecedented around Antarctica, and these sites are easily accessible from the planned cruise path for Expedition 379. The IODP Proposal 732 and its addenda are available at **http://iodp.tamu.edu/scienceops/expeditions/amundsen_sea_ice_sheet_history.html**.

Scenarios

Scenario A—Amundsen Sea: if enough primary and alternate sites, including the four new alternates recently added to Expedition 379, are free of sea ice cover and accessible to the *JOIDES Resolution* for the time available for operations in the study area, drilling will take place exclusively in the Amundsen Sea as originally planned.

Scenario B—Antarctic Peninsula/Bellingshausen Sea: in the case of unfavorable conditions in the Amundsen Sea that allow for access only to a limited number of proposed sites (likely ASRE-05B and ARSE-08A) or conditions that worsen during the expedition after starting operations in the Amundsen Sea, then drilling operations will shift to the Bellingshausen Sea–Antarctic Peninsula region to drill Proposal 732 sites. If all sites are free of sea ice or icebergs and available for drilling, they will be drilled in the following order: BELS-1A, PEN-5D, PEN-2C, PEN-1B, and then, depending on the outcome of earlier activities, any of the remaining sites, including BELS-2C, BELS-3B, PEN-3C, and PEN-4B. The drilling plans for these sites require triple advanced piston corer (APC) drilling because each site targets high-resolution climate records that can only be achieved by guaranteeing continuous records. Previous coring in the region (Ocean Drilling Program Leg 178) targeted somewhat similar sites but did not achieve the continuous records desired. Drilling at any of these sites will only be started if time is available for triple coring.

Scenario C—Ross Sea: in the case of extremely unfavorable ice conditions throughout the Amundsen Sea that do not allow drilling of any planned sites or alternates, Expedition 379 would sail directly to the Ross Sea. If all sites are free of ice cover and available to be drilled, they will be drilled in the following order: RSCR-19A, RSCR-15A, U1524 (RSCR-10A), then RSCR-18A. In the case of Site U1524, the site has already been partially cored during Expedition 374, but core recovery was poor in some sections and they had to stop coring before reaching the middle Miocene target.

Timing of decisions

Sea ice concentration data is available on a near-real time basis. In the weeks before the start of Expedition 379, the likelihood of each of the above scenarios will start to become apparent. Either an extremely good year or an extremely bad year for sea ice cover will start to become apparent with a longer lead time than the more likely scenario of something in between. Excepting either extreme, the choice of initial targets will be made as the expedition begins.

Coordination

Discussions of each of these possible alternate scenarios and the priority rankings have included the Ross Sea Expedition 374 Co-Chief Scientists and Expedition Project Manager and the two lead proponents of Proposal 732. Each team has offered its support and advice for such a possibility with the understanding that any site from outside the Amundsen Sea will be targeted only if necessary and that the science objectives and operational plans originally proposed will be followed. We anticipate that, should core be obtained from these sites, all efforts will be made for an integration of science teams within existing IODP protocols.

Summary

To be clear, the priority is and will remain accessing the totally undrilled regions of the Amundsen Sea. Inclusion of Proposal 732 and the undrilled Expedition 374 Ross Sea sites in contingency planning is for an extreme worst-case scenario in sea ice cover in the austral summer of 2019.

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Table T1. Recently approved Expedition 379 proposed alternate drill sites with approved range of shotpoint numbers and coordinates. CDP = common depth point.

		Location		Deviation range ("ribbon")			
Drill site	Seismic line	CDP	Corresponding longitude/latitude	Minimum CDP	Corresponding longitude/latitude	Maximum CDP	Corresponding longitude/latitude
ASRE-07A	AWI-20100130	5684	−105.247 −69.2438	5940	−105.374 −69.209	5590	−105.2 −69.2567
ASRE-08A	AWI-20100130	10319	−107.525 −68.6114	10500	−107.613 −68.5867	10052	−107.395 −68.6479
ASRE-09A	TH86003B	2080	−109.01 −68.7336	2110	−109.051 −68.7342	2040	−108.955 −68.7331
ASRW-02A	AWI-20100117	15591	−125.326 −71.4093	15481	−125.403 −71.409	16220	−124.89 −71.4232

Table T2. Previously approved Expedition 379 proposed primary and alternate drill sites with newly approved range of shotpoint numbers and coordinates. (Continued on next page.)

		Location		Deviation range ("ribbon")			
Drill site	Seismic line	Shot	Corresponding longitude/latitude	Minimum shot	Corresponding longitude/latitude	Maximum shot	Corresponding longitude/latitude
ASRE-01B	AWI-94042	2016	−103.718 −70.242	1850	−103.66 −70.1823	2190	−103.786 −70.3047
	AWI-20060022	1395	−103.718 −70.242	1300	−103.827 −70.2374	1560	−103.531 −70.2477
ASRE-02B	AWI-20100129	1600	−102.394 −70.528	1450	−102.393 −70.5747	1750	−102.401 −70.4824
ASRE-03B	AWI-20200130	1200	−103.299 −69.7737	1200	−103.299 −69.7737	1430	−103.458 −69.7353
ASRE-04A	AWI-20060023	1750	−105.775 −70.2409	1750	−105.775 −70.2409	1980	−106.061 −70.2248
ASRE-05B	AWI-20060023	4150	−108.6122 −70.0793	4070	−108.522 −70.0844	4210	−108.68 −70.0754
ASRE-06A	AWI-20060023	8670	−114.223 −70.325	8600	−114.136 −70.3177	8825	−114.413 −70.3389
ASRW-01C	AWI-20100117	17050	−120.6681 −71.7052	16800	−120.872 −71.6689	17050	−120.6681 −71.7052
ASSW-01B	BAS056-S110	2605	−115.792 −72.993	2410	−115.875 −73.003	2605	−115.792 −72.993
	AWI-20100119	5610	−115.792 −72.993	5515	−115.862 −72.9768	5750	−115.704 −73.0134
ASSW-02B	AWI-20100119	4490	−116.583 −72.817	4380	−116.64 −72.7966	4650	−116.469 −72.8469
ASSW-03B	AWI-20100119	2330	−117.972 −72.502	2200	−118.059 −72.4817	2500	−117.871 −72.5202
ASSE-01C	AWI-20100134	2775	−107.8143 −72.8946	2700	−107.828 −72.8737	2800	−107.809 −72.9016
ASSE-02C	AWI-20100122	1235	−106.347 −72.848	1150	−106.352 −72.8233	1340	−106.341 −72.8774
ASSE-03B	AWI-20100134	1674	−108.002 −72.582	1450	−108.025 −72.5154	1750	−107.994 −72.6049
	AWI-20100121	2220	−108.002 −72.582	2100	−108.12 −72.5843	2350	−107.864 −72.5807
ASSE-04B	AWI-20100122	250	−106.448 −72.558	220	−106.442 −72.5503	400	−106.438 −72.6025
	AWI-20100121	3748	−106.448 −72.558	3670	−106.525 −72.5612	3750	−106.447 −72.56
ASSE-05C	AWI-20100134	150	−108.436 −72.149	75	−108.441 −72.1243	260	−108.433 −72.1839
ASSE-06B	AWI-20060001	100	−105.552 −71.893	50	−105.573 −71.9065	175	−105.524 −71.8732
	AWI-20100133	42	−105.552 −71.893	25	−105.468 −71.8893	42	−105.551 −71.8933
ASSE-07B	AWI-94042	4800	−104.75 −71.287	4700	−104.743 −71.2496	4880	−104.787 −71.3167
	BAS056-S114	13600	−104.75 −71.287	13310	−104.864 −71.29	13850	−104.644 −71.286
ASSE-08C	AWI-20100139	2100	−113.2551 −71.5966	2100	−113.2551 −71.5966	2200	−113.316 −71.5724
ASSE-09A	AWI-20100126	1596	−107.307 −72.91	1470	−107.437 −72.9092	1690	−107.211 −72.9101

Table T2 (continued).

Drill site	Seismic line	Location		Deviation range ("ribbon")			
		Shot	Corresponding longitude/latitude	Minimum shot	Corresponding longitude/latitude	Maximum shot	Corresponding longitude/latitude
	NBP9902-11	4850	−107.307 −72.91	4550	−107.244 −72.965	5050	−107.374 −72.88
ASSE-10A	AWI-20100121	2930	−107.267 −72.572	2800	−107.401 −72.5742	3050	−107.145 −72.5701
	NBP9902-11	6900	−107.267 −72.572	6625	−107.255 −72.6165	7250	−107.316 −72.5095
ASSE-11A	AWI-20100133	440	−107.588 −72.022	400	−107.401 −72.0104	475	−107.749 −72.0322
	NBP9902-11	10150	−107.588 −72.022	9750	−107.52 −72.0819	10450	−107.602 −72.0037
ASSE-12A	BAS056-S114	4806	−108.365 −71.332	4570	−108.453 −71.332	5060	−108.262 −71.332
	NBP9902-11	14400	−108.365 −71.332	14200	−108.302 −71.3728	14700	−108.397 −71.2871

Table T3. Summary of proposed drill sites on continental shelf and rise of the Amundsen Sea Embayment (ASE). Alternate sites are listed below their primary sites. Scientific objectives and scientific hypotheses (H) are defined in the original Expedition 379 *Scientific Prospectus* (Gohl et al., 2017). CDW = Circumpolar Deep Water, MC = multichannel, SC = single channel. Drill site locations are shown in Figure F1. (Continued on next page.)

Site	Location	Drill targets	Scientific hypotheses/objectives	Site selection criteria and seismic site data
Continental shelf				
ASSE-02C (primary)	Eastern ASE, central Pine Island Trough, middle shelf	Preglacial to early glacial sequences, Late Cretaceous to early Miocene	H 4, 5; greenhouse-to-icehouse transition, Eocene–Oligocene climate gradient, timing of early West Antarctic glaciation	Single-line MC seismics (7 km north of cross-line): penetrating early Miocene and reaching Late Cretaceous, avoiding structural complication
ASSE-01C (primary)	Eastern ASE, central Pine Island Trough, middle shelf	Preglacial to early glacial sequences, late Oligocene to mid-Miocene	H 4, 5; transition from preglacial to glacial, timing of onset of major West Antarctic glaciation	Crossing MC seismics: continuous early Miocene; avoiding unconformity ASS-u3 but penetrating into late Oligocene
ASSE-09A (alternate)	Eastern ASE, central Pine Island Trough, middle shelf	Preglacial to early glacial sequences, Eocene/ Oligocene to mid-Miocene	H 4, 5; transition from preglacial to glacial, timing of onset of major West Antarctic glaciation	Crossing SC/MC seismics: continuous early Miocene; avoiding unconformity ASS-u3 but penetrating into Oligocene and Eocene
ASSW-01B (alternate)	Western ASE, Dotson-Getz Trough, middle shelf	Preglacial sediment sequences, early to mid-Miocene	H 4, 5; timing of onset of glaciation, transition from preglacial to glacial, mid-Miocene climate optimum	Crossing SC/MC seismics: capturing most of early to mid-Miocene; intentionally penetrating unconformities ASS-u3 and -u4
ASSE-03B (primary)	Eastern ASE, central Pine Island Trough, middle shelf	Glacial sediment sequences, mid-Miocene to Plio/Pleistocene	H 1, 2, 3; transition to full glacial conditions, CDW events; early Pliocene warm period, transition to cooling in late Pliocene	Crossing MC seismics: continuous mid-Miocene; penetrating major glacial unconformity ASS-u4 (full glacial advance conditions)
ASSE-10A (alternate)	Eastern ASE, central Pine Island Trough, middle shelf	Glacial sediment sequences, mid-Miocene to Plio/Pleistocene	H 1, 2, 3; transition to full glacial conditions, CDW events; early Pliocene warm period, transition to cooling in late Pliocene	Crossing SC/MC seismics: continuous mid-Miocene; penetrating major glacial unconformities ASS-u4 (full glacial advance conditions) and ASS-u3 (erosional truncation?)
ASSE-04B (alternate)	Eastern ASE, central Pine Island Trough, middle shelf	Glacial sediment sequences, mid-Miocene to Plio/Pleistocene	H 1, 2, 3; transition to full glacial conditions, CDW events; early Pliocene warm period, transition to cooling in late Pliocene	Crossing MC seismics: penetrating major glacial unconformities ASS-u4 (full glacial advance conditions) and ASS-u3 (erosional truncation?)
ASSW-02B (alternate)	Western ASE, Dotson-Getz Trough, middle shelf	Glacial sediment sequences, mid-Miocene to Plio/Pleistocene	H 1, 2, 3; transition to full glacial conditions, CDW events; early Pliocene warm period, transition to cooling in late Pliocene	Single-line MC seismics: thick Pliocene/ Pleistocene sequences; penetration through major glacial unconformity ASS-u4
ASSE-06B (alternate)	Eastern ASE, Pine Island Trough East, mid- to outer shelf	Glacial sediment sequences, mid-Miocene to Plio/Pleistocene	H 1, 2, 3; transition to full glacial conditions, CDW events; early Pliocene warm period, transition to cooling in late Pliocene	Crossing MC seismics: thick Pliocene/ Pleistocene sequences; penetration into major glacial unconformity ASS-u4
ASSE-11A (primary)	Eastern ASE, central Pine Island Trough, mid- to outer shelf	Glacial sediment sequences, mid/late Miocene to Plio/Pleistocene	H 1, 2, 3; transition to full glacial conditions, CDW events; early Pliocene warm period, transition to cooling in late Pliocene	Crossing SC/MC seismics: thick Pliocene/ Pleistocene sequences and penetration into major glacial unconformity ASS-u4
ASSE-05C (alternate)	Eastern ASE, central Pine Island Trough, mid- to outer shelf	Glacial sediment sequences, late Miocene to Plio/Pleistocene	H 1, 2, 3; transition to full glacial conditions, CDW events; early Pliocene warm period, transition to cooling in late Pliocene	Single-line MC seismics (7 km south of cross-line): thick Pliocene/ Pleistocene sequences and penetration into major glacial unconformity ASS-u4
ASSE-07B (alternate)	Eastern ASE, Pine Island Trough East, outer shelf	Glacial sediment sequences, early Pliocene to Pleistocene	H 1, 2, 3; full glacial conditions, CDW events; late Pliocene cooling	Crossing SC/MC seismics: thick Pliocene and Pleistocene sequences, above prograding sequences
ASSE-12A (alternate)	Eastern ASE, Pine Island Trough East, outer shelf	Glacial sediment sequences, early Pliocene to Pleistocene	H 1, 2, 3; full glacial conditions, CDW events; late Pliocene cooling	Crossing SC/MC seismics: thick Pliocene and Pleistocene sequences, above prograding sequences
ASSE-08C (alternate)	Central ASE, Pine Island Trough West, outer shelf	Glacial sediment sequences, late Miocene to Pleistocene	H 1, 2, 3; full glacial conditions, CDW events; late Pliocene cooling	Crossing SC/MC seismics: thick Pliocene and Pleistocene sequences, above prograding sequences
ASSW-03B (alternate)	Western ASE, Dotson-Getz Trough, middle to outer shelf	Glacial sediment sequences, late Miocene to Pleistocene	H 1, 2, 3; full glacial conditions, CDW events; late Pliocene cooling	Single-line MC seismics: thick Pliocene and Pleistocene sequences

Table T3 (continued).

Site	Location	Drill targets	Scientific hypotheses/objectives	Site selection criteria and seismic site data
Continental rise				
ASRE-05B (primary)	Eastern ASE, continental rise	Deep-sea record of glacial sequences, early Miocene to Plio/Pleistocene, drift deposit	H 1, 2, 3; onset of major glaciation, mid-Miocene climate optimum, high-resolution record, correlation with paleo-current reconstruction	Crossing MC seismics: thick sequence down to early Miocene; avoiding structural complication and top of drift
ASRE-03B (alternate)	Eastern ASE, continental rise	Deep-sea record of glacial sequences, early Miocene to Plio/Pleistocene, drift deposit	H 1, 2, 3; onset of major glaciation, mid-Miocene climate optimum, high-resolution record, correlation with paleo-current reconstruction	Crossing MC seismics: thick sequence down to early Miocene; avoiding structural complication
ASRE-07A (alternate)	Central ASE, continental rise	Deep-sea record of glacial sequences, early Miocene to Plio/Pleistocene, drift deposit	H 1, 2, 3; onset of major glaciation, Miocene–Pliocene warm times, high-resolution record, correlation with paleo-current reconstruction	Single-line MC: thick Plio/Pleistocene drift sequence and down to late Miocene into older drift; avoiding structural complication
ASRE-08A (alternate)	Central ASE, continental rise	Deep-sea record of glacial sequences, early Miocene to Plio/Pleistocene, drift deposit	H 1, 2, 3; onset of major glaciation, mid-Miocene climate optimum, high-resolution record, correlation with paleo-current reconstruction	Single-line MC: thick Plio/Pleistocene drift sequence and down to mid-Miocene; avoiding top of drift and structural complication
ASRE-09A (alternate)	Central ASE, continental rise	Deep-sea record of glacial sequences, early Miocene to Plio/Pleistocene, drift deposit	H 1, 2, 3; onset of major glaciation, mid-Miocene climate optimum, high-resolution record, correlation with paleo-current reconstruction	Single-line MC: thick Plio/Pleistocene sequence and down to early Miocene/late Oligocene; structural complication
ASRE-06A (alternate)	Central ASE, continental rise	Deep-sea record of glacial sequences, early Miocene to Plio/Pleistocene, drift deposit	H 1, 2, 3; onset of major glaciation, mid-Miocene climate optimum, high-resolution record, correlation with paleo-current reconstruction	Single-line MC: thick Plio/Pleistocene sequence and down to early Miocene; avoiding top of drift and structural complication
ASRE-01B (primary)	Eastern ASE, continental rise	Deep-sea record of glacial sequences, mid-Miocene to Pleistocene	H 1, 2, 3; major glacial and warm periods from mid-Miocene climate optimum to early Pliocene warm period to present, high-resolution record of Plio/Pleistocene	Crossing MC seismics: thick Plio/Pleistocene sequence and down to mid-Miocene; avoiding structural complication
ASRE-02B (alternate)	Eastern ASE, continental rise	Deep-sea record of glacial sequences, mid-Miocene to Pleistocene	H 1, 2, 3; major glacial and warm periods from mid-Miocene climate optimum to early Pliocene warm period to present, high-resolution record of Plio/Pleistocene	Single-line MC seismics: thick Plio/Pleistocene sequence and down to mid-Miocene; avoiding structural complication
ASRE-04A (alternate)	Eastern ASE, continental rise	Deep-sea record of glacial sequences, late Miocene to Pleistocene, drift deposit	H 1, 2, 3; major glacial and warm periods from early Pliocene warm period to present, high-resolution record, correlation with paleo-current reconstruction	Single-line MC seismics (7 km west of cross-line): thick Pleistocene sequence and down to late Miocene; avoiding top of drift and structural complication
ASRW-01C (alternate)	Western ASE, continental rise	Deep-sea record of glacial sequences, late Miocene to Pleistocene	H 1, 2, 3; major glacial and warm periods from early Pliocene warm period to present, high-resolution record	Crossing MC seismics: thick Plio/Pleistocene sequence and down to late Miocene; avoiding structural complication
ASRW-02A (alternate)	Western ASE, continental rise	Deep-sea record of glacial sequences, late Miocene to Pleistocene	H 1, 2, 3; glacial onset and warm periods from Late Eocene to Quaternary, high-resolution record	Single-line MC seismics: thick Plio/Pleistocene sequence and down to late Eocene; avoiding structural complication

Table T4. Prioritization of proposed drill sites. Highest priority level is 1; lowest is 3. Penetration depths differ in some cases from the maximum penetration depths of a particular site according to the overall objectives within a priority level. Hypothesis/objective numbers are defined in the original Expedition 379 *Scientific Prospectus* (Gohl et al., 2017). NA = not applicable, ASE = Amundsen Sea Embayment, H = hypothesis. Drill site locations are shown in Figure F1.

Ice cover scenario	Priority level	Primary site or first-choice alternate site	Respective alternate site(s)	Maximum penetration (m)	Scientific hypotheses/ objectives
Minimum ice cover on east and west ASE shelf (best case)	1.1	ASSE-11A	ASSE-05C, ASSE-07B, ASSE-12A, ASSE-08C	600–950	H 1, 2, 3
	1.2	ASSE-03C	ASSE-10A, ASSE-04B, ASSE-06B	850–950	H 1, 2, 3
	1.3	ASRE-05B	ASRE-03B, ASRE-06A	1200–1400	H 1, 2, 3
	1.4	ASSE-02C	ASSE-09A	900	H 4, 5
	1.5	ASRE-01B	ASRE-02B, ASRE-04A	900–950	H 1, 2, 3
	1.6	ASSE-01C	ASSE-09A	900	H 4, 5
Minimum ice cover on west ASE shelf and maximum ice cover on east ASE	2.1	ASSW-02B	NA	900	H 1, 2, 3
	2.2	ASSW-03B	ASSE-08C	850–950	H 1, 2, 3
	2.3	ASRW-01C	ASRW-02A, ASRE-06A, ASRE-05B, ASRE-01B	900–1200	H 1, 2, 3
	2.4	ASSW-01B	NA	600	H 4, 5
	2.5	ASRE-06A	ASRE-05B, ASRE-01B	950–1200	H 1, 2, 3
Maximum ice cover on east and west ASE shelves (worst case)	3.1	ASRE-01C	ASRE-02B, ASRE-04A	900–950	H 1, 2, 3
	3.2	ASRE-05B	ASRE-07A, ASRE-08A, ASRE-09A, ASRE-04A	900–1200	H 1, 2, 3
	3.3	ASRE-03B	ASRE-07A, ASRE-08A, ASRE-09A, ASRE-04A	900–1400	H 1, 2, 3
	3.4	ASRE-06A	ASRE-09A	1200	H 1, 2, 3
	3.5	ASRW-01C	NA	900	H 1, 2, 3

Figure F1. Bathymetric map of the Amundsen Sea Embayment (ASE) off West Antarctica (adopted from Nitsche et al., 2007) with Expedition 379 primary (red) and alternate (yellow) drill sites. Thick gray lines mark existing marine multi- and single-channel seismic profiles collected during six ship expeditions from 1994 to 2010 (e.g., Gohl et al., 2013b). Orange line marks the boundary between the outcropping basement of the inner shelf and the sedimentary basin of the middle shelf (Graham et al., 2009; Gohl et al., 2013a, 2013b).

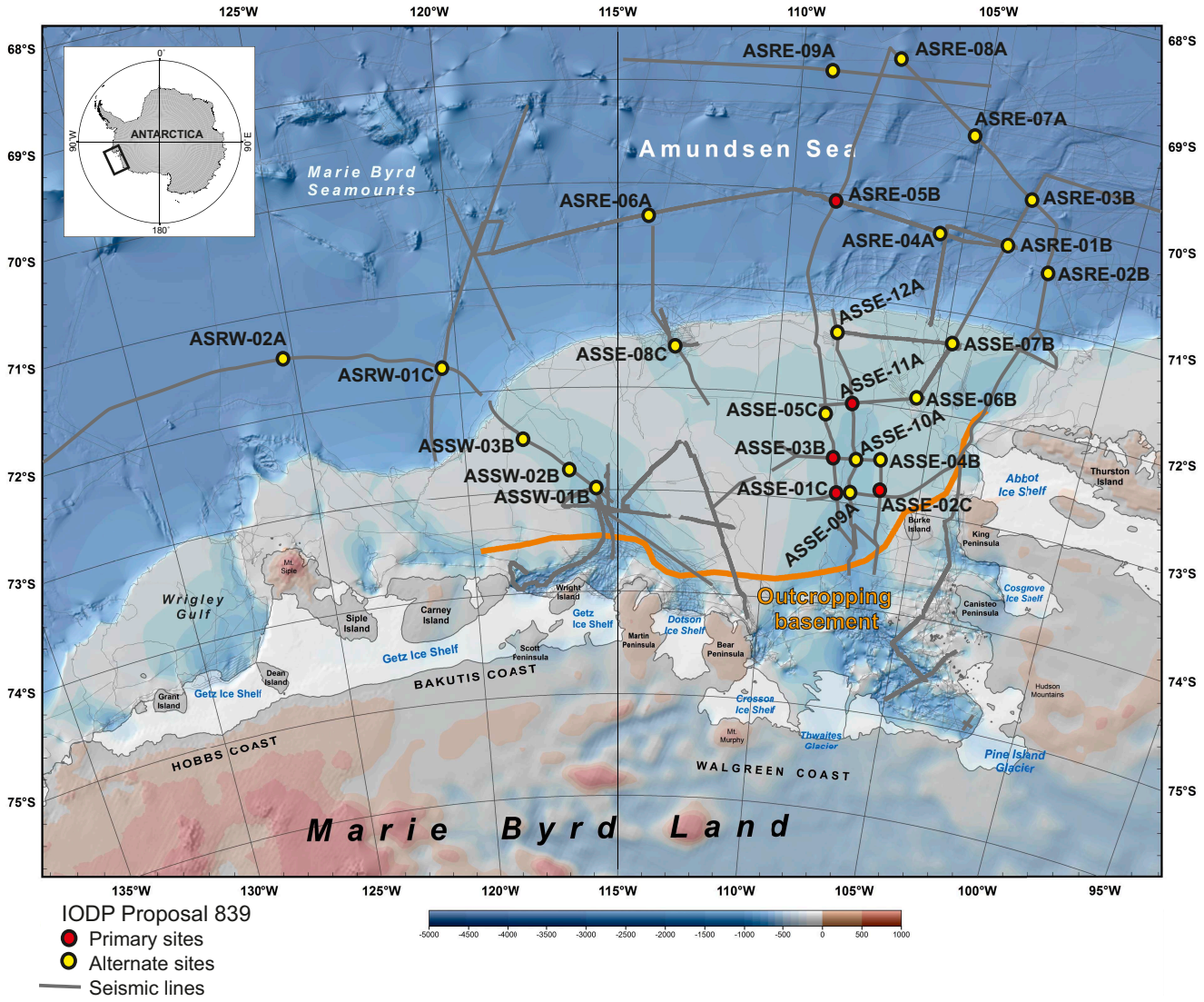


Figure F2. Drill sites along the Antarctic Peninsula/Bellingshausen Sea margin (See Proposal 732-Full2 at **http://iodp.tamu.edu/scienceops/precruise/amundsensea/732-Full2_For_Web.pdf**).

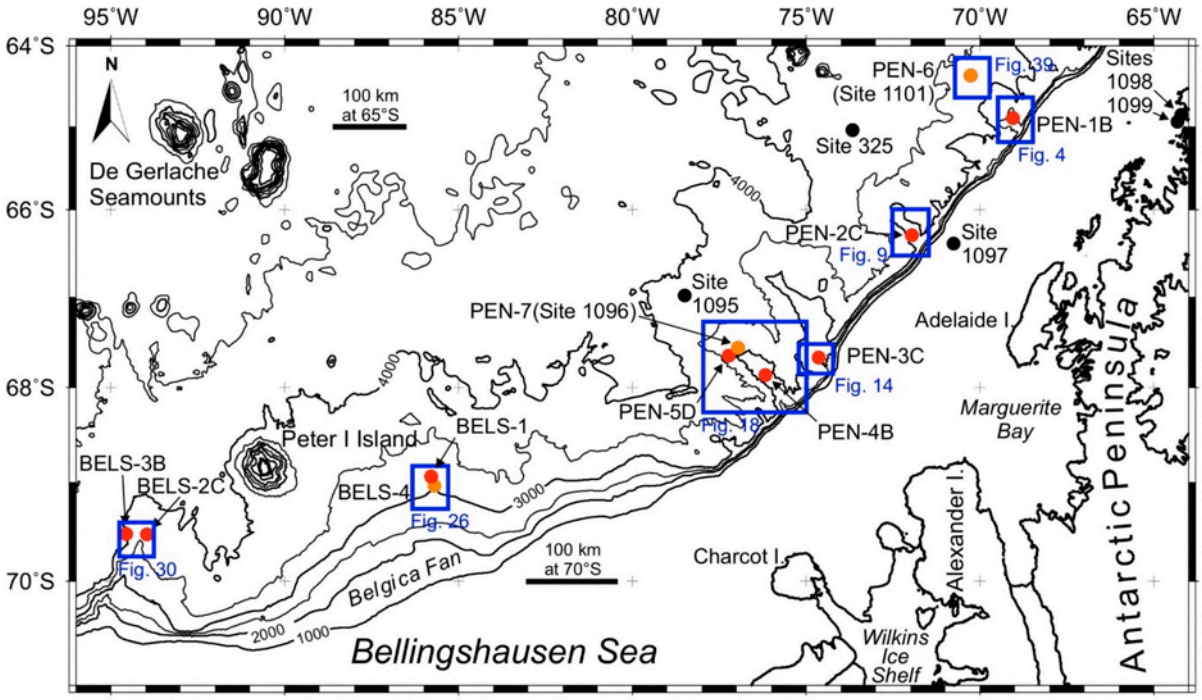
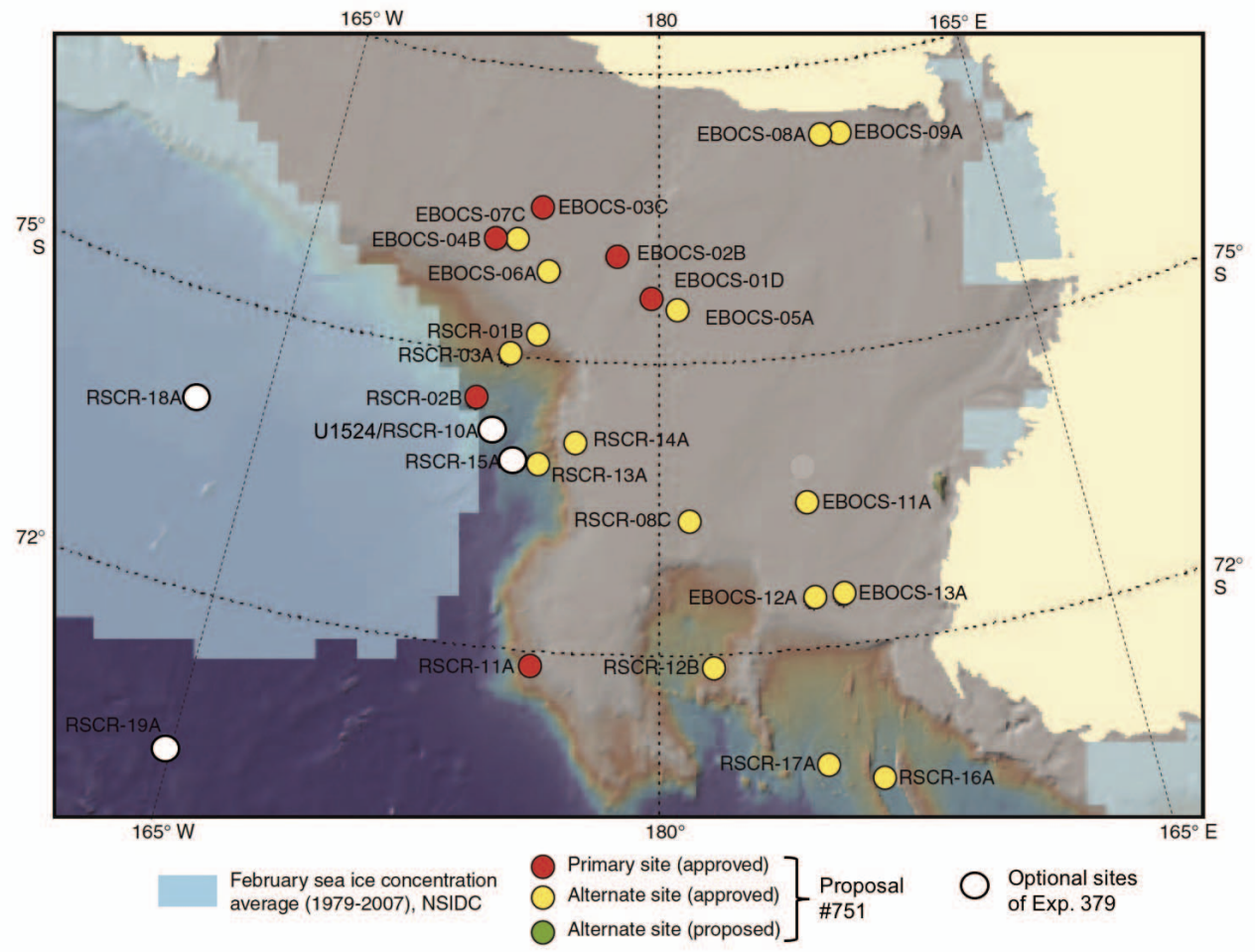


Figure F3. Overview map of drill sites in the Ross Sea (see McKay et al., 2017a, 2017b).

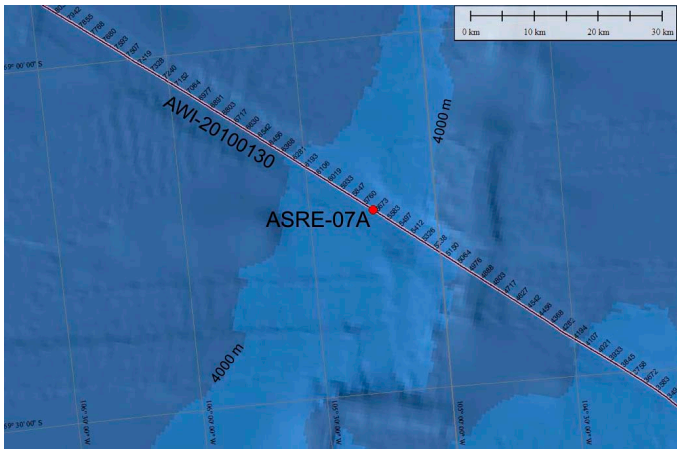


Site summaries

Figure AF1. Top: bathymetric map of Site ASRE-07A with MCS seismic track and CDP numbers. Bottom: MCS Line AWI-20100130 across Site ASRE-07A. This migrated line was recorded with a 3000 m long, 240-channel digital streamer. Gray bar = deviation range for drill site with min/max CDP numbers.

Site ASRE-07A

Site-specific objective(s):	• Plio/Pleistocene high-resolution record • Continuous records of glacially transported sediments • Reconstructing climatic and oceanographic changes throughout glacial-interglacial cycles • Major change from cold late Miocene to warm early-mid Pliocene periods • Correlation with paleo-current reconstruction
Location, bathymetry, and site selection criteria:	Site is located on the upper northwestern flank of a thick (700 m) sediment drift on the continental rise of the Amundsen Sea. Bathymetric dip is <10%. Site is selected because it is expected to obtain records of high-resolution and continuous Pliocene/Pleistocene and Quaternary sequences as well as reaching the late Miocene. One high-quality MCS line crosses over site.
Water depth (m):	3960
Depth of penetration (mbsf):	1200
Applied seismic velocity with degree of confidence:	• 0–700 m: 1500–2000 m/s • 700–1000 m: 2000–2700 m/s • 1000–1200 m: 2700 m/s • High confidence from velocity analysis of 3000 m streamer data; uncertainty is <5%
Expected nature of section:	• Fine-grained hemipelagic biogeneous mud/silt • Fine-grained turbidites
Planned type of coring, sampling, and logging:	• Triple or double APC to refusal, then XCB to refusal, then change to RCB • Logging with standard suite of tools, check shots to determine physical properties, and core-log-seismic integration
Possible safety and pollution issues:	No safety and pollution issues related to hydrocarbon/ fluid occurrences are expected at this site. No indications for structural/stratigraphic traps and fluid conduits. Sea-ice cover and icebergs are a potential risk. However, the Amundsen Sea continental rise is not sea ice covered in most seasons. Risk of both sea ice and icebergs can be mitigated by high-resolution satellite imaging/tracking. Re-entry funnel is recommended.



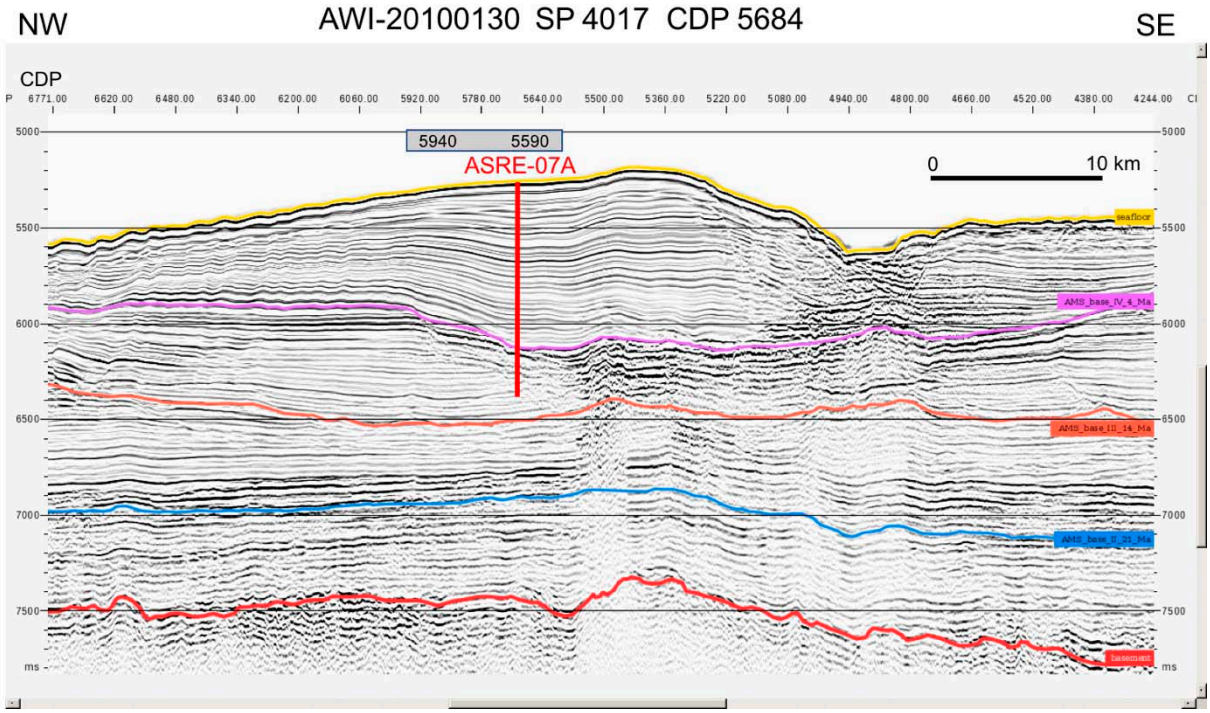
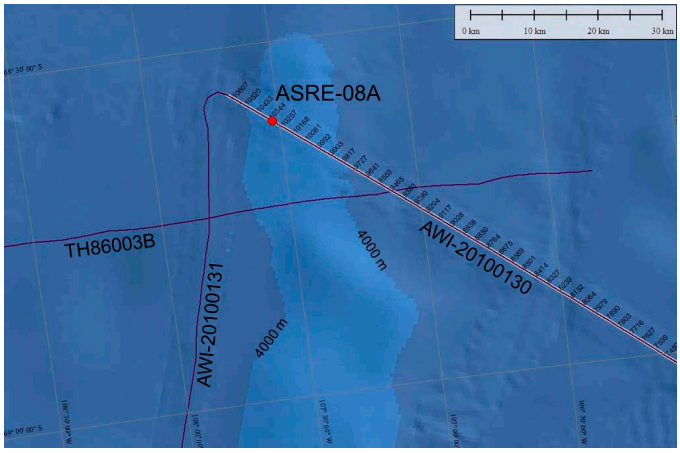


Figure AF2. Top: bathymetric map of Site ASRE-08A with MCS seismic tracks and CDP numbers of Line AWI-20100130. Bottom: MCS Line AWI-20100130 across Site ASRE-08A. This migrated line was recorded with a 3000 m long, 240-channel digital streamer. Gray bar = deviation range for drill site with min/max CDP numbers. The thin green vertical line indicates a seismic line crossing this line at more than 20 km distance from the site. It is not shown here.

Site ASRE-08A

Site-specific objective(s):	• Plio/Pleistocene high-resolution record, sampling mid- to late Miocene • Continuous records of glacially transported sediments • Reconstructing climatic and oceanographic changes throughout glacial–interglacial cycles • Major glacial and warm periods from mid-Miocene climate optimum to early Pliocene warm period to present • Correlation with paleo-current reconstruction
Location, bathymetry, and site selection criteria:	Site is located on the upper northwestern flank of a thick (750 m) sediment drift on the continental rise of the Amundsen Sea. Bathymetric dip is <10%. Site is selected because it is expected to obtain records of high-resolution and continuous Pliocene/Pleistocene and Quaternary sequences as well as reaching the middle Miocene. One high-quality MCS line crosses over site.
Water depth (m):	4020
Depth of penetration (mbsf):	1200
Applied seismic velocity with degree of confidence:	• 0–700 m: 1500–2000 m/s • 700–1000 m: 2000–2700 m/s • 1000–1200 m: 2700 m/s • High confidence from velocity analysis of 3000 m streamer data; uncertainty is <5%
Expected nature of section:	• Fine-grained hemipelagic biogeneous mud/silt • Fine-grained turbidites
Planned type of coring, sampling, and logging:	• Triple or double APC to refusal, then XCB to refusal, then change to RCB • Logging with standard suite of tools, check shots to determine physical properties, and core-log-seismic integration
Possible safety and pollution issues:	No safety and pollution issues related to hydrocarbon/fluid occurrences are expected at this site. No indications for structural/stratigraphic traps and fluid conduits. Sea ice cover and icebergs are a potential risk. However, the Amundsen Sea continental rise is not sea ice covered in most seasons. Risk of both sea ice and icebergs can be mitigated by high-resolution satellite imaging/tracking. Re-entry funnel is recommended.



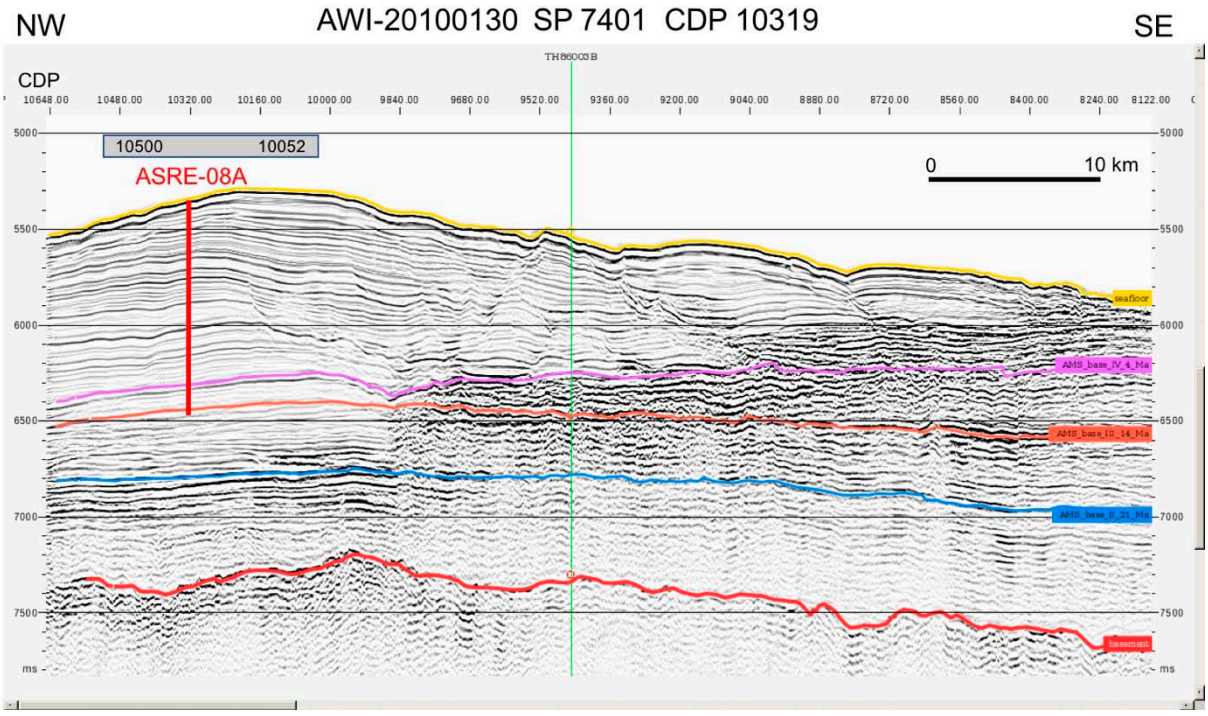
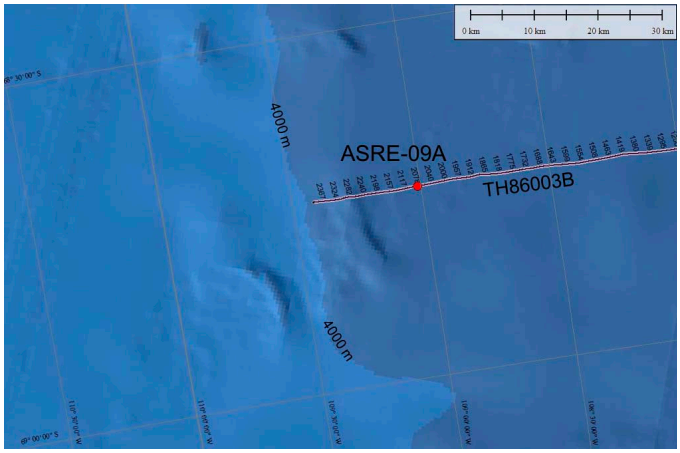


Figure AF3. Top: bathymetric map of Site ASRE-09A with MCS seismic track and CDP numbers. Bottom: MCS Line TH86003B across Site ASRE-09A. This stacked line was recorded with a 600 m long, 24-channel analogue streamer. Gray bar = deviation range for drill site with min/max CDP numbers.

Site ASRE-09A

Site-specific objectives:	• Neogene to Quaternary continuous record • Continuous records of glacially transported sediments • Reconstructing climatic and oceanographic changes throughout glacial–interglacial cycles • Onset of major glaciation in mid-late Miocene • Record of Mid-Miocene Climate Optimum
Location, bathymetry, and site selection criteria:	Site is located on the outer continental rise of the Amundsen Sea. Bathymetric dip is <10%. Site is selected because it is expected to reach early Miocene sequences by also obtaining records of Pliocene/Pleistocene and Quaternary. One MCS line crosses over site.
Water depth (m):	4210
Depth of penetration (mbsf):	1200
Applied seismic velocity with degree of confidence:	• 0–700 m: 1500–2000 m/s • 700–1000 m: 2000–2700 m/s • 1000–1200 m: 2700 m/s • Velocity data are not available; velocities are estimated based on AWI-owned MCS data in close proximity that have high-confidence from velocity analysis; uncertainty is about 10%
Expected nature of section:	• Fine-grained hemipelagic biogeneous mud/silt • Fine-grained turbidites
Planned type of coring, sampling, and logging:	• Triple or double APC to refusal, then XCB to refusal, then change to RCB • Logging with standard suite of tools, check shots to determine physical properties, and core-log-seismic integration
Possible safety and pollution issues:	No safety and pollution issues related to hydrocarbon/fluid occurrences are expected at this site. No indications for structural/stratigraphic traps and fluid conduits. Sea ice cover and icebergs are a potential risk. However, the Amundsen Sea continental rise is not sea ice covered in most seasons. Risk of both sea ice and icebergs can be mitigated by high-resolution satellite imaging/tracking. Re-entry funnel is recommended.



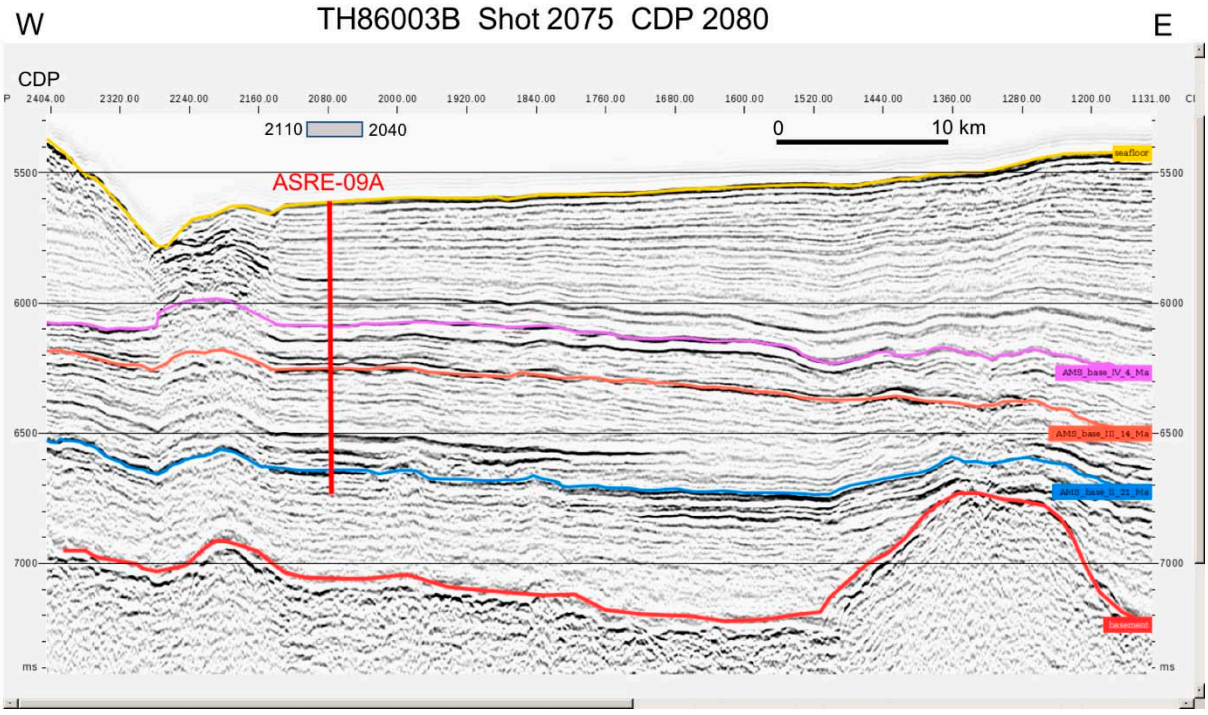
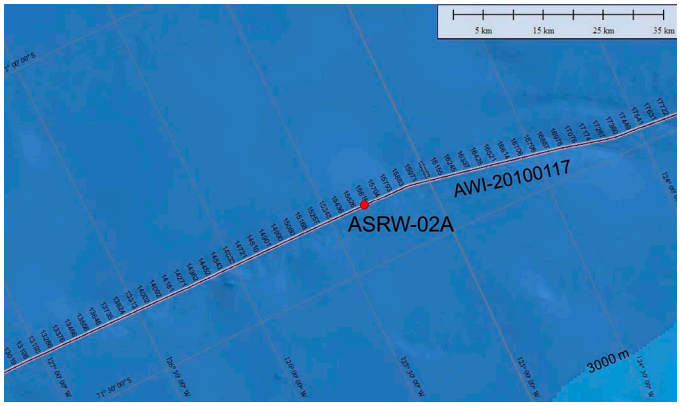


Figure AF4. Top: bathymetric map of Site ASRW-02A with MCS seismic track and CDP numbers. Bottom: MCS Line AWI-20100117 across Site ASRW-02A. This migrated line was recorded with a 3000 m long, 240-channel digital streamer. Gray bar = deviation range for drill site with min/max CDP numbers.

Site ASRW-02A

Site-specific objectives:	• Late Eocene and Oligocene to Quaternary continuous records • Continuous records of glacially transported sediments • Reconstructing climatic and oceanographic changes throughout glacial-interglacial cycles • Record of Mid-Miocene Climate Optimum • Onset of early glaciation at Eocene-Oligocene transition • Correlation with paleo-current reconstruction
Location, bathymetry, and site selection criteria:	Site is located on the continental rise off the western Amundsen Sea Embayment with a 300 m thick sediment drift on top. Bathymetric dip is <5%. Site is selected because it is expected to penetrate continuous Plio/Pleistocene sequences of the sediment drift and to sample continuous records from throughout the Miocene down to Oligocene and late Eocene. One MCS line crosses over site.
Water depth (m):	3331
Depth of penetration (mbsf):	1250
Applied seismic velocity with degree of confidence:	• 0–400 m: 1500–2000 m/s • 400–1000 m: 2000–2400 m/s • 1000–1250 m: 2400–2700 m/s • High confidence from velocity analysis of 3000 m streamer data; uncertainty is <5%
Expected nature of section:	• Fine-grained hemipelagic biogeneous mud/silt • Fine-grained turbidites
Planned type of coring, sampling, and logging:	• Triple or double APC to refusal, then XCB to refusal, then change to RCB • Logging with standard suite of tools, check shots to determine physical properties, and core-log-seismic integration
Possible safety and pollution issues:	No safety and pollution issues related to hydrocarbon/fluid occurrences are expected at this site. No indications for structural/stratigraphic traps and fluid conduits. Sea ice cover and icebergs are a potential risk. However, the Amundsen Sea continental rise is not sea ice covered in most seasons. Risk of both sea ice and icebergs can be mitigated by high-resolution satellite imaging/tracking. Re-entry funnel is recommended.



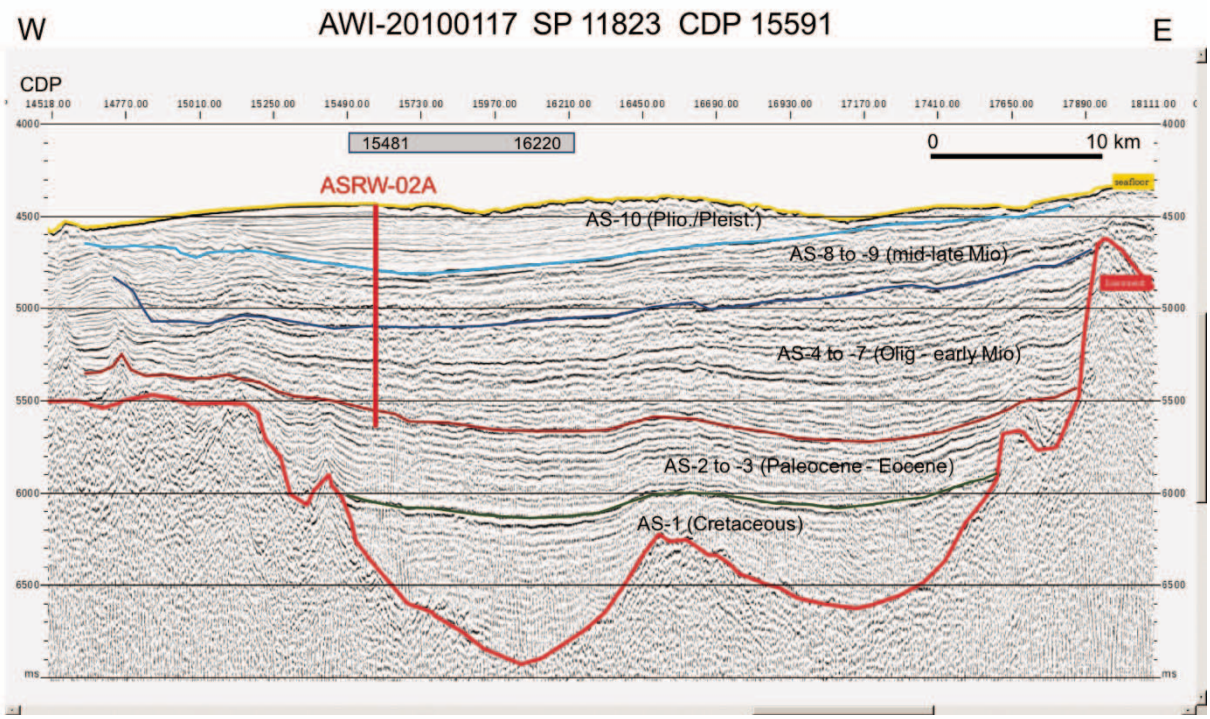
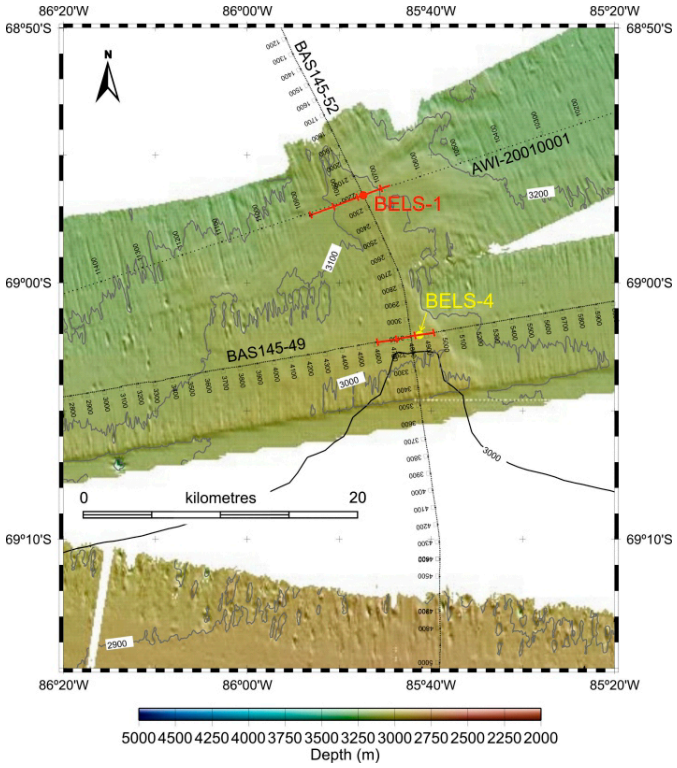
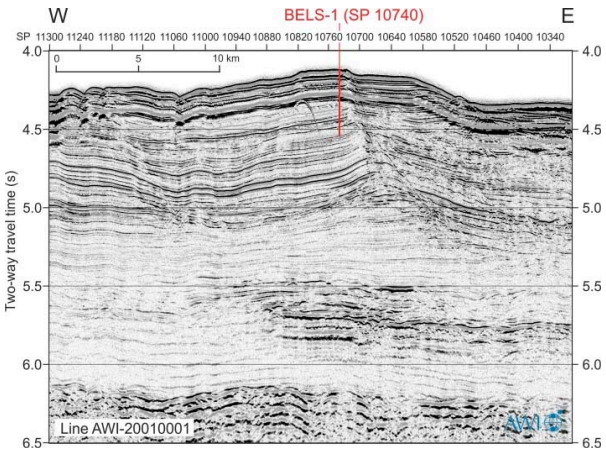


Figure AF5. Contoured bathymetric map and seismic reflection Profiles AWI-20010001 and BAS145-52 showing location of proposed Site BELS-01A. CDP = commom depth point, AWI = Alfred Wegener Institute.

Site BELS-01A

Position:	68.9428°S, 85.7893°W Seismic Line AWI-20010001, CDP 10740 Seismic Line BAS145-52, CDP 2222
Water depth (m):	3117
Depth of penetration (mbsf):	350
Site-specific objective(s):	Pliocene–Quaternary paleoceanography and history of West Antarctic Ice Sheet (WAIS)
Location, bathymetry, and site selection criteria:	Site is located on a sediment drift on the continental rise of the Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain near-continuous high-resolution records of Pliocene to Quaternary sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	Triple APC to refusal





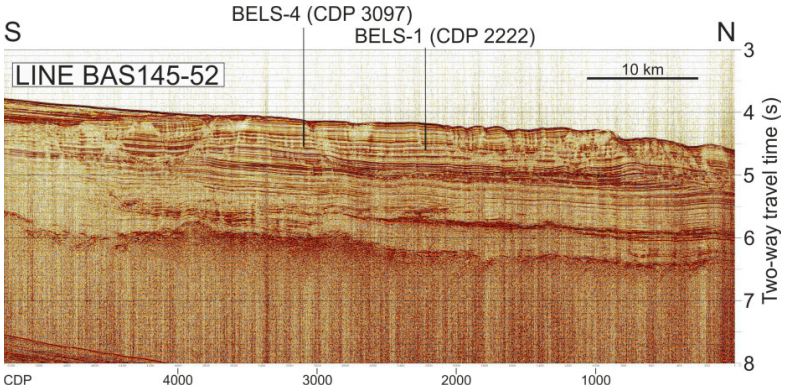
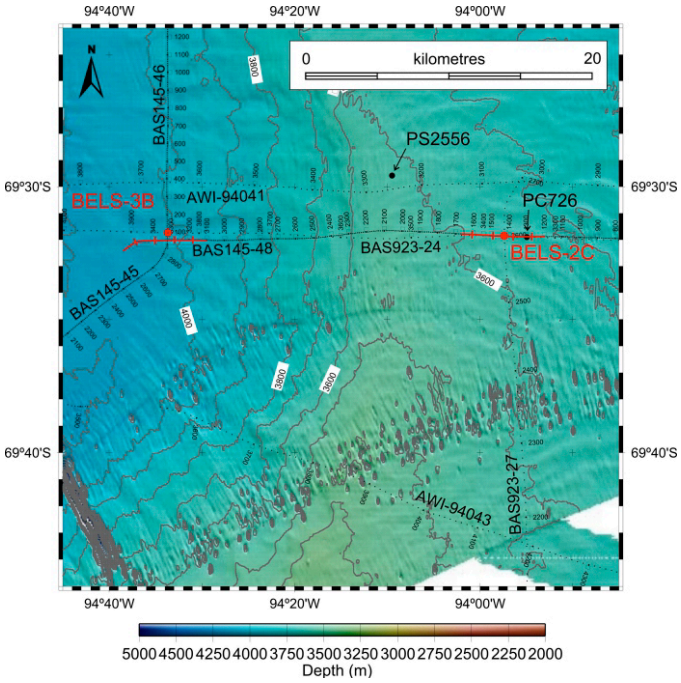
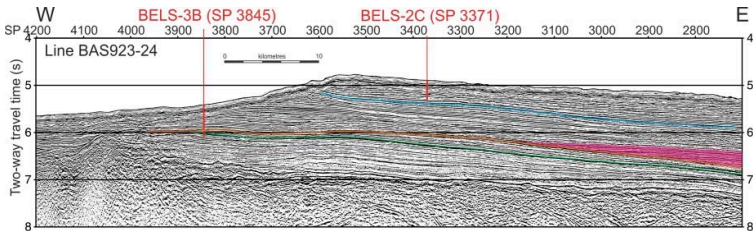


Figure AF6. Contoured bathymetric map and seismic reflection Profiles BAS923-24 and BAS923-27 showing location of proposed Site BELS-02C. XCB = extended core barrel, SP = shotpoint.

Site BELS-02C

Position:	69.5308°S, 93.9563°W Seismic Line BAS923-24, SP 3371 Seismic Line BAS923-27, SP 2600
Water depth (m):	3632
Depth of penetration (mbsf):	350
Site-specific objective(s):	Pliocene–Quaternary paleoceanography and history of West Antarctic Ice Sheet (WAIS)
Location, bathymetry, and site selection criteria:	Site is located on a sediment drift on the continental rise of the western Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain near-continuous high-resolution records of Pliocene to Quaternary sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	Triple APC to refusal, XCB until core quality deteriorates





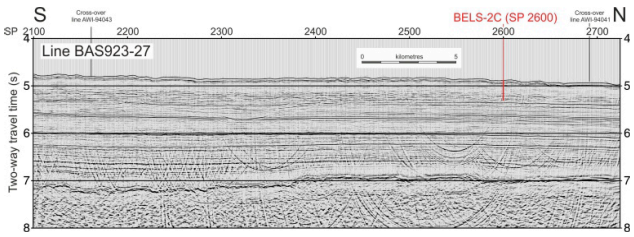
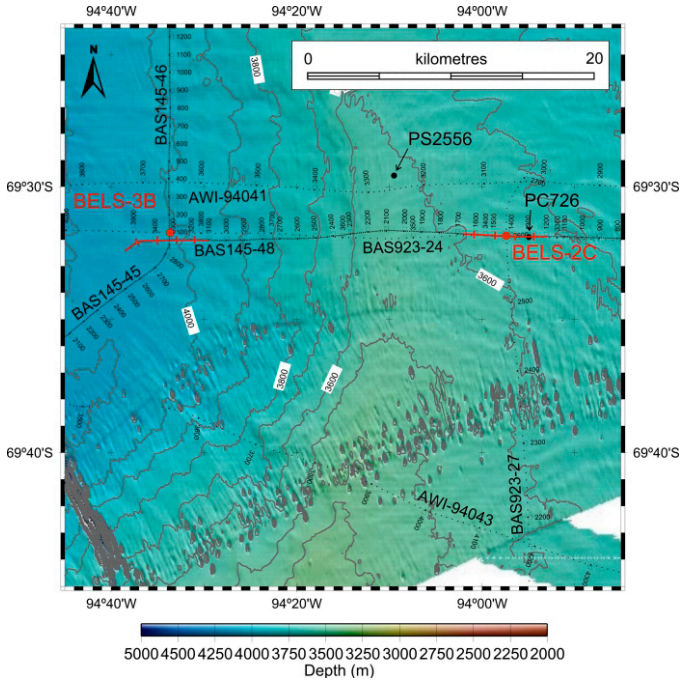
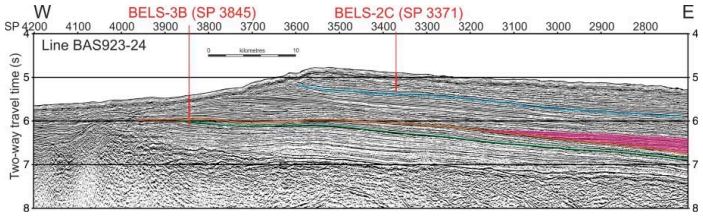


Figure AF7. Contoured bathymetric map and seismic reflection Profiles BAS923-24 and BAS145-46 showing location of proposed Site BELS-03B. Triple combo = triple combination logging tool, FMS = Formation MicroScanner logging tool.

Site BELS-03B

Position:	69.5290°S, 94.5610°W Seismic Line BAS923-24, SP 3845 Seismic Line BAS145-46, CDP 98
Water depth (m):	4024
Depth of penetration (mbsf):	600
Site-specific objective(s):	Early Cenozoic paleoceanography
Location, bathymetry, and site selection criteria:	Site is located on western flank of a sediment drift on the continental rise of the western Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain early Cenozoic sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	• Triple APC to refusal, XCB until core quality deteriorates • Downhole: triple combo, FMS-sonic





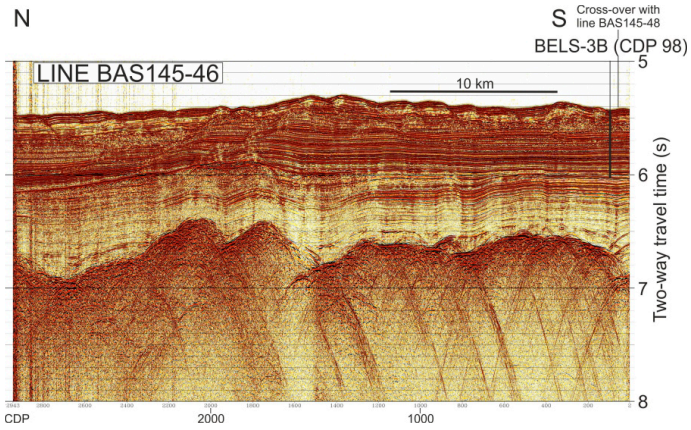
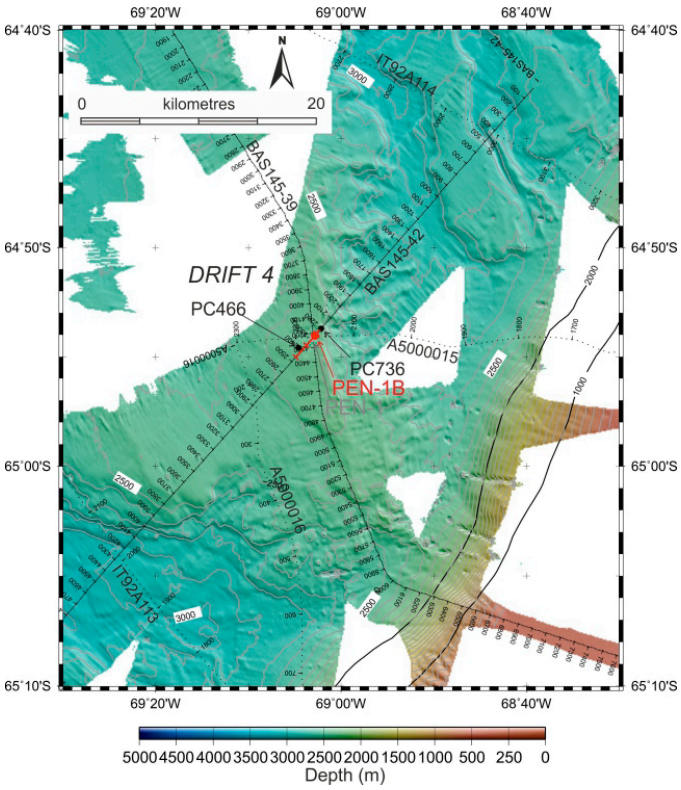
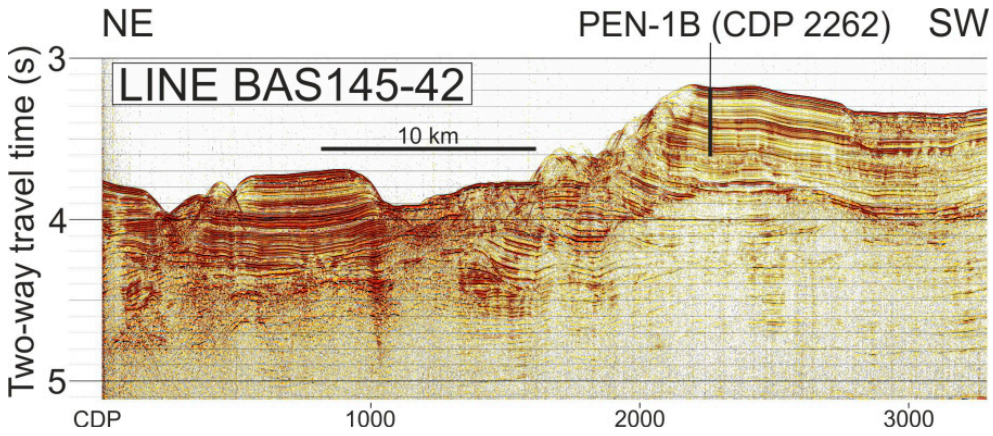


Figure AF8. Contoured bathymetric map and seismic reflection Profiles BAS145-42 and A5000015 showing location of proposed Site PEN-01B.

Site PEN-01B

Position:	64.9006°S, 69.0467°W Seismic Line BAS145-42, CDP 2262 Seismic Line A5000015, 220 m from SP 2170
Water depth (m):	2365
Depth of penetration (mbsf):	350
Site-specific objective(s):	Pliocene–Quaternary paleoceanography and history of Antarctic Peninsula Ice Sheet (APIS)
Location, bathymetry, and site selection criteria:	Site is located on a sediment drift on the continental rise of the eastern Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain continuous high-resolution Pliocene to Quaternary sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	Triple APC to refusal





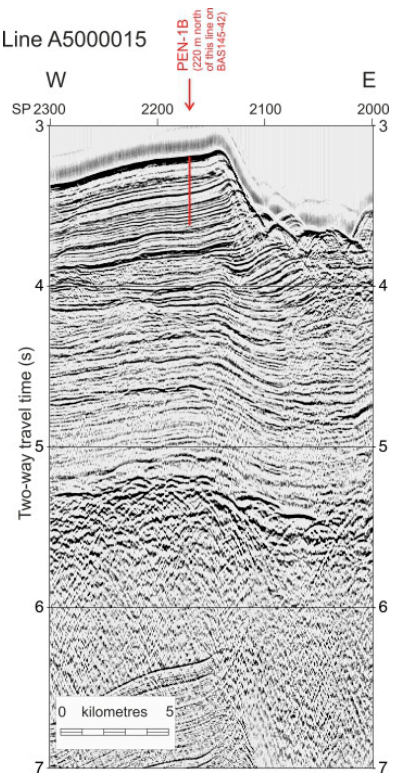
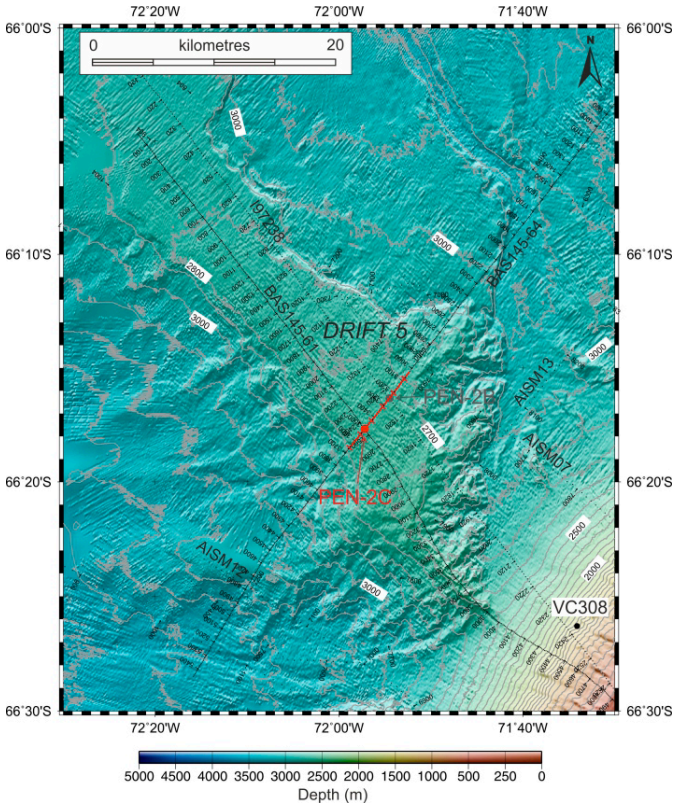
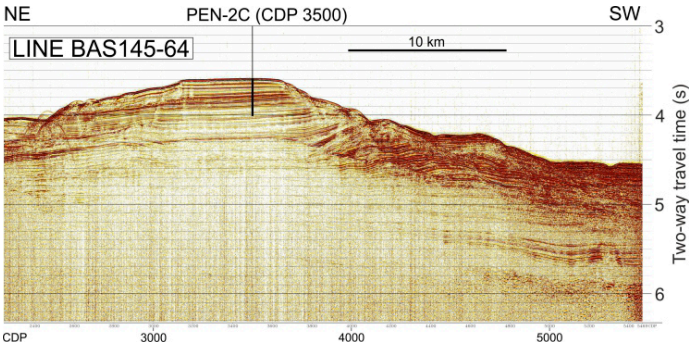


Figure AF9. Contoured bathymetric map and seismic reflection Profiles BAS145-64 and BAS145-61 showing location of proposed Site PEN-02C.

Site PEN-02C

Position:	66.2946°S, 71.9534°W Seismic Line BAS145-64, CDP 3500 Seismic Line BAS145-61, CDP 2453
Water depth (m):	2650
Depth of penetration (mbsf):	350
Site-specific objective(s):	Pliocene–Quaternary paleoceanography and history of Antarctic Peninsula Ice Sheet (APIS)
Location, bathymetry, and site selection criteria:	Site is located on a sediment drift on the continental rise of the eastern Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain continuous high-resolution Pliocene to Quaternary sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	Triple APC to refusal





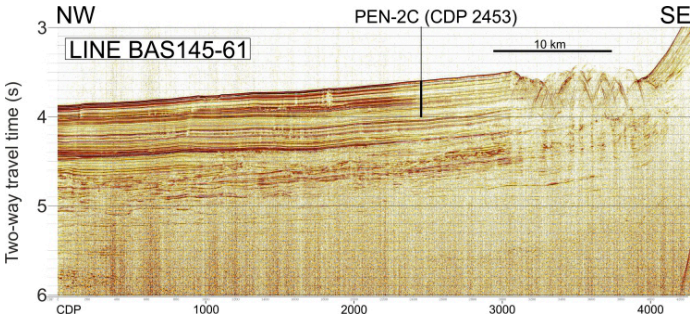
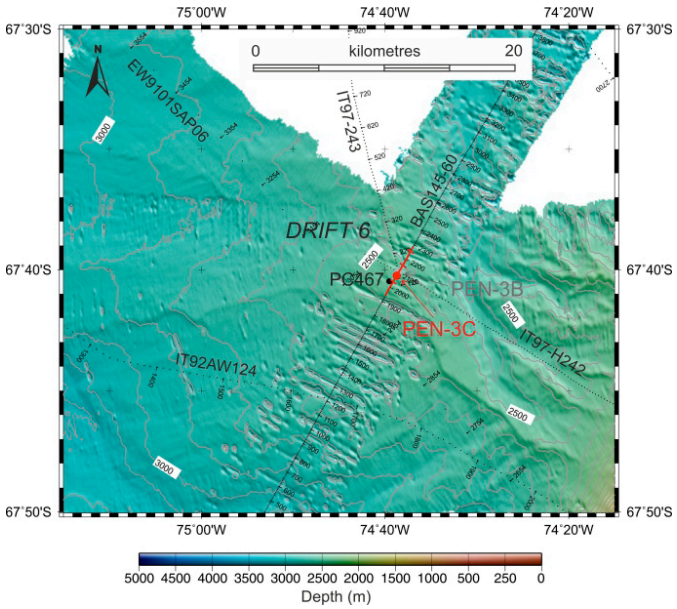
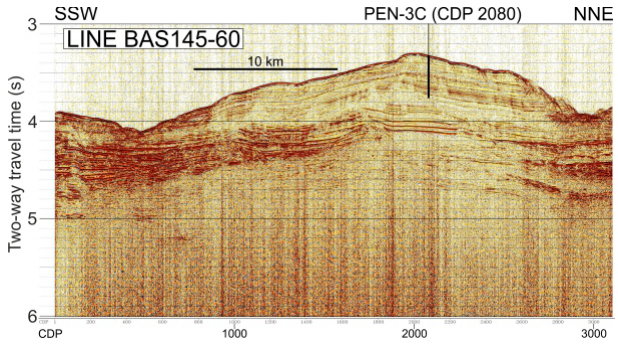


Figure AF10. Contoured bathymetric map and seismic reflection Profiles BAS145-60 and IT97-243 showing location of proposed Site PEN-03C.

Site PEN-03C

Position:	67.6707°S, 74.6453°W Seismic Line BAS145-60, CDP 2080 Seismic Line IT97-243, SP 160
Water depth (m):	2445
Depth of penetration (mbsf):	300
Site-specific objective(s):	Pliocene–Quaternary paleoceanography and history of Antarctic Peninsula Ice Sheet (APIS)
Location, bathymetry, and site selection criteria:	Site is located on a sediment drift on the continental rise of the eastern Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain continuous high-resolution Pliocene to Quaternary sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	Triple APC to refusal





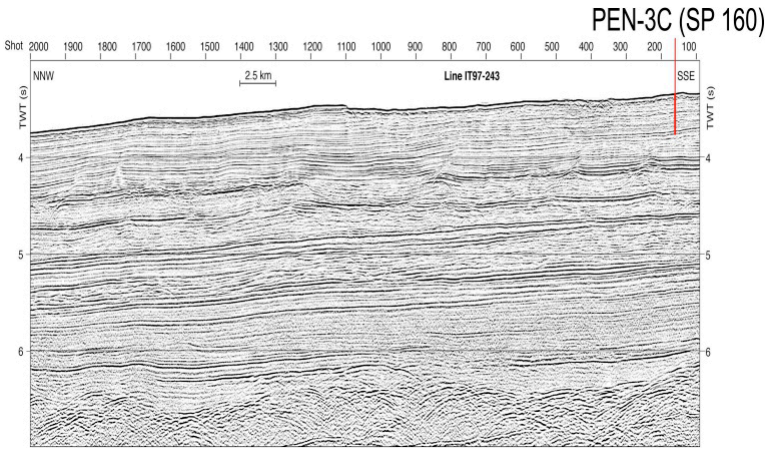
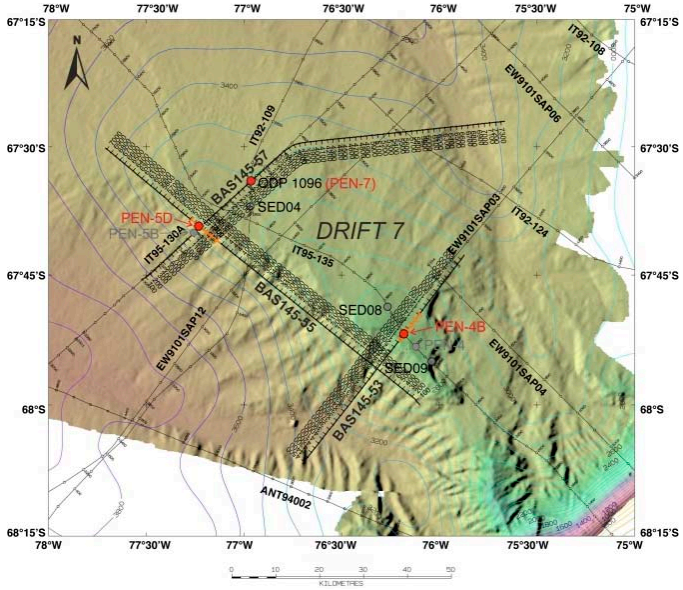
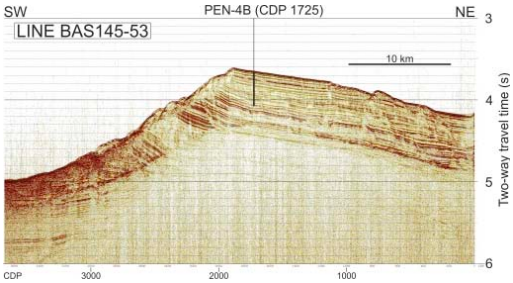


Figure AF11. Contoured bathymetric map and seismic reflection Profiles BAS145-53 and IT95-135 showing location of proposed Site PEN-04B.

Site PEN-04B

Position:	67.8643°S, 76.1793°W Seismic Line BAS145-53, CDP 1725 Seismic Line IT95-135, SP 3320
Water depth (m):	2700
Depth of penetration (mbsf):	350
Site-specific objective(s):	Pliocene–Quaternary paleoceanography and history of Antarctic Peninsula Ice Sheet (APIS)
Location, bathymetry, and site selection criteria:	Site is located on a sediment drift on the continental rise of the central Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain continuous high-resolution Pliocene to Quaternary sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	Triple APC to refusal





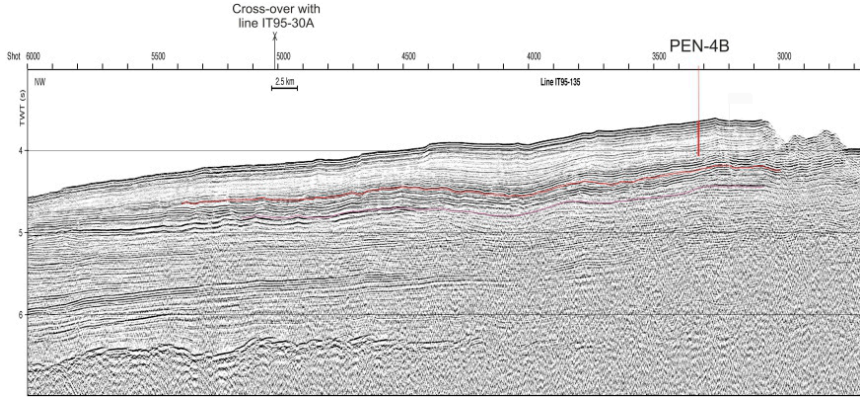
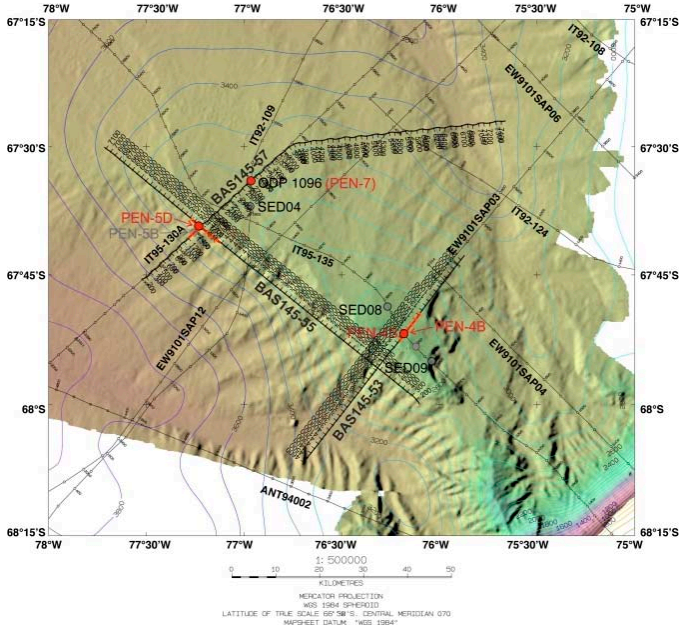
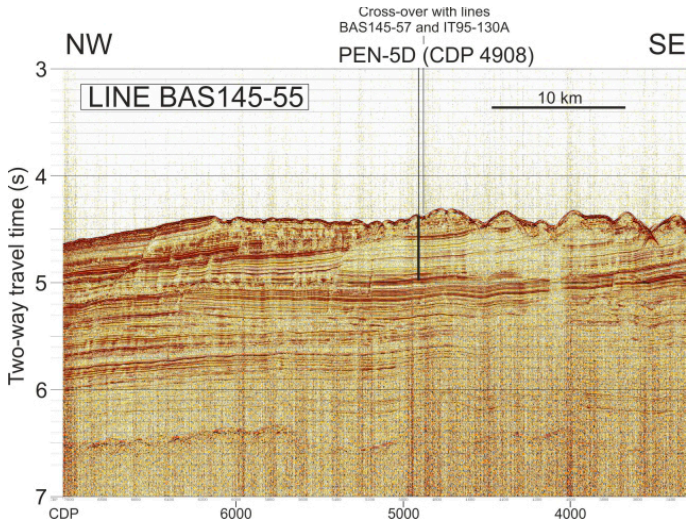


Figure AF12. Contoured bathymetric map and seismic reflection Profiles BAS145-55 and IT95-130A showing location of proposed Site PEN-05D.

Site PEN-05D

Position:	67.6546°S, 77.2307°W Seismic Line BAS145-55, CDP 4908 Seismic Line IT95-130A, 375 m from SP 3650
Water depth (m):	3225
Depth of penetration (mbsf):	500
Site-specific objective(s):	Late Miocene paleoceanography and history of Antarctic Peninsula Ice Sheet (APIS)
Location, bathymetry, and site selection criteria:	Site is located on a sediment drift on the continental rise of the central Bellingshausen Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain continuous high-resolution late Miocene sequences.
Expected nature of section:	Diatom/foraminifer-bearing silty clay
Planned type of coring, sampling, and logging:	• Triple APC to refusal, XCB until core quality deteriorates • Downhole: triple combo, FMS-sonic





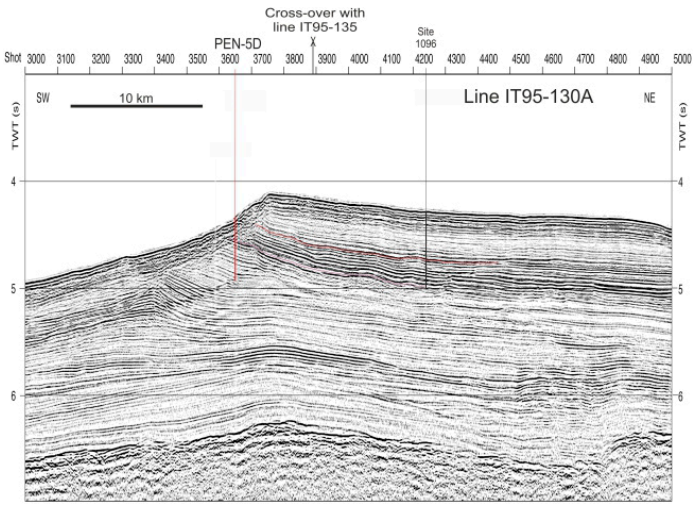
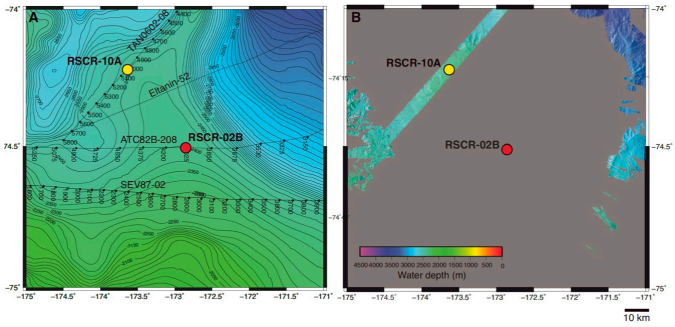


Figure AF13. Contoured bathymetric map (with multibeam swath on the right map) and seismic reflection Profile TAN0602-08 showing location of Site U1524 (RSCR-10A). APCT-3 = advanced piston corer temperature tool, MCS = multichannel seismic, RCB = rotary core barrel, VSI = Vertical Seismic Imager.

Site RSCR-10A (Site U1524)

Position:	74.21739°S, 173.63372°W Seismic Line TAN0602-08, CDP 5000
Water depth (m):	2390
Depth of penetration (mbsf):	1000
Site-specific objective(s):	• Obtain a near-continuous post-RSU3 (mid-Miocene to Pleistocene?) and pre-RSU3 (mid-Miocene to Pliocene) sediment sequence to provide a high-resolution chronology and an ice-distal record of glacial–interglacial cycles • Recover a high-resolution record for correlation to inner and outer shelf records and mid- to high-latitude deep-sea records of glacial and environmental change • Reconstruct Antarctic Slope Current
Location, bathymetry, and site selection criteria:	Site is located on the continental rise of the Ross Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain near-continuous records of Pleistocene to mid-Miocene sequences. One high-quality MCS line crosses over site.
Expected nature of section:	Diatom-bearing mud with dispersed clasts
Planned type of coring, sampling, and logging:	Operations depend on the amount of time available. The primary unmet objective is to recover the mid-Miocene Climatic Optimum. This would involve drilling without coring from the seafloor to 299 or 441 m, the previous total depths for Holes U1524A and U1524C, respectively, and then RCB coring to 1000 mbsf with nonmagnetic core barrels followed by downhole logging with all three tool strings (triple combo, FMS-sonic, and VSI). If this process is completed and more time is available, then additional priorities would be to re-core from 299 to 441 m (RCB or XCB) to increase coverage and APC core from the seafloor to ~270 m to be able to create a complete section when combined with Expedition 374 cores/data.



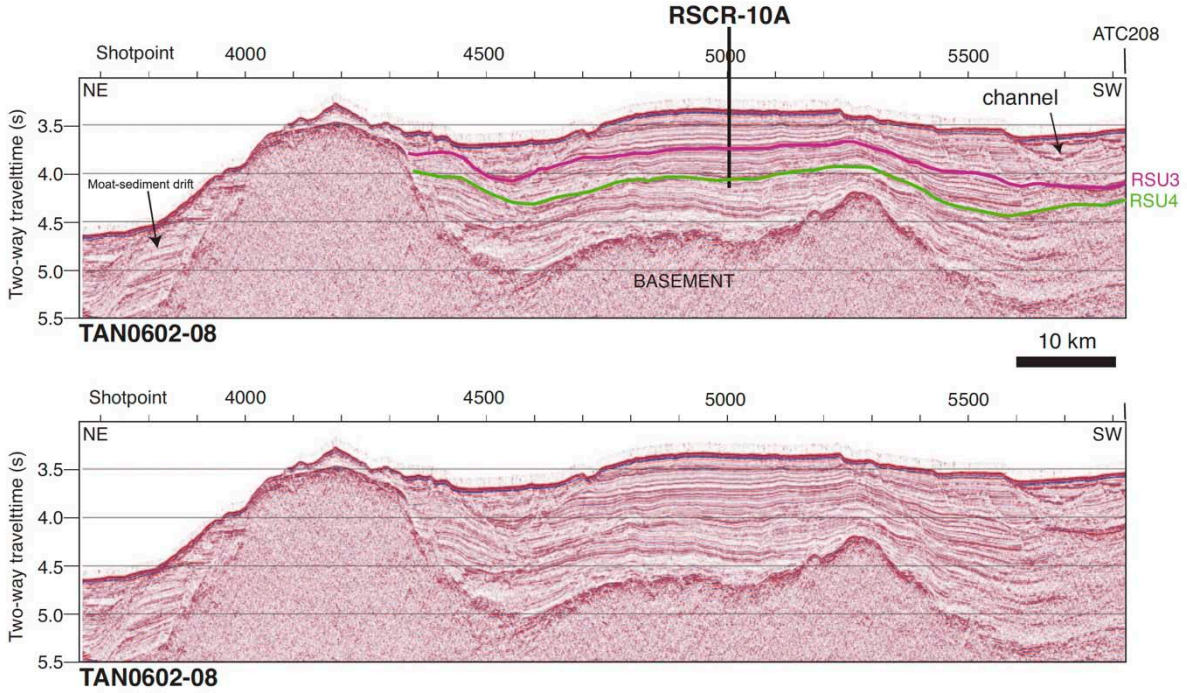
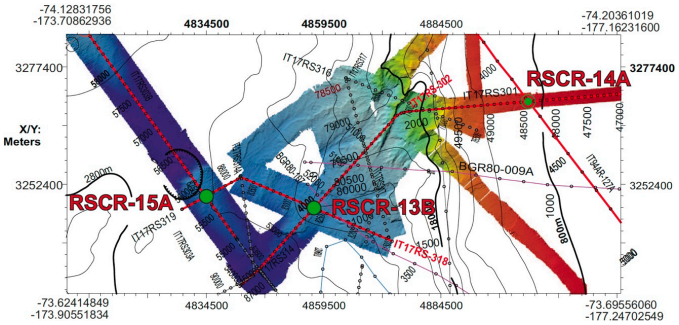
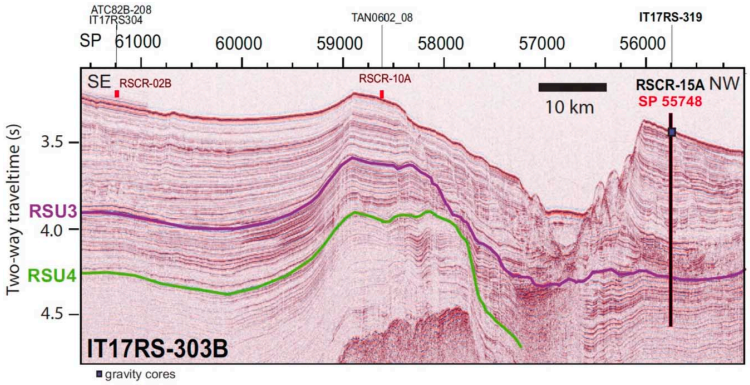


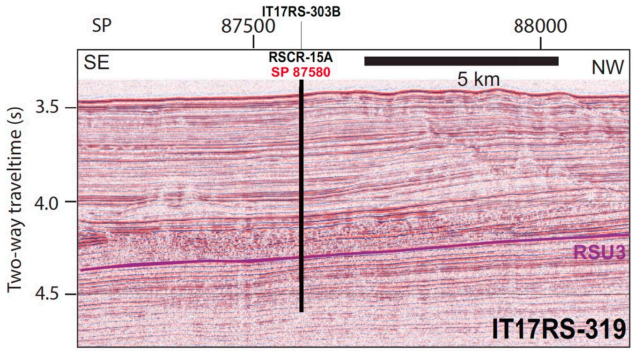
Figure AF14. Contoured bathymetric map and seismic reflection Profiles IT17RS-303B and IT17RS-319 showing location of proposed Site RSCR-15A.

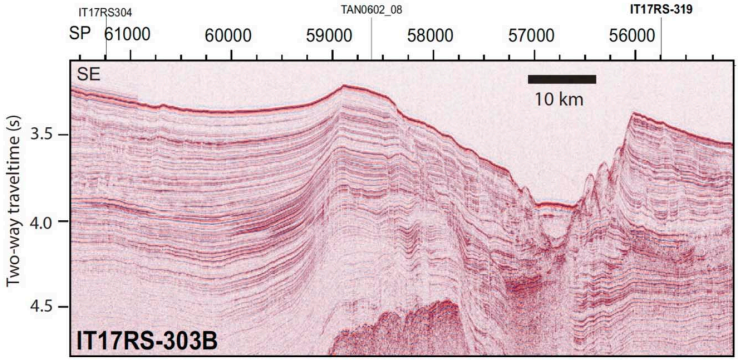
Site RSCR-15A

Position:	73.920300°S, 174.598800°W Seismic Line IT17RS-303B, CDP 55748 Seismic Line IT17RS-319, CDP 87580
Water depth (m):	2475
Depth of penetration (mbsf):	1000
Site-specific objective(s):	• Obtain a near-continuous post-RSU3 (mid-Miocene to Pleistocene?) and pre-RSU3 (mid-Miocene to Pliocene) sediment sequence to provide a high-resolution chronology and an ice-distal record of glacial–interglacial cycles • Recover a high-resolution record for correlation to inner and outer shelf records and mid- to high-latitude deep-sea records of glacial and environmental change • Reconstruct Antarctic Slope Current vigor and Ross Sea bottom water production
Location, bathymetry, and site selection criteria:	Site is located on the continental rise of the Ross Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain near-continuous records of Pleistocene to mid-Miocene sequences. Two high-quality MCS lines cross over site.
Expected nature of section:	Turbiditic/contouritic mud alternating with hemipelagic biogenic mud
Planned type of coring, sampling, and logging:	• Hole A: APC to 250 mbsf with nonmagnetic core barrels, orientation (Icefield MI-5 core orientation tool), and APCT-3 • Hole B: APC to 350 mbsf with nonmagnetic core barrels and orientation, XCB to 500 mbsf • Hole C: RCB to 1000 mbsf with nonmagnetic core barrels • Downhole: Hole C: triple combo, FMS-sonic, VSI









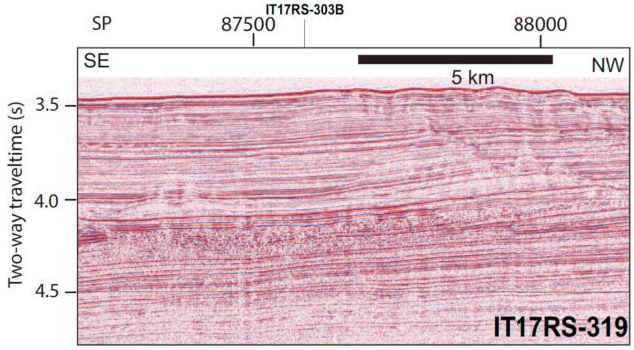
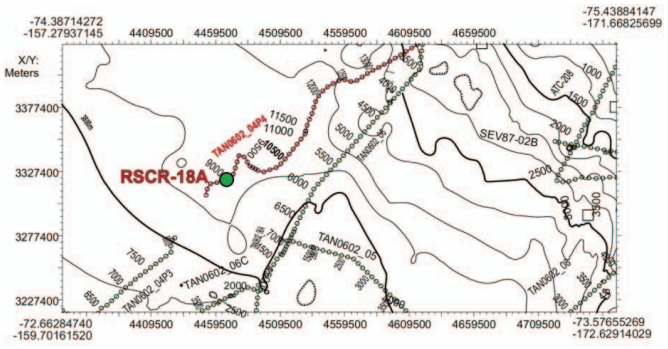


Figure AF15. Contoured bathymetric map and seismic reflection Profile TAN0602-04P4 showing location of proposed Site RSCR-18A.

Site RSCR-18A

Position:	73.910571°S, 162.456325°W Seismic Line TAN0602-04P4, CDP 9000
Water depth (m):	3650
Depth of penetration (mbsf):	650
Site-specific objective(s):	• Obtain a near-continuous Pliocene/late Miocene? to present sediment sequence to provide a high-resolution chronology and an ice-distal record of glacial–interglacial cycles • Recover a high-resolution record for correlation to inner and outer shelf records and mid- to high-latitude deep-sea records of glacial and environmental change • Reconstruct Antarctic Slope Current vigor and Ross Sea bottom water production
Location, bathymetry, and site selection criteria:	Site is located on the continental rise of the Ross Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain near-continuous records of Pliocene to late-Miocene sequences. One high-quality MCS line crosses over site.
Expected nature of section:	Drift sediments
Planned type of coring, sampling, and logging:	• Hole A: APC to 250 mbsf with nonmagnetic core barrels, orientation (Icefield MI-5 core orientation tool), and APCT-3 • Hole B: APC to 250 mbsf with nonmagnetic core barrels and orientation, XCB to 500 mbsf • Hole C: RCB to 650 mbsf with nonmagnetic core barrels • Downhole: Hole C: triple combo, FMS-sonic, VSI



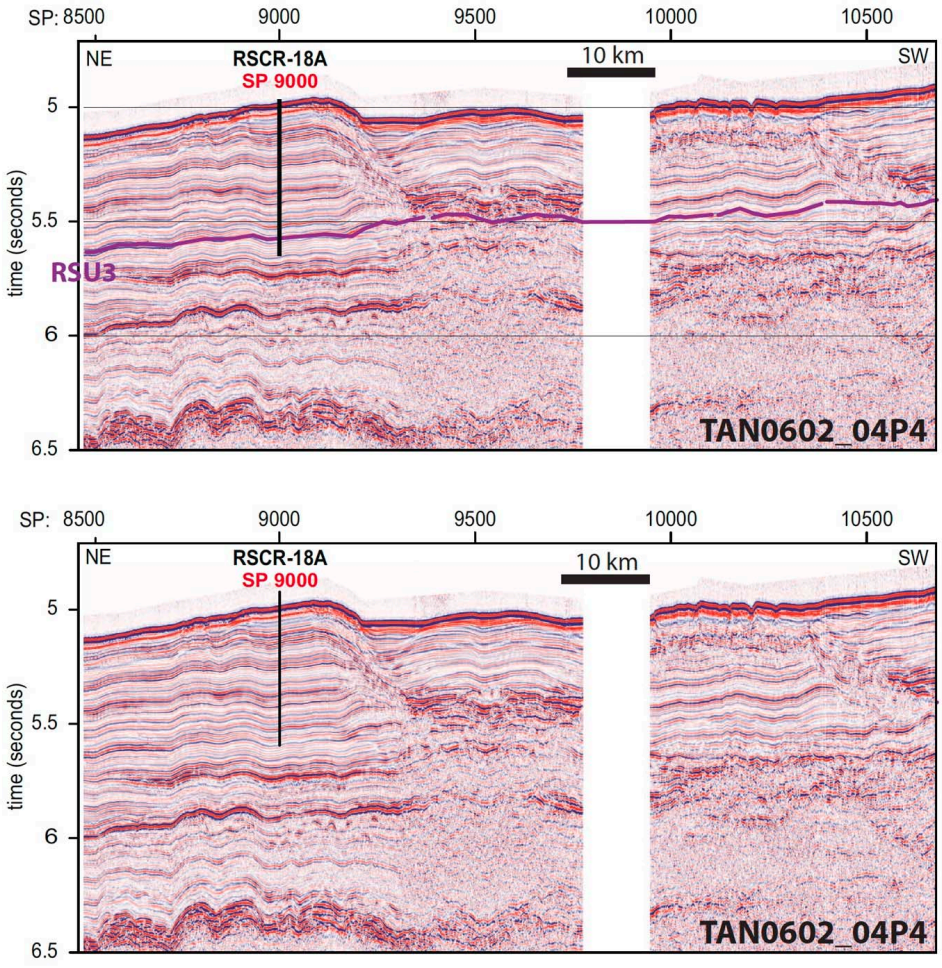


Figure AF16. Contoured bathymetric map and seismic reflection Profile AWI-20100107 showing location of proposed Site RSCR-19A. Bottom: Seismic reflection Profile AWI-20100107 with location of proposed Site RSCR-19A. Red bar = reduced penetration depth as approved by the Environmental Protection and Safety Panel (EPSP).

Site RSCR-19A

Position:	70.327650°S, 164.70000°W Seismic Line AWI-20100107, CDP 6950
Water depth (m):	4250
Depth of penetration (mbsf):	465 m (EPSP restricted)
Site-specific objective(s):	• Obtain a near-continuous Eocene to present sediment sequence to provide a high-resolution chronology and an ice-distal record of glacial–interglacial cycles • Recover a high-resolution record for correlation to inner and outer shelf records and mid- to high-latitude deep-sea records of glacial and environmental change • Reconstruct Antarctic Slope Current vigor and Ross Sea bottom water production
Location, bathymetry, and site selection criteria:	Site is located on the outer continental rise of the Ross Sea. Bathymetric dip is <5%. Site is selected because it is expected to obtain records of high-resolution and continuous Quaternary to Eocene sequences. One high-quality MCS line crosses over site.
Expected nature of section:	Deep-sea sediments
Planned type of coring, sampling, and logging:	• Hole A: APC to 250 mbsf with nonmagnetic core barrels, orientation (Icefield MI-5 core orientation tool), and APCT-3 • Hole B: APC to 250 mbsf with nonmagnetic core barrels and orientation, XCB to 500 mbsf • Hole C: RCB or XCB as needed to 465 mbsf with nonmagnetic core barrels • Downhole: Hole C: triple combo, FMS-sonic, VSI