Figure F1. Seismic data coverage and magnetic anomalies of the SCS Basin, Expeditions 367 and 368. Black lines = ocean-bottom seismometer refraction data. Other seismic lines are mostly multichannel seismic reflection data. White stars = Expedition 367/368 sites, red squares = Leg 184 sites, red circles = Expedition 349 sites. For more detail, see Figure F2.

Figure F2. A, B. North SCS margin with seismic coverage of 2-D, time-migrated multichannel seismic reflection data, and ocean-bottom seismometer data. Seismic profiles across Site U1500 are shown in Figure F4. Magnetic chron number is after Briais et al. (1993). Thick blue lines and red lines = key regional seismic lines used for planning the drilling transect, orange lines (in A) and pink rectangles (in B) = magnetic lineations within the ocean crust, red stars = Expedition 367/368 sites, orange square = Leg 184 Site 1148, yellow squares = Expedition 349 Sites U1432 and U1435.

Figure F3. Two-way traveltime to (A) basement (Tg reflector) and (B) Unconformity T60 with the location of Expedition 367/368 sites indicated. Proposed drilling transect (thick black line) was located approximately at the center of a margin segment bounded to the southwest by a transform fault. Northeastern boundary of margin segment is located around Expedition 349 Site U1435. In this location, the outer margin high and Ridge A seem to coalesce, and Ridges B and C of the COT become indistinct toward the northeast within the next margin segment. Note that outer margin high is slightly oblique to the more parallel Ridges A, B, and C.

Figure F4. Original and interpreted multichannel seismic reflection profiles across Site U1500. Site U1500 is located on seismic Profile 08ec1555 and projected 75 m onto seismic Profile 15ecLW4. Red text and tick marks = locations of crossing seismic lines, red lines = faults interpreted from the seismic data. CDP = common depth point. All seismic profiles are courtesy of the Chinese National Offshore Oil Corporation [CNOOC]).

Figure F5. Uninterpreted and interpreted seismic profiles and sequence correlation between Sites U1499 and U1500.

Figure F6. A–D. Schematic development of continental breakup initiated by a simple shear along a deep, low-angle fault. B–D are slightly modified from Huismans and Beaumont (2011) and illustrate modeling-based stages of extension at magma-poor rifted margins of the Iberia-Newfoundland type. Key features of D are thinning of upper crust, juxtaposition of lower crust (e.g., Site U1499), and serpentinized mantle (Site U1500) between outer margin and igneous oceanic crust. UP = upper plate, LP = lower plate.

Figure F7. A–E. Composite figures redrawn from models in Huismans and Beaumont (2011), Sibuet and Tucholke (2012), Makris et al. (2012), and Sun et al. (2016) showing spectrum of possible magma-poor rifted margin models based on rheological differences. These models suggest that lithospheric layers with relatively lower strength will tend to stretch and thin more than other layers. Thus, COT may be dominated by these weaker layers. D features a strong lower crust overlying a weak, wet upper mantle, resulting in upper subcontinental (serpentinized) mantle dominating the COT. C shows a particularly interesting alternative in which moderately weaker lower crust leads to its exhumation in the COT. UCC = upper continental crust, LCC = lower continental crust, UCM = upper continental mantle, UOM = upper oceanic mantle, OC = oceanic crust.

Figure F8. Uninterpreted and simplified interpretation of seismic Profile 1555. Note the seaward shallowing of interpreted Mohorovicic seismic discontinuity (Moho) seismic reflection and presence of major detachment faults that seem to sole out between the upper and middle/lower crust. Although general location of the COT (question marks) is well constrained by both this seismic profile and Figure F9, details of crustal structure within the COT are not well constrained. Seismic line in Figure F9 images this zone slightly better, in particular the Moho. Location of ocean floor magnetic Lineations C11n to C9n are projected from Figure F2B. MSB = midslope basin.

Figure F9. Uninterpreted and simplified interpretation of seismic Profile 1530. Note the presence of reflectors interpreted as major detachment faults that seem to sole out between the upper and middle/lower crust in the outer margin high. Location of ocean floor magnetic lineations C11n to C9n are projected from maps in Figure F2B.

Figure F10. Hole U1500B reentry system and casing.

Figure F11. Lithostratigraphic summary of Site U1500 with simplified lithology and unit description of combined Holes U1500A and U1500B.

Figure F12. Correlation of lithostratigraphic units with magnetic susceptibility, reflectance spectroscopy, and carbonate contents, Site U1500. Magnetic susceptibility and reflectance spectroscopy are displayed as a 10-point running average.

Figure F13. Bulk mineralogy with major mineral compositions and correlation of calcite with carbonate contents, Site U1500.

Figure F14. Heavily bioturbated nannofossil-rich clay between two darker clay intervals, Unit I. Abundant (A) discoasters (plane-polarized light [PPL]) and (B) coccolithophores (cross-polarized light [XPL]).

Figure F15. A. Entire recovered interval from Core 367-U1500A-11R (5 cm), Unit II. Well-lithified greenish gray sandstone fragments with mud clasts. B. Foraminiferal siltstone, Unit II.

Figure F16. Turbidite sequences and sedimentary structures within claystone and sandstone intervals, Unit III. A. Cross-stratification and climbing ripple beds in foraminiferal sandstone. B. Sandstone with biogenic carbonate containing mud clasts. C. Parallel laminations in foraminiferal sandstone. D. Contorted strata within carbonate-rich, coarse-grained interval highlighted by folded light and dark laminations.

Figure F17. Patterns of color banding and sedimentary structures, Unit IV. A. Coarser grained sediment organized into parallel laminations with heavy bioturbation at the base of the fragmented interval. B. Small fining-upward sequence that transitions from light-colored sand to heavily bioturbated clay. C. Heavily bioturbated clay transitioning to clay-rich parallel laminations that are overlain by cross-stratified sandstone that fines upward into clay-rich wavy lamination.

Figure F18. Sandstone intervals in Unit IV with feldspar (Fld), foraminifer shells (Foram), quartz (Qtz), glauconite (Glc), and carbonate cement, Hole U1500B. A. 23R-1, 69–71 cm. B. 24R-1, 16–18 cm. The sediment within the possible bryozoan microfossil is altering to glauconite. C, D. 33R-CC, 0–3 cm. Sample in C contains chert lithic grains, quartz, feldspar, carbonate cement, and mica (another common mineral in these sandstones). Sample in D contains a foraminifer shell filled with glauconite, quartz and feldspar grains, and carbonate cement.

Figure F19. Transitions between subunits, Unit V. A. Silty clay with clay minerals, rare calcite, and no nannofossils. B. Foraminifer-rich sandstone with foraminifer fragments, quartz, feldspar, chlorite, and glauconite. C. Nannofossil-rich claystone with abundant discoasters, clay minerals, and unknown opaque material. D. Nannofossil-rich claystone with abundant nannofossils, clay minerals, and Fe oxides. E. Clay-rich chalk with clay-sized carbonate material, clay minerals, and Fe oxides.

Figure F20. Contacts between Units VI, VII, and VIII, Hole U1500B. A. Nannofossil-rich claystone with abundant nannofossils, quartz, feldspar, organic material, and clay minerals (55R-3). B. Sandstone with quartz, glauconite, feldspar, foraminifer fragments, and calcite cement (56R-1). C. Claystone with abundant clay minerals, lithic grains, and Fe oxides but no nannofossils (57R-1). D. Abrupt contact between claystone in Unit VII and basalt in Unit VIII. E. Clay-filled fracture within basalt of Unit VIII.

Figure F21. Claystone-filled fracture/vein within basalt. Star = location of smear slide images in A and B. A. Discoaster nannofossil and other siliciclastic components (PPL). B. Authigenic calcite and rare calcareous nannofossils (XPL).

Figure F22. Trace fossils in claystone and chalk intervals. A. Gray chalk interval within dark gray-brown claystone with *Scolicia* and *Nereites* trace fossils (367-U1500B-5R-2, 98–106 cm). B. Greenish gray claystone with biogenic carbonate with *Chondrites* trace fossils (367-U1500A-26R-4, 66–72 cm). C. Dusky red claystone with *Planolites* trace fossils (367-U1500B-45R-3, 90–102 cm). D. Dark reddish gray calcareous-rich claystone with *Zoophycos* trace fossils (46R-2, 55–64 cm).

Figure F23. Lithostratigraphic summary of Unit VIII basalts showing lithology, lava flow types, and igneous Subunits 1a and 1b, Hole U1500B.

Figure F24. Homogeneous sparsely vesicular and sparsely to moderately plagioclase phyric basalts spanning 27 m in Hole U1500B interspersed with minor chilled margins (from left to right: 57R-5, 0–50 cm, 58R-4, 0–50 cm, 59R-4, 60–110 cm, and 59R-7, 30–90 cm), grading downhole into moderately to highly plagioclase phyric basalts with a higher abundance of glassy chilled margins and baked sediments (pillow lava flows; from left to right: 60R-1, 60–110 cm, 60R-2, 0–50 cm, 69R-5, 1–50 cm, and 71R-1, 75–125 cm). A. Sparsely plagioclase phyric basalt with sparse vesicularity (57R-5, 33–38 cm). B. Haloed vein containing carbonates and Fe (hydr)oxides with 2 cm thick alteration halo (59R-4, 91–96 cm). Alteration of host basalt is predominantly focused on groundmass alteration of glass to low-temperature green-yellow alteration minerals (e.g., zeolites or chlorite) and localized replacement of plagioclase by carbonate. C. Upper rim of sample with a black glassy chilled margin grading into aphyric basalt (dark gray) and a joint perpendicular to the glassy margin (60R-1, 90–95 cm). D. Hyaloclastite with mixing of rounded to angular quenched basaltic glass shards with baked claystone (69R-5, 6–13 cm). E. Highly plagioclase phyric basalt with sparse vesicles (69R-5, 4–9 cm). F. Basaltic chilled margin with a sharp contact to a baked reddish calcareous sandy claystone (top of section to the left; 71R-1, 106–120 cm).

Figure F25. Unit VIII basalts highlighting all observed chilled contacts and (glassy) margins (dashed yellow lines), Hole U1500B. (Continued on next two pages.)

Figure F25 (continued). (Continued on next page.)

Figure F25 (continued).

Figure F26. Pillow basalts with glassy chilled rims and hypocrystalline interiors, Hole U1500B. Polycrystalline carbonate veins and Fe (hydr)oxide halos were observed within the pillow basalt. A. 69R-4, 19–50 cm. B. 66R-1A, 75–84 cm. C. 64R-3A, 61–71 cm.

Figure F27. Representative textures observed in hypocrystalline basalts, Hole U1500B (XPL). A. Fine-grained basalt with plagioclase (Plg) phenocrysts embedded in microcrystalline groundmass of plagioclase microphenocrysts, interstitial clinopyroxene, and altered interstitial glass (interstitial dark green) (68R-3, 56–60 cm). Note the presence of a filled round vesicle (Ves). B. Medium-grained basalt with plagioclase phenocrysts embedded in a groundmass of subophitic texture showing plagioclase laths intergrown with clinopyroxene (Cpx) (59R-5, 112–114 cm). Note the presence of altered interstitial glass (Gl). C. Holohyaline to hypohyaline chilled margin with preserved basaltic glass (brown in PPL) and plagioclase phenocrysts increasingly nucleating away from the holohyaline rim (74R-1, 117–121 cm). Chilled margin is crosscut by calcite-bearing veins (Cc).

Figure F28. Representative primary rock-forming minerals and textures of basalts, Hole U1500B (XPL). A. Subhedral to euhedral plagioclase phenocrysts (Plg) found throughout Unit VIII basalts show resorption textures, inherited cores, and oscillatory zoning (59R-1, 67–70 cm). B. Olivine phenocryst (Ol) (59R-5, 112–114 cm). C. Subophitic texture showing poikilitic clinopyroxene (Cpx) enclosing laths of plagioclase (59R-5, 112–114 cm). D. Quenched texture showing plagioclase phenocrysts within radially oriented, dendritic intergrowths of plagioclase and clinopyroxene (59R-1, 67–70 cm). E. Intersertal texture in groundmass showing swallow-tail plagioclase with radially oriented, dendritic clinopyroxene (60R-4, 135–138 cm). F. Intersertal texture of swallow-tail plagioclase and comb-texture clinopyroxene with altered interstitial glass (60R-4, 135–138 cm).

Figure F29. Lithostratigraphic summary with bedding dips, Site U1500.

Figure F30. Sedimentary and deformation structures in Units I–III, Hole U1500A. A. Normal fault. B. Millimeter-scale faults and contorted beds. C. Synsedimentary folds. D. Oriented claystone clasts in sandstone with clay. E. Synsedimentary folds in sandstone. F. Subrounded mud clasts in sandstone.

Figure F31. Sedimentary and deformation structures in Units IV–VII, Hole U1500B. A. Compaction fault in Unit IV with a slickenside. B. Synsedimentary fold. C. Pyrite vein. D. Slickenside of one fault in Unit VI.

Figure F32. Igneous structures in Unit VIII, Hole U1500B. A. Open fracture with a halo. B. Vein perpendicular to chilled glassy selvage. C. Haloed carbonate and Fe oxide vein. D. Haloed vein. E. Neptunian dike. F. Carbonate vein network within a glassy margin. G. Tilted sedimentary bedding. H. Angular basalt and sediment clasts in a carbonate vein.

Figure F33. Whole-round images, Hole U1500B.

Figure F34. Stereographic projection of Unit VIII fractures and veins in core reference frame, Site U1500. Note random orientations of the fractures and veins.

Figure F35. Age-depth model, Site U1500. Plotted event data are in Table T5.

Figure F36. Inclination of remanent magnetization, fraction of magnetization remaining after 25 mT AF treatment, magnitude of initial magnetization, and point magnetic susceptibility, Site U1500. Yellow squares = discrete sample ChRM inclination.

Figure F37. Demagnetization plots of (A, B) archive-half sections and (C–F) discrete samples. Stereographic plots: solid squares = positive (down) inclination, open squares = negative (up) inclination. A. Potential normal polarity. B. Potential reversed polarity. C. Normal polarity. Blue line = PCA calculated ChRM, red squares = measurements used in calculation. D, F. Reversed polarity. E. Normal polarity.

Figure F38. Demagnetization plots of (A, B) archive-half sections and (C, D) discrete samples, Hole U1500B basalts. Blue line = PCA calculated ChRM, red squares = measurements used in calculation. A, C. Normal polarity. B, D. Reversed polarity.

Figure F39. Magnetostratigraphy. Inclination: red = archive-half measurements after 25 mT treatment, yellow = discrete sample ChRM. Lithology column is simplified from shipboard core description (see Figure F11).

Figure F40. Magnetic property variation (367-U1500B-57R-2). Archive-half section inclination after 25 mT demagnetization, magnitude of magnetization, and point magnetic susceptibility. Note that the negative inclination at 1380.75 m correlates to fractures in core, higher magnetization remaining after 25 mT treatment, and a low in magnetic susceptibility.

Figure F41. Lithology, methane, calcium carbonate, TOC, and TOC/TN profiles, Site U1500.

Figure F42. Total alkalis ($Na_2O + K_2O$) vs. SiO_2 diagram (Le Maitre et al., 1989) showing analyses of samples from Sites U1500, U1431, U1433, and U1434 (Li et al., 2015b). All samples plot in subalkaline basalt field.

Figure F43. V vs. Ti (Shervais, 1982) diagram for basalts from Site U1500 compared to samples from Expedition 349 Sites U1431, U1433, and U1434 (Li et al., 2015b). All samples plot in MORB/back-arc basalt (BAB) field. OIB = ocean-island basalt.

Figure F44. Zr vs. Ti (Pearce and Cann, 1973) diagram showing analyses of basalts from Site U1500 compared to samples from Expedition 349 Sites U1431, U1433, U1434 (Li et al., 2015b). All samples plot in MORB field.

Figure F45. Physical property measurements, Holes U1500A and U1500B. Solid black line = boundary between sediment and basalt, dashed lines = lithostratigraphic unit boundaries (see Lithostratigraphy). Note that magnetic susceptibility (MS) plot has a log scale.

Figure F46. Physical properties measurements of Unit VIII basalts, Hole U1500B. Alteration rank observed by petrologists. Note that MS plot has a log scale.

Figure F47. Core NGR measurements, Holes U1500A and U1500B. Estimates of K, U, and Th concentrations are derived from NGR and GRA density measurements using the method of De Vleeschouwer et al. (2017).

Figure F48. A–C. Downhole logging tool string configurations for logging Runs 1–3, Hole U1500B. LEH-MT = logging equipment head-mud temperature. HLDS is without nuclear source.

Figure F49. Logging operations summary, Site U1500.

Figure F50. Deployment scheme of seismic source used during VSI tool string logging run.

Figure F51. MAD density and PWC velocity laboratory measurements and TDR adjusted to seafloor, Site U1500.

Figure F52. Site U1500 TDR compared to Sites U1499, U1431, U1433, and 1148 (Li et al., 2008).

Figure F53. Seismic section across Site U1500 (northwest–southeast). The site is located where the lithostratigraphic column is plotted (black = Unit I, yellow = Unit II, light blue = Unit III, blue = Unit IV, pink = Subunit VA, purple = Subunit VB, cyan = Unit VI, green = Unit VIII). Hole U1500A and U1500B core recovery is also shown (black = 100%, white = 0%). Other Site U1500 data are offset from site location. See CORRELATION in Supplementary material for original profile from Petrel software in the reversed direction.

Figure F54. Synthetic seismogram computed for the deeper part (800–1400 m) of Site U1500 (southeast–northwest). Panels from left to right: density (blue) and velocity (black) values, reflection coefficient (RC), and real seismic traces with synthetic seismogram inserted in the center. TVD = true vertical depth computed by Petrel program based on TDR quadratic equation given in TDRs from the velocity data and plotted in Figure F51.