Figure F1. Bathymetry and seismic lines, Site U1503.

Figure F2. Bathymetric maps with Expedition 367/368 sites (stars) and (A) regional and (B) local coverage of multichannel seismic reflection and ocean-bottom seismometer data. Thick blue and red lines are key seismic lines used for drilling transect planning. A. Magnetic isochrons (pink lines) from Briais et al. (1993). B. Magnetic picks (pink squares) from the same reference, extracted from the Seton et al. (2014) compilation. Chron labels for the picks correspond to the old edge of the normal polarity intervals (see Ogg et al. [2016] timescale for ages). Orange square = ODP Leg 184 Site 1148, yellow squares = IODP Expedition 349 Sites U1432 and U1435.

Figure F3. Two-way traveltime to (A) basement (Tg reflector) and (B) T60 unconformity. Proposed drilling transect (thick black line) is approximately at the center of a margin segment bounded to the southwest by a transform fault. Northeastern boundary of margin segment is around IODP Expedition 349 Site U1435. At this location, outer margin high (OMH) 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 the OMH is slightly oblique to the more parallel Ridges A, B, and C.

Figure F4. Deep crustal time-migrated seismic reflection data without and with interpretation. Note the rather thin lower crust (two layers) above a strong Mohorovičić seismic discontinuity (Moho) reflector that can be followed oceanward. Moho reflection is weak to absent seaward from around the interpreted COT. Wide-angle seismic data (Yan et al., 2001) confirm ~6 km thick ocean crust (OC) seaward of the COT. A large detachment fault ~150 km inland of the COT separates more stable crust landward from that of highly extended crust seaward. An OMH is a fairly consistent feature along this margin segment. Key seismic unconformities are shown in purple (T70; ~32 Ma breakup unconformity?) and blue (T60; ~23 Ma regional basin event). These ages are inferred from long-distance (>100 km) correlation of seismic unconformities with industry holes and ODP Leg 184 Site 1148 (T60); ages need confirmation by coring and are only tentative. Tg (black) is basement. Arrows = approximate positions of seafloor magnetic anomalies with chron numbers (from Briais et al., 1993). Seismic data are from Line 04ec1555-08ec1555 (courtesy of Chinese National Offshore Oil Corporation [CNOOC]). Location of line is shown in Figure F3. CDP = common depth point. C11n, C10n, and C9n = approximate location of normal polarity magnetic isochrons. MSB = midslope basin. P = projected.

Figure F5. Seismic Line 08ec1555, which is the primary seismic line for Site U1503, and crossing seismic line for proposed Site SCSII-30A. Dashed lines = unconformities, red solid lines = faults.

Figure F6. Crossing seismic Line 15ecLW5 for Site U1503. Dashed lines = unconformities.

Figure F7. Reentry system and casing, Hole U1503A.

Figure F8. Lithostratigraphic summary, Hole U1503A.

Figure F9. Lithostratigraphic units correlated with physical properties and carbonate content, Hole U1503A. MS = magnetic susceptibility.

Figure F10. XRD bulk mineralogy, Hole U1503A.

Figure F11. pXRF element abundances, Hole U1503A.

Figure F12. Sedimentary structures from Unit I, Hole U1503A. A. Fining-upward sequence from massive medium-grained sandstone to laminated silty fine-grained sandstone. The sequence is overlain by the planar base of the next fining-upward interval. B. Dark brownish gray laminated clayey siltstone with sand over dark greenish gray sandstone with a low carbonate content. This lithology is underlain by greenish gray sandstone with a high carbonate content. The laminated clayey siltstone with sand has claystone intraclasts. C. Two fining-upward sequences with claystone overlain by laminated clayey siltstone, laminated silty claystone, and claystone. The laminated clayey siltstone has a sharp base that overlies the claystone. The intensity of bioturbation increases upward in the fining-upward sequence. D. Inclined burrow filled with light gray silty sediment cutting across olive-gray, highly bioturbated claystone. E. Sandstone with claystone intraclasts overlain by claystone. F. Convolute and plane laminations in silty fine sandstone. G. Parallel laminations in fine sandstone. H. Greenish gray massive and well-sorted sandstone. Blue star = location of image in I. I. Thin section image of sandstone in H with subangular quartz (Qtz), plagioclase (Pl), muscovite (M), and a foraminifer (F) in carbonate cement.

Figure F13. Gradual transition from Unit I to Unit II with alternating greenish gray and dark reddish brown claystone, silty claystone, and clayey siltstone, Hole U1503A. White dashed line = Unit I/II boundary.

Figure F14. Sedimentary and deformation structures, Hole U1503A. A. Laminated and bioturbated greenish black interval. Blue star = location of image in B. B. Thin section image of the greenish black interval with chlorite alteration. C. Alternating beds of light and dark gray nannofossil-rich claystone and nannofossil-rich silty claystone with foraminifers dipping ~30°. D. Millimeter-scale normal fault system in laminated siltstone.

Figure F15. Macroscopic features in igneous lithologic Unit 1, Hole U1503A. A. Moderately plagioclase (Plg)-olivine (Ol) phyric basalt with an altered glassy chilled margin. B. Baked blueish gray chert with some glass residue on its side. C. Macroscopic vesicles filled by recrystallized carbonate (CalV) and zeolite (ZV). D. Sparsely Plg phyric basalt with porphyritic texture (most common macroscopic texture observed throughout lithostratigraphic Unit IV). E. Vein with angular basalt fragments in calcite cement. F. Composite vein network with vuggy texture and carbonate (Cal), Fe oxide (FeO) and pyrite (Py) infill.

Figure F16. Lithostratigraphic summary of igneous lithologic Unit 1 basalts showing lithology, lava flow type, and Subunits 1a–1d, Hole U1503A. So-called XRF groups based on Zr intensities obtained from XRF core scanning (see Figure F17) are shown. The classification of subunits is primarily based on the predominant lava flow type, which may be coincident with a change in chemical composition reflected by the XRF data.

Figure F17. XRF basalt geochemical proxies, Sections 368X-U1503A-70R-1 through 88R-4. The three igneous Subunits 1a, 1b, and 1c are divided into 3, 1, and 4 distinct XRF groups, respectively. See text for more explanation. A. Zr enrichment factor, defined as the ratio of Zr peak area total counts of a given sample to the average Zr peak area counts of the combined low-Zr orange + yellow + green XRF groups. B. Ti intensity in peak area total counts. C. Ti/Zr values.

Figure F18. Microscopic features in igneous lithologic Unit 1, Hole U1503A. A. Hypocrystalline texture with Plg and Cpx microphenocrysts. Cpx is altered to amphibole (72R-1; TS03). Plg = plagioclase, Cpx = clinopyroxene. B. Ophitic texture with some Plg phenocryst and Plg, Cpx, and Ol constituting the groundmass (73R-2; TS04). Ol = olivine. C. Plg phenocryst (73R-2; TS04). D. Close-up of Ol and Cpx (73R-2; TS04). E. Calcite vein crosscutting basalt with intergranular texture (76R-2; TS05). F. Vesicle (Vsl) and vein filled by calcite (Cal) and FeO with zeolite (Z) on the rim (76R-2; TS05).

Figure F19. Age-depth plot, Hole U1503A. Details of each plotted event are given in Tables T4 and T5.

Figure F20. Demagnetization plots of (A, C, E, G) discrete sediment samples and (B, D, F, H) equivalent archive-half sections, Hole U1503A. Zijderveld plots: solid squares = declination, open squares = inclination. Stereographic plots: solid squares = positive (down) inclination, open squares = negative (up) inclination. Red = steps used to calculate ChRM. A–D. Examples from Unit I of (A, B) higher coercivity ChRM where a low-coercivity component can be isolated in the discrete sample but not in the archive-half section and (C, D) lower coercivity remanence with similar ChRMs in the discrete sample

and archive-half section. E, F. Examples from Unit II of higher coercivity ChRM where a low-coercivity component can be isolated in the discrete sample but not in the archive-half section. G, H. Examples from Unit III of demagnetization behavior.

Figure F21. A. Expected intensity changes for Hole U1503A sediments after demagnetizing archive-half sections and relative NRM ratios estimated based on all AF demagnetization (AFD) steps. Two subpopulations were identified (Ratio-1 and Ratio-2). B, C. Inclination changes of all archive-half sections from NRM and 25 mT AFD and their expectations with 1σ uncertainties (red). Discrete NRM and ChRM: blank rectangle = positive inclination, blue rectangle = negative inclination.

Figure F22. Demagnetization plots of (A, C) discrete basalt samples and (B, D) equivalent archive-half sections, Hole U1503A. Zijderveld plots: solid squares = declination, open squares = inclination. Stereographic plots: solid squares = positive (down) inclination, open squares = negative (up) inclination. Red = steps used to calculate ChRM. A, B. Samples demagnetized at higher coercivity, where a complete demagnetization could be obtained in the discrete sample but not in the archive-half section. C, D. Samples demagnetized at lower coercivity showing similar ChRM up to 15 mT.

Figure F23. A. Expected intensity changes for Hole U1503A basalts after demagnetizing archive-half sections and relative NRM ratios. Estimation based on all AFD steps. Two subpopulations were identified (Ratio-1 and Ratio-2). B, C. Inclination changes of all archive-half sections from NRM and 25 mT AFD and their expectations with 1σ uncertainties (red). Discrete NRM and ChRM: blank rectangle = positive inclination, blue rectangle = negative inclination.

Figure F24. Paleomagnetic measurements, Hole U1503A.

Figure F25. AMS data for (A, B) discrete sediment and (D, E) basalt samples, Hole U1503A. A, D. Stereonet of AMS directions (lower hemisphere, equal area projection). K_1 = maximum principal axis, K_2 = intermediate principal axis, K_3 = minimum principal axis. Confidence ellipses at 95% level are shown in corresponding color. Tensorial means are shown with larger symbols of the same color. B, E. Degree of magnetic anisotropy (P') vs. magnetic susceptibility (K_m). C, F. Magnetic shape parameter (T) vs. P'. Sediments exhibit dominant planar and subhorizontal fabric and strong oblate shape, which is less marked and exhibits a slight decrease in P' consistent with sedimentary fabric acquired in a calm pelagic environment. Samples from Units II and III (darker symbols) exhibit an inclination of the fabric as much as ~30° (368X-U1503A-69R-1W, 70–72 cm; Unit III). Basalts exhibit a prolate fabric suggesting the presence of a flow.

Figure F26. Lithology and geochemical profiles, Hole U1503A. cps = counts per second.

Figure F27. Physical property measurements summary for sediments and basalt, Hole U1503A. Note log scale for MS.

Figure F28. Physical property measurements summary for basalts in Unit IV (PP Unit 9), Hole U1503A. Note log scale for MS.

Figure F29. Logging operation summary, Hole U1503A.

Figure F30. VSI tool string, Hole U1503A. EDTC = Enhanced Digital Telemetry Cartridge.

Figure F31. Seismic source deployment scheme used during the VSI logging run, Hole U1503A.

Figure F32. Waveforms and first arrivals of 18 check shot stations, Hole U1503A. First arrivals were picked using Schlumberger software.

Figure F33. Physical properties, interval velocity calculated from VSI data (solid red line), average velocity for sediments (dashed red line), seismic wave forms with depth calculated using a composite velocity-depth relationship from the VSI and *P*-wave velocity, and uncorrected seismic image, Hole U1503A. Open circles and thin black lines connect prominent seismic reflectors to the individual seismic wave forms. Seismic data are from Line 04ec1555-08ec1555 (courtesy of CNOOC).