Figure F1. Bathymetry at Site U1504 and location of the site in relation to seismic lines. Note that the clear offset in bathymetry along the margin may indicate some transform offset within the deeper margin structure. Seismic Line 15ecLW6 crossing the structural high is shown in Figure F4.

Figure F2. Bathymetric maps showing Expedition 367/368 sites (stars), and (A) regional and (B) local coverage of multichannel seismic reflection data and OBS data. Thick blue and red lines are key seismic lines used for planning of the drilling transect. A. Magnetic isochrons (orange lines) from Briais et al. (1993). B. Magnetic picks (orange 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 = Leg 184 Site 1148, yellow squares = Expedition 349 Sites U1432 and U1435.

Figure F3. Lithostratigraphic, petrographic/petrological, and structural observations at Site U1504 with strong focus on the metamorphic basement. A, B. Clast-supported limestone with large benthic foraminifers and coral fragments. C. Severely quartz-veined, angular clast of chlorite-epidote granofels enclosed in mylonitic foliation of a typical epidote-chlorite schist. D. Steep (~75°) widely anastomosing foliation in a quartz + feldspar-rich variety of the rock. Arrow = extensively stretched veined clast of chlorite-epidote granofels oriented parallel to the foliation. E. Epidote-chlorite schist with granofels clasts split parallel to the *xy*-plane of finite strain. Large granofels clast is crosscut by a shear band within the epidote-chlorite schist. Several sigma clasts are observed right above the shear band. Both deformation structures indicate normal sense of shear. A late, postkinematic vein crosscuts both the mylonitic foliation and the granofels clast. F. Tight foliation affected by crenulation cleavage in quartz-poor (i.e., more melanocratic) variety of the rock. G. Local occurrence of foliated impure calcite marble. H. Veined and altered aphyric mafic granofels clast (left side) and granofels clast interpreted as protolithic epidote vein (right side). Both clasts are internally undeformed but show synkinematic deformation together with the mylonitic fabric at their rims. I. Rigid (left) and strongly deformed (upper end) granofels clasts embedded in calc-silicate schist. Note the deflection of the mylonitic foliation at the clast boundaries. J. Long piece of core showing the characteristic morphology of the mylonitic foliation in calc-silicate schist of Subunit IIIB. Note the steep inclination and anastomosing geometry enclosing heterolithic clasts that are strongly elongated, folded, and oriented parallel to the foliation.

Figure F4. Seismic Profile 15ecLW6 with location of Holes U1504A and U1504B. Fault structures and basement location are complex to interpret. Drill holes were placed in the most simple, well-defined locations with a high probability to reach crystalline basement. Drill site choice was constrained by seabed communications cables in the area (to the north). Basement at drill site is interpreted to be at the strong (second) reflector at ~3940 ms TWT. Distance between Holes U1504A and U1504B is ~200 m. CDP = common depth point. Dashed lines = unconformities, red solid line = fault.

Figure F5. TWT 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 around Expedition 349 Site U1435. At this location, OMH and Ridge A seem to coalesce, and Ridges B and C of the continent–ocean transition (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 F6. A. Lithostratigraphic summary of Hole U1504A with simplified lithology and unit descriptions. B. Lithostratigraphic summary of Hole U1504B with simplified lithology and unit descriptions. (Continued on next page.)

Figure F6 (continued).

Figure F7. Representative images of core sections from Unit I. Subunit IA (4R-3) includes dark greenish gray nannofossil-rich ooze with biogenic silica (0–70 cm) and nannofossil-rich clay (70–139 cm). Subunit IB (6R-2) consists of pale and light brown nannofossil ooze with varying amounts of foraminifers. Subunit IC (8R-3 and 10R-3) is composed of greenish gray and pale brown nannofossil ooze with clay. Subunit ID (12R-3) contains light brown nannofossil ooze with foraminifers.

Figure F8. Bulk XRD mineralogy analysis data, Site U1504.

Figure F9. A. Dark greenish gray nannofossil-rich ooze, Subunit IA. B. Greenish gray nannofossil ooze with foraminifers (red) (Subunit IA; 0–9 cm) and pale brown nannofossil ooze with foraminifers (green) (Subunit IB; 9–145 cm). C. Light brownish gray nannofossil ooze with clay (Subunit IC). D. Light brown nannofossil ooze with foraminifers (Subunit ID).

Figure F10. Subunit ID. A. Brownish yellow layer with foraminifer-rich nannofossil ooze. B, C. Smear slide images of brownish yellow layer showing foraminifers and discoasters. D. Black pyrite nodule in yellowish brown foraminifer-rich nannofossil ooze. E. Smear slide image of pyrite nodule.

Figure F11. Unit II. A. Bioclast-rich and clast-supported limestone. Lithic clasts of metamorphic schist (13–24 cm). B. Lithic clasts with iron manganese coatings. C. Clast-supported limestone. D. Large benthic foraminifer in clast-supported limestone.

Figure F12. Limestone in Unit II (U1504A-15R-1, 21–23 cm [TS 55]). A, C, D. Large benthic foraminifers *Nummulites* (Num) and *Assilina* (Assi) and epidote (Ep) grains. B. Overview image. A: cross-polarized light (XPL); C, D: plane-polarized light (PPL).

Figure F13. Lithostratigraphic summary of metamorphic lithologic Unit 1 rocks showing recovered lithologies and their metamorphic division into Subunits 1a and 1b, Holes U1504A and U1504B.

Figure F14. Textural diversity in epidote-chlorite schists in Subunit 1a, Hole U1504A. A. Typical medium-grained epidote-chlorite schist. B. Severely quartz-veined angular clast of chlorite-epidote granofels within the schist matrix. C. Domain (clast or vein) formed by patchy epidote and quartz in a chlorite-rich matrix. D. Strongly foliated variety of the schist with abundant small cavities, likely resulting from dissolution.

Figure F15. Lithologies in Subunits 1a and 1b, Hole U1504B. (A) Coarse-grained and (B) fine-grained variety of mafic granofels breccias. C. Foliated impure calcite marble. D. Typical calc-silicate schist with granofels clasts. Granofels clasts are mafic in nature, being highly phyric, possibly vesicular, and strongly altered. E. Deformed chlorite schist interpreted as a large "granofels" clast.

Figure F16. Greenschist facies mineral assemblage and structural relationships of different minerals in epidote-chlorite schist, Subunit 1a. A. Alternating bands dominated by quartz and fine-grained chlorite + epidote, defining the foliation. B. Band dominated by chlorite and coarse-grained subhedral epidote. C. Clast of chlorite-epidote granofels with quartz veins.

Figure F17. Greenschist facies mineral assemblage and textural variety in epidote-chlorite and calc-silicate schist in Subunits 1a and 1b, Hole U1504B. A. Epidote-chlorite schist with clinopyroxene crystal dissected by chlorite veins embedded in a matrix of quartz, albite, chlorite, and disseminated epidote. B. Calc-silicate schist with angular (upper half) and sigmoidally deformed (lower half) granofels clasts embedded in a poorly foliated matrix of quartz/albite, phyllosilicates, and epidote. Upper clast is cut by calcite-quartz vein. C. Microcrystalline chlorite schist with weaker foliation and rare large epidote grains.

Figure F18. Granofels clasts enclosed in calc-silicate schists and epidote-chlorite schists in Subunit 1b, Hole U1504B. A. Veined and altered aphyric mafic granofels clast (left) and granofels clast interpreted as protolithic epidote vein (right). Both clasts are internally undeformed but show synkinematic deformation together with a mylonitic fabric at their rims. B. Highly phyric granofels clast, most likely of igneous origin, showing euhedral, probably replaced crystals and deformed epidote-calcite vein. C. Strongly deformed epidote chlorite gneiss interpreted as deformed "granofels" clast. D. Highly phyric igneous granofels clast with subhedral, probably replaced crystals. E. Slightly deformed phyric igneous granofels clast. F. Protolithic predominantly epidote vein forming a granofels clast.

Figure F19. pXRF data showing compositional variations in metamorphic rocks of metamorphic lithologic Unit 1. A. MgO vs. Al_2O_3. B. MgO vs. CaO. C. MgO vs. Ni. D. TiO_2 vs. Zr.

Figure F20. Convolutely bedded sequence indicative of mass transport deposition in Subunit IA, Hole U1504A.

Figure F21. Corrected true dip angles of mylonitic foliation measured in metamorphic lithologic Unit 1/lithostratigraphic Unit III, Holes U1504A and U1504B. CRF = core reference frame.

Figure F22. Ductile deformation structures in epidote-chlorite schists in Subunit IIIA, Hole U1504A. A. Steep (~75°) widely anastomosing foliation in a quartz-rich variety of the rock. Arrow = extensively stretched veined clast of chlorite-epidote granofels, oriented parallel to the foliation. B. Tight foliation affected by crenulation cleavage in quartz-poor variety of the rock (top: core photo; bottom: interpretation). C. Folded epidote vein.

Figure F23. Deformation structures, Hole U1504B. A. Epidote-chlorite schist with granofels clasts split parallel to the *xy*-plane of finite strain. Large granofels clast is crosscut by shear band within the epidote-chlorite schist. Several sigma clasts are observed right above the shear band. Both deformation structures indicate normal sense of shear. A late, postkinematic vein crosscuts both mylonitic foliation and granofels clast. B. Epidote-chlorite schist with crenulation cleavage. C. Long piece of core showing characteristic morphology of mylonitic foliation in calc-silicate schist, Subunit IIIB. Note steep inclination and anastomosing geometry enclosing heterolithic clasts that are strongly elongated, folded, and oriented parallel to the foliation. D, E. Rigid granofels clasts embedded in calc-silicate schist. Note deflection of the mylonitic foliation at the clast boundaries. F. Segmented and deformed composite epidote + quartz vein within the almost gneissose foliation of more leucocratic schist variation. G. Late kinematic (left) to postkinematic (i.e., undeformed; right) calcite veins crosscutting tight mylonitic foliation.

Figure F24. Metamorphic basement with focus on microstructural observations in metamorphic lithologic Unit 1/lithostratigraphic Unit III, Site U1504. Thin section domains are shown (left = PPL; right = XPL). A. Epidote-chlorite schist with minor modal quartz forming thin, discontinuous bands within foliation (black lines). Crenulation cleavage indicates a second deformation phase (white lines). Some quartz-rich aggregates are recognized as deformed chlorite-epidote granofels clasts preserving original veining. B. Sigma clast consisting of mainly quartz with minor chlorite and epidote probably representing deformed chlorite-epidote granofels clast preserving original veining. Sigma clast is synkinematic with respect to main mylonitic foliation and also affected by late crenulation cleavage. Tails of the sigma clast show clear evidence for subgrain rotation recrystallization. C. Prismatic, coarse, prekinematic epidote grain passively rotated into the foliation and underwent subsequent axial stretching and brittle boudinage. D. Coarse-grained epidotes showing irregular shapes, locally some crystals are observed to break down to fine-grained minerals.

Figure F25. Age-depth model, Site U1504. Plotted event data are in Tables T7 and T8.

Figure F26. Larger benthic foraminiferal fragments (*Nummulites* sp.; 368-U1504A-14R-CC).

Figure F27. Abundant larger benthic foraminifers (*Nummulites* sp. and *Assilina* sp.; 368-U1504A-15R-CC).

Figure F28. AF demagnetization plots of (A) discrete samples and (B, C) archive-half sections of sedimentary rocks, Hole U1504A. Zijderveld plots: solid squares = declination, open squares = inclination. Stereographic plots: solid squares = positive (down) inclination, open squares = negative (up) inclination. Calculated ChRM (blue line; red squares = measurements used in calculation) using PCA is also shown. A. Soft demagnetization behavior up to 10 mT associated with removal of drilling overprint, followed by gradual demagnetization from 10 to 60 mT, characteristic of single-domain or pseudosingle-domain magnetite, and finally magnetization gain above 70 mT indicative of GRM, most likely due to greigite. B. Removal of drilling overprint in first step (5 mT). C. Soft demagnetization behavior and negative inclination of sample. MAD = maximum angular deviation.

Figure F29. Magnetic measurements, Hole U1504A. Inclination used to determine polarity. AFD = AF demagnetization. Magnetostratigraphic features are referred to as n1, etc., in a sequential manner for convenience and have no bearing on chrons. GPTS2016 = geomagnetic polarity timescale of Ogg et al. (2016).

Figure F30. AMS data, Hole U1504A sediments. A. Stereonet of AMS principal directions for 13 discrete samples (lower hemisphere, equal-area projection). K_1 = maximum axis, K_2 = intermediate axis, K_3 = minimum axis. Confidence ellipses at 95% level (same color convention) show dominantly planar and subhorizontal fabric (oblate), consistent with sedimentary fabric acquired in a calm pelagic environment. Tensorial means are shown with larger symbols of same color. B. Degree of magnetic anisotropy (P') vs. magnetic susceptibility (K_m) showing a slight increase in P' with K_m; increase typically occurs in materials in which AMS is controlled, at least in part, by ferromagnetic phases. C. Shape parameter (T) vs. P' showing dominantly oblate symmetry of sedimentary fabric in Unit I and II.

Figure F31. AMS data, Hole U1504A and U1504B basement. A. Stereonet of AMS principal directions for four discrete samples (lower hemisphere, equal-area projection). K_1 = maximum axis, K_2 = intermediate axis, K_3 = minimum axis. Confidence ellipses cannot be calculated due to low sample number. B. Degree of magnetic anisotropy (P') vs. magnetic susceptibility (K_m). C. Shape parameter (T) vs. P' showing oblate symmetry of basement rock fabric in Unit III. D. Stereonet of AMS foliations, defined by K_1–K_2 axes and plotted as a great circle with AMS lineations (K_1 axis) plotted as a square. Because RCB core is not azimuthally oriented, AMS fabrics of these samples can be rotated to any position about the vertical core axis. Because AMS foliation matches macroscopic foliation observed on core, both AMS fabrics can be arbitrarily reoriented to a common north–south foliation strike. After this vertical axis rotation, AMS lineations show variable plunges.

Figure F32. TOC, TOC/TN ratio and carbonate, and TS in bulk sediments. OB = overburden.

Figure F33. Geochemical parameters of bulk sediments: carbonate vs. TOC/TN ratio and TS vs. TOC. Solid circles = lithostratigraphic Subunit IA, open triangles = Subunits IB–ID, crosses = Unit II.

Figure F34. Interstitial water alkalinity, major cations, and anions.

Figure F35. Physical properties for Holes U1504A and U1504B with petrophysical (PP) units. Note that in PP Units 3 and 4, the scattered GRA density measurements are less reliable due to void between core material and core liner. Descriptions and discussions in text are based on discrete samples of bulk density (MAD). cps = counts per second.

Figure F36. Bulk density (GRA and MAD), dry density, grain density, and porosity, Hole U1504A. Note that in PP Units 3 and 4, the scattered GRA density measurements are less reliable due to void between core material and core liner. Descriptions and discussions in text are based on discrete samples of bulk density (MAD).

Figure F37. Core color reflectance parameters L*, a*, and b*, Holes U1504A and U1504B.

Figure F38. Core RGB values, Holes U1504A and U1504B.

Figure F39. Comparison of a subset of physical properties (magnetic susceptibility [MS], velocity, density, and NGR) with seismic waveform (converted to depth scale using best-fitting TDR model) and seismic image (in timescale) in Hole U1504A. Red circles = reference points (discussed in text).

Figure F40. A. Site U1504 time-depth relation curve in Hole U1504A compared to Site U1501. Red circles = reference points at 112.7 and 134.2 m (RP1 and RP2), coinciding with noticeable changes in density and velocity. B. Hole U1504A PWC and interval velocity model. Interval velocity for 112.7–134.2 m was calculated using TWT and depth range values of RP1 and RP2; interval velocity for 134.2–163.5 m corresponds to average PWC for that interval.

Figure F41. Synthetic seismogram, Hole U1504A. Panels from left to right: interval velocity and MAD density used in the calculation, resultant reflection coefficient (RC), real seismic traces with synthetic seismogram inserted in the center, and seismic source function "Ricker 2" used in modeling.

Figure F42. Seismic section at Site U1504 with lithostratigraphic units overlain at Hole U1504A location. Also shown are selected core measurements converted to depth scale using best-fitting TDR model, including Hole U1504A PWC and PWL, MAD density, GRA density, porosity, MS, and NGR.