Figure F1. Bathymetric map of 6.6 Ma SAT study area showing location of Site U1559 and multichannel seismic (MCS) Reflection Lines 1E/1F, 01, 06, and 08 (Christeson and Reece, 2020). Seismic reflection profiles were acquired during CREST cruise (Reece et al., 2016). Solid black lines = location of wide-angle MCS profiles for which seismic images are shown in Figure F2.

Figure F2. CREST multichannel seismic (MCS) reflection profiles on 6.6 Ma crust, showing local basement topography, Site U1559. A. West–east MCS Line 1E/1F crosses Line 01 ~5.7 km north of Site U1559. B. North–south Line 01. Black lines = intersections of MCS reflection profiles. CDP = common depth point, TWT = two-way traveltime.

Figure F3. Backscatter reflections from Site U1559 region collected during CREST site survey cruise (Reece et al., 2016; Reece and Estep, 2019; Christeson et al., 2020). Red = higher normalized reflectivity values, blue = lower normalized reflectivity values. Solid lines = location of wide-angle MCS profiles shown in Figure F2.

Figure F4. Reentry system, casing, and BHA, Hole U1559B (Estes et al., 2021).

Figure F5. Map of holes drilled at Site U1559. Scale is in meters.

Figure F6. Top: Drill bit used to core Hole U1559B (right) in comparison to fresh drill bit (left). Bottom: Close-up of wear on roller-cones and core guides. Note extensive damage to roller cones.

Figure F7. Lithostratigraphic summary of volcanic units, Hole U1559B. Unit contact depths and thicknesses are expanded depths (Table T5).

Figure F8. Lithologic summary. A. Hole U1559A. B. Hole U1559C. C. Hole U1559D. a* = red–green value (greater value = redder) smoothed with a 100-point moving average. cps = counts per second. RGB is in machine units.

Figure F9. Main sedimentary components, Site U1559. A, B. Calcareous nannofossil ooze with foraminifera and trace siliciclastic materials (390-U1559D-1H-1, 55 cm). C, D. Foraminiferal nannofossil ooze with relatively high abundance of porous planktic foraminifera (390-U1559C-2H-1, 106 cm). E, F. Calcareous nannofossil ooze enriched in *Discoaster* sp. (390-U1559D-5H-5, 50 cm). A, C, E: plane-polarized light (PPL); B, D, F: cross-polarized light (XPL).

Figure F10. Core sections, Site U1559. A. Pale brown calcareous nannofossil ooze with foraminifera (CNF) with trace of siliciclastic material (Subunit IA). B. Stratigraphically dislocated white CNF (Subunit IC). C. Sharp contact between dislocated white CNF above very pale brown CNF (Subunits IC and ID). D. Very pale brown CNF (Subunit ID). E. Very pale brown *Discoaster*-rich CNF (Subunit IE).

Figure F11. Representative X-ray diffractograms of bulk sediments, Holes U1559A, U1559C, and U1559D.

Figure F12. Downhole changes in mineralogy, including clay (all), quartz, feldspar, and calcite, based on XRD results, Holes U1559A, U1559C, and U1559D (see Figure F11). Values are normalized such that total clay minerals (smectite + illite + chlorite + kaolinite) + quartz + feldspar (plagioclase + K-feldspar) + calcite totals 100%.

Figure F13. Scatterplots of SHMSL MSP and reflectance (L*) in sediments, Holes U1559C and U1559D. L* = lightness (greater value = lighter). Insets on top: properties of individual subunits.

Figure F14. Scatterplots of SHMSL color reflectance data, including reflectance (L*) and chromaticity (a*/b*) in sediments, Holes U1559C and U1559D. L* = lightness (greater value = lighter), a* = red–green value (greater value = redder), b* = yellow-blue value (greater value = yellower). Insets on top: properties of individual subunits.

Figure F15. A. Main sediment/volcanic basement contact recovered (Hole U1559B: RCB; Holes U1559A and U1559D: XCB). B. Hydrothermal veins in micritic limestone. C. Vuggy porosity associated with calcite hydrothermal veining. D. Pelagic sediment with fossil foraminifera and altered glass clast (PPL). E. Fragments of completely altered basaltic glass adhering to indurated calcareous sediment.

Figure F16. Basalt, Hole U1559D. (A) Fragment of basalt dislodged from larger basalt clast floating in micritic limestone; (B) fragments of both basalt and altered glass on exterior core surface (8X-1 [Piece 6, 28–33 cm]). C. Clasts of basalt embedded in unconsolidated calcareous nannofossil ooze (7X-CC, 0–22 cm). Note chilled margin (cm) on one of the basalt clasts.

Figure F17. Volcanic Unit 1, Hole U1559B. A. Aphyric fine-grained basalt with vuggy vesicles. B. Typical aphyric microcrystalline Unit 1 basalt overprinted by alteration halos. C. Whole thin section image of representative aphyric fine-grained texture with seriate variation in groundmass plagioclase lath size (~0.5 to <0.1 mm) (PPL). Upper, right, and lower sides subtly overprinted by ~5–10 mm alteration halo. D, E. Close-up of seriate plagioclase (Plag) and sparse equant olivine (Ol) set in fine clinopyroxene (Cpx) groundmass with round vesicle (Ves) (D: PPL, E: XPL).

Figure F18. Volcanic Subunit 2A, Hole U1559B. A, B. Gray basaltic pieces from chilled glassy margin with sparse millimetric plagioclase (Plag) phenocrysts and gray alteration halos. C. Thin section from chilled margin in B of glassy selvage that grades into holocrystalline groundmass of microcrystalline plagioclase laths and small equant olivine set in plumose clinopyroxene (cpx) matrix, with sparse millimetric plagioclase phenocrysts (PPL). Rock is largely fresh, but there is incipient clay–Fe oxide alteration of outermost glass. D, E. Equant single plagioclase phenocryst set in groundmass of sparse plagioclase laths and equant olivine microlites with brownish altered plumose interstitial clinopyroxene (D: PPL, E: XPL).

Figure F19. Volcanic Subunit 2B, Hole U1559B. Sparse to extremely sparse, fresh, equant olivine microcrysts 0.1–0.2 mm in size are a common feature of groundmass and visible under binocular magnification. A, B. Typical microcrystalline groundmass of pillow lava; (A) Olivine (Ol)-plagioclase (Plag) glomerocryst in gray microcrystalline groundmass; curved dark gray alteration halo overprints upper right side of piece; (B) 1.5 mm olivine phenocryst attached to ~6 mm plagioclase phenocryst. C. Glass-encrusted basaltic tube. D. Whole thin section: 7 mm single-crystal plagioclase phenocryst in microcrystalline matrix of densely packed plagioclase laths and sparse (<0.2 mm) equant olivine. E–G. Typical groundmass texture; (E) plagioclase phenocryst from slightly coarser, microcrystalline to fine-grained interval; (F, G) plagioclase laths up to 0.5 mm surrounded by interstitial clinopyroxene (Cpx), approaching subophitic texture (F: PPL, G: XPL).

Figure F20. Volcanic Subunit 2C, Hole U1559B. A. Sparsely plagioclase-phyric fine-grained basalt with vuggy vesicles interpreted to be related to magmatic volatiles exsolving and coalescing within sheet flow. B. Relatively large piece of consistently fine-grained, sparsely plagioclase (Plag)-phyric basalt interpreted to be from interior of sheet flow. C. Thin section of fine-grained basalt with euhedral, equant plagioclase phenocryst and smaller olivine (Ol) phenocryst, all cut by secondary clay–carbonate vein. D, E. Olivine phenocrysts in groundmass of plagioclase laths and brown, plumose clinopyroxene (Cpx) (D: PPL, E: XPL).

Figure F21. Intervolcanic sedimentary Unit 3, pink (7.5 Y 7/3) indurated calcareous sediment consisting only of imaged piece, Hole U1559B. A. Unoriented piece, presumably but not definitively with long axis approximately paleohorizontal. B. Altered volcanic glass adhering to flat surface. Similar altered glass is present on opposite surface, showing piece resided between two lavas. C. Whole thin section of limestone cut by thin carbonate vein shows post-depositional/injection fracturing and fluid flow. D, E. Photomicrographs of (D) carbonate vein in C and ~0.25 mm shale pellet in micritic matrix (PPL) and (E) disseminated dark spots of opaque, low-reflectivity (Mn ± Fe) oxide or hydroxide mineral with diffuse margins and framboidal shape.

Figure F22. Sheet flows showing typical texture characteristics of Volcanic Unit 4, Hole U1559B. A. Coarsely plagioclase-phyric basalt with 10 mm subequant, euhedral plagioclase phenocryst, partly altered near thin carbonate vein. Gray alteration halo encompasses both vein and phenocryst. B. Outer core texture with relatively coarse, fine-grained groundmass and sparse but large distinctive plagioclase phenocrysts. C. Relatively coarse, fine-grained plagioclase (Plag)-olivine (Ol)-clinopyroxene groundmass with sparse plagioclase phenocrysts consisting of 2–3 agglomerated crystals. D, E. Groundmass radiating plagioclase laths and interstitial plumose clinopyroxene (cpx) (D: PPL, E: XPL).

Figure F23. Volcanic Subunit 5A, interpreted to comprise both pillow and sheet flows, Hole U1559B. A. Fresh plagioclase-olivine-phyric basalt with well-developed chilled glassy margin. B. Broken end of core piece with 5 mm dark clinopyroxene phenocryst intergrown with minor pale plagioclase. Rare presence of black clinopyroxene, probably augite, phenocrysts defines Subunit 5A. C. Whole thin section of typical microcrystalline Unit 5 groundmass with sparse plagioclase (Plag), olivine (Ol), and clinopyroxene (Cpx) phenocrysts. D, E. Microcrystalline to fine-grained groundmass with plagioclase laths surrounded by partly plumose, partly well-crystallized interstitial clinopyroxene (D: PPL, E: XPL).

Figure F24. Cut surface of only significant piece recovered from Subunit 5B and lowermost basalt recovered at Site U1559. Piece is sector of rounded pillow lava that exhibits curved chilled margin and, notably for Subunit 5B, relatively abundant (~5%) but small (<0.5 mm) olivine and plagioclase phenocrysts.

Figure F25. Macroscopic core observations plotted with expanded depth, Hole U1559B. A. Cr/Ti ratios from high-resolution pXRF analysis of archive split-core sections. B. Phenocryst abundance. C. Flow interior grain size. D. Vesicularity. E. Glass occurrences per meter for each core.

Figure F26. A–F. Split-core surface pXRF major and trace element concentrations and ratios plotted with expanded depth, Hole U1559B. Total Fe is calculated as Fe_2O_3. MORB reference means and 95% confidence intervals from Gale et al. (2013). E-MORB = enriched MORB, D-MORB = depleted MORB.

Figure F27. Alteration overview, Hole U1559B. Data are plotted at individual core level at top of cored intervals. Black trend lines = locally weighted scatter plot smoothing (LOWESS) nonparametric regression, gray shaded areas = 2σ of mean.

Figure F28. Glassy chilled margin, Hole U1559B. Glass is partially altered to orange clay and Fe oxyhydroxides. Two sets of narrow veins crosscut core piece parallel to margin (close up). Outer vein shows similar alteration to glass, whereas inner vein is dark gray. Note that both sides of core piece have glassy chilled margins with veins.

Figure F29. Downhole distribution of background alteration types normalized to recovery for each core, Hole U1559B. Gray background alteration dominates hole with orange speckled background more abundant below 93 mbsf. Olivine phenocryst abundance (*) shown for context and plotted as olivine phenocryst abundance (area%) × 10. Yellow olivine phenocryst trend line = locally weighted scatter plot smoothing (LOWESS) nonparametric regression.

Figure F30. Background alteration, Hole U1559B. A. Homogeneous gray background, typical for recovery away from veins and chilled margins. B, C. Typical interstitial cryptocrystalline groundmass partially altered to brown clay ± Fe oxyhydroxides. Plagioclase, olivine, and clinopyroxene microphenocrysts are mostly unaltered.

Figure F31. A–D. Replacement of groundmass olivine by carbonate, Hole U1559B. Olivine microphenocrysts completely replaced by calcium carbonate. Interstitial groundmass is partially altered to brown clay ± Fe oxyhydroxides, whereas plagioclase and clinopyroxene show limited alteration.

Figure F32. Secondary vesicle fills, Hole U1559B. Unfilled vesicles in (A) gray groundmass and (B) orange halo. C. Vesicle with narrow yellow clay lining. D. If filled, vesicles in dark gray halos show linings of yellow and/or brown clay. E. Yellow clay completely filling vesicles in a dark gray halo. F. Vesicle filled with yellow clay and minor Fe oxyhydroxides as well as brown clay toward center. G. Narrow lining of yellow clay with brown clay fill toward center of vesicle in dark gray halo. H. Vesicle in dark gray halo mostly filled with brown clay, except for very narrow yellow clay lining. I. Calcium carbonate–filled vesicle center in gray background; narrow clay lining surrounds carbonate (main: PPL, inset: XPL).

Figure F33. A, B. Rare orange speckled background alteration, Hole U1559B. Olivine microphenocrysts are pseudomorphically replaced by clay ± Fe oxyhydroxides, resulting in orange spots in gray groundmass.

Figure F34. Downhole distribution of halo abundance normalized to recovery for each core, showing decrease in light brownish gray and dark gray halos and increase in orange-gray halos with depth, Hole U1559B.

Figure F35. Dark gray halos, Hole U1559B. Halos extend outward from (A) chilled margins (toward left of core piece) or (B) veins, reaching up to several centimeters into gray background. Individual rock pieces commonly host multiple millimeter-wide dark gray halos, with irregular or commonly concentric geometries. C, D. In dark gray halos, olivine is pseudomorphically replaced by yellow clay ± Fe oxyhydroxides; plagioclase and clinopyroxene microphenocrysts are mostly unaltered.

Figure F36. Multiple dark gray halos, Hole U1559B. A. Whole thin section annotated with macroscopically visible halos (white dashed lines). Wider dark gray halo (left) extends from calcium carbonate–filled vein (not shown). Several irregular dark gray halos of variable thickness are present. Dashed boxes = locations of B–G. B–G. In halos, olivine as well as some groundmass surrounding former olivine is mostly replaced by yellow clay ± Fe oxyhydroxides (yellow arrows).

Figure F37. Light brownish gray halos, Hole U1559B. A. Typical example of light brownish gray halo extending from sediment-carbonate vein overprinting dark gray halo. B, C. Halo types separated by dashed line. In light brownish gray halos (upper right of dashed line), both groundmass and microphenocrysts are more strongly altered to brown clay (likely Mg-saponite) ± Fe oxyhydroxides, compared to dark gray halos (lower left of dashed line).

Figure F38. Vug fillings, Hole U1559B. A. Core piece with vugs up to 5 mm. Note dark gray and light brownish gray halos extending from vug, typical for Hole U1559B. B. Calcium carbonate coating in vugs. C. Vug filled with calcium carbonate and minor brown clay ± Fe oxyhydroxides. D. Coating of vug composed of blueish clay, presumably saponite. B, D: reflected brightfield photomicrograph.

Figure F39. Orange-gray halos, Hole U1559B. A, B. Typical orange-gray halo (dashed line = limit of halo) overprinting several centimeters of groundmass. C, D. Partial alteration of groundmass to brown and yellow clay ± Fe oxyhydroxides; locally, minor proportions of feldspar are replaced by yellow clay.

Figure F40. Complex halos, Hole U1559B. A. Two halo generations extended from veins result in asymmetric dark gray halo with variable halo width of up to several centimeters, followed by orange-gray halo (yellow arrows). B. Dark gray halos with variable width approximately following veins with irregular light brownish gray halo between bands of dark gray.

Figure F41. Veins, Hole U1559B. A. Submillimeter dark gray vein mostly composed of brown clay and minor Fe oxyhydroxides. B. Vein of brown clay and orange Fe oxyhydroxides on broken surface of core piece (toward right). Two additional veins, composed of brown clay, orange Fe oxyhydroxides, and white Ca carbonate, crosscut piece toward the top. C. Vein of blue clay, presumably saponite, and minor Fe oxyhydroxides on broken surface of core piece. D. Vein of Ca carbonate (white; vein lining), Fe oxyhydroxides (orange; vein lining), and clay (gray-brown; center fill). E. Several connected veins crosscutting core piece. Vein fill is variable, dominantly Ca carbonate, with increased Fe oxyhydroxide and clay toward the left. F. Vein of mainly altered sediment with increasing Ca carbonate and brown clay toward the left. G. Single irregular sulfide vein crosscutting core piece (yellow arrow; reflected brightfield photomicrograph). H. Millimeter vein of massive Fe oxyhydroxide crosscutting very large plagioclase phenocryst.

Figure F42. A–C. Vein width characteristics, Hole U1559B. C: solid line = median, dashed lines = 1σ equivalent range of median, dot-dashed lines = 2σ equivalent range of median. Expanded depth scale stretches curated depths within each core advance to compensate for incomplete recovery.

Figure F43. Vein density normalized to core recovery, Hole U1559B. Total veins are separated by secondary mineral fill. Data plotted at the top depth of each core. Trend lines = locally weighted scatter plot smoothing (LOWESS) nonparametric regression, gray shaded areas = 2σ of mean.

Figure F44. Secondary mineral abundance normalized to core recovery, Hole U1559B. Volume percent is calculated using length and width of each vein, where vein length is calculated from interval and approximate angle of vein (veins logged as vertical do not cross more than half the core; all other veins are assumed to be inclined and cross more than half the split-core face) assuming full core width of 58 mm. Trend lines = locally weighted scatter plot smoothing (LOWESS) nonparametric regression, gray shaded areas = 2σ of mean.

Figure F45. Vein dip angles for measured veins, Hole U1559B. A. True vein dip angles ranging 0°–90°. B. Histogram of measured vein true dip angles overlain by probability density function. C. Cumulative frequency of measured vein true dip angles. Solid line = median, dashed lines = 1σ equivalent range of median, dot-dashed lines = 2σ equivalent range of median. Expanded depth scale stretches curated depths within each core advance to compensate for incomplete recovery.

Figure F46. Vein width and dip angle statistics differentiated by halo association, Hole U1559B. A. Vein width histogram. B. True vein dip angle histogram with probability distribution functions overlain. C. Vein width cumulative frequency. D. True vein dip angle cumulative frequency. On C and D, solid line = median, dashed lines = 1σ equivalent range of median, dot-dashed lines = 2σ equivalent range of median.

Figure F47. Calcareous nannofossil and planktic foraminifera biostratigraphic zones and datums, Site U1559. Red asterisk = oldest nannoplankton datum, blue asterisk = oldest planktic foraminiferal datums, highlighting that Hole U1559A contains an older datum for both groups. Upward arrows = bioevent base (first occurrence), downward arrows = bioevent top (last occurrence).

Figure F48. Group abundance and preservation of calcareous nannofossils and planktic and benthic foraminifera, Site U1559.

Figure F49. Light microscope images of several biostratigraphically important and other notable calcareous nannofossil taxa, Site U1559. Scale bar in first plate = 2 µm. Images were taken in XPL and/or PPL at 1000× magnification.

Figure F50. SEM images of planktic foraminifera. 1, 6, 7, 11. 390-U1559C-1H (mudline): (1) Light micrograph of *Globigerinoides ruber* (pink); (6) *Sphaeroidinella dehiscens*, (7) *Orbulina* aff. *suturalis*, (11) *Globorotalia truncatulinoides*. 2–5, 8–10. 1H-1, 75–77 cm: (2, 3) *Beella digitata*, (4) *Globorotalia hirsuta*, (5) *Globoconella inflata*, (8) *Globorotalia crassaformis*, (9) *Globorotalia flexuosa*, (10) *Globorotalia tumida*. (Continued on next page.)

Figure F50 (continued). 12. *Globigerinoides extremus* (390-U1559C-5H-5, 80–82 cm). 13. *Globorotalia miocenica* (5H-CC). 14, 15. 5H-3, 19–21 cm: (14) *Dentoglobigerina altispira*, (15) *Globoturborotalita nepenthes*. 16. *Globorotalia margaritae* (6H-5, 100–102 cm). 17, 18. 6H-CC: (17) *Globoconella conomiozea*, (18) *Globigerinoidesella* cf. *fistulosa*. 19, 20. 390C-U1559A-8X-2, 27–29 cm: (19) *Globorotalia pseudomiocenica*, (20) *Candeina nitida*. 21–23. 8X-4, 74–76 cm: (21) *Sphaeroidinellopsis kochi*, (22) *Sphaeroidinellopsis seminula*, (23) *Orbulina universa*.

Figure F51. SEM images showing preservation of planktic and benthic foraminifera from (1, 2) Pleistocene (390-U1559C-1H-1, 75–77 cm) and (3, 4) Miocene (390C-U1559A-8X-4, 76–78 cm). 1. Well-preserved *Cibicidoides wuellerstorfi* showing (A) minor surface recrystallization and (B) original wall material with some infilling of calcareous nannoplankton. 2. Well-preserved *Globigerinoides ruber* showing (A) well-preserved surface texture and (B) original wall material with some spines preserved and infilling with calcareous nannoplankton. 3. Moderately preserved *C. wuellerstorfi* showing (A) significant surface dissolution/recrystallization but (B) original wall material with infilling by calcareous nannoplankton. 4. Poorly preserved *Orbulina universa* showing (A) significant secondary calcite on test surface and (B) recrystallization of test wall. This specimen was completely infilled with calcareous nannoplankton, but internal mold rolled away when test was broken.

Figure F52. Archive-half MSP (MS; from SHMSL) and SRM measurements, Hole U1559A. APC cores from Hole U1559A were not oriented, so declinations refer to core coordinates (see Paleomagnetism in the Expedition 390/393 methods chapter [Coggon et al., 2024c]). Shading = interval of Subunit IC defined as a slump (see Sedimentology). Dashed lines on inclination = GAD inclination (±49.1°) expected for this latitude (~30°S).

Figure F53. Archive-half MSP (MS; from SHMSL) and SRM measurements, Hole U1559C. Declinations for Cores 1H–6H are corrected using data from Icefield MI-5 core orientation tool (see Paleomagnetism in the Expedition 390/393 methods chapter [Coggon et al., 2024c]). Shading = interval of Subunit IC defined as a slump (see Sedimentology). Dashed lines on declination = value expected for normal (360°) and reversed (180°) polarity for oriented cores. Dashed lines on inclination = GAD inclination (±49.1°) expected for this latitude (~30°S).

Figure F54. Archive-half MSP (MS; from SHMSL) and SRM measurements, Hole U1559D. Declinations for Cores 1H–6H are corrected using data from Icefield MI-5 core orientation tool (see Paleomagnetism in the Expedition 390/393 methods chapter [Coggon et al., 2024c]). Shading = interval of Subunit IC defined as a slump (see Sedimentology). Dashed lines on declination = value expected for normal (360°) and reversed (180°) polarity for oriented cores. Dashed lines on inclination = GAD inclination (±49.1°) expected for this latitude (~30°S).

Figure F55. Histograms of inclination data after 20 mT AF demagnetization. A. Hole U1559A. B. Hole U1559C. C. Hole U1559D. Dashed lines = GAD inclination (±49.1°) expected for this latitude (~30°S) for normal (N) and reversed (R) chrons.

Figure F56. NRM demagnetization for representative samples. A. Hole U1559A. B. Hole U1559C. C. Hole U1559D. Declination data for samples from Hole U1559A are unoriented. Demagnetization plots were produced using Rema6 (AGICO) software.

Figure F57. Archive-half SRM inclination measurements after 20 mT AF demagnetization for Hole U1559A, U1559C, and U1559D sediments. Shading = part of Subunit IC determined to contain slumped intervals (see Stratigraphic unit summary and Sedimentology). Polarity determined from inclination data: black = negative inclinations/normal polarity, white = reversed polarity/positive inclinations. Dashed lines across panels = correlation of magnetozone boundaries between holes. Proposed tie to GPTS (Gradstein et al., 2020) is depicted. Half-strip reversed polarity within uppermost normal magnetozone represents potential reversed magnetic excursion within normal Brunhes Chron.

Figure F58. A. Normalized IRM acquisition curves up to 1.2 T and backfield IRM truncated at −0.4 T for representative samples from Holes U1559C and U1559D. B. Bulk magnetic susceptibility vs. IRM intensity, fit with a linear regression.

Figure F59. A. Lower hemisphere, equal-area projections of three principal AMS axes in core coordinates for discrete samples, Holes U1559C and U1559D. Mean tensor and confidence ellipses of its principal directions were calculated using Bootstrap method (Constable and Tauxe, 1990). B. Jelinek crossplot of anisotropy degree (*P*) vs. shape parameter (*T*) for same samples. Oblate (planar) and prolate (linear) fields are indicated. Shading = area between *T* values of 0.5 and −0.5, where majority of data points plot.

Figure F60. Archive-half MSP (MS; from SHMSL) and SRM measurements, Hole U1559B. Dashed lines on inclination = GAD inclination (±49.1°) expected for this latitude (~30°S).

Figure F61. Histogram of inclination data from remanence after 20 mT AF demagnetization, Hole U1559B basement cores. Dashed lines on inclination = GAD inclination (±49.1°) expected for this latitude (~30°S) for normal (N) and reversed (R) polarities.

Figure F62. AF demagnetization results for 2 discrete basalt samples, Hole U1559B. Equal-area projections, orthogonal projection diagrams (Zijderveld, 1967), and demagnetization trends of normalized intensity.

Figure F63. A. IRM acquisition, Hole U1559B. B. SIRM acquisition up to 1200 mT and backfield IRM truncated at −300 mT for two representative samples, Hole U1559B. C. Coercivity distribution and unmixing of IRM acquisition curves (Maxbauer et al., 2016).

Figure F64. A. Equal-area projection showing shape of magnetic susceptibility axes (K_{max}, K_{int}, and K_{min}). B. Shape parameter (*T*) vs. degree of anisotropy (*P*). C. Bulk susceptibility (K_m) and AMS parameters (Jelinek, 1981).

Figure F65. Age-depth model showing biostratigraphic datums, Holes U1559A and U1559C. LSRs calculated based on datums listed in Tables T25 and T26. Black line = points used for Hole U1559A age model, dashed black line = points used for Hole U1559C age model. See Sedimentology for a description of lithologic symbols.

Figure F66. (A) MAR, (B) CAR, and (C) OCAR averaged in 1 My intervals, Holes U1559A and U1559C. Differences in rates between holes is likely a product of differences in age models developed for each hole. Gaps represent time bins with no data.

Figure F67. Summary of core physical properties data, Hole U1559A. cps = counts per second.

Figure F68. Summary of core physical properties data, Hole U1559C. cps = counts per second.

Figure F69. Summary of core physical properties data, Hole U1559D. cps = counts per second.

Figure F70. Estimation of conductive heat flow, Site U1559. A. Thermal conductivity measured on cores. Mean thermal conductivity for interval above deepest temperature is shown. B. Calculated thermal resistance and linear regression. C. Temperature and linear regression for all measurements. D. Bullard plot of measured temperature vs. calculated thermal resistance. Slope of regression line is conductive heat flow for Site U1559.

Figure F71. Physical properties calculated from MAD analyses, Holes U1559C and U1559D. A. Bulk density vs. porosity by lithologic member-like subunit. B. Grain density vs. bulk density by porosity. C. Bulk density. D. Porosity. Teal vertical lines = Hole U1559C mean values, purple vertical lines = Hole U1559D mean values, red horizontal lines = transition from APC to XCB coring.

Figure F72. Construction of Site U1559 composite depth scale (CCSF) and splice. Dashed lines = correlation tie points aligning similar stratigraphies between holes. Spliced color shows hole each interval was selected from.

Figure F73. APCT-3 temperature records, Site U1559. Highlighted time intervals show where the best fit temperature decay model (green curve) was calculated to derive equilibrium temperature for each deployment. In situ formation temperature value for each record is extrapolated from best-fit model.

Figure F74. Summary of physical properties, Hole U1559B. cps = counts per second.

Figure F75. Comparison of discrete physical properties, Hole U1559B and ODP Hole 896A. Mean values for Hole 896A, calculated from entire data set for each parameter, are shown (red line = mean value of each data type, shaded boxes = ±1σ). *P*-wave velocity shown for Hole U1559B is maximum velocity measured for each sample. Symbol colors represent alteration level (see Alteration petrology and Figure F77). Black thermal conductivity measurements lack alteration description.

Figure F76. Comparison of basalt piece from Lithologic Unit 4 (393-U1559B-10R-2, 29–37 cm, Piece 6). A. X-ray image of whole-round piece. B. Full-circumference exterior image of whole-round piece using DMT CoreScan3 system. Blue line = splitting line between archive and working halves.

Figure F77. Crossplots of discrete physical properties, Hole U1559B. A. *P*-wave velocity (V_P) vs. porosity. B. V_P vs. bulk density. C. Bulk density vs. porosity. D. Grain density vs. porosity. E. Thermal conductivity vs. V_P. Symbol colors represent alteration level (see Alteration petrology). V_P shown is maximum velocity measured for each sample. Mean (stars) and ±1 standard deviation (error bars) for each alteration level are shown.

Figure F78. IW profiles of (A) sodium, (B) chloride, (C) bromide, and (D) potassium concentrations, Site U1559. Na and K: Hole U1559A = ICP-AES, Hole U1559D = IC. Seawater (SW) reference values correspond to IAPSO standard composition.

Figure F79. IW profiles of (A) pH, (B) alkalinity, (C) calcium, (D) magnesium, (E) strontium, and (F) Sr/Ca, Site U1559. Horizontal dashed line = depth of maximum Sr concentration. Blue shaded area = range in pH observed for bottom seawater at this location (7.6–7.7 at ~31° S; Ríos et al., 2015). Seawater (SW) reference values in B–F correspond to IAPSO standard composition.

Figure F80. ICP-AES IW profiles of (A) boron, (B) lithium, and (C) silica concentrations, Site U1559. Seawater (SW) reference values for B and Li correspond to IAPSO standard composition; local Si concentration is sourced from World Ocean Atlas (Boyer et al., 2018).

Figure F81. IW profiles of (A) sulfate, (B) manganese, (C) ammonium, (D) phosphate, and (E) oxygen concentrations, Site U1559. Shading = dissolved Mn peak. Seawater (SW) reference value corresponds to IAPSO standard composition.

Figure F82. (A) calcium carbonate and total inorganic carbon (TIC), (B) TOC, and (C) total nitrogen (TN), Site U1559.

Figure F83. Total alkali vs. silica diagram (Le Bas et al., 1986) showing ICP-AES data from Site U1559 basalts compared to recovered basalts from other SAT sites.

Figure F84. V vs. Ti/1000 tectonic classification diagram (Shervais, 1982) showing Hole U1559B basalts compared to ICP-AES data from other SAT sites.

Figure F85. A. TiO_2. B. CaO. C. K_2O. D. MgO. Shaded vertical fields = fresh MORB K_2O and MgO values, drawn from new data for fresh glasses from Mid-Atlantic Ridge 26°N (Marschall et al., 2017).

Figure F86. K/Zr vs. Cr/TiO_2 for Site U1559 compared to basalts from Sites U1556 (orange field = Stratigraphic Sequences A and B; yellow field = Stratigraphic Sequence C) and U1557 (green field). Fields for South Atlantic MORB data are based on results for Mid-Atlantic Ridge 26°S basalt glasses (Marschall et al., 2017) and zero-age MORBs compiled through EarthChem Portal (**http://portal.earthchem.org/**) on 10 July 2022 via map polygon function for MORB basalt glasses <100,000 y old from South Atlantic Ocean (specific sources: Kelley et al., 2013; Kendrick et al., 2017; Le Roux, 2000; Michael and Graham, 2015; Paulick et al., 2010; Reekie et al., 2019; van der Zwan et al., 2017; Yang et al., 2018).

Figure F87. PFMD data by sample location (core exterior vs. interior), Site U1559. Thick black line = mean tracer concentration, box top and bottom = upper and lower quartiles.

Figure F88. Samples collected for shore-based microbiology research, Hole U1559B. NA = not applicable.

Figure F89. PFMD tracer concentrations measured by gas chromatography comparing concentrations on core exterior surfaces with whole-round interiors for microbiological analyses, Hole U1559B.