Figure F1. Bathymetric and track chart, Site U1451. Two knolls rise ~50 and ~200 m above the fan surface. A minor straight channel passes ~10 km west. Projection is UTM Zone 45N. Multibeam bathymetry was acquired during R/V *Sonne* Cruises SO125 and SO188. Blue line = seismic Line SO125-GeoB97-027 with common depth point annotation. Contour interval is 20 m. Portions of seismic data are shown in Figures **F2** (red line, 22 km) and **F3** (14 km).

Figure F2. Seismic Line SO125-GeoB97-027 across Site U1451, showing upper portion of sedimentary section.

Figure F3. Seismic Line SO125-GeoB97-027 across Site U1451, showing complete sedimentary section cored. A 0.5 s AGC algorithm was applied to equalize amplitudes throughout the seismic section.

Figure F4. Lithostratigraphic summary, Hole U1451A. For legend, see Figure **F5** in the Expedition 354 methods chapter (France-Lanord et al., 2016a). For a larger version of this figure, see LITHOSTRAT in **Supplementary material**. (Continued on next page.

Figure F4 (continued).

Figure F5. Lithostratigraphic summary, Hole U1451B. For legend, see Figure **F5** in the Expedition 354 methods chapter (France-Lanord et al., 2016a). For a larger version of this figure, see LITHOSTRAT in **Supplementary material**. (Continued on next page.

Figure F5 (continued).

Figure F6. Lithology and carbon contents, Core 354-U1451B-47R.

Figure F7. Representative examples of major lithologies recovered in Hole U1451A. A. Volcanic ash (1H-2, 97–129 cm). B. Succession of mud turbidites (7H-2, 65–97 cm). C. Homogeneous fine sand (7H-5, 3–35 cm). D. Centimeter-sized deformed clasts with no discernible matrix; clasts consist of light gray nannofossil-rich calcareous clay and gray silty clay (64F-1, 44–76 cm). E. Nannofossil-rich calcareous clay (11F-2, 79–111 cm). F. Silt/fine sand–dominated turbidites (5H-1, 85–117 cm).

Figure F8. Hole U1451A features. A. Bioturbated clay with bioturbated very thin silt layers (2H-1, 30–50 cm). B. Mud turbidite sequences consisting of repeated lower silt to upper clay units (10H-1, 85–105 cm). C. Structureless to bioturbated clay (100–112 cm) intercalated with calcareous clay (28H-1 95–115 cm). D. Volcanic ash layer (13F-2, 116–126 cm) overlain by calcareous clay (108–128 cm); dark green color indicates diagenetic alteration of volcanic glass.

Figure F9. Representative smear slide images, Hole U1451A. A. Silt (2H-5, 136 cm; 13.86 m CSF-A). B. Nannofossil-rich calcareous clay (28H-2, 88 cm; 170.58 m CSF-A). C. Volcanic ash (13F-2, 118 cm; 72.37 m CSF-A). D. Volcanic ash with nannofossils (17F-2, 78 cm; 90.78 m CSF-A). E. Weakly altered volcanic ash (21F-1, 30 cm; 107.5 m CSF-A). F. Weakly altered volcanic ash (26H-4, 32 cm; 153.4 m CSF-A). All photos are under plane-polarized light (PPL).

Figure F10. Representative smear slide images, Hole U1451B. A. Silty sand with mica (47R-2; 952.86 m CSF-A). B. Silty sand with organic matter (19R-3; 687.82 m CSF-A). C. Nannofossil-rich calcareous clay (57R-3; 1042.48 m CSF-A). D. Calcareous clay (19R-3; 687.65 m CSF-A).

Figure F11. Representative examples of major lithologies recovered in Hole U1451B. A. Brown mottled claystone interbedded with very thin silt layers and occasional green color banding (29R-4, 6–38 cm). B. White to light gray mottled limestone with abundant microfractures (67R-3, 97–129 cm). C. Green claystone with volcanic ash particles (70R-2, 40–72 cm). D. Fragmented clayey limestone with gray silt filling the fractures (silt injectite; 68F-1, 68–100 cm).

Figure F12. Hole U1415B features. A. Disorganized silt turbidite with a floating mud clast (84 cm) and scattered dark plant fragments (51R-2, 80–110 cm). B. Silt turbidite with parallel plant fragment–rich dark laminae (58R-1, 36–60 cm). C. Thinly laminated silt turbidite with cross-laminations (83–84, 89.5–92, and 94–95 cm) (58R-3, 79–101 cm). D. Thin-bedded thinly laminated silt turbidite (52.5–58 cm) interbedded with bioturbated claystone (48R-2, 44–65 cm). Arrow = location of thin section photographs in Figure **F13**.

Figure F13. A. Thin section photograph of thinly laminated silt turbidite (354-U1451B-48R-2, 52–55 cm) (for location, see Figure **F12D**). Black dots are bubbles. B. Enlargement of upper dark lamina enriched with mica and organic flakes aligned parallel to the bedding and lower quartz-rich light lamina (PPL). C. View of B tilted 45° counterclockwise (under cross-polarized light [XPL]). Mica flakes show high-order birefringence colors.

Figure F14. Representative thin section images, Hole U1451B. A. Limestone (72R-2, 48–51 cm). B. Claystone (72R-1, 17–20 cm). C. Injectite siltstone in PPL. D. Same view as C under crossed nicols (70R-1, 84–87 cm).

Figure F15. Maximum grain size, Hole U1451A.

Figure F16. Maximum grain size, Hole U1451B.

Figure F17. Semiquantitative clay mineral proportions, Site U1451.

Figure F18. NRM decay (left) and AF demagnetization vector (right) diagrams of discrete samples, Site U1451. Points on demagnetization vector diagrams = projected endpoints of remanent magnetization vector measured for each sample in core coordinates (azimuth not oriented). A. Positive principal component inclination interpreted as normal polarity. B. Negative principal component inclination interpreted as reversed polarity. C. Anomalous horizontal ChRM vector, polarity undetermined. Note strong drilling overprint and zigzag ChRM vector endpoints (indicative of ARM acquisition). D. Sample from 794.13 m CSF-A, recovered using the RCB system. Magnetic drilling overprint appears to be easily removed by 10 mT AF demagnetization, and ChRM can be identified. Coercivity spectra during AF demagnetization seem consistent with younger samples, suggesting first-order consistent downhole magnetic carriers.

Figure F19. NRM of archive section halves and discrete samples before and after 20 mT AF demagnetization, Cores 354-U1451A-1H through 28H. Light gray dots = before demagnetization. Dark gray circles = intervals that do not meet quality criteria (see **Paleomagnetism** in the Expedition 354 methods chapter [France-Lanord et al., 2016a]). Blue dots = calcareous clay, black dots = other lithology. Inclination and declination: dark green dots = principal component directions from discrete samples. Inclination: gray lines either side of 0° = expected inclinations from GAD. Declination: yellow = oriented cores. Declinations are in a geographic reference frame only where orientation data are available. Intensity: intensity of magnetization before and after demagnetization. Large light green dots = before demagnetization, dark green dots = after demagnetization. Magnetic susceptibility (MS) = point measurements on archive section halves.

Figure F20. NRM of archive section halves and discrete samples after 20 mT AF demagnetization, Cores 354-U1451A-11F through 15F. These cores were deposited during the early Bruhnes and late Matuyama, with the short normal intervals representing the Jaramillo (J) and Cobb Mountain (CM) Subchrons. Circles = measurements do not meet quality criteria. Blue dots = calcareous clay, black dots = other lithology, green dots = discrete samples. Declination is rotated and illustrates magnetostratigraphic interpretation. A single vertical axis rotation was applied to the entire core so that points interpreted as normal polarity plot near the 0° line. Intensity = intensity of magnetization after 20 mT AF demagnetization. Magnetic susceptibility (MS) = point measurements on archive section halves. Polarity: black = normal, white = reversed, gray = uncertain. Geomagnetic polarity timescale (GPTS) of Gradstein et al. (2012).

Figure F21. NRM of archive section halves and discrete samples after 20 mT AF demagnetization, Cores 354-U1451A-25H through 28H. These cores were deposited during the early Gauss and Gilbert Chrons, with three of the four Gilbert normal polarity subchrons in Cores 26H and 27H. Circles = measurements do not meet quality criteria. Blue dots = calcareous clay, black dots = other lithology, green dots = discrete samples. Declination is rotated and illustrates magnetostratigraphic interpretation. A single vertical axis rotation was applied to the entire core so that points interpreted as normal polarity plot near the 0° line. Intensity = intensity of magnetization after 20 mT AF demagnetization. Magnetic susceptibility (MS) = point measurements on archive section halves. Polarity: black = normal, white = reversed, gray = uncertain. Geomagnetic polarity timescale (GPTS) of Gradstein et al. (2012). C = Cochiti, N = Nunivak, S = Sidufjall, T = Thvera Subchrons.

Figure F22. Variations of salinity, bromide, sulfate, phosphate, alkalinity, magnesium, calcium, sodium, potassium, and silicon concentrations in interstitial waters, Site U1451.

Figure F23. TIC content expressed as $CaCO_3$, Holes U1451A and U1451B. Pelagic and hemipelagic deposits correspond to calcareous clay and calcareous claystone in the lithostratigraphy. Note that these lithologies do not have carbonate content systematically >15 wt%.

Figure F24. Variations of carbonate, potassium, sulfur, thorium, and authigenic uranium content from XRF measurements on split cores in selected individual beds, Hole U1451B.

Figure F25. Variation in potassium content with carbonate content from XRF measurements on split cores in selected individual beds, Hole U1451B. The triangular shape of the distribution of the data in this diagram suggests a dilution effect related to the amount of carbonate (very poor in potassium) superimposed onto the occurrence of at least two types of noncarbonate material (likely silicate), with some beds characterized by a low-K bearing silicate and other beds containing K-rich silicate.

Figure F26. Variation in potassium/calcium ratio with carbonate content from in situ XRF measurement in selected individual beds, Hole U1451B. Data are compared with the modeling of mixing between two types of silicate (A and B) and two types of carbonate (detrital and biogenic). The compositions of those end-members have been tuned to fit the data and suggest the occurrence of supracrustal (Silicate B) and less evolved (subduction-related?) silicate in addition to detrital carbonate similar to those found in modern Himalayan rivers and marine Neogene biogenic carbonate. Note the paucity of beds corresponding to the mixture of Silicate A and detrital carbonate (dotted blue curve) compared to the occurrence of beds corresponding to either Silicate B + detrital carbonate (red curve) or Silicate A + biogenic carbonate (black curve).

Figure F27. Sr/Ca (ICP-AES data) vs. carbonate content, Holes U1451A and U1451B. Trends are similar to those revealed by XRF analysis, indicating detrital vs. biogenic influence on the carbonate component. Note that ICP-AES Sr/Ca ratios may not be directly compared with XRF Sr/Ca ratios.

Figure F28. Fe/Si vs. Al/Si by ICP-AES, Holes U1451A and U1451B. The higher, off-trend Fe/Si values in Hole U1451B occur below 700 m CSF-A, possibly reflecting an increasing contribution from Fe-rich clays.

Figure F29. K/Ca and Ca/Sr (ICP-AES data), Hole U1451B. The sand injectite unit (68 wt% SiO_2) near the base of the hole is characterized by low K/Ca and high Ca/Sr relative to other lithologies with similar SiO_2 abundances.

Figure F30. TOC content, Holes U1451A and U1451B. Pelagic and hemipelagic deposits correspond to calcareous clay and calcareous claystone in the lithostratigraphy.

Figure F31. Relationship between TOC content and Al/Si ratio, Holes U1451A and U1451B. Pelagic and hemipelagic deposits correspond to calcareous clay and calcareous claystone in the lithostratigraphy.

Figure F32. Physical property measurements, Hole U1451A.

Figure F33. Physical property measurements, Hole U1451B.

Figure F34. Moisture and density results, Site U1451.

Figure F35. Color reflectance data, Hole U1451A.

Figure F36. PWL data vs. GRA wet bulk density and WRMSL magnetic susceptibility vs. NGR, Site U1451. Note the distinction between different lithologies.

Figure F37. APCT-3 temperature-time series, Hole U1451A.

Figure F38. Heat flow calculations, Hole U1451A. A. Sediment temperatures. B. Thermal conductivity data from Hole U1451A (circles and dashed line) with calculated thermal resistance (solid line). C. Bullard plot of heat flow calculated from a linear fit of the temperature data.

Figure F39. Seismic Line SO125-GeoB97-027, upper 350 ms TWT of the cored interval, Site U1451 (black line). Seismically identified units/features: L = levee, IS = interlevee, C = channel/fill. For lithologic legend, see Figure **F5** in the Expedition 354 methods chapter (France-Lanord et al., 2016a). Magnetic susceptibility (MS) data reveal high values in sandy intervals and a distinct variability in calcareous clay intervals, indicating detrital clays. Ages are taken from Figure **F41** and denote distinct changes in deposition. For a larger version of this figure, see STRATSYNTH in **Supplementary material**.

Figure F40. Seismic Line SO125-GeoB97-027, upper 1.1 s TWT of seismic section, Site U1451. Because an automatic gain control algorithm was applied to enhance deeper amplitudes, they cannot be directly compared. A color-coded envelope plot shows overall relative amplitude variations with depth. Density values from MAD samples (left) illustrate the compaction trend. PWC data (right) shows red dotted line at 2000 m/s. Both data sets are plotted to depth and are not adjusted/converted to the two-way traveltime axis. Dotted lines = transitions in scatter behavior. For a larger version of this figure, see STRATSYNTH in **Supplementary material**.

Figure F41. Compilation of biostratigraphic and chronostratigraphic markers, Hole U1451A. Calcareous nannofossil and foraminiferal biozones follow Gradstein et al. (2012; based on Martini [1971], Okada and Bukry [1980]) and Wade et al., (2011), respectively. Biomarkers are calculated as midpoints (Table **T8**). Dashed lines = approximate biozone boundary. Paleomagnetic reversals follow the chronostratigraphic scheme of Gradstein et al. (2012); boundaries are the lower depth of the identified reversal (Table **T10**).

Figure F42. Compilation of biostratigraphic and chronostratigraphic markers, Hole U1451B. Calcareous nannofossil and foraminiferal biozones follow Gradstein et al. (2012; based on Martini [1971], Okada and Bukry [1980]) and Wade et al., (2011), respectively. Biomarkers are calculated as midpoints (Table **T8**). Paleomagnetic reversals follow the chronostratigraphic scheme of Gradstein et al. (2012); boundaries are the lower depth of the identified reversal (Table **T10**).

Figure F43. Age-depth plot, Site U1451. Nannofossil and foramimiferal biomarkers are plotted as midpoints; error bars = uncertainty in depth. Cross = youngest Toba ash.

Figure F44. Age-depth plot, 0–6 Ma, Site U1451. Nannofossil and foramimiferal biomarkers are plotted as midpoints; error bars = uncertainty in depth. For biomarkers: right arrow = first occurrence, left arrow = last occurrence (Table **T8**). For magnetic reversals, see Table **T10**. Dashed lines = ash layers. Except for the youngest Toba ash (cross), no ages are assigned to ash layers. Black arrows = selected accumulation rates.