Figure F1. Bathymetry of Guaymas Basin with Baja California in the southwest and the Sonora margin in the northeast, Deep Sea Drilling Project (DSDP) Leg 64 and IODP Expedition 385 sites. Seismic = seismic transects conducted prior to Expedition 385. Inset: tectonic setting of the Gulf of California; green shading = Guaymas Basin; blue box = main figure area. Contour lines = 200 m.

Figure F2. Bathymetric map, Sites U1545 and U1546. Seismic Lines AH-0102 and crossing Seismic Lines AH-0304 and AH-0506 are also shown. The locations of drilled holes at each site are not distinguishable at the given scale. Contour lines = 20 m.

Figure F3. Seismic Lines AH-0102, AH-3233, and AH-4041. Lines AH-3233 and AH-4041 cross Sites U1545 and U1546 perpendicularly. Line AH-4041 shows the ~1800 m extent (in the southwest–northeast direction) of the sill at ~358 mbsf at Site U1546. CDP = common depth point. Blue lines = cross-line locations, black lines = interpreted prominent disconformities.

Figure F4. Lithostratigraphic column, Site U1546. Data on the right are from Hole U1546A. Magnetic susceptibility (MS) plot shows no data between ~350 and 420 mbsf because this interval corresponds to the magmatic sill whose Fe-rich igneous rocks yield MS values two orders of magnitude higher than the embedding sediments, beyond the scale of display. NGR = natural gamma radiation, cps = counts per second, WRMSL = Whole-Round Multisensor Logger.

Figure F5. Presence and contrasting appearance of lamination in (A) Subunit IA (385-U1546A-9H-2, 65–95 cm) and (B) Subunit IB (21H-5, 70–100 cm). Note that the styles of lamination are similar except for the millimeter-scale, white micritic laminae in Subunit IB, which are continuous to discontinuous. Scale = cm.

Figure F6. Comparison of sediment micrite content based on photomicrographs from Subunit IB, Hole U1546A. Left: plane-polarized light (PPL). Right: cross-polarized light (XPL). A, B. Clay-rich diatom ooze with calcareous nannofossil placoliths (385-U1546A-3H-3, 50 cm). (B) Placoliths are visible under XPL (white arrows = largest examples). C, D. Clay-rich diatom ooze with nannofossil placoliths and micrite (dolomite) particles (white arrows) (385-U1546A-14H-5, 60 cm). (C) Micrite crystals (dolomite) show higher relief in PPL but (D) are more visible under XPL because of their high birefringence (see matching arrows). E, F. Micrite-bearing clay-rich diatom ooze (385-U1546A-19H-3, 84 cm). (E) Micrite crystals (dolomite) show higher relief in PPL in but (F) are more visible under XPL because of their high birefringence (see matching arrows).

Figure F7. Soft-sediment deformation in Subunits IA and IB, Site U1546. A, C. Tilted beds from similar stratigraphic intervals in Subunit IA (A: 385-U1546A-11H-7, 5–90 cm. C: 385-U1546B-12H-1, 45–75 cm). B. Tight folds and a fault in Subunit IB (385-U1546A-16H-5A, 0–50 cm). All of these features are interpreted to be the product of slope destabilization and slumping. c = carbonate concretion. Scale = cm.

Figure F8. Detailed correlations of black volcanic ash (v), gray sand (s), and white micritic laminae (m) between (A) Hole U1546B (21H-5, 22–55 cm) and (B) Hole U1546A (20H-5, 111–142 cm). Dashed lines refer to distinct micritic (top) and ash (middle and bottom) laminae. There are subtle differences in the pattern of laminae between holes. The white U-shaped feature in A is a degraded mollusk fragment. Scale = cm.

Figure F9. Scanning electron microscope (SEM) images of main authigenic mineral phases in Subunit IC, Hole U1546A. A. Pyrite framboids (p) associated with diatom (diat) debris of diatom frustules (58X-CC, 18–19 cm) in Subunit ID. B. Micrite composed of euhedral dolomite crystals (d) associated with much more fine grained pyrite framboids (p) that appear as micrometer-sized white dots at this scale (34X-CC, 25–26 cm).

Figure F10. Main sedimentary microfacies based on photomicrographs from Subunits IC and ID, Site U1546. Left: XPL. Right: PPL. A, B. Clay-rich diatom ooze (Subunit IC; 385-U1546A-57X-2, 129 cm). (A) Fragments of biosiliceous tests (d), pyrite framboids (p), and clay-rich clumps (cl). (B) Scattered placoliths of calcareous nannofossils are visible because of their birefringence. C, D. Siliceous claystone (Subunit ID; 58X-1, 80 cm). (C) Clay-rich cloudy clump (cl) of more lithified material on top and disaggregated sediment below with only traces of diatom fragments and pyrite framboids (p). (D) Clay-sized material produces a diffuse birefringence characterized by bright spots (undifferentiated minerals). E, F. Clay-rich diatom ooze (Subunit IC; 385-U1546C-2R-1, 121 cm) with a clump of sediment (cl) that may be a fecal pellet, pyrite framboids (p), and dominant diatom fragments (d). G, H. Siliceous claystone (Subunit ID; 3R-1, 125 cm); micrometer-sized silica particles are visible under PPL and XPL, suggesting a more ordered form of silica (opal-CT) is present in these sediments. Fine-grained opaque minerals are assumed to be pyrite (p).

Figure F11. XRD analyses showing opal-A to opal-CT transition in Subunit IC, Hole U1546A. A. 50F-2, 49–50 cm. B. 54F-4, 30–31 cm. C. 57F-2, 129–130 cm. Qtz = quartz, Fls = feldspar, Cal = calcite, Hal = halite.

Figure F12. (A, B) Optical microscope and (C, D) scanning electron microscope (SEM) images in alteration zone (385-U1546A-62X-CC, 10–11 cm). (A) PPL and (B) XPL images show authigenic sulfide (possibly pyrrhotite [po]) and dolomite (dol) with clay minerals. SEM images show that authigenic clay is the main component, and the veil-like morphology suggests that it is authigenic smectite (Sm). Authigenic zeolite (Zeol) may also be present.

Figure F13. Indurated sediments sampled at the bottom sediment contact with the sill, Hole U1546C. A. Siltstone (possibly altered sediment or sediment-magma mixture?) (21R-1, 55–63 cm). Black arrows = disseminated sulfide crystals. B. Chert (21R-1, 128–133 cm). Black arrows = laminations. C. Dark silty claystone (altered sediment?) (21R-2, 39–46 cm). White arrow = vertical calcite vein.

Figure F14. Sill/sediment contact zone (385-U1546A-62X-CC) and underlying doleritic rock (63X-1). A, B. Basaltic (62X-CC) and doleritic (63X-1) rock, showing plagioclase phenocrysts and fine-grained groundmass. C. Patchy alteration caused by hydrothermal fluid flow in doleritic rock (63X-CC). Vesicularity of the rocks is visible. Vesicles are turned into calcite amygdules.

Figure F15. Progressive lithologic change from sediment to sill and within the sill (basaltic–doleritic–gabbroic–doleritic–basaltic transitions) (385-U1546C-6R-1, 7R-1, 9R-2, 10R-4, 19R-1, and 20R-1). Insets are distinct features observed in the sill. A. Sediment/basalt contact zone with baked sediment contact and chilled basaltic contact below (Section 6R-1). B. Elongated vesicle filled with calcite in the upper basaltic interval of the sill (7R-1). C. Gabbroic–doleritic transition and change in the texture of the sill (9R-2). D. Pyroxene phenocrysts (~2 mm) in the lower doleritic interval. E. Doleritic–basaltic transition zone at the bottom part of the sill (20R-1).

Figure F16. Recovery plots and textural description of the encountered mafic sill, Holes U1546A and U1546C. Cpx = clinopyroxene.

Figure F17. Representative photomicrographs from Site U1546 sill thin section (TS) samples (XPL). (A) Porphyritic (385-U1546C-19R-1; TS 16) and (B) subophitic (8R-5; TS 13) textures in doleritic rock. (C) Oscillatory zoned plagioclase (385-U1546A-63X-1; TS 10) and (D) clinopyroxene pseudomorphs (385-U1546C-19R-1; TS 16) are found in doleritic intervals. E, F. Ophitic texture is the typical texture in the coarse-grained gabbroic layer (E: 385-U1546C-10R-3, TS 14; F: 10R-3, TS 15). Porphyritic texture with (G) plagioclase and clinopyroxene phenocrysts (8R-1; TS 12) and (H) angular vesicle filled with calcite (20R-1; TS 17) in altered basalt. Plg = plagioclase, Cpx = clinopyroxene, Chl = chlorite, Cal = calcite.

Figure F18. Representative core sections with sill intrusion, Hole U1546C. Dashed blue lines = all observed lithologic contacts evident by change in texture. White boxes = portions of whole-round core taken for microbiology sampling before splitting and imaging of sections.

Figure F19. Total alkali ($Na_2O + K_2O$) versus silica (SiO_2) of mafic igneous rocks at drill sites from the Gulf of California. Subdivision of fields after Le Bas et al. (1986). Guaymas Basin (GB) drill sites: DSDP Leg 64 (477, 478, 481) and Expedition 385 (U1546 [Hole C], U1547 [Holes B/C/D/E], and U1550 [Holes A/B]). On-axis: Sites 477 (southern rift) and 481/U1550 (northern rift). Off-axis: Sites 478 (southern rift flank), U1546 (northern rift flank in NW GB), and U1547 (northern rift flank at Ringvent). Gulf of California mouth drill sites lie at East Pacific Rise

(EPR) off-axis locations on the Pacific plate (474, 483) and Rivera plate (482, 485). DSDP Leg 64 and 65 (Sites 482, 483, 485) data were compiled from the PetDB Database (**http://www.earthchem.org/petdb**) on 26 October 2020 using the following search criteria: longitude = −106 to −114, latitude = 20 to 28, and materials = igneous.

Figure F20. Titanium (Ti) versus vanadium (V) content (after Shervais, 1982) of mafic igneous rocks at drill sites from the Gulf of California. ppm = µg/g. Guaymas Basin drill sites from Expedition 385: U1546 (Hole C), U1547 (Holes B/C/D/E), and U1550 (Holes A/B). On-axis: Site U1550 (northern rift). Off-axis: Sites U1546 (northern rift flank in NW GB) and U1547 (northern rift flank at Ringvent). Gulf of California mouth drill sites at East Pacific Rise (EPR) off-axis locations are located on the Pacific plate (Site 483) and Rivera plate (Site 485). DSDP Leg 65 (Sites 483, 485) data were compiled from the PetDB Database (**http://www.earthchem.org/petdb**) on 26 October 2020 using the following search criteria: longitude = −106 to −114, latitude = 20 to 28, and materials = igneous. IAB = island arc basalts, MORB = mid-ocean-ridge basalts, OIB = ocean island basalts.

Figure F21. Mg# versus (A) strontium (Sr) and (B) zirconium (Zr) content of mafic igneous rocks at drill sites from the Gulf of California. ppm = µg/g. Mg# = 100 × molar MgO/(MgO + FeO), where all iron is treated as FeO. Guaymas Basin (GB) drill sites: DSDP Leg 64 (477, 478, 481) and Expedition 385 (U1546 [Hole C], U1547 [Holes B/C/D/E], and U1550 [Holes A/B]). On-axis: Sites 477 (southern rift) and 481/U1550 (northern rift). Off-axis: Sites 478 (southern rift flank), U1546 (northern rift flank in NW GB), and U1547 (northern rift flank at Ringvent). Gulf of California mouth drill sites lie at East Pacific Rise (EPR) off-axis locations on the Pacific plate (474, 483) and Rivera plate (482, 485). DSDP Leg 64 and 65 (Sites 482, 483, 485) data were compiled from the PetDB Database (**http://www.earthchem.org/petdb**) on 26 October 2020 using the following search criteria: longitude = −106 to −114, latitude = 20 to 28, and materials = igneous.

Figure F22. Yttrium (Y) versus Zr/Y value of mafic igneous rocks at drill sites from the Gulf of California. µg/g = ppm. Guaymas Basin (GB) drill sites: DSDP Leg 64 (477, 478, 481) and Expedition 385 (U1546 [Hole C], U1547 [Holes B/C/D/E], and U1550 [Holes A/B]). On-axis: Sites 477 (southern rift) and 481/U1550 (northern rift). Off-axis: Sites 478 (southern rift flank), U1546 (northern rift flank in NW GB), and U1547 (northern rift flank at Ringvent). Gulf of California mouth drill sites lie at East Pacific Rise (EPR) off-axis locations on the Pacific plate (474, 483) and Rivera plate (482, 485). DSDP Leg 64 and 65 (Sites 482, 483, 485) data were compiled from the PetDB Database (**http://www.earthchem.org/petdb**) on 26 October 2020 using the following search criteria: longitude = −106 to −114, latitude = 20 to 28, and materials = igneous.

Figure F23. Normal fault (385-U1546B-54F-1; 290.5 mbsf). Left: high-resolution close-up of core, right: fault is highlighted. Solid line = fault where best exposed, dashed line = fault where more difficult to see. The present white layer is displaced 5 cm by the fault, which has an apparent dip of 63° relative to the horizontal. Scale = cm.

Figure F24. Measured dips of planar structures in igneous rock Cores 7R–20R (~358–430 mbsf), Hole U1546C.

Figure F25. Age-depth plot, Site U1546. See Table T7 for event details. T = top, B = bottom.

Figure F26. Inclination, declination, magnetic intensity, and magnetic susceptibility, Site U1546. Inclination data (A) before and (B) after demagnetization at 20 mT are for advanced piston corer (APC), half-length APC, and rotary core barrel cores only. Red squares = characteristic remanent magnetization inclination of discrete samples after principal component analysis. Expected geocentric axial dipole inclination (~46.3°) is indicated by green (reversed polarity) and blue (normal polarity) lines. C. Declination before demagnetization (in gray). Black = corrected using core orientation from the Icefield MI-5 core orientation tool. D. Magnetic intensity (natural remanent magnetization) on a logarithmic scale. E. Section Half Multisensor Logger point magnetic susceptibility.

Figure F27. A–F. Alternating field demagnetization on selected igneous sections and representative demagnetization diagrams, Hole U1546C. See Discrete sample analysis for upper and lower unit definitions. Gray line = average inclination value of the overlying sediments in Hole U1546A. NRM = natural remanent magnetization.

Figure F28. Alternating field (AF) demagnetization and principal component analysis on discrete sediment samples, Hole U1546A. A. Zijderveld demagnetization diagrams. B. Evolution of magnetization with applied AF. NRM = natural remanent magnetization.

Figure F29. Equal area stereographic projections of discrete sediment sample directions of natural remanent magnetization (NRM) (A) before and (B) after alternating field (AF) demagnetization at 20 mT and (C) characteristic remanent magnetization (ChRM), Hole U1546A. Note that AF demagnetization at 20 mT was effective to determine magnetic polarity.

Figure F30. Alternating field demagnetization and principal component analysis results on discrete igneous rock samples, Holes U1546A and U1546C. A. Zijderveld demagnetization diagrams. B. Evolution of magnetization with temperature for the same samples. C. Equal area stereographic projection of discrete sample directions of the characteristic remanent magnetization (ChRM). NRM = natural remanent magnetization.

Figure F31. Alternating field (AF) demagnetization and principal component analysis results on discrete sediment samples, Hole U1546C. A. Zijderveld demagnetization diagrams for selected discrete sediment samples from below the sill intrusion. B. Evolution of magnetization with applied AF for the same samples. C. Equal area stereographic projection of discrete sample directions before AF demagnetization (natural remanent magnetization [NRM]) and characteristic remanent magnetization (ChRM).

Figure F32. Anisotropy of magnetic susceptibility, Holes U1546A and U1546C.

Figure F33. Interstitial water chemistry, Site U1546. The recovered portions of sill are illustrated by a gray shaded area directly on the graph and a black area in the lithostratigraphic unit column.

Figure F34. $CaCO_3$, total organic carbon (TOC), TOC/total nitrogen (TN), and total sulfur (TS), Holes U1546A–U1546C. Gray bars = sill location. Shading denotes that drilling was terminated prior to determining the bottom extent of the sill in Hole U1546A.

Figure F35. Total organic carbon (TOC_{SRA}), hydrogen index (HI), oxygen index (OI), T_{max}, and S1, Holes U1546A and U1546C.

Figure F36. Hydrogen index and oxygen index shown in relationship to the three kerogen types, Holes U1546A and U1546C. TOC = total organic carbon. Figure modified from Pimmel and Claypool (2001).

Figure F37. Dissolved C_1–C_6 hydrocarbon concentrations and C_1/C_2 and C_1/C_+ in headspace gas samples, Holes U1546A and U1546D. Shading denotes that drilling was terminated prior to determining the bottom extent of the sill.

Figure F38. Dissolved C_1–C_6 hydrocarbon concentrations and C_1/C_2 and C_1/C_+ in headspace gas samples, Holes U1546B and U1546C.

Figure F39. C_1/C_2 variations in headspace gas with temperature, Holes U1546B and U1546C. TOC = total organic carbon. Modified from Pimmel and Claypool (2001) to include observed extended range of temperature and ratios.

Figure F40. C_1–C_6 hydrocarbons, C_1/C_2, and C_1/C_+ in void gas samples, Holes U1546A–U1546C.

Figure F41. Void space per meter core as percent of length, Hole U1546B.

Figure F42. Concentrations of H_2 and CO dissolved in headspace (pore water) and void gas samples, Holes U1546B and U1546C.

Figure F43. Microbial cell abundance versus depth, Hole U1546B. Insets: microscopic field views used to count microbial cells (top: 2H-1; bottom: 35F-3). Gray triangles indicate counts below the detection limit with shipboard epifluorescence microscopy.

Figure F44. Heat flow calculations, Site U1546. A. Formation temperature measurements. APCT-3 = advanced piston corer temperature tool, SET2 = Sediment Temperature 2 tool. B. Measured thermal conductivity. C. Heat flow, q (mW/m^2), shown as the slope of the line relating T(z) to cumulative thermal resistance.

Figure F45. Physical properties, Holes U1546A–U1546D. A. Recovery plot and lithostratigraphic column. B. Density. GRA = gamma ray attenuation, MAD = moisture and density. C. Magnetic susceptibility (MS). D. Sonic velocities. FMS = Formation MicroScanner. E. Natural gamma radiation (NGR). cps = counts per second, HNGS = Hostile Environment Natural Gamma Ray Sonde. F. Rheology. AVS = automated vane shear, PEN = pocket penetrometer. G. Porosity.

Figure F46. Downhole measurement data, Hole U1546C. A. Recovery plot and lithostratigraphic column. B. Natural gamma radiation. FMS = Formation MicroScanner, HNGS = Hostile Environment Natural Gamma Ray Sonde. C. Potassium concentration. D. Uranium and Thorium concentrations. E–G. Inset enlarging the completely logged sill intrusion.

Figure F47. Borehole diameter and resistivity, Site U1546. A. Recovery column and lithostratigraphy. (B) Orthogonal borehole diameter and (C) orientation from calipers in Hole U1546A. FMS = Formation MicroScanner, TC = triple combo. D. Resistivity. RL5 = deepest resistivity, RT = true resistivity.

Figure F48. Formation MicroScanner (FMS) resistivity images, Hole U1546C. Top and bottom contacts of the sill with the sediment identified at 356.5 and 430 mbsf, respectively. Comparison between the static FMS scaling and dynamic scaling.

Figure F49. Formation MicroScanner (FMS) resistivity images (dynamic scaling), Hole U1546C. Left depth column: extent of the bottom-hole assembly (BHA) below the seafloor and two large washout areas where the FMS pads had no contact with the hole walls. FMS resistivity images are shown in 2 m increments. A. 210–270 mbsf. Images show numerous planar interfaces. B. 340–400 mbsf. Host sediments above the sill contact at 355.5 mbsf (340–355.5 mbsf). Upper part of the sill shows numerous planar features (355.5–400 mbsf; fractures and veins will be analyzed on shore). C. 400–460 mbsf. Lower part of the sill (400 to 430 mbsf) followed by host sediments below the sill (430–460 mbsf). Numerous planes at an angle are visible in the upper 8 m of the lower contact, underlain by dominantly horizontal planar features. D. 460–520 mbsf. Remainder of the imaged part of Hole U1546C, showing the deeper sediments distal from the bottom sill contact.