Figure F1. Bathymetry of Guaymas Basin with Baja California in the southwest and the Sonora margin in the northeast, showing all DSDP Leg 64 and IODP Expedition 385 sites drilled in the area. 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 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 U1545. NGR = natural gamma radiation, cps = counts per second, MS = magnetic susceptibility, WRMSL = Whole-Round Multisensor Logger, Reflectance b* = color reflectance parameter b* (more positive = more blue; more negative = more yellow). All data on display obtained from Hole U1545A, including the lithostratigraphic information.

Figure F5. Dominant lithology, lamination, soft-sediment deformation, and color alternations in Subunit IA (385-U1545A-3H). Image was adjusted to highlight sedimentary features. The rhythmic characteristic of the fine-scale lamination is apparent as alternating light- and dark-colored intervals that are generally a few millimeters thick. Some of the white bands can be several centimeters thick and are almost entirely composed of diatom ooze. Red arrows = top and bottom locations of an interval showing evidence of soft-sediment deformation (tilting and folding) between about ~16.3 and ~18.1 mbsf (3H-2, 80 cm, to 3H-3, 105 cm). Black arrow = gray interval with a higher concentration of silt-sized siliciclastic detritus mixed with diatom ooze.

Figure F6. Main sedimentary microfacies in Subunits IA and IB, Site U1545. Left: plane-polarized light (PPL). Right: cross-polarized light (XPL). A, B. Diatom ooze (Subunit IA; 385-U1545A-2H-2, 122 cm). (A) Biosiliceous particles are dominated by whole centric and pennate diatoms and secondarily silicoflagellates. (B) Diatoms “disappear” under XPL because of the amorphous composition of their valves, whereas fewer, scattered placoliths of nannofossils are visible due to calcite content. C, D. Clay-rich diatom ooze (Subunit IA; 385-U1545A-3H-6, 122 cm). (C) Clay-sized fraction is visible only as cloudy brownish areas. (D) Fine silt to clay-sized minerals associated with the brownish areas produce a diffuse, very low birefringence with bright birefringent spots (mineral grains) that are smaller in size than the birefringence produced by the placoliths. E, F. Micrite-rich diatom ooze (Subunit IB). (E) Colorless micrite has high relief. (F) Micrite exhibits higher birefringence characteristic of very fine grained (<30 µm) carbonate particles.

Figure F7. Dominant lithology and color alternations in Subunit IB, Site U1545. A. Homogeneous, olive-gray (5Y 3/2) diatom clay that includes a light olive-gray (5Y 5/2) micrite-rich diatom ooze layer (385-U1545A-10H-2, 14–23 cm). Contact between these two lithologies is gradational. White dashes = top and bottom of the layer. B. Yellowish gray (5Y 7/2) patches and bands of lighter micrite-rich diatom clay (arrows) clearly stand out in comparison with the darker, olive-gray (5Y 3/2) diatom clay that comprises most of the interval (385-U1545A-30F-3, 42–91 cm). The micrite-rich sediments are also more indurated as a result of the precipitation of the authigenic carbonates. C. Lamination is pervasive throughout the section (385-U1545A-32F-5). An excellent example of fine-scale lamination in which the lighter laminae have a higher abundance of diatoms than the darker ones. Micrite is also present in both lamina types. The lighter colored, centimeter- to several centimeters–thick bands contain mainly diatom ooze (arrows = larger bands).

Figure F8. Stages of dolomite concretion formation, Hole U1545A. Dashed lines highlight the approximate extent of the concretions. A. Initial stages of carbonate (c) growth associated with enhanced core stiffness in Subunit IB, mainly in the central part of this interval (26F-4, 41–81 cm; ~179 mbsf). B. Hard carbonate concretion (c) fragmented during core splitting(?) in Subunit IC (35F-3, 11–51 cm; ~225 mbsf). C. Decimeter-thick limestone/dolostone layer (d) in Subunit IC (49X-1, 0–41 cm; ~278 mbsf).

Figure F9. XRD mineralogic analyses, Holes U1545A and U154C. A. Carbonate concretion composed of dolomite (Dol) in Subunit IC (385-U1545A-35F-3, 32–33 cm; ~225 mbsf). B. Diatom ooze in Subunit IB that contains opal-A, dolomite, and halite (Hal) (385-U1545A-47F-2, 70–71 cm; ~274 mbsf). C. Opal-CT as the main mineralogic phase in Subunit ID (385-U1545C-56X-3, 68–69 cm; ~337 mbsf). QTZ = quartz, Cal = calcite.

Figure F10. Dominant and minor lithologies in Subunit IC, Hole U1545A. A. Dolomite concretion (c), a burrowed ash layer (a), and degraded shell fragments (f) in clay-rich diatom ooze (38F-1, 1–31 cm). B. Volcaniclastic layer with erosional base (v) and micrite (m) and silt (s) laminae in micrite-bearing clay-rich diatom ooze (35F-2, 97–117 cm).

Figure F11. Main sedimentary components and lithologies under PPL, Hole U1545A. A. Diatom clay (Subunit IC; 55X-3, 70 cm). Diatom frustules are partially dissolved. B. Siliceous claystone with silt and pyrite (Subunit ID; 70X-2, 82 cm). Diatoms are absent, clay is the dominant component, and authigenic pyrite framboids are abundant.

Figure F12. Typical lithologies and coring deformation (biscuiting) in Subunit ID (385-U1545A-75X-5, 61–123 cm).

Figure F13. SEM images of main authigenic mineral phases in Subunit ID, Hole U1545A. A. Pyrite framboids (p) associated with detrital clay (c) and silt (s) particles (70X-1, 150 cm). B. Pyrite framboids trapped in organic filaments (o) (74X-5, 150 cm). C. Micrite composed of euhedral dolomite crystals (d) associated with pyrite framboids (70X-2, 19–20 cm). D. Authigenic euhedral dolomite crystals (74X-6, 108–109 cm).

Figure F14. Correlation of volcanic ash and sand deposits between (A) Hole U1545B (36F-3, 45–70 cm) and (B) Hole U1545A (36F-3, 44–64 cm). Tripartite correlative sequence (shown by dashed lines) of gray sand (66 cm in A; 61 cm in B), white ooze (63.5 cm in A; 59.5 cm in B), and black ash (54 cm in A; 49 cm in B). Note that the sequence is not perfectly duplicated.

Figure F15. A. Composite image of recovered basaltic sill. B. Top baked zone of carbonate metasediment and chilled contact below. C. Amygdaloidal basalt layer with carbonate-filled vesicles within the microcrystalline aphyric basalt.

Figure F16. Typical basaltic texture in (A) aphyric and (B) amygdaloidal basalt, (C) plagioclase (plg) phenocrysts, (D) vesicles filled with calcite (Cal) in aphyric basalt, (E) primary and secondary magnetite, and (F) pyroxene pseudomorph (385-U1545A-71X-3, 56–59 cm; Thin Section 6). A–D: XPL, E–F: reflected light.

Figure F17. A. Interval containing the 1 cm thick amygdaloidal basalt layer in the sill (385-U1545A-71X-3, 25–61 cm). Inset: basalt sample that cuts across the boundary between the aphyric and amygdaloidal basalt. B. Haloed vein, 31 cm long, steeply crosscutting the sill (71X-CC, 0–36 cm). Top inset: ~0.2 cm wide brown halos that. Bottom inset: carbonate and sulfide minerals precipitated from hydrothermal fluid. Vesicles on the flat cut surface are ~2 mm in size.

Figure F18. Large-scale folds. Fold axes are at a low angle to the horizontal at 0, 17, and 35 cm. Color is enhanced to show folded beds. Another required fold axis or fault must exist at about 10 cm to account for the top two folds having the same facing direction.

Figure F19. Concentric fold (385-U1545A-12H-3). Fold axis at 33–34 cm. Left: shipboard X-ray image showing folded strata. Right: same image with several of the folded beds outlined in pink to illustrate the deformation. Compare to fold in Figure F18.

Figure F20. Normal fault displacing sedimentary layers by 2 mm (385-U1545A-50F-1, 82–84 cm). Left: unmarked image. Right: same image with a red line indicating the fault.

Figure F21. Age-depth plot, Site U1545. See Table T7 for event details. T = top, B = bottom.

Figure F22. Inclination, declination, magnetic intensity, and magnetic susceptibility, Hole U1545A. A, B. Inclination data are for advanced piston corer (APC) and half-length APC 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. Gray = declination before demagnetization, 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 F23. Tentative magnetic intensity (natural remanent magnetization) and point magnetic susceptibility (Section Half Multisensor Logger) correlation between Holes U1545A and U1545B. Inclination data after alternating field demagnetization at 20 mT are from Cores 385-U1545B-46F through 60F. Expected geocentric axial dipole inclination (~46.3°) is indicated by green (reversed polarity) and blue (normal polarity) lines.

Figure F24. Discrete sample alternating field (AF) demagnetization and principal component analysis results, Hole U1545A. A. Zijderveld demagnetization diagrams for selected discrete samples. NRM = natural remanent magnetization. B. Evolution of magnetization with applied AF for the same specimens.

Figure F25. Equal area stereographic projections of unoriented discrete 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), Site U1545. Note that AF demagnetization at 20 mT was effective to determine the magnetic polarity.

Figure F26. Anisotropy of magnetic susceptibility, Hole U1545A.

Figure F27. Interstitial water chemistry, Site U1545. The recovered portion of a sill fully penetrated in Hole U1545A is illustrated by a gray shaded bar directly on the downhole plot and a black bar in the lithostratigraphic unit column. SMTZ = sulfate–methane transition zone. (Continued on next page.)

Figure F27 (continued).

Figure F28. Alkalinity/NH_4^+ ratio, Site U1545. Blue line = Redfield ratio (6.6), gray line = recovered portion of a sill fully penetrated in Hole U1545A.

Figure F29. $CaCO_3$, total organic carbon (TOC), TOC/total nitrogen (TN), and total sulfur (TS), Holes U1545A and U1545B. Gray line = recovered portion of a fully penetrated sill in Hole U1545A.

Figure F30. Source rock analyzer results. Left: T_{max} (°C), Holes U1545A and U1545B. Right: oxygen and hydrogen indexes shown in relationship to the three kerogen types, Hole U1545A. TOC = total organic carbon. Figure modified from Pimmel and Claypool (2001).

Figure F31. Dissolved C_1–C_6 hydrocarbon concentrations and C_1/C_2 and C_1/C_+ in headspace gas samples, Hole U1545A. C_1/C_2 (black) and C_1/C_+ (gray) values are based on ppmv concentrations. Gray line = recovered portion of a fully penetrated sill in Hole U1545A.

Figure F32. C_1/C_2 variations in headspace gas with temperature, Hole U1545A. TOC = total organic carbon. Figure modified from Pimmel and Claypool (2001) to include the extended range of Expedition 385 temperature and ratios.

Figure F33. Dissolved C_1–C_6 hydrocarbon concentrations and C_1/C_2 and C_1/C_+ in headspace gas samples, Hole U1545B. C_1/C_2 (black) and C_1/C_+ (gray) values are based on ppmv concentrations.

Figure F34. Dissolved C_1–C_6 hydrocarbon concentrations and C_1/C_2 and C_1/C_+ in headspace gas samples, Hole U1545C. C_1/C_2 (black) and C_1/C_+ (gray) values are based on ppmv concentrations.

Figure F35. C_1–C_6 hydrocarbons, C_1/C_2, and C_1/C_+ in void gas samples, Hole U1545B.

Figure F36. Void space per meter core as percent of length, Hole U1545B.

Figure F37. Concentrations of H_2 and CO dissolved in headspace (pore water) and void gas samples, Hole U1545B.

Figure F38. Microbial cell abundance versus depth, Hole U1545B. Insets: microscopic field views used to count microbial cells (top: 1H-1; bottom: 30F-2). Gray symbols = no cell was detected in these samples.

Figure F39. Selected advanced piston corer temperature (APCT-3) tool temperature-time series with extrapolated formation temperature estimates, Hole U1545A. (Table T20.)

Figure F40. Heat flow calculations, Site U1545. 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 F41. Physical properties, Site U1545. A. Recovery plot and lithostratigraphic column. B. Density. GRA = gamma ray attenuation, MAD = moisture and density. C. Magnetic susceptibility (MS) measured on Whole-Round Multisensor Logger and Section Half Multisensor Logger. D1, D2. Sonic velocities (D1: V_{P1} and V_{P2}, D2: WRMSL, Discrete, Formation MicroScanner [FMS]). 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 (MAD).

Figure F42. Physical properties, Site U1545. A. Recovery plot and lithostratigraphic column. B. Natural gamma radiation (NGR). cps = counts per second, HNGS = Hostile Environment Natural Gamma Ray Sonde, FMS = Formation MicroScanner. C. Potassium concentration. D. Uranium and thorium concentrations.

Figure F43. Borehole diameter and resistivity, Site U1545. A. Recovery plot and lithostratigraphic column. B–E. Orthogonal borehole diameter and orientation from calipers, Holes U1545A and U1545B. FMS = Formation MicroScanner, TC = triple combo. F. Resistivity. RL5 = deepest resistivity, RT = true resistivity.