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. DSDP = Deep Sea Drilling Project.

Figure F2. Bathymetric map, Site U1550. DSDP Site 481 is also shown. Contour lines = 2 m.

Figure F3. Seismic Lines AH-1213 (top left), AH-1011 (top right), and GM-012 (bottom), with the location of Hole U1550A indicated as a thick blue line on the AH-1011 profile and crossing-line locations indicated by thin blue lines. Line GM-012 provides an expanded view of the axial trough, which is floored by numerous mounds believed to be formed primarily in response to sill intrusion. The brighter band of reflectivity at ~2.9–3.0 s two-way traveltime is believed to represent sill intrusions. Data quality between 1850 and 2150 on Line AH-1011 is particularly poor, and the broad diffractions observed over that interval are not representative of subsurface structure. CDP = common depth point.

Figure F4. Lithostratigraphic column, Site U1550. Data on right are from Hole U1550A. Depth of the upper sill/sediment contact corresponds to Hole U1550A. NGR = natural gamma radiation, cps = counts per second, MS = magnetic susceptibility, WRMSL = Whole-Round Multisensor Logger.

Figure F5. Example of overturned depositional unit at the top of Subunit IA in both holes drilled at Site U1550. A. Normal bedding (white arrow) with coarser sandy layer at the bottom and a light-colored band mainly composed of diatoms at the top (385-U1550A-1H-1, 44–53 cm). B. The same depositional unit is overturned (white arrow), and coarse shell debris is visible at the erosional base of the dark sandy interval (385-U1550B-1H-1, 110–130 cm). Scale = cm.

Figure F6. A. Diatom ooze (Do) overlying homogeneous diatom clay (Ho) is offset along a fault (F) or series of faults (U1550A-8H-4, 117–140 cm). Note overlying laminated diatom clay (Lam) with distinct dark ash lamina (Ash). B. Homogeneous diatom clay deformed and injected by fluidized sand (SI). A fault (F) crosscuts the injection features in the upper part (9H-4, 75–105 cm). C. Multiple phases of sand injection, light (lSI) and dark (dSI). White arrow = a thin contorted vein of dark sand extending down the left half of the core and crosscutting a lighter injection feature (9H-5, 120–150 cm). D. Complex mix of deformed diatom clay to diatom ooze crosscut by various sand injection veins (10H-2, 80–105 cm). E. Gray sandy bed with a scoured base (Scour) fines upward from sand (135–125 cm) to silt (<125 cm) with black streaks of organic matter (Org) potentially defining cross-lamination (23X-4, 116–142 cm). This extended core barrel core is slightly biscuited. F. Potentially cross-laminated (Xlam?) fine sand to silt bed abruptly overlain by diatom clay at a potential fault (F) contact (23X-2, 110–140 cm). The diatom clay is then overlain at a scoured contact by normally graded to laminated gray sand (Glam). Scale = cm.

Figure F7. Subunit IA, Hole U1550A. A, B. Unusual bed containing dark (mafic?) volcanic lapilli (to ash) and fragments of diatom clay that can be more clearly defined in (B) X-ray images where the lapilli are black to dark gray and the large sedimentary fragments (S) and muddy matrix are lighter shades of gray.

Figure F8. XRD mineralogic analyses, Hole U1550A. A. 1H-3, 50–51 cm. B. 6H-3, 65–66 cm. C. 11F-3, 70–71 cm. D. 14F-3, 50–51 cm. E. 25X-5, 111–112 cm. The broad hump between ~20 and 35 2θ in A, B, and C suggests the presence of amorphous silica (opal-A). Silica phase changes deeper in the site are suggested by the occurrence of opal-CT in E. Qtz = quartz, Fds = feldspar, Hal = halite, Cal = calcite.

Figure F9. Igneous rock stratigraphy and core recovery, Holes U1550A and U1550B. A. Recovery columns for the igneous sill material recovered in each hole. B. Core composite images (displaying section depth) of the igneous rock intervals drilled in each hole.

Figure F10. Doleritic rock and its textural relationship with the coexistent basaltic intervals, Holes U1550A and U1550B. A. Thin vein of baked clay within light-colored doleritic rock. B. Doleritic fragment in basaltic rock with parallel running calcite veinlets. C. Change of gradational grain size from basaltic to doleritic groundmass crosscut by parallel calcite veins. D–F. Progressive downhole coarsening of matrix plagioclase crystals displayed in doleritic intervals in Hole U1550A. Scale = cm.

Figure F11. Representative sill thin section (TS) samples (cross-polarized light). A. Sharp contact between the slightly altered basaltic (phyric) and doleritic (inequigranular) rock domains (385-U1550B-23X-1, 73–76 cm; TS 44). B, C. Porphyritic texture showing (B) less altered versus (C) more altered in parts within the basaltic rock domain (385-U1550B-23X-1, 73–76 cm; TS 44). D, E. Subophitic texture in coarser grained doleritic rock (385-U1550A-31X-1, 40–52 cm; TS 43). Plg = plagioclase, Cpx = clinopyroxene.

Figure F12. 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 F13. 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 F14. 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 F15. 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 F16. Faults. A. Four subparallel faults (385-U1550A-17F; 129.1–131.1 mbsf). B. Three subparallel faults (Core 385-U1550B-17F; 128.7–131.7 mbsf).

Color is digitally enhanced to highlight compositional differences of stratigraphic layers and contrast across faults.

Figure F17. Small-scale fault zone with apparent normal displacement (385-U1550A-7H-2; 54.9 mbsf). Laminations reveal an offset of about 0.8 cm. Left: uninterpreted X-ray image. Right: same X-ray image with fault zone marked in red. Scale = cm.

Figure F18. Closely spaced parallel veinlets at the top of the basaltic sill interval just below the chilled margin adjacent to the overlying sedimentary rock (385-U1550B-23X-1, 41–52 cm; 172.6 mbsf). Scale = cm.

Figure F19. Age-depth plot, Site U1550. See Table T6 for event details. T = top, B = bottom.

Figure F20. Inclination, declination, magnetic intensity, and magnetic susceptibility, Hole U1550A. Inclination data (A) before and (B) after AF demagnetization at 20 mT. Red squares = characteristic remanent magnetization inclination of discrete samples after principal component analysis. Expected geocentric axial dipole inclination (~45.9°) is indicated by green (reversed polarity) and blue (normal polarity) lines. C. Declination before demagnetization (in gray). Black = corrected using core orientation obtained 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 F21. Alternating field (AF) demagnetization and principal component analysis results on discrete samples, Hole U1550A. A. Zijderveld demagnetization diagrams for selected discrete samples. B. Evolution of magnetization with applied AF for the same samples. C. Equal-area stereographic projection of discrete sample directions in specimen coordinates. NRM = natural remanent magnetization, ChRM = characteristic remanent magnetization.

Figure F22. Anisotropy of magnetic susceptibility, Hole U1550A.

Figure F23. Interstitial water chemistry, Site U1550. The recovered portion of a sill in Hole U1550B is illustrated by a gray shaded area directly on the graph and a black bar in the lithostratigraphic unit column of the corresponding borehole. SMTZ = sulfate–methane transition zone. (Continued on next page.)

Figure F23 (continued).

Figure F24. $CaCO_3$, total organic carbon (TOC), TOC/total nitrogen (TN), and total sulfur (TS), Holes U1550A and U1550B.

Figure F25. Dissolved C_1–C_6 hydrocarbon concentrations and C_1/C_2 and C_1/C_+ in headspace gas samples, Holes U1550A and U1550B. Shading denotes that drilling was terminated prior to determining the bottom extent of the sill.

Figure F26. C_1/C_2 variations in headspace gas with temperature, Holes U1550A and U1550B. TOC = total organic carbon.

Figure F27. C_1–C_6 hydrocarbons, C_1/C_2, and C_1/C_+ in void gas samples, Holes U1550A and U1550B.

Figure F28. Void space per meter core as percent of length, Holes U1550A and U1550B.

Figure F29. Concentrations of H_2 and CO dissolved in headspace (pore water) and void gas samples, Holes U1550A and U1550B.

Figure F30. Microbial cell abundance versus depth, Hole U1550B. Insets: microscopic field views used to count microbial cells (top = 1H-1; bottom = 11H-4). White triangle indicates cell count below the detection limit of shipboard epifluorescence microscopy.

Figure F31. Heat flow calculations, Site U1550. 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 measured T(z) to cumulative thermal resistance.

Figure F32. Physical properties, Holes U1550A and U1550B. A. Recovery and lithostratigraphic columns (depicted lithostratigraphy represents Hole U1550A). B. Density. GRA = gamma ray attenuation, MAD = moisture and density. C. Magnetic susceptibility (MS). D. Sonic velocity. E. Natural gamma radiation (NGR). cps = counts per second. F. Rheology. AVS = automated vane shear, PEN = pocket penetrometer. G. Porosity.