Figure F1. Bathymetric map of Asùt Tesoru Seamount summit area, Site U1496, and ship tracks for MCS Line EW0202 42-44 with common midpoints labeled. Bathymetry data was collected by Simrad EM300 during a 2003 R/V *Thomas G. Thompson* cruise (Oakley et al., 2008). The inset illustrates depth of penetration relative to the bathymetry defined by the dashed line X to X′ on the bathymetric map. Holes U1495A and U1495B are shown for context.

Figure F2. MCS Line EW0202 42-44 across the summit of Asùt Tesoru Seamount and the location and depth of penetration in Holes U1496B and U1495A (Oakley et al., 2008; Oakley, 2008).

Figure F3. The observatory construction in Hole U1496C reaches 105.6 mbsf. The screened section was placed between 35.8 and 70.8 mbsf. The transition from 16 inch casing to 10¾ inch casing is highlighted by a dashed circle (Figure F4). This transition occurs at 0.8 mbsf. This transition will support the weight of the CORK-Lite and seal it in the 9.9 inch inner diameter (ID) section of this crossover. The depth to the cement is estimated based on the amount of fill and the volume of cement displaced into the borehole.

Figure F4. 16 inch casing hanger (Figure F5) and swage (16 × 10¾ inch crossover) (Figure F6), Hole U1496C. Downhole instruments must fit in the tolerance of the crossover, which is 9.894 inches in diameter. Note that this transition is different from that deployed at Sites U1492 and U1497; it lacks the pup joint.

Figure F5. The 16 inch casing hanger and 10¾ inch swage deployed in Hole U1496C were screwed together in a cap welded to the top of the core shop. This arrangement was made to mill out the seal surface by hand so that the casing hanger could mate with the DQ running tool. Another 16 inch casing hanger with a 4 ft pup joint is on the left. The unit on the left was deployed in Hole U1497D, and a similar unit with a pup joint was deployed in Hole U1492D.

Figure F6. The ROV platform in Hole U1496C has an outer diameter of 142 inches. The inner circle through which a CORK-Lite must pass has a diameter of 39⅜ inches.

Figure F7. A. The VIT camera system hangs over the moonpool attached to the "lunar lander" and the ROV platform below (Figure F6). B. The lunar lander is the release mechanism for the ROV platform. During the deployment, it was bent, releasing the platform to free-fall to the seafloor and reentry cone. Because of this incident and to protect the fiber-optic cable on the camera, the remaining ROV platforms were deployed by free-fall from the surface.

Figure F8. Reentry cone and ROV platform on the seafloor viewed from the VIT camera system, Hole U1496C. The ROV platform was slightly damaged during the deployment but is still operational. The platform is not centered because it lacks a strut, which was broken off during deployment.

Figure F9. Final preparations for the WSTP were conducted on the rig floor prior to deployment within the cased borehole.

Figure F10. Bathymetric map of Asùt Tesoru Seamount showing Site U1496 relative to Sites U1493–U1495.

Figure F11. Lithostratigraphy, Holes U1496A and U1496B. Colors are according to DESClogik with slight changes for subunits or when representative for the particular unit.

Figure F12. Green garnet associated with Cr spinel (Section 366-U1496A-7F-CC, 0–11 cm).

Figure F13. Serpentinite mud, Hole U1496A. All in plane-polarized light (PPL). A, B. Light brown mud with serpentinite matrix, Fe oxide (probably limonite), brown glass (Glass), acicular aragonites (Arg), and euhedral garnets (Grt) (1F-1, 2 cm) Serpentine = Srp, Mt = magnetite. C. Dark bluish gray mud with fibrous dusty serpentines, a euhedral garnet, and magnetite aggregations (1F-1, 50 cm). D. Dark bluish gray mud with chlorite (Chl) (1F-1, 50 cm). E. Light greenish gray mud with a euhedral brucite (Brc) crystal in the clean serpentine matrix (3F-3, 10 cm). F. Light greenish gray mud with spinel (Spl) and brucite in the clear serpentinite mud (that is lacking fine dusty inclusions of magnetite) (6F-2, 52 cm).

Figure F14. Downhole changes in mud composition, Hole U1496A. D = dominant (>50%), A = abundant (20%–50%), C = common (10%–20%), R = rare (1%–10%), Tr = trace (<1%).

Figure F15. Dark bluish black serpentinite mud (366-U1496A-1F-1, 48–49 cm). A. Prisms of aragonite (Arg) embedded in and draped by matted asbestiform serpentine (Srp), probably chrysotile, with microcrystalline magnetite (Mt) scattered in the serpentine fibers (magnification = 1000×). B. Matted, fibrous serpentine with microcrystals of euhedral magnetite surrounding an aragonite prism (2000×). C. Asbestiform serpentine with scattered microcrystals of magnetite (2500×).

Figure F16. Serpentinite mud, Hole U1496B. All in PPL. A. Dark bluish gray sample with dusty serpentines (Srp), magnetite (Mt) aggregates, and acicular aragonites (Arg) (1F-1, 0 cm). B, C. Dark bluish gray sample with subhedral to euhedral magnetite grains, garnet (Grt) aggregate, and acicular aragonites in the dusty serpentine matrix (i.e., containing fine dusty inclusions of magnetite) (1F-1, 8 cm). Foram = foraminifer. D. Bluish gray sample with dusty serpentines filled with magnetite, as well as a brucite (Brc) fragment (1F-1, 20 cm). E. Light greenish gray sample with a garnet aggregate and pipe-like siliceous microfossil shown by the bubble in it (3F-5, 25 cm). F. Light greenish gray sample with fragments of brucite and dusty volcanic glass (Glass) (5F-1, 110 cm).

Figure F17. Downhole changes in mud compositions, Hole U1496B.

Figure F18. Downhole changes in mud compositions, Hole U1496C.

Figure F19. Serpentinite mud, Hole U1496C. All in PPL. A, B. Light brown sample with serpentine (Srp) matrix, foraminiferal (Foram) fragment, acicular aragonites (Arg), garnet (Grt), magnetite (Mt), and other Fe oxide (1R-1, 1 cm). C. Dark bluish gray sample with dusty serpentines, magnetite grains, subhedral garnet, and a brucite (Brc) fragment (1R-1, 10 cm). D. Dark bluish gray sample with dusty serpentines, acicular aragonites, and a spinel (Spl) fragment (1R-1, 65 cm). E. Light greenish gray sample with garnet, brucite, spinel, and magnetite grains (1R-1, 45 cm). F. Light greenish gray sample with a foraminifer fragment (11R-3, 25 cm).

Figure F20. (A) Location of thin section billet and (B) serpentinized harzburgite clast displaying porphyroclastic texture (366-U1496C-5R-1, 5–7 cm [TS 87]; cross-polarized light [XPL]). Partly serpentinized orthopyroxenes (Opx) up to 3 mm in size have curvilinear grain boundaries with smaller olivines (Ol) about 1 mm in size. Minor spinel (Spl). The clast is crosscut by irregular thin, zoned serpentine veins.

Figure F21. Porphyroclastic texture (366-U1496C-5R-1; TS 87). (A) PPL and (B)XPL photomicrographs showing holly leaf spinel (Spl) adjacent to deformed orthopyroxene (Opx). Ol = olivine. (C) PPL and (D) XPL photomicrographs of a large (~6 mm) orthopyroxene porphyroclast that has been extended and fractured into three pieces by shear strain.

Figure F22. Dunite and pyroxenite, Hole U1496A. A. Olivine domains with distinct optical orientations allow estimation of primary grain boundaries (dotted line) and sizes (1F-1, 4–6 cm [TS 70]; XPL). B. Orthopyroxenite with decussate texture cut by serpentine veins (2F-4, 10–13 cm [TS 71]; PPL).

Figure F23. Metadolerite and carbonate veins, Hole U1496B. A. Metadolerite composed mainly of titanaugite (pink) and plagioclase (pale gray) (10F-2, 5–8 cm). Augites are partly altered to aegirine–augite (green), and plagioclases are completely altered to clay minerals. White box = area of B. B. Euhedral to subhedral titanaugite and plagioclase (Plg) with equigranular texture (10F-2, 5–8 cm [TS 85]; PPL). Altered plagioclase shows relict albite twinning. Cpx = clinopyroxene. C. Reddish carbonate veins associated with metadolerite (8X-CC, 25–28 cm). White box = area of D. D. Red domain consists of carbonate overprinted by secondary clay-mineral alteration (8X-CC, 25–28 cm; TS 82; PPL). Green domain is composed of chlorite, epidote, and clay minerals.

Figure F24. Volcaniclastic breccias (XPL), Hole U1496A. A. Moderately clinopyroxene (Cpx)–plagioclase-phyric metabasalt vitrophyre with black glassy matrix (Glass) in altered microcrystalline matrix (3F-CC, 17–20 cm [TS 72]). B. Metabasalt clast in volcaniclastic breccia with altered plagioclase (Plg) phenocrysts (>2 mm) and a matrix composed of equigranular plagioclase (altered) and clinopyroxene (7F-4, 124–126 cm [TS 79]).

Figure F25. Brittle deformation structures, Hole U1496A. A. Branched and single serpentine veins located at the edges of ultramafic clasts (6F-CC, 20–34 cm). B. Altered brecciated clast (11X-CC, 12–28 cm). C. Brecciated clasts (10G-CC, 10–31 cm). D. Close-up of C.

Figure F26. Head space and interstitial water H_2, CH_4, and AVS concentration-depth profiles, Holes U1496A–U1496C. CH_4/H_2 ratio and pH, chloride, and sulfate concentrations are shown for comparison. Red shading highlights zones with H_2 concentration anomalies (see text for discussion).

Figure F27. Headspace H_2 and CH_4 concentrations vs. CH_4/H_2 concentration ratios, Sites U1491–U1496.

Figure F28. Interstitial water alkalinity, pH, and salinity concentrations, Holes U1496A–U1496C. Hole U1496C data are not shown, except for the WSTP sample plotted at 0 m (actual depth = 43.5 mbsf). Bottom seawater values are from Mottl et al. (2003, 2004).

Figure F29. Interstitial water phosphate, sulfate, and ammonium concentrations, Holes U1496A–U1496C. Hole U1496C data are not shown, except for the WSTP sample plotted at a depth of 0 m (actual depth = 43.5 mbsf). Bottom seawater values are from Mottl et al. (2003, 2004).

Figure F30. Interstitial water Cl, Br, and Na concentrations, Holes U1496A–U1496C. Hole U1496C data are not shown, except for the WSTP sample plotted at 0 m (actual depth = 43.5 mbsf). Chloride datum from the WSTP sample is not shown because the value (515 mM) is significantly lower than the bottom seawater value. Bottom seawater values are from Mottl et al. (2003, 2004).

Figure F31. Interstitial water K, Na, Sr, Ca, B, Li, Mg, and SiO_2 concentrations, Holes U1496A–U1496C. Hole U1496C data are not shown, except for the WSTP sample plotted at 0 m (actual depth = 43.5 mbsf). Bottom seawater values are from Mottl et al. (2003, 2004).

Figure F32. Interstitial water DIC and DOC concentrations, Holes U1496A–U1496C. Hole U1496C data are not shown, except for the WSTP sample plotted at 0 m (actual depth = 43.5 mbsf). Bottom seawater values are from Eglinton and Repeta (2014).

Figure F33. PFMD concentrations from the interior, halfway, and exterior of the microbiology whole round, the top of the core, and the drill fluid recovered from the top of the core, Site U1496. All PFMD concentrations are given in headspace parts per million (ppm). Alkalinity and pH data are shown to provide a measure for the level of active serpentinization and potential seawater contamination (see Fluid geochemistry).

Figure F34. Color reflectance, GRA density and discrete bulk density, *P*-wave velocity, magnetic susceptibility, and NGR data, Hole U1496A.

Figure F35. Color reflectance, GRA density and discrete bulk density, *P*-wave velocity, magnetic susceptibility, and NGR data, Hole U1496B.

Figure F36. Color reflectance, GRA density and discrete bulk density, *P*-wave velocity, magnetic susceptibility, and NGR data, Hole U1496C.

Figure F37. Index property data (grain density, bulk density, and porosity), thermal conductivity, and shear strength, Hole U1496A.

Figure F38. Index property data (grain density, bulk density, and porosity), thermal conductivity, and shear strength, Hole U1496B.

Figure F39. Index property data (grain density, bulk density, and porosity), thermal conductivity, and shear strength, Hole U1496C.

Figure F40. APCT-3 temperature measurements during insertion and recovery from two deployments, Hole U1496C.

Figure F41. Calculated APCT-3 formation and bottom seawater temperatures and best fit linear thermal gradient, Hole U1496C.

Figure F42. Measured WSTP temperatures and depths during borehole operations, Hole U1496C.

Figure F43. WSTP temperature in the borehole and overlying 80 m of the water column, Hole U1496C. Depth calculated using RigWatch wireline data.

Figure F44. Estimated WSTP and APCT-3 temperatures and calculated linear thermal gradients, Hole U1496C. Blue diamonds represent WSTP temperatures when the wireline was paused. Gray triangles indicate APCT-3 temperatures. Two thermal gradients are shown, representing maximum and minimum values.

Figure F45. NRM decay (left) and AF demagnetization vector (right) diagrams of discrete samples, Site U1496. A. 366-U1496A-3F-3, 10.37 mbsf. B. 366-U1496B-1F-1, 0.35 mbsf. Demagnetization diagrams: points = projected endpoints of the remanent magnetization vector measured for each sample in core coordinates, blue lines = principal component directions from discrete samples, open symbols = vector endpoints projected on a vertical plane, solid symbols = vector endpoints projected on a horizontal plane.

Figure F46. Paleomagnetic intensity, inclination, and declination of archive halves after 5 mT AF demagnetization and magnetic susceptibility of discrete samples, Hole U1496A. For intensity, NRM before AF demagnetization is also shown. For intensity and inclination, dots are the original data and lines are running averages of that data.

Figure F47. Paleomagnetic intensity, inclination, and declination of archive halves after 5 mT AF demagnetization and magnetic susceptibility of discrete samples, Hole U1496B. For intensity, NRM before AF demagnetization is also shown. For intensity and inclination, dots are the original data and lines are running averages of that data.