Figure F1. Bathymetric map of Sites U1491 and U1492, Yinazao Seamount, and ship tracks for MCS Lines EW0202 71-72 and 75-78 with common midpoints labeled. Bathymetry data was collected by Simrad EM300 during a 2003 R/V *Thomas G. Thompson* cruise (Oakley et al., 2008).

Figure F2. Fossilized high-spire gastropod (Ga) (366-U1491C-2H-5, 133–140 cm).

Figure F3. Fossilized pecten or scallop shell (Sh) fragment (366-U1491C-8F-1, 94–101 cm).

Figure F4. MCS Line EW0202 71-72 and Sites U1491 and U1492 (Oakley et al., 2007, 2008; Oakley, 2008). Reflectors on the flank dip inward toward the body of the edifice.

Figure F5. Lithostratigraphic summary, Holes U1491A–U1491C. Colors are defined in Figure F6 in the Expedition 366 methods chapter (Fryer et al., 2018a), with slight changes for subunits or when representative for the particular unit.

Figure F6. Perspective, color-contoured map of Yinazao Seamount and Site U1491. Contour interval = 10 m.

Figure F7. Representative core images of lithostratigraphic units, Holes U1491B and U1491C.

Figure F8. Composite clast with highly altered and possibly Mn-encrusted serpentinized ultramafic clasts enclosed in a semi-indurated brown mudstone (366-U1491C-3F-1A, 142–151 cm).

Figure F9. Ultramafic clast exhibiting red weathering with a black (Mn-rich?) crust (366-U1491C-3F-2, 77–84 cm).

Figure F10. Representative smear slide images, Holes U1491B and U1491C. A. Subhedral to anhedral carbonate (Cb) (366-U1491B-3H-3, 82 cm). Brown spinel is also present. B. Foraminifer (366-U1491C-1H-CC, 4 cm). C. Rounded to subrounded opaque lithic fragments and green pyroxene and colorless plagioclase (Pl) crystals (2H-4, 38 cm). Cpx = clinopyroxene. D. Transparent lithic grains with acicular phenocryst (2H-4, 47 cm). E. Cruciform twinning of zeolite (center) (2H-4, 80 cm). F. Dominant carbonate (5F-1, 3 cm; cross-polarized light [XPL]).

Figure F11. Carbonate breccia. A. Fine-grained carbonate matrix of breccia (white to mottled medium gray) embedded with small fibrous serpentine or bastite fragments (366-U1491B-2H-5, 85–88 cm; plane-polarized light [PPL]). B. Subangular to angular serpentinized harzburgite and serpentine clasts (dark) hosted by a carbonate matrix (white) (366-U1491C-4F-1, 92–97 cm). C. Carbonate breccia characterized by matrix of aragonite (white radiating clusters) and angular serpentinite (dark) clasts (Sample U1491C-6F-2, 42–45 cm; XPL).

Figure F12. Serpentinized harzburgite clasts, Hole U1491B. A. Serpentinite presenting mesh textures crosscut by a fibrous vein (center of right edge and extending across lower right corner) (2H-2, 69–89 cm; XPL). B. Serpentinite presenting interpenetrating serpentine textures crosscut by polyphased veins (500 µm wide tan to brown vein across upper third of image and thinner [~250 µm] vein extending down the left side) composed of fibrous serpentine, magnetite, and carbonate (3H-2, 10–15 cm; XPL). C. Serpentinized harzburgite (about 50% serpentinized) displaying rounded relict olivine crosscut by one 500 µm wide serpentine vein from top middle to lower left corner and numerous thinner (approximately a few micrometers wide) veins (5H-CC, 1–5 cm; PPL). The wider serpentine veins have mesh textures associated with thin strings of dusty opaque magnetite. One 500 µm diameter grain (white) of bastite is replaced by serpentine in the lower left corner to the right of the wide serpentine vein. D. Serpentinized harzburgite (about 50% serpentinized) displaying rounded relict olivines (high-order birefringence colors) associated with a bastite in the lower right quarter of the image (5H-CC, 1–5 cm; XPL). Crosscutting serpentine vein (low first-order gray birefringence color) with interpenetrating texture is also present.

Figure F13. Putative pyrrhotite or pyrite grains (bright yellow to orange-yellow euhedral to subhedral crystals) contained in carbonate veins (paler orange) and at contact with serpentinized harzburgite domain (darker orange) (366-U1491C-6F-2, 42–45 cm; reflected light).

Figure F14. Very fine grained sulfide grains contained in carbonate veins (paler orange) along and near contacts with serpentinized harzburgite domains (darker orange) (366-U1491C-6F-2, 42–45 cm; reflected light).

Figure F15. Carbonate breccia. A. Single serpentine vein network (light gray) crosscutting an ultramafic clast (dark gray) surrounded by serpentinite matrix (mottled dark and light gray) (366-U1491B-2H-6, 141–147 cm). B. Angular ultramafic clast–dominated breccia or fragmented clast (dark gray) cemented by mixture of carbonate (light gray) and serpentinite mud matrix (mottled dark and light gray at bottom center of clast) and surrounded by serpentinite mud matrix (2H-5, 2–7 cm). C. Subangular to subrounded millimetric to centimetric ultramafic clasts (dark gray) and millimetric pieces of serpentine veins embedded in a carbonate (light gray) cement matrix (>30% of the sample) (366-U1491C-4F-1, 92–97 cm). D. Millimeter-scale clasts (dark gray) embedded in a carbonate (light gray) cement matrix (>50% of the sample) (2H-CC, 12–17 cm).

Figure F16. Serpentinized harzburgite clasts, Hole U1491C. A. Clast, which contains relict orthopyroxene and clinopyroxene, interpreted to be a highly altered, dark reddish brown harzburgite clast with crosscutting black serpentine veins. It is embedded in soft serpentinite mud (3F-3, 49–54 cm). B. Highly altered dark reddish brown harzburgite similar to A in a graded sequence of drilling-disturbed polymict gravel interval composed of smaller granule- to gravel-sized similar dark reddish brown harzburgite, white subrounded carbonate, and dark gray to black harzburgite (4F-1, 102–106 cm).

Figure F17. Microstructures of serpentinite breccias. A. Ultramafic breccia with carbonate matrix (366-U1491B-2H-5, 85–88 cm). B. Matrix of clast in Figure F11B showing small serpentinite fragments (elongate dark gray and light gray, low-order birefringence colors) embedded in micritic carbonate matrix (mottled medium-gray birefringence color) (366-U1491C-4F-1, 92–97 cm; XPL). C. Massive serpentinized harzburgite crosscut by veins of brownish and fibrous serpentine associated with carbonate and magnetite (366-U1491B-3H-2, 10–15 cm; XPL).

Figure F18. 3-D microstructures of proto-serpentine veins (V1 and V2), Hole U1491B. A. Positioning of three orthogonal thin sections (TS 5, TS 49, and TS 50) (5H-CC, 1–5 cm). B, C. Proto-serpentine vein (see text).

Figure F19. Interstitial water H_2 and methane concentrations, Site U1491.

Figure F20. Interstitial water major and minor cation concentrations, Site U1491. All data were measured with the ICP-AES except Na, which was measured with IC. Bottom seawater values are from Mottl et al. (2003, 2004).

Figure F21. Interstitial water pH, alkalinity, and chloride concentrations, Site U1491. Bottom seawater values are from Mottl et al. (2003, 2004).

Figure F22. Interstitial water ammonium, phosphate, bromide, and sulfate concentrations, Site U1491. Bottom seawater values are from Mottl et al. (2003, 2004).

Figure F23. Interstitial water DOC and DIC concentrations, Site U1491. Bottom seawater values are from Eglinton and Repeta (2014).

Figure F24. PMCH 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 U1491. LOD = limit of detection. Alkalinity

and pH data provide a measure for the level of active serpentinization and potential seawater contamination (see Fluid geochemistry).

Figure F25. Color reflectance, GRA density, and discrete bulk density, *P*-wave velocity, magnetic susceptibility, and NGR data, Hole U1491B.

Figure F26. Color reflectance, GRA density and discrete bulk density, *P*-wave velocity, magnetic susceptibility, and NGR data, Hole U1491C.

Figure F27. Index property data (grain density, bulk density, and porosity), thermal conductivity, and shear strength, Hole U1491B.

Figure F28. Index property data (grain density, bulk density, and porosity), thermal conductivity, and shear strength, Hole U1491C.

Figure F29. APCT-3 temperature measurements during insertion and recovery, Hole U1491B.

Figure F30. Calculated APCT-3 formation and bottom seawater temperatures and the best fit linear thermal gradient, Hole U1491B. Gradient was calculated utilizing each of the three measurements from the formation and two measurements of bottom seawater.

Figure F31. NRM decay (left) and AF demagnetization vector (right) of discrete samples, Hole U1491C. A. 2H-3, 4.77 mbsf. B. 2H-5, 7.31 mbsf. Demagnetization: points = projected endpoints of remanent magnetization vector measured for each sample in core coordinates, blue lines = principal component directions from discrete samples, open symbols = vector endpoints projected on vertical plane, solid symbols = vector endpoints projected on horizontal plane.

Figure F32. NRM intensity, inclination, and declination, Hole U1491B. Declination and inclination values are based on PCA fitting of the series of AF demagnetization declination and inclination data.

Figure F33. NRM intensity, inclination, and declination, Hole U1491C. Declination and inclination values are based on PCA fitting of the series of AF demagnetization declination and inclination data.