

Figure F1. A. Bathymetry around Site U1517 with in-line and cross-line tracks from the 3-D seismic cube (white rectangle). B. IL1778 seismic section from the 3-D cube crossing Site U1517 with interpreted key horizons.

Figure F2. Seismic in-lines and cross-lines (X-lines) across Site U1517 with depth scale and key horizons. Depth scale assumes a subsurface velocity of 1700 m/s.

Figure F3. Composite lithology log based on visual core descriptions showing lithostratigraphic units and 1 cm resolution SHMSL magnetic susceptibility, Hole U1517C. cps = counts per second.

Figure F4. Correlation between RGB, core photograph (372-U1517C-1H-4), and point magnetic susceptibility (MS) data. Gray shading indicates position of sandy intervals and their RGB and magnetic susceptibility response.

Figure F5. Grain size distribution based on visual estimates of a representative smear slide from each lithostratigraphic unit, Hole U1517C. Unit II: coarse silt from alternating sand and mud layers (3F-4, 28 cm). Unit III: silt from thin alternating silt and clay layers (13F-4, 30 cm). Unit IV: clayey silt (15H-3, 8 cm). Unit V: very fine sand from thin bedded sand, silt, and clay (36F-1, 28 cm).

Figure F6. Visual estimates of average grain size for representative sediment from Units II–V on a standard ternary plot, Hole U1517C.

Figure F7. Drilling-related disturbance, Hole U1517C. A. Subhorizontal parallel beds showing very little obvious drilling-related disturbance. B. Bed drag deformation (concave-downward form) occurring above and below a 5 cm thick sandy bed that has not deformed. C. Void left after core was pushed back together following gas expansion. D. Top section mixing of lithologies and disturbance of sediment structures. Below 63 cm, sedimentary structures are preserved but retain bed drag type deformation. E. Fluidization of sand that may be related to drilling with clear bed drag below. F, G. Midcore disturbance in soft, fine-grained sediments.

Figure F8. Lithostratigraphic Unit I, Hole U1517C. A. Very soft mud (1H-1, 64–82 cm). B. Lower unit boundary defined by sandy beds (1H-2, 111–130 cm).

Figure F9. Representative photomicrographs, Unit II (372-U1517C-3F-4, 28 cm; 19.6 mbsf; A, C: plane-polarized light [PPL]; B, D: cross-polarized light [XPL]). Q = single and polycrystalline detrital quartz (weak birefringence), L = lithic fragments, C = nonskeletal carbonate grains (high birefringence). Foraminifer test (red arrow), green glauconite (G) grains, and glass shards (yellow circles) are minor components. Note speckled birefringence of clay-sized material in B. Note the different texture between angular carbonate grains and subrounded quartz grains in C. Brownish fragments in PPL with moderate birefringence are interpreted to be sedimentary lithic fragments (mudstone).

Figure F10. Lithostratigraphic Unit II, Hole U1517C. A. Very thin to thin graded beds with highly irregular basal contacts (2H-2, 24–43 cm). B. Thin graded beds with sharp irregular to planar contacts (5F-2, 20–38 cm). Note that concave-downward structure is drilling-induced deformation. C. Thin to medium graded beds with highly irregular basal contacts (6F-3, 15–34 cm).

Figure F11. Amalgamated sand beds with sharp upper and lower contact (372-U1517C-7F-2). Turbidites are characterized by grading into overlying sediment, and sharp upper contact indicates postemplacement modification.

Figure F12. Lithostratigraphic Unit III, Hole U1517C. A. Thin clayey silt laminations (11F-3, 1–18 cm). B. Thicker clayey silt laminations (13F-3, 11–27 cm). Note the overall darker color of the beds compared with Units I and II (see Figures F8, F10). C. Convolute beds indicating debrite deposit (12F-4, 39–55 cm).

Figure F13. Representative photomicrographs, Unit III (372-U1517C-13F-4, 30 cm; 65.8 mbsf; A, C: PPL; B, D: XPL). A, B. Sample is dominated by clay-sized brownish chloritic clumps or authigenic glauconite. Spherical to irregular opaque material is interpreted to be authigenic micromnodules. Silt-sized fraction comprises detrital quartz and volcanic fragment grains. Sample has minor detrital carbonate input. Note the opaques of the micromnodules in B, C, D. Spherical micromodule and brown organic matter surrounded by chlorite or authigenic glauconite clumps.

Figure F14. Lithostratigraphic Unit IV, Hole U1517C. Greenish gray, massive clayey silt. A. Structureless interval with millimeter-scale light-colored blebs at 95 and 99 cm (14F-3, 89–106 cm). Shell fragments are present between 108 and 110 cm. B. Structureless interval with a ~3 cm sandy bed between 72 and 75 cm (17H-2, 66–82 cm).

Figure F15. Representative photomicrographs of calcareous clay, Unit IV (372-U1517C-15H-3, 8 cm; 73.5 mbsf; A, C: PPL; B, D: XPL). A, B. Sponge spicules (yellow arrow). Elongated euhedral crystal (red arrow) is phillipsite, a type of zeolite associated with volcanic glass shards (yellow circles). G = glauconite. C, D. Large sponge spicule with distinct axial tube and knobbed end (tylostyle) clearly visible. XPL reveals a large amount of coccoliths (white circles).

Figure F16. Lithostratigraphic Unit V, Hole U1517C. A. Mostly massive, greenish gray clayey silt intervals (29F-3, 11–30 cm). B. Sandy based graded bed (31F-3, 14–32 cm). Gas hydrates were recovered from this core section. C. Volcanic tephra bed that mixed with overlying sediment (35F-4, 48–66 cm).

Figure F17. Representative photomicrographs, Unit V (372-U1517C-36F-1, 28 cm; 184 mbsf; A, C: PPL; B, D: XPL). A, B. Well-rounded grains of calcareous debris (C) and altered volcanic fragments (V). Note the high birefringence color of calcareous grains. C, D. Interpreted calcareous debris. Note incipient formation of a coating with different optical orientation around grains, probably amorphous silica.

Figure F18. Simplified lithostratigraphic column with bulk powder XRD results, Hole U1517C. Values are normalized such that total clay minerals (smectite + illite + chlorite + kaolinite) + quartz + feldspar (plagioclase + K-feldspar) + calcite = 100%. See Table T4 for data.

Figure F19. Representative X-ray diffractograms of bulk sediments, Hole U1517C. Note the changes in scale for peak intensity. Diagnostic peaks are labeled: Cl = total clay minerals, Q = quartz, F = feldspar, Cc = calcite.

Figure F20. Magnetic inclination, declination, intensity, and point magnetic susceptibility (MS), Site U1517. See text for details. See Figure F3 for lithology key. GAD = geocentric axial dipole.

Figure F21. Vector component (Zijderveld) and NRM intensity vs. demagnetization level from superconducting rock magnetometer measurements on archive halves displaying typical demagnetization behavior, Hole U1517C.

Figure F22. A. Downcore chloride profiles (titration and IC), Site U1517. Discrete excursions to low chloride values are indicative of gas hydrate dissociation during core retrieval and are used to estimate (B) gas hydrate saturation (S_h) values.

Figure F23. Sulfate and methane profiles, upper 100 m of Hole U1517C. SMT (dashed red line) illustrates horizon where sulfate is consumed and methane begins to increase with depth.

Figure F24. Alkalinity, ammonium, bromide, iron, manganese, and silica concentration profiles, Hole U1517C. Dashed lines = lithostratigraphic unit boundaries, blue arrows = average seawater values.

Figure F25. Calcium, magnesium, strontium, barium, potassium, and lithium concentration profiles, Hole U1517C. Dashed lines = lithostratigraphic unit boundaries, blue arrows = average seawater values.

Figure F26. Methane and ethane concentration profiles and methane/ethane ratio in samples, Site U1517. Concentrations are given in parts per million by volume, representing the volume of the respective hydrocarbon in the air headspace of the serum vial.

Figure F27. TC, CaCO_3 , total organic C, and TN downhole profiles and organic carbon to TN weight (C/N) ratio, Site U1517.

Figure F28. Physical properties summary, Hole U1517C. Shear strength from penetrometer readings was estimated by dividing reported results by a factor of two (see Physical properties in the Expedition 372A methods chapter [Pecher et al., 2019a]).

Figure F29. GRA bulk density (WRMSL), discrete sample grain density, and discrete sample porosity using MAD, Hole U1517C.

Figure F30. Magnetic susceptibility profiles, Hole U1517C.

Figure F31. WRMSL NGR profile, Hole U1517C.

Figure F32. Thermal conductivity, Hole U1517C.

Figure F33. APCT-3 temperature-time data (blue dots) and estimated formation temperature ($T_{\text{formation}}$; red line), Hole U1517C. A. Data from 81.1 mbsf deployment with estimated formation temperature of 8.55°C. B. Data from 99.6 mbsf deployment with estimated formation temperature of 9.14°C. C. Data from 117.7 mbsf deployment with estimated formation temperature of 10.32°C. D. Data from 131.8 mbsf deployment with estimated formation temperature of 10.39°C.

Figure F34. Temperature-depth data (blue dots) and least-squares linear fit ($r^2 = 0.94$; red line) to temperature-depth data that defines a gradient of 39.8°C/km (0.0398°C/m), Hole U1517C.

Figure F35. Pressure data at T2P tip and shaft and temperature data at T2P tip from 80 mbsf deployment, Hole U1517D. Hydrostatic pressure is shown for reference. Pressure data show good insertion spikes and decay curves. Temperature data show loss of reliable data at time of insertion. All field-processed data are available in DOWNHOLE in Supplementary material.

Figure F36. Drilling parameters, Hole U1517A.

Figure F37. LWD measurements and logging unit interpretation, Hole U1517A.

Figure F38. Resistivity image log data with interpretation of bedding orientation and fracture orientation, Hole U1517A. GVR = geoVISION.

Figure F39. Archie exponent analysis using NMR porosity and neutron porosity, Hole U1517A.

Figure F40. Gas hydrate saturation for Logging Subunit 5A, Hole U1517A.

Figure F41. Comparison between LWD and core NGR, P -wave velocity (WRMSL), porosity (MAD core sample measurements), and bulk density measurements, Site U1517.

Figure F42. Top: Neutron porosity and resistivity used to derive LWD-based estimate of hydrate saturation and chlorinity used to estimate hydrate saturation from core samples, Site U1517. P -wave velocity and waveforms are also shown. Bottom: IR imaging used as diagnostic indicators of potential gas hydrate occurrences during core retrieval.

Figure F43. Interpreted seismic units on IL1778, Site U1517. SU = seismic unit.

Figure F44. Log-seismic integration, including Hole U1517A LWD data (ultrasonic caliper, gamma ray, porosity, density, resistivity, sonic V_p , and NMR) and synthetic traces generated from density- V_p log and lithologic model compared with seismic trace from IL1778 (see Lithostratigraphy for core lithology).