

Figure F1. Location of IODP Site U1617 (red), Expedition 402 alternate drilling locations (pink), and DSDP Leg 42 Site 373 (yellow). White line = location of Seismic Reflection Profile MEDOC 6 in Figure F2.

Figure F2. Site U1617 location and estimated penetration (red line) on Seismic Reflection Profile MEDOC 6 (location in Figure F1). Black line = alternate drilling location TYR-08A. CDP = common depth point.

Figure F3. Lithostratigraphic summary, Hole U1617A. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F4. VCDs, Holes U1617A and U1617B. Nannofossils and foraminifera ages and the main physical properties used unit identification. cps = counts per second. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F5. Section Half Imaging Logger (SHIL) core images showing representative examples of the main lithologies, Site U1617.

Figure F6. Smear slides representing main lithologies, Site U1617. PPL = plane-polarized light, XPL = cross-polarized light. Note different scales.

Figure F7. GRA bulk density and L* data, where the presence of volcanoclastic material is reflected in both decreasing density and reflectance data (L*) and highlighted by horizontal gray bars (402-U1617A-9H).

Figure F8. Section Half Imaging Logger (SHIL) core images showing MTDs and sapropel layers.

Figure F9. Distinctive features of Subunits IA and IB and Unit III as revealed by smear slide analysis, Site U1617. A. Smear slide made up entirely of calcareous nannofossil *Braarudosphaera bigelowii* plates. B. Abundant pyrite. C. Wood indicating terrigenous input (XPL not included due to opaque nature of wood in XPL). D. Aragonite crystals. Note different scales.

Figure F10. Representative XRD diffractograms of deep-marine (lower left) to continental (upper right) input and transition (center) in sediments, Holes U1617A and U1617B. Upper right: representative diffractogram of halite (Hal) with minor anhydrite (Anhy). Ca = calcite, Dol = dolomite, Gyp = gypsum, Qtz = quartz, Py = pyrite.

Figure F11. Core images from the Section Half Imaging Logger (SHIL) and close-ups showing evaporitic lithologies identified during shipboard core descriptions.

Figure F12. Planktic foraminifera marker species, Hole U1617A. A, B. *Globigerina bulloides* (3H-CC). C, D. *Globigerina umbilicata* (7H-CC). E, F. *Globigerinella siphonifera* (13H-CC). G, H. *Globigerinoides obliquus* (19H-CC).

Figure F13. Planktic foraminifera marker species, Hole U1617A. A, B. *Globigerinoides ruber* var. white (4H-CC). C, D. *Globigerinoides rublobatus* (12H-CC). E, F. *Globoconella inflata* (15H-CC). G, H. *Globorotalia bononiensis* (18H-CC).

Figure F14. Planktic foraminifera marker species, Hole U1617A. A, B. *Globorotalia crassaformis* (31X-CC). C, D. *Globoconella punctulata* (32X-CC). E, F. *Globorotalia excelsa* (6H-CC). G, H. *Globorotalia margaritae* (32X-CC).

Figure F15. Planktic foraminifera marker species, Hole U1617A. A, B. *Neogloboquadrina incompta* (11H-CC). C, D. *Neogloboquadrina atlantica* (20H-CC). E, F. *Neogloboquadrina acostaensis* (16H-CC). G, H. *Globorotalia scitula* (10H-CC).

Figure F16. Planktic foraminifera marker species, Hole U1617A. A, B. *Trilobatus quadrilobatus* (21H-CC). C. *Neogloboquadrina pachyderma* (12H-CC). D. *Globigerinella calida* (2H-CC). E. *Globigerinoides extremus* (19H-CC). F. *Neogloboquadrina atlantica* (20H-CC). G. *Orbulina universa* (17H-CC). H. *Trilobatus sacculifer* (22F-CC).

Figure F17. Calcareous nannofossil biozonal assignment for examined samples according to the Di Stefano et al. (2023) scheme for the Mediterranean area, Site U1617. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F18. NRM variation, Hole U1617A. A. Intensity of NRM and NRM after demagnetization at 20 mT peak AF (i.e., $NRM_{@20mT}$). B. NRM inclination. C. $NRM_{@20mT}$ inclination. Square symbols = ChRM inclination of discrete samples, dashed lines in B and C = GAD values, shaded interval = Messinian unit in Hole U1617A.

Figure F19. NRM and $NRM_{@20mT}$ inclination histograms. Dashed lines = GAD values.

Figure F20. NRM variation, Hole U1617B. A. Intensity of NRM and NRM after demagnetization at 20 mT peak AF (i.e., $NRM_{@20mT}$). B. NRM inclination. C. $NRM_{@20mT}$ inclination. Square symbols = ChRM inclination of discrete samples, dashed lines in B and C = GAD values, shaded intervals = the Messinian unit in Hole U1617B.

Figure F21. NRM and ARM demagnetization, Site U1617. NRM and ARM intensities are normalized to respective initial intensity.

Figure F22. ARM demagnetization curves normalized to the initial ARM intensity. Orange = samples from Unit III, Site U1617; blue = samples from other units.

Figure F23. AMS ellipsoid for Holes (A) U1617A and (B) U1617B.

Figure F24. Variation of dip for (A) bedding and (B) faults and fractures, Site U1617.

Figure F25. Example of MTD, Hole U1617A. Inset: detail of the MTD illustrating the complexity of these deposits.

Figure F26. Deformation structures encountered in the Messinian deposits, Hole U1617B. A. Faulted and folded banded gypsum. B. Normal dextral fault juxtaposing fault gouge with sigmoidal porphyroclasts of anhydrite and consolidated sand layer. C. Fold in halite deposit. D. Lamination with compaction structures. E. Breccia. F. Chicken-wire structure in anhydrite. G. Banded gypsum. H. Gypsum vein cutting Messinian deposits. I. Alternating sediment and anhydrite-bearing laminations at a high angle to the core reference frame.

Figure F27. Alkalinity, salinity, sodium, and chloride in IW, Holes U1617A (circles) and U1617B (diamonds).

Figure F28. Major ions (sulfate, magnesium, calcium, and potassium) in IW, Holes U1617A (circles) and U1617B (diamonds).

Figure F29. Lithium, boron, strontium, and manganese in IW, Holes U1617A (circles) and U1617B (diamonds).

Figure F30. Silicon, iron, and barium in IW, Holes U1617A (circles) and U1617B (diamonds).

Figure F31. Ammonium and phosphate in IW, Holes U1617A (circles) and U1617B (diamonds).

Figure F32. Calcium carbonate and total carbonate contents and relative percentages of different carbonate phases, Holes U1617A and U1617B.

Figure F33. Total organic matter, TOC, atomic TOC/TN ratio, and TS, Holes U1617A and U1617B.

Figure F34. Relationship between TOC and TN contents, Holes U1617A and U1617B.

Figure F35. HI/OI plot from source rock analysis data in relationship to the four kerogen types, Holes U1617A and U1617B. Figure modified from Dembicki (2009).

Figure F36. pXRF elemental concentration, Holes U1617A and U1617B. SHLF = section half, IW SC = IW squeeze cake.

Figure F37. Black layer identified as having anomalous physical properties (402-U1617A-34X-4). Left: high-resolution image. Top: SEM-EDS maps of iron, silicon, and sulfur content. Bottom: spectra of elements observed with SEM.

Figure F38. Dissolved methane concentrations in headspace gas samples, Holes U1617A and U1617B.

Figure F39. C_1/C_2 ratio in the headspace gas sample (402-U1617B-22R-2) with sediment temperature (from Pimmel and Claypool, 2001). Low C_1/C_2 ratios indicate the presence of thermogenic methane.

Figure F40. Physical properties, Hole U1617A. Small points = WRMSL data, larger circles = discrete measurements, cps = counts per second. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F41. Physical properties, Hole U1617A (402-U1617A-33X-1 through 47X-CC), zoomed in on the Messinian interval. Small points = WRMSL data, large circles = discrete measurements, cps = counts per second. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F42. Physical properties, Hole U1617B. Small points = WRMSL data, large circles = discrete measurements, cps = counts per second. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F43. Left: V_p profile from WRMSL and discrete Gantry measurements with velocity-depth functions, Site U1617. Red line = ultrasmooth three-degree polynomial, green line = less smoothed Savitzky-Golay filter. Right: Plot of Site U1617 core tops (green stars) in TWT computed using the smoothed velocity function (green line) overlain on MEDOC 6 seismic reflection profile (courtesy of the Institute of Marine Science of the Spanish National Research Council [ICM-CSIC]) (Ranero and Sallarès, 2017). CDP = common depth point.

Figure F44. Temperatures measured near the seafloor and downhole on the Campania Terrace and local temperature gradient from a least-squares line fit, Site U1617.

Figure F45. Composite of downhole logging with physical properties (dots) measured from cores, Hole U1617A. SGR: dark green = spectral GR (SGR), light green = computed GR (CGR) with U removed. NGR: NGR measured on core. Potassium (K), thorium (Th), and uranium (U) profiles from SGR logging tool (lines) and values extracted from core NGR data (dots). cps = counts per second. Density: from core only. Small red points = WRMSL, larger pink dots = MAD. MS: dark purple profile from MSS logging tool and small pink dots = SHMSL, small violet dots = WRMSL. Resistivity: cyan = R2, blue = R5. The R2 and R5 measurements of the HRLA somewhat correspond to the traditional shallow and deep measurements of the dual laterolog (Ellis and Singer, 2007). Heavy dashed line = lithostratigraphic unit boundaries. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F46. Composite of downhole logging with physical properties from cores, Hole U1617B. SGR: dark green = spectral GR (SGR), light green = computed GR (CGR) with uranium removed. NGR: NGR measured on core. Potassium (K), thorium (Th), and uranium (U) profiles from SGR logging tool (lines) and values extracted from core NGR data (dots). cps = counts per second. Bulk density: from core only. Small red points = WRMSL, larger pink dots = MAD. MS: dark purple profile from MSS logging tool and small pink dots = SHMSL, small violet dots = WRMSL. Electrical resistivity: cyan = R2, blue = R5. V_p : light blue dots = discrete Gantry measurements, dark blue dots = WRMSL, dark blue profile = downhole V_p data from DSI. Heavy dashed line = lithostratigraphic unit boundaries. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F47. Oxygen concentration profile, Hole U1617A. A: 0–90 mbsf. B: Uppermost 7 mbsf. See lithology key in Figure F8 in the Expedition 402 methods chapter (Malinverno et al., 2025).

Figure F48. PFD tracer concentrations, Hole U1617A. Horizontal lines in each box = median value, the box encloses the upper and lower quartiles of the measured values and the whiskers span the range of measured values, excluding outliers. A: Concentrations in drilling fluids, core exteriors, and core interiors. B: Close-up of A; concentrations on core exterior surfaces and core interiors for microbiological analyses, showing a lower median concentration of tracer detected in samples collected from the core interiors.