Figure F1. Bathymetry of the PPA showing the locations of the four sites (U1586, U1587, U1385, and U1588) drilled during Expedition 397, Marion Dufrense (MD) piston cores, and Integrated Ocean Drilling Program Site U1391. Site U1385 was occupied previously during Expedition 339, as was Site U1391. The map is modified from Hodell et al. (2015) and was made with GeoMapApp (**https://www.geomapapp.org**) using the bathymetry of Zitellini et al. (2009).

Figure F2. Depth distribution of Expedition 397 drill sites on the PPA looking onshore to the east. The sites are located on a bathymetric transect that intersects each of the major subsurface water masses of the North Atlantic. Depths range from 1339 mbsl (Site U1588) to 4692 mbsl (Site U1586). Expedition 339 Site U1391 is also shown. (Figure made by Helder Pereira using Mirone and iVew4D software.)

Figure F3. Location of Site U1587 on the PPA at a water depth of 3479 mbsl. See Figure F2 for broader bathymetric context. (Figure made by Helder Pereira using Mirone and iVew4D software.)

Figure F4. Salinity and silicate profiles on WOCE Line A03 (36°N) showing proposed site locations on the Iberian margin. Tongue of high salinity water between 600 and 1200 m is MOW. High Si (>35 µmol/kg) below 3000 m represents a contribution from LDW sourced from the Southern Ocean. Water masses do not have clearly defined boundaries but rather consist of a series of core layers bordered by transition (mixing) zones between adjacent layers. The positions of Expedition 397 sites are shown relative to each of the identified subsurface water masses.

Figure F5. XRF Ca/Ti and Zr/Sr measured on Piston Core JC089-4-2P. Heinrich stadials (H0, H1, etc.) are marked by peaks in Zr/Sr and minima in Ca/Ti, reflecting an increase in detrital over biogenic sedimentary components. BA = Bølling-Allerød, LGM = Last Glacial Maximum, IS = prominent Greenland interstadials. Data from Channell et al. (2018).

Figure F6. Bathymetric map of Seismic Lines JC89-6 and JC89-7 showing the location of Site U1586 and Piston Core JC89-4-2P. CMP = common midpoint, SSDB = Site Survey Databank, SEGY = Society of Exploration Geophysicists.

Figure F7. Original and interpreted Seismic Profile JC89-6 showing the location of Site U1587. Age of reflectors has been revised to reflect age of recovered sediment. Penetration = 500 mbsf. TWT = two-way traveltime, CMP = common midpoint.

Figure F8. Original and interpreted Seismic Profile JC89-7 showing the location of Site U1587. Penetration = 500 mbsf. TWT = two-way traveltime, CMP = common midpoint.

Figure F9. Lithofacies 1, Site U1587. All images: upper left = transmitted light brightfield, lower left = cross-polarized light (XPL), right = section half images, which include the interval where smear slides were taken.

Figure F10. Lithofacies 2, Site U1587. All images: upper left = transmitted light brightfield, lower left = XPL, right = section half images, which include the interval where smear slides were taken.

Figure F11. Core closeup photos, Site U1587. A. Light patches (397-U1587A-10H-4, 101–108 cm). B. Macro fossil (11H-2, 4–14 cm). C. Trace fossil (23X-1, 130–141 cm). D. Trace fossil (397-U1587C-30X-4, 122–127 cm). E. Nodules (14X-5, 31–36 cm). F. Pyrite nodule (397-U1587B-58X-2, 100–106 cm).

Figure F12. Nannofossil ooze with clay and biosilica, Hole U1587B. Red box = smear slide sample location (88 cm), upper right = XPL, lower right = transmitted light brightfield.

Figure F13. $CaCO_3$ weight percent, L*, and MS, Site U1587. Hole U1587A = 0.2–498 m CSF-A, Hole U1587B = 495–545 m CSF-A, Hole U1587C = 546.8–561.57 m CSF-A. Color shading represents different lithostratigraphic units and subunits.

Figure F14. Drilling disturbance examples, Site U1587. A. Soupy. B. Gas expansion. C. Fall-in. D. Biscuits.

Figure F15. pXRF bulk element compositions (397-U1587B-22X-5 through 22X-7). Al_2O_3, SiO_2, K_2O, and Ti contents are presented with L* and core photos.

Figure F16. Lithologic summary, Site U1587. ? = uncertainty. Blue dashed lines = unit divisions, blue dotted line = subunit divisions. Colors are based on visual description and L*a*b* values (see Physical properties). Unit and subunit boundaries are primarily based on changes and color and banding thickness. Color is independent of lithology and is related to relative amounts of minor constituents such as pyrite and glauconite. Nannofossil biozones and paleomagnetic boundaries are summarized from shipboard data and may disagree. Inset: cropped section of Seismic Line JC89 Line 7 showing location along transect and depth of Holes U1587A–U1587C. SB = seabed, MPle = Middle Pleistocene, BPle = Base Pleistocene, BPli = Base Pliocene, MM = Middle Miocene, TWT = two-way traveltime, CMP = common midpoint.

Figure F17. Preliminary age model from Site U1587 based on calcareous nannofossil and planktonic and benthic foraminifer biostratigraphy.

Figure F18. Paleomagnetism data after 20 mT AF demagnetization, Hole U1587A. Chron: black = normal polarity zone/boundary, white = reversed polarity zone/boundary, gray = uncertain polarity zone/boundary. Squares = depths where discrete cube samples were collected. Inclination: dashed lines = expected GAD inclinations at the site latitude during reversed and normal polarities. Pink shading = strongly disturbed intervals. Declination: gray = measured declination values, green = declination values corrected using core orientation data collected with the Icefield MI-5. Susceptibility: magenta = SHMSL, black = WRMSL. (Continued on next page.)

Figure F19. Paleomagnetism data after 20 mT AF demagnetization, Hole U1587B. Chron: black = normal polarity zone/boundary, white = reversed polarity zone/boundary, gray = uncertain polarity zone/boundary. Squares = depths where discrete cube samples were collected. Inclination: dashed lines = expected GAD inclinations at the site latitude during reversed and normal polarities. Pink shading = strongly disturbed intervals. Declination: gray = measured declination values, green = declination values corrected using core orientation data collected with the Icefield MI-5. Susceptibility: magenta = SHMSL, black = WRMSL. (Continued on next page.)

Figure F20. Paleomagnetism data after 20 mT AF demagnetization, Hole U1587C. Chron: black = normal polarity zone/boundary, white = reversed polarity zone/boundary, gray = uncertain polarity zone/boundary. Squares = depths where discrete cube samples were collected. Inclination: dashed lines = expected GAD inclinations at the site latitude during reversed and normal polarities. Pink shading = strongly disturbed intervals. Declination: gray = measured declination values, green = declination values corrected using core orientation data collected with the Icefield MI-5. Susceptibility: magenta = SHMSL, black = WRMSL.

Figure F21. Discrete cube sample AF demagnetization results, Holes U1587A (1 cube) and U1587B (142 cubes). Results are organized by sample depth. All samples: left = intensity variation with progressive AF demagnetization, middle = NRM demagnetization data on orthogonal (Zijderveld) projections, right = equal area projections. Orthogonal projection plots: blue squares = horizontal projections, red circles = vertical projections. Equal area projection plots: solid circles = positive inclinations, open circles = negative inclinations. Measurements that were influenced by flux jumps and measurements from the first few demagnetization steps (typically <4–10 mT) that are heavily influenced by drilling-induced overprint are removed. (Continued on next eight pages.)

Figure F22. Dissolved SO_4, alkalinity, headspace CH_4, SO_4^{2-}, Fe, Mn, Ba, NH_4, PO_4, and pH, Hole U1587A.

Figure F23. Dissolved Na, K, and Cl concentrations, Hole U1587A.

Figure F24. Dissolved Ca, Mg, and Sr, Hole U1587A.

Figure F25. Dissolved Si, Li, and B, Hole U1587A.

Figure F26. $CaCO_3$ discrete measurements using coulometry and ICP-AES with L*, Holes U1587A–U1587C.

Figure F27. $CaCO_3$ discrete measurements and NGR counts, Holes U1587A–U1587C. cps = counts per second.

Figure F28. Crossplot and linear regression of $CaCO_3$ vs. L*, Holes U1587A–U1587C. Red line = linear regression with 95% confidence interval (CI) for all carbonate data (including direct measurements by coulometry and calculated values from bulk sediment ICP-AES data), black solid line = linear regression with 95% CI for coulometry data. Dotted line = linear regression for 0–235 m CSF-A and dash-dotted line = linear regression for 235–550 m CSF-A, coulometry data.

Figure F29. Crossplot and linear regression of $CaCO_3$ vs. NGR, Holes U1587A–U1587C. cps = counts per second, red line = linear regression with 95% confidence interval (CI) for all carbonate data (including direct measurements by coulometry and calculated values from bulk sediment ICP-AES data), black line = linear regression with 95% CI for coulometry data.

Figure F30. TOC, TN, C/N, and TS, Holes U1587A–Hole U1587C. TN and TS error bars indicate the absolute difference for duplicate measurements or ±1σ for triplicate measurements.

Figure F31. Sedimentary major and minor element concentrations, Site U1587.

Figure F32. Downhole profiles of bulk sedimentary Ca/Ti, Si/Al, K/Al, Ti/Al, biogenic Ba (Ba-bio), and Sr/Ca, Site U1587.

Figure F33. GRA and MAD bulk density, porosity, thermal conductivity (TCON), and *P*-wave velocity (PWC and PWL), Holes U1587A–U1587C. ma-20 = moving average of 20 points.

Figure F34. Discrete sample GRA and MAD bulk density and porosity from dark and light sediments (sed), Hole U1587B.

Figure F35. MS (WRMSL), MSP (SHMSL), NGR, and L*a*b* values, Hole U1587C. Solid lines = moving average of 20 points, cps = counts per second.

Figure F36. NGR; K, Th, and U deconvolved and extracted from NGR spectra; and U/Th and K/Th ratios, Hole U1587B. All data from section edges (top and bottom) were eliminated. cps = counts per second.

Figure F37. Whole-round X-ray of authigenic (black grains) mineral grains (pyrite), Hole U1587A. Thin white lines = core gas expansion.

Figure F38. Downhole logging data, Hole U1587C. LCAL = caliper, RHOM = HLDS corrected bulk density, RT = true resistivity, RLA1 = shallow apparent resistivity, RLA3 = medium apparent resistivity. HSGR is downlog data, and the others are uplog data.

Figure F39. Comparison of downhole logs and core physical properties data, Hole U1587C. Logging data include (A) borehole size, (B) NGR, (D) density, and (F) MS plotted against the WMSF depth scale. Dashed line in A = the bit size of 12 inches. A is downlog data, and B, D, and F are uplog data. Core measurement data include (C) NGR, (E) density, and (G) MS plotted against the CSF-A depth scale. In C, NGR data from the section edges were cut. cps = counts per second.

Figure F40. Comparison of HNGS uplog and core NGR data, Site U1587. Wireline logging data are plotted against the WMSF depth scale, and core section data are plotted against the CSF-A depth scale. cps = counts per second. See Stratigraphic correlation.

Figure F41. Comparison of GR, and K, Th, and U concentrations between downhole logs and core measurements, Hole U1587C. Logging data are plotted against the WMSF depth scale. Core data are plotted against the CSF-A depth scale, and data from the section edges were cut.

Figure F42. APCT-3 plots of heat flow calculations against the CSF-A depth scale, Hole U1587A. A. Downcore thermal conductivity data. B. Thermal resistance calculated from thermal conductivity measurements. C. In situ APCT-3 data for Cores 4H, 7H, 10H, and 13H. Red square = average value of minimum mudline temperatures.

Figure F43. Composite section construction using MSP in 50–80 m CCSF-A intervals, Site U1587. (Continued on next two pages.)

Figure F44. Spliced composite records of SHMSL MSP, L*, RGB blue, NGR, and lithology, Site U1587. Data points at the beginning and end of core sections were removed (NGR = 10 cm; other measurements = 2 cm) or not measured at all (WRMSL = 2.5 cm) to filter out spurious values. Lithology column based on the lithostratigraphy summary presented in Figure F16. Data plotted on the CCSF-A* scale. cps = counts per second.

Figure F45. Depth scales, Site U1587. Left: comparison of CSF-A and CCSF-A depth scales. A 1:1 line is shown for comparison. Right: comparison of the growth of cumulative depth offset and CSF-A depth scale.

Figure F46. Blue color reflectance splice with MISs tentatively identified and compared with biostratigraphic constraints from nannofossil datum events, Holes U1587A and U1587B. The splice was constructed after compressing each core by the growth factor of the composite section (CCSF-A*), aligning to driller's depth, and making slight adjustments to the driller's depth to align the signals. cps = counts per second, gray bands = possible disturbed intervals.

Figure F47. Correlation of splice depth (CCSF-A) to the CSF-A depth scale for splice construction tie points, Site U1587. The polynomial fit to the trend can be used to invert composite depth to a close approximation to the true stratigraphic depth (CCSF-A*).