

Figure F1. Bathymetry of the Promontório dos Príncipes de Avis (PPA) showing the locations of the four sites (U1586, U1587, U1385, and U1588) drilled during Expedition 397, Marion Dufrenoy (MD) piston cores, and IODP 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 (<http://www.geomapapp.org>) using the bathymetry of Zitellini et al. (2009).

Figure F2. Depth distribution of Expedition 397 drill sites on the Promontório dos Príncipes de Avis (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. Correlation of $\delta^{18}\text{O}$ record of Greenland ice core (GRIP; red) to $\delta^{18}\text{O}$ of *Globigerina bulloides* (black) in Core MD95-2042 (Shackleton et al., 2000). Selected Dansgaard-Oeschger events are labeled in GRIP record and Antarctic isotope maxima (A1–A5) are labeled in Vostok. Timescale is SF2004 published by Shackleton et al. (2004). V-SMOW = Vienna standard mean ocean water, VPDB = Vienna Pee Dee belemnite. From Hodell et al. (2013b).

Figure F4. Oxygen isotope record of (A) *Globigerina bulloides* and (B) mixed benthic foraminifer species mostly consisting of *Cibicides wuellerstorfi*, spanning the last 1.45 My (to MIS 47) at Expedition 339 Site U1385. Marine isotope stages are numbered: interglacial in (A) and glacial in (B). Figure from Hodell et al. (2023). VPDB = Vienna Pee Dee belemnite.

Figure F5. Salinity and silicate profiles on WOCE Line A03 (36°N) showing proposed site locations on the Iberian margin (Schlitzer, 2000). Tongue of high salinity water between 600 and 1200 m is MOW. High Si (>35 $\mu\text{mol/kg}$) 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 F6. Core recovery for each hole drilled during Expedition 397. Holes U1385F, U1385H, and U1588C were washed down without recovery before XCB coring. HAXCB = half advance extended core barrel. Gray bar alongside Holes U1586D and U1587C = portion of the hole logged using the triple combo tool string.

Figure F7. Age-depth points based on biostratigraphy and magnetostratigraphy for each Expedition 397 site. Sedimentation rates of 5, 10, and 20 cm/ky are shown for reference. Squares = planktonic foraminifer markers, circles = nannofossil markers, diamonds = magnetostratigraphic markers.

Figure F8. D–G. NGR data for each Expedition 397 site relative to (C) the global carbon and oxygen stable isotope curves (Westerhold et al., 2020) showing (A, B) the depth transect of sites and relative age of the sequences. VPDB = Vienna Pee Dee belemnite, cps = counts per second.

Figure F9. Comparison of XCB and APC cores, Site U1586. Archive halves are shown. 397-U1586A-19H-5, 0–150 cm, spans 173.88–175.38 m CSF-A. 397-U1586B-21X-3, 28–150 cm, spans 173.88–175.1 m CSF-A. 397-U1586B-21X-4, 0–28 cm, spans 175.1–175.38 m CSF-A. 397-U1586A-19H-5 (APC) exhibits slight up-arching between 0 and 75 cm and basal flow-in between 75 and 150 cm. 397-U1586B-21X-3 and 21X-4 (XCB) exhibit slight biscuiting.

Figure F10. NGR data for each Expedition 397 site showing the approximate location of selected marine oxygen isotope stages. cps = counts per second. NGR data have been cleaned for outliers and spurious data at section ends.

Figure F11. Correlation of Pliocene NGR cycles between Sites U1587 and 397-U1385. cps = counts per second. NGR data have been cleaned for outliers and spurious data at section ends.

Figure F12. Gulf Stream and its relation to the Azores Current and Azores Front system and Portugal and Canary Currents. Also shown are the MOW, Iberian Winter Front, and the river plumes' flow direction (small arrows). Lower inset: more detail of the changing surface circulation on the western Iberian margin in summer (Portugal Coastal Current; blue arrows) and winter (Iberian Poleward Current; red arrows).

Figure F13. Temperature vs. salinity of CTD casts made during Cruise JC089 to the Iberian margin showing major subsurface water masses (Hodell et al., 2014). Color bar = percent oxygen saturation, contours = potential density.

Figure F14. Location of Site U1586 at the toe of the Promontório dos Príncipes de Avis (PPA) at a water depth of 4692 mbsl. See Figure F2 for broader bathymetric context. (Figure made by Helder Pereira using Mirone and iVew4D software.)

Figure F15. Original and interpreted seismic profile (JC89-2) showing the location of Site U1586 with penetration to 350 mbsf. The ages of the reflectors have been revised during the expedition to reflect the ages of the recovered sediment. TWT = two-way traveltime, CMP = common midpoint.

Figure F16. Lithologic summary, Site U1586. Left: summary lithostratigraphic logs of Holes U1586A–U1586AD, ordered left to right from northeast to southwest (upslope to downslope). Blue dashed line = divisions of lithostratigraphic units, blue dotted line = division of subunits (not slump related), green overlay = correlation of slumped intervals (Subunits IB, ID, IF, and IH and Subunit IIB). Right: lithologic unit names and preliminary interpretations of depositional processes. Colors are based on visual description as well as $L^*a^*b^*$ values. Unit and subunit boundaries are primarily based on sedimentary structures as well as 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. Inset: cropped section of Seismic Line JC89 Line 3 showing location along transect and depth of Holes U1586A–U1586D. TWT = two-way traveltime, CMP = common midpoint, SB = seabed, MP = Middle Pleistocene, BPlc = base Pleistocene, BPli = base Pliocene, MM = Middle Miocene.

Figure F17. Core composite downhole trends of physical properties data, Site U1586. B-L = Burdigalian–Langhian. MSP = section-half point MS, NGR = whole-round NGR, cps = counts per second, NGR-logging = NGR data from the triple combo logging tool. WMSF = wireline log matched depth below seafloor. MSP and L^* panels: a smoothed curve (black line; 20-point moving average) is shown over the original data (gray line). NGR panels: only the original data is shown.

Figure F18. Preliminary age model based on calcareous nannofossils (Nanno) and planktonic foraminifer (Foram) biostratigraphic events and magnetostratigraphic (Pmag) transitions for Sites (A) U1586, (B) U1587, (C) U1385, and (D) U1588.

Figure F19. Comparison of IW sulfate, headspace methane, alkalinity, and calcium among Expedition 397 sites.

Figure F20. Location of Site U1587 on the Promontório dos Príncipes de Avis (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 F21. Original and interpreted seismic profile (JC89-6) showing the location of Site U1587 with penetration to 500 mbsf. The age of the reflectors have been revised to reflect the age of the recovered sediment. TWT = two-way traveltime, CMP = common midpoint.

Figure F22. Lithologic summary, Site U1587. Left: summary lithostratigraphic logs of Holes U1587A–U1587C, ordered left to right from southwest to northeast (upslope to downslope). Blue dashed line = divisions of lithostratigraphic units, blue dotted line = division of subunits (not slump related). Right: lithologic unit names and preliminary interpretations of depositional processes. Colors are based on visual description as well as color ($L^*a^*b^*$) values. Unit and subunit boundaries are primarily based on sedimentary structures as well as changes in

color and banding thickness. Color is independent of lithology and is related to relative amounts of minor constituents such as pyrite and glauconite. Inset: cropped section of Seismic Line JC89 Line 7 showing location along transect and depth of the holes at the site. TWT = two-way traveltime, CMP = common midpoint, SB = seabed, MPLe = Middle Pleistocene, BPlc = base Pleistocene, BPl = base Pliocene, MM = Middle Miocene.

Figure F23. Core composite downhole trends of physical properties data, Site U1587. MSP = section-half point MS, NGR = whole-round NGR, cps = counts per second, NGR-logging = NGR data from the triple combo logging tool. WMSF = wireline log matched depth below seafloor. Inset MSP data (red and blue) are the same as the original signal but with an expanded scale to highlight the variability. MSP and L*: smoothed curve (black line; 50-point moving average) is shown over original data (gray line). NGR: only original data is shown.

Figure F24. Location of Site U1385 on the Promontório dos Príncipes de Avis (PPA) at a water depth of 2591 mbsl. See Figure F2 for broader bathymetric context. (Figure made by Helder Pereira using Mirone and iVew4D software.)

Figure F25. Original and interpreted seismic profile (JC89-9) showing the location of Site U1385 with penetration to 400 mbsf. The age of the reflectors have been revised to reflect the age of the recovered sediment. TWT = two-way traveltime, CMP = common midpoint.

Figure F26. Lithologic summary, Site U1385. Left: summary lithostratigraphic logs of Holes U1385F–U1385J. Right: lithologic unit names and preliminary interpretations of depositional processes. Colors are based on visual description as well as L*a*b* values. Color is independent of lithology and is related to relative amounts of minor constituents such as pyrite and glauconite. Inset: cropped section of Seismic Line JC89 Line 9 showing location along transect and depth of Holes U1385F–U1385J. TWT = two-way traveltime, CMP = common midpoint, SB = seabed, BPlc = base Pleistocene, BUPl = base of Upper Pliocene, BPl = base Pliocene.

Figure F27. Core composite downhole trends of physical properties data, Site U1385. MSP = section-half point MS, NGR = whole-round NGR, cps = counts per second. The red MSP data are the same as the original signal but with an expanded scale to emphasize the cyclic variability. MSP, L*, and RGB-blue: smoothed curve (black line; 20-point moving average) is shown over original data (gray line). NGR: only original data is shown.

Figure F28. Location of Site U1588 on the Promontório dos Príncipes de Avis (PPA) at a water depth of 1339 mbsl. See Figure F2 for broader bathymetric context. (Figure made by Helder Pereira using Mirone and iVew4D software.)

Figure F29. Original and interpreted seismic profile (TGS-NOPEC PD00-613) showing the location of Site U1588 with penetration to ~400 mbsf. The depth of penetration and age of the reflectors have been revised to reflect the actual depth and age of the recovered sediment (data courtesy of TGS-NOPAC Geophysical Company ASA). TWT = two-way traveltime, CMP = common midpoint.

Figure F30. Lithologic summary, Site U1588. Left: summary lithostratigraphic logs of Holes U1588A–U1588D. Right: lithologic unit name and preliminary interpretation of depositional processes. Colors are based on visual description as well as L*a*b* values. Inset: cropped section of Seismic Line JC89 Line PD00-613 showing location along transect and depth of the holes at the site. TWT = two-way traveltime, CMP = common midpoint, SB = seabed, MPLe = Middle Pleistocene.

Figure F31. Core composite downhole trends of physical properties data, Site U1588. MSP = section-half point MS, NGR = whole-round NGR, cps = counts per second. Red MSP data are the same as the original signal but with an expanded scale to emphasize the cyclic variability. MSP, L*, and RGB-blue: smoothed curve (black line; 20-point moving average) is shown over original data (gray line). NGR: only original data is shown.