Figure F1. Bathymetric map with locations of Site U1521, other Expedition 374 sites, DSDP Leg 28 Sites 270–273, and ANDRILL Cores AND-1 and AND-2. Red box = location of inset map with Site U1521 on seismic-reflection Profile PD90-36 (Figure F3), green lines = locations of seismic-reflection Profiles BGR80-004 (east–west; Figure F4) and BGR80-008 (north–south; Figure F5). Bathymetry from Arndt et al. (2013).

Figure F2. Depth (two-way traveltime [TWT]) contour map for regional ANTOSTRAT Ross Sea Unconformity 4 (RSU4) with location of Site U1521 and Leg 28 sites. Orange lines = erosion limits, green lines = onlap limits, red lines = intrusion limits. The modern 1000 m water depth contour, Ross Ice Shelf edge, Ross Island, and Victoria Land coast are also shown for reference. Modified from Brancolini et al. (1995). Note that the geographic orientation of this figure is inverted relative to other maps presented in the volume.

Figure F3. Top: single-channel seismic-reflection Profile PD90-36 across Site U1521 (see inset in Figure F1) and DSDP Site 273. Profile (air gun 2.4 L) was collected by Rice University, TX (USA), in 1990 (Anderson and Bartek, 1992). SP = shotpoint. Bottom: interpretation of seismic reflectors and RSU4 in top panel. Arrows = reflector termination.

Figure F4. Top: multichannel seismic-reflection Profile BGR80-004 (green line in Figure F1). Profile was collected by Bundesanstalt für Geowissenschaften und Rohstoffe (BGR, Germany) in 1980 (Hinz and Block, 1984) with a 24–air gun array (23.45 L). Data were acquired with a 3000 m streamer (48 channels; first offset = 250 m, last offset = 2600 m). Bottom: interpretation of key seismic reflectors in Profile BGR80-004, showing RSU4 and other Ross Sea unconformities regionally mapped by ANTOSTRAT (Brancolini et al., 1995).

Figure F5. Top: multichannel seismic-reflection Profile BGR80-008 (green line in Figure F1). Profile was collected by BGR (Germany) in 1980 (Hinz and Block, 1984) with a 24–air gun array (23.45 L). Data were acquired with a 3000 m streamer (48 channels; first offset = 250 m, last offset = 2600 m). Bottom: interpretation of key seismic reflectors in Profile BGR80-008, showing RSU4 and other Ross Sea unconformities regionally mapped by ANTOSTRAT (Brancolini et al., 1995).

Figure F6. Lithostratigraphic summary, Hole U1521A. GRA = gamma ray attenuation, MAD = moisture and density, MS = magnetic susceptibility, NGR = natural gamma radiation.

Figure F7. Major lithofacies, Hole U1521A. A. Interbedded diatom-bearing mud and sandy mud (Unit I; 1R-4A, 23–47 cm; Facies 3). B. Clast-poor sandy diamictite (Unit II; 5R-3A, 30–36 cm; Facies 1). C. Bioturbated diatom-rich mudstone (Unit III; 20R-6A, 120–126 cm; Facies 5). D. Bioturbated diatom-bearing mudstone (Unit III; 20R-6A, 58–64 cm; Facies 3). E. Stratified diamictite (Unit IV; 23R-1A, 58–64 cm; Facies 2). F. Muddy conglomerate (Unit IV; 30R-1A, 126–133 cm; Facies 7). G. Chert (Unit V; 31R-2A, 56–66 cm; Facies 6). H. Silica-cemented mudstone (Subunit VIA; 37R-1A, 47–52 cm; Facies 3). I. Conglomerate (Subunit VIA; 43R-3A, 44–54 cm; Facies 7). J. Carbonate-cemented mudstone (Subunit VIC; 50R-2A, 127–132 cm; Facies 3). K. Clast-rich sandy diamictite (Unit VII; 63R-CC, 4–14 cm; Facies 1).

Figure F8. Sedimentary structures, unit contacts, and lithologic accessories, Hole U1521A. A. Physical intermixing (Unit II; 2R-1A, 56–66 cm). B. First downhole occurrence/appearance of diatomite physically intermixed with diamictite (Unit II; 3R-2A, 57–64 cm). C. Laminated contact between diamictite and diatomite (Unit II; 9R-1A, 51–64 cm). D. Contact between Units II and III (10R-1A, 104–116 cm). E. Bivalve (Unit III; 20R-4, 111 cm). F. Basalt clast (Unit IV; 23R-2A, 61–64 cm). G. Foraminifer (Unit IV; 27R-4A, 123–124 cm). H. $CaCO_3$ concretion (Unit IV; 30R-2A, 124–127 cm). I. Burrows in $CaCO_3$-cemented mudstone (Subunit VIA; 37R-2A, 28–38 cm). J. Mudstone with vein network (Subunit VIB; 46R-3A, 34–41 cm). K. Mudstone with $CaCO_3$ concretion (Subunit VIC; 51R-2A, 34–37 cm). L. Sandy diamictite with wavy laminae (Unit VII; 68R-2A, 81–87 cm).

Figure F9. Lithology and sedimentary structures, Hole U1521A. Downhole profiles represent the occurrence of a described lithology or lithologic feature. Bioturbation intensity: 0 = no apparent bioturbation (<10%) to 4 = complete bioturbation (>90%).

Figure F10. XRD patterns, Hole U1521A. Bulk mineralogy is uniform downhole, although minor changes in intensity occur, as indicated by relative peak heights.

Figure F11. Micropaleontology summary, Hole U1521A. Diatom and radiolarian biostratigraphic zonations are defined by the first appearance datum (FAD) and/or last appearance datum (LAD) of corresponding marker species.

Figure F12. Preliminary shipboard age model, Hole U1521A. Biochronologic events (e.g., Diatom D1, Radiolarian R1; see Table T5) and paleomagnetic reversals are calibrated to Gradstein et al. (2012). Event D20 is not observed in Hole U1521A, and associated black arrow indicates sediment must be younger than this (see Table T5 and text for discussion).

Figure F13. Diatoms, Hole U1521A. A. *Denticulopsis simonsenii* (4R-CC). B. *Fragilariopsis malinterpretaria* (10R-CC). C. *Nitzschia grossepunctata* (10R-CC). D. *Denticulopsis maccollumi* (9R-CC). E. *Fragilariopsis truncata* (10R-CC). F. Well-preserved assemblage (10R-CC). G. Poorly preserved assemblage (51R-CC). A–E: scale bar = 10 µm. F–G: scale bar = 30 µm.

Figure F14. Radiolarians, Hole U1521A. A, B. *Helotholus vema* (3R-CC). C. *Eucyrtidium calvertense* (3R-CC). D. *Cycladophora golli regipileus*, reworked in this sample (3R-CC). E, H, M. Phaeodarian species (3R-CC). F. *Saccospyris praeantarctica* (3R-CC). G. *Desmospyris spongiosa* (3R-CC). I. *Cycladophora davisiana* (3R-CC). J. *Antarctissa cylindrica* (3R-CC). K. *Helotholus haysi*. L. *Phorticium polycladum* (22R-CC). A, B, E, F, M: scale bar = 50 µm. C, D, G–L: scale bar = 100 µm.

Figure F15. Benthic foraminifers, Hole U1521A. A, B. *Elphidium magellanicum* (A: 14R-CC; B: 9R-CC). C. *Cassidulinoides porrectus* (4R-CC). D, E, K, L. *Cibicides lobatulus* (D: umbilical view, 2R-CC; E: edge view, 2R-CC; K: umbilical view, 21R-CC; L: spiral view, 28R-CC). F. *Globocassidulina subglobosa* (8R-CC). G. *Globocassidulina* cf. *crassa* (9R-CC). H. *Globobulimina* sp. (14R-CC). I. *Miliammina arenacea*, broken specimen (3R-CC). J. *Nonionella iridea* (9R-CC). M. *Uvigerina* cf. *bifurcata* (9R-CC). N. *Angulogerina* aff. *fueguina* (69R-CC). O. *Martinottiella communis* (28R-CC). P. *Spheroidina bulloides* (21R-CC). Q, R. *Cibicides temperatus*, (69R-CC; Q: spiral view, R: umbilical view). S, T. *Melonis barleeanus* (S: 20R-CC; T: 28R-CC). U. *Melonis affinis* (60R-CC). Scale bar = 50 µm.

Figure F16. Dinocysts, Hole U1521A. A–F. *Lejeunecysta* sp. (A: dorsal view, 12R-CC; B: ventral view, 16R-CC; C, E: dextral view, 16R-CC; D: ventral view, 16R-CC; F: ventral view, 12R-CC). G. *Protoperidinium* sp. 1 (16R-CC). H. *Protoperidinium* sp. 2 (16R-CC). I. *Cymatosphaera* sp. 3 of Hannah et al. (1998) (16R-CC). Scale bars = 20 µm.

Figure F17. Dinocysts, Hole U1521A. A, B. *Batiacasphaera minuta* (12R-CC). C. *Impagidinium pallidum* (16R-CC). D. *Opeculodinium centrocarpum* (12R-CC). E. *Opeculodinium ?eirikianum*, showing the archeopyle (16R-CC). F. *Spiniferites ramosus* (12R-CC). G. *Cymatiosphaera* sp. (12R-CC). H. *Nematosphaeropsis labyrinthus* (12R-CC). I. *Vozzhennikovia apertura* (58R-CC). Scale bars = 20 µm.

Figure F18. Calcareous nannofossils, Hole U1521A. A. *Coccolithus pelagicus* (65R-CC). B. *Reticulofenestra lockeri* (60R-CC). C. *Reticulofenestra daviesii* (65R-CC). D. *Dictyococcites antarcticus* (60R-CC). E. *Cyclicargolithus floridanus* (58R-CC). F. *Cyclicargolithus* sp. cf. *Cyclicargolithus floridanus* (58R-CC). Scale bar = 10 µm.

Figure F19. Paleomagnetic data, Hole U1521A. MS: black circles = WRMSL, red triangles = SHMSL, yellow stars = Kappabridge. Intensity, declination, and inclination: gray = initial NRM, red = after 10 mT peak AF demagnetization, blue = after 20 mT peak AF demagnetization, yellow stars = discrete samples. Polarity: black = normal (N), white = reversed (R), gray = uncertain or no recovery. Note that Site U1521 is in the Southern Hemisphere, and positive inclination corresponds to a reversed polarity interval. The expected inclination at Site U1521, assuming a geocentric axial dipole, is ±82.7°. See text for discussion of polarity Zones R1–R5.3. GPTS from Gradstein et al. (2012).

Figure F20. Representative AF demagnetization behavior of discrete samples, Hole U1521A. From left to right for each sample: Zijderveld diagram with peak AF fields and initial NRM, equal area projection of directions during demagnetization (solid gray circles = lower hemisphere, open circles = upper hemisphere), and fractional magnetization (normalized to initial NRM) during AF demagnetization. A. Sample without stable remanence and no characteristic remanent magnetization (ChRM) direction is estimated. B. Sample with multiple components (see text for discussion). C, D. Samples with commonly encountered demagnetization pattern revealing one stable ChRM direction.

Figure F21. Anisotropy of magnetic susceptibility, Hole U1521A. Degree of anisotropy (*P*) is approximated by the k_{max}/k_{min} ratio, in which $P = 1$ indicates no anisotropy and $P > 1$ is more anisotropic. Mean magnetic susceptibility is the average of k_{max}, k_{int}, and k_{min}.

Figure F22. MS, thermal conductivity, and NGR, Hole U1521A.

Figure F23. GRA and MAD bulk density, grain density, and porosity, Hole U1521A.

Figure F24. Discrete *P*-wave velocity, Hole U1521A.

Figure F25. Color reflectance spectroscopy, Hole U1521A. Data are plotted with a 5-point smooth.

Figure F26. Physical properties summary, Hole U1521A. Dashed lines mark intervals with distinctive physical property characteristics that correlate with lithostratigraphic units defined primarily by sedimentological characteristics (see Table T12).

Figure F27. Headspace gas concentrations, Hole U1521A. See Table T2 for lithostratigraphic unit information.

Figure F28. Interstitial water alkalinity, chloride, sulfate (circles), and ammonium in the upper 350 m CSF-A, Hole U1521A. ICP-OES sulfate measurements (white circles) compare well with sulfate measurements performed by ion chromatography (yellow circles). Dashed line = sulfate concentration of modern seawater.

Figure F29. Interstitial water calcium, magnesium, silicon (silica), and barium in the upper 350 m CSF-A, Hole U1521A. Solid symbols = ICP-OES results, open symbols = ion chromatography results (Mg) or spectrophotometry results (silica).

Figure F30. MS, bulk sediment TOC, TOC/TN ratio, and calcium carbonate ($CaCO_3$), Hole U1521A. Dashed horizontal lines mark lithostratigraphic unit boundaries (see Table T2).

Figure F31. Element ratios derived from handheld pXRF scanning, Hole U1521A. Note that the scanning frequency was higher in the uppermost five cores and that no scans were performed between Cores 6R and 23R. Dashed horizontal lines mark lithostratigraphic unit boundaries (see Table T2).

Figure F32. Downhole log data summary, Hole U1521A. Core data are on the CSF-A depth scale, whereas downhole logging data are on the WMSF depth scale, with small depth discrepancies (usually <2 m) between the two depth scales. See Table T10 in the Expedition 374 methods chapter (McKay et al., 2019a) for tool and measurement acronym definitions. V_P = *P*-wave velocity, V_S = *S*-wave velocity.

Figure F33. NGR and *P*-wave velocity data comparison, Hole U1521A. Core data are on the CSF-A depth scale, whereas downhole logging data are on the WMSF depth scale, with small depth discrepancies (usually <2 m) between the two depth scales.

Figure F34. Bulk density and porosity data comparison, Hole U1521A. Core data are on the CSF-A depth scale, whereas downhole logging data are on the WMSF depth scale, with small depth discrepancies (usually <2 m) between the two depth scales.

Figure F35. MS data comparison, Hole U1521A. Core data are on the CSF-A depth scale whereas downhole logging data are on the WMSF depth scale with small depth discrepancies (usually <2 m) between the two depth scales.

Figure F36. FMS image examples, Hole U1521A. A. Low-resistivity diatom-rich mudstone in logging Unit 2 (lithostratigraphic Unit II). B. Highly resistive chert layers/nodules and low-resistivity mudstone in logging Unit 4 (lithostratigraphic Unit V). Mottled and patchy resistivity expression of various diamictite lithologies in logging Units (C) 3, (D) 5, and (E) 9 (lithostratigraphic Unit IV and Subunits VIA and VIC). Depths are meters WMSF.

Figure F37. Core-log-seismic integration, Hole U1521A. Line PD90-36 is a single-channel reflection seismic profile (air gun 2.6 L) collected by Rice University, TX (USA), in 1990 (Anderson and Bartek, 1992). CDP = common depth point. MSL = WRMSL MS (10^{-5} SI), PWC = SHMG *P*-wave velocity (m/s), GRA = WRSML bulk density (g/cm^3). A–F = seismic units.