

Figure F1. Oceanographic and bathymetric setting, Site U1543. A. Marine geological features. Yellow lines = seismic lines available in the region. B. Detailed bathymetry with seismic lines and shotpoints.

Figure F2. (A) Multichannel seismic (MCS) and (B) Parasound profiles across Site U1543. CDP = common depth point, TWT = two-way traveltime.

Figure F3. Surface circulation in the Southeast Pacific with examples of surface buoy trajectories (each 30-day position is marked by a circle) indicating northeast flow of northern Antarctic Circumpolar Current (ACC) water after crossing the East Pacific Rise. Also shown is the bifurcation of surface waters close to the Chilean coast (at about 45°S) with northward flowing water in the Humboldt Current System (HCS) and strongly accelerated southward flow in the Cape Horn Current (CHC) toward the Drake Passage. West–east drifting buoys follow the South Pacific Current (SPC). Modified from Chaigneau and Pizarro (2005) and Lamy et al. (2015).

Figure F4. Schematic view of the southern Chilean margin and the Drake Passage region with major surface and intermediate water circulation and location of Expedition 383 sites and ODP Leg 202 Site 1233. HCS = Humboldt Current System, SPC = South Pacific Current, AAIW = Antarctic Intermediate Water, CHC = Cape Horn Current, ACC = Antarctic Circumpolar Current, SAF = Subantarctic Front, WSI = winter sea ice (approximate location).

Figure F5. Modern oxygen distribution in the eastern South Pacific used to visualize major water masses. AAIW = Antarctic Intermediate Water, PDW = Pacific Deep Water, CDW = Circumpolar Deep Water, AABW = Antarctic Bottom Water.

Figure F6. Hole summaries, Holes U1543A and U1543B. GRA = gamma ray attenuation, MSP = point magnetic susceptibility, RGB = red-green-blue, NGR = natural gamma radiation, cps = counts per second. (Continued on next page.)

Figure F6 (continued).

Figure F7. Primary lithologies used to define sedimentary lithofacies, Site U1543.

Figure F8. Representative images and mineral properties of Lithofacies 4 (calcareous ooze), Hole U1543A. At Site U1543, Lithofacies 4 is a (A–D) foraminifer-bearing variety of the nannofossil ooze described at previous Expedition 383 sites and may include (E–H) a large proportion of altered calcareous debris, in particular further down in the sedimentary sequence. C, G. Plane-polarized light (PPL). D, H. Cross-polarized light (XPL).

Figure F9. Representative (A) core and (B) X-ray and photomicrograph images of mineral properties of Lithofacies 10 (clay-, silt-, and/or diatom-bearing to diatom-rich calcareous ooze) in (C) PPL and (D) XPL, Hole U1543A.

Figure F10. Representative (A) core and (B) X-ray and photomicrograph images of mineral properties of Lithofacies 6 (silt-bearing, clay-bearing to clayey diatom ooze) in (C) PPL and (D) XPL, Hole U1543A.

Figure F11. Representative (A) core and (B) X-ray and photomicrograph images of mineral properties of Lithofacies 7 (diatom-bearing to diatom-rich clay to silt) in (C) PPL and (D) XPL, Hole U1543A.

Figure F12. Representative (A) core and (B) X-ray and photomicrograph images of mineral properties of Lithofacies 8 (silt-bearing clay to clay-bearing silt) in (C) PPL and (D) XPL, Hole U1543A.

Figure F13. Relative contribution of lithofacies, Site U1543.

Figure F14. Summary of primary lithostratigraphic variations, Site U1543. MSP = point magnetic susceptibility, RGB = red-green-blue.

Figure F15. Deformational features in Lithostratigraphic Unit II, Holes U1543A and U1543B. A. Fracturing. B. Microfaulting. B, C. Uparching sediment. D, E. Suck-in.

Figure F16. X-ray diffractograms of untreated representative samples of each lithostratigraphic unit in Hole U1543A. Minerals occurring in the samples include quartz (Q), plagioclase (Pl), smectite (Sm), illite (Il), and chlorite (Chl). Line color is used to visually distinguish diffractograms and does not indicate sample treatments. cps = counts per second.

Figure F17. Characteristic variations in major lithology and physical properties, Hole U1543A. Pale orange bars = Lithofacies 4 and 10 (nannofossil-dominant), green bars = Lithofacies 6 (diatom-dominant), white bars = Lithofacies 7 and 8 (silt- and clay-dominant). GRA = gamma ray attenuation, NGR = natural gamma radiation, cps = counts per second, MS = point magnetic susceptibility, RGB = red-green-blue.

Figure F18. Relationships between bulk sedimentary carbonate content and (A) red-green-blue (RGB) blue and (B) color reflectance L*, Hole U1543A.

Figure F19. Diatom, radiolarian, calcareous nannofossil, and planktonic foraminifer zonations and biostratigraphic events, Site U1543.

Figure F20. Age-depth plot, Hole U1543A. Diatom datums in red parentheses are assigned with lower confidence.

Figure F21. Distribution of siliceous and calcareous microfossils, Hole U1543A. B = barren, R = rare, F = few, C = common, A = abundant, D = dominant. Ostracods reported as number of valves per sample (>125 µm fraction).

Figure F22. Silicoflagellates, Site U1543. Focus on basal ring (upper images) and apical structure (lower images). Light microscope. 1. *Dictyocha stapedia*. 2. *Stephanocha speculum* var. *coronata*. 3. *S. speculum* var. *notabilis*. 4. *Octactis* sp. (9-sided). 5. *Octactis pulchra*. 6. *Dictyocha perlaevis*. 7. *D. perlaevis*, asperoid. 8. *Dictyocha brevispina*. 9. *Dictyocha* sp., malformed (unclosed basal corners). 10. *Paramesocena circulus*. 11. *Bachmannocena quadrangula*.

Figure F23. Calcareous nannofossils, Hole U1543A. Light microscope. 1, 3, 4. 1H-CC. (1) *Emiliania huxleyi*. 2, 5. 7H-5, 24 cm. (2) *Pseudoemiliania lacunosa*. (3) *Helicosphaera carteri*. (4) *Calcidiscus leptoporus*. (5) *Reticulofenestra asanoi*. 6. *Gephyrocapsa* spp. (>5.5 µm) large (8H-CC). 7. *Reticulofenestra* (<3 µm) (20H-2, 92 cm). 8. *Pontosphaera* spp. 9. *Reticulofenestra pseudumbilicus* (30H-CC). 10–12. 27H-2, 57 cm. (10, 11) *Amaurolithus primus/delicatus*. (12) Coccosphere of *Reticulofenestra*.

Figure F24. Planktonic foraminifers, Site U1543. Scale bars = 100 µm. A. *Orbulina universa*. B, C. *Globoconella pliozea* in (B) umbilical and (C) side view. D, E. *Globoconella conomiozea* in (D) side and (E) umbilical view. F, G. *Globoconella sphericomiozea* in (F) umbilical and (G) side view. H–J. *Globoconella puncticulata puncticuloides* in (H) umbilical, (I) spiral, and (J) side view. K, L. *Globoconella puncticulata* in (K) umbilical and (L) side view. M–O. *Globoconella inflata* in (M) spiral, (N) side, and (O) umbilical view. P, Q. *Truncorotalia crassaformis* in (P) umbilical and (Q) side view. R–T. *Truncorotalia truncatulinoides* in (R) spiral, (S) side, and (T) umbilical view.

Figure F25. Planktonic foraminifers, Site U1543. Scale bars = 100 µm. A–C. *Hirsutella scitula* in (A) umbilical, (B) side, and (C) spiral view. D. *Neoglobobulimina pachyderma*. E. *Neoglobobulimina incompta*. F. *Globigerina bulloides*. G. *Globobulimina woodi*. H. *Globigerina glutinata*. I. *Neoglobobulimina dutertrei*. J. *Turborotalita quinqueloba*. K, L. *Globigerina calida* in (K) umbilical and (L) spiral view. M, N. *Beella digitata* (M) with and (N) without elongated final chambers.

Figure F26. Natural remanent magnetization (NRM) intensities before and after 15 mT peak alternating field demagnetization, Holes U1543A and U1543B.

Figure F27. Inclination before and after 15 mT peak alternating field demagnetization, Holes U1543A and U1543B. NRM = natural remanent magnetization.

Figure F28. Inclination after 15 mT peak alternating field demagnetization, Hole U1543A. Polarity interpretation and correlation to the geomagnetic polarity timescale (GPTS; Cande and Kent, 1995) on the 2012 geologic timescale (Hilgen et al., 2012).

Figure F29. Headspace methane concentrations, Site U1543.

Figure F30. Interstitial water alkalinity and pH, Site U1543. Red square = overlying seawater sample.

Figure F31. Interstitial water chloride and sodium, Site U1543. Red square = overlying seawater sample.

Figure F32. Interstitial water ammonium, phosphate, and sulfate, Site U1543. Red square = overlying seawater sample.

Figure F33. Interstitial water calcium, strontium, and magnesium, Site U1543. Red square = overlying seawater sample.

Figure F34. Interstitial water iron, manganese, and lithium, Site U1543. Red square = overlying seawater sample.

Figure F35. Interstitial water silicon, barium, potassium, and bromide, Site U1543. Red square = overlying seawater sample.

Figure F36. Solid phase geochemistry of (A) CaCO_3 , (B) total organic carbon:total nitrogen (TOC:TN), (C) TN, and (D) TOC, Site U1543.

Figure F37. Bulk sediment elemental (Na, K, Si, P, Mg, Ca, Ti, Mn, and Fe) oxides vs. aluminum oxide, Site U1543.

Figure F38. Bulk sediment major and minor element concentrations, Site U1543.

Figure F39. Splice data: Whole-Round Multisensor Logger magnetic susceptibility (MS; red) and Section Half Multisensor Logger point magnetic susceptibility (MSP; orange), Site U1543. Black vertical line = lithostratigraphic unit boundary (see Sedimentology).

Figure F40. Splice data: Whole-Round Multisensor Logger magnetic susceptibility (MS; red) and gamma ray attenuation density-normalized natural gamma radiation (NGR*; black). cps = counts per second.

Figure F41. U/Th (blue) and K/Th (black) from deconvolved natural gamma radiation (NGR*) data, each shown as five-point smoothed records, Hole U1543B. Lower panel: core image (383-U1543B-31H-5, 47–75 cm) and corresponding values for U from deconvolved density-normalized natural gamma radiation (NGR*). These correspond to a U peak at 264.2–264.5 m CSF-A.

Figure F42. Splice data: density-normalized NGR (NGR*; brown) and U/Th from deconvolved NGR* data (blue). A. U/Th without normalizing the U and Th records. B. U/Th* after each record is normalized. cps = counts per second.

Figure F43. Bulk density data (green = Whole-Round Multisensor Logger, yellow diamonds = moisture and density [MAD]), Hole U1543A. Top: correlation between MAD- and gamma ray attenuation (GRA)-derived bulk density. Red triangles = outlier ($>3\sigma$), not used for regression.

Figure F44. Splice data: Whole-Round Multisensor Logger gamma ray attenuation (GRA) data.

Figure F45. Splice data: Whole-Round Multisensor Logger (WRMSL) gamma ray attenuation (GRA) bulk densities processed and WRMSL magnetic susceptibility (MS).

Figure F46. Top: *P*-wave data from Whole-Round Multisensor Logger (WRMSL; blue line) and discrete *P*-wave caliper (PWC) measurements (diamonds), Holes U1543A and U1543B. Bottom: correlation between PWC (x-axis) and WRMSL results for Holes U1543A and U1543B.

Figure F47. Splice data: WRMSL GRA bulk density processed and WRMSL *P*-wave velocity.

Figure F48. Thermal conductivity data from needle probe measurements, Hole U1543A. 0.7 W heating power over 80 s interval. Mean values of three measurements (red diamonds) or less (orange diamonds) in cases with insufficient solution to calculate temperature conductivity.

Figure F49. Advanced piston corer temperature (APCT-3) tool heat flow calculations, Hole U1543A. A. Thermal resistance calculated from heat conductivity measurements. B. In situ sediment temperatures from APCT-3 tool measurements with average values for Cores 4H, 7H, 10H, 13H, 16H, 19H and 22H (diamonds), and the linear best fit (stippled line). C. Bullard plot of heat flow calculated from a linear fit of temperature vs. thermal resistance data.

Figure F50. Whole-Round Multisensor Logger magnetic susceptibility (MS) data versus composite depth in 100 m intervals, Holes U1543A and U1543B. Top panel shows the MS splice constructed by combining data from all holes. (Continued on next page.)

Figure F50 (continued).

Figure F51. Spliced composite records of Whole-Round Multisensor Logger magnetic susceptibility (MS), gamma ray attenuation (GRA) bulk density, and natural gamma radiation (NGR) versus composite depth in 50 m intervals, Site U1543. (Continued on next four pages.)

Figure F51 (continued). (Continued next page.)

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Figure F51 (continued).

Figure F52. Complete spliced composite records of natural gamma radiation (NGR), cleaned gamma ray attenuation (GRA) bulk density, and Whole-Round Multisensor Logger magnetic susceptibility (MS), Site U1543.

Figure F53. A. Comparison of core and composite depth scales in the Site U1543 splice. B. Comparison of the growth of cumulative depth offset and core depth.