Figure F1. IODP convention for naming sites, holes, cores, sections, and samples. Ship positioning while coring was primarily accomplished with GPS data.

Figure F2. APC system used during Expedition 390/393 (see Graber et al., 2002). ID = inside diameter.

Figure F3. XCB system used during Expedition 390/393 (see Graber et al., 2002).

Figure F4. Diagram of typical APC/XCB and RCB BHAs. ID = inside diameter.

Figure F5. RCB system used during Expedition 390/393 (see Graber et al., 2002). ID = inside diameter. OD = outside diameter.

Figure F6. Sediment core flow through *JOIDES Resolution* laboratories, Expedition 390/393. See text for differences between expeditions for each laboratory. PWC = *P*-wave velocity measured by caliper.

Figure F7. Hard rock core flow through *JOIDES Resolution* laboratories, Expedition 390/393. See text for differences between expeditions for each laboratory. PWC = *P*-wave velocity measured by caliper.

Figure F8. Example sediment VCD summarizing data from core imaging, macro- and microscopic description, and physical properties measurements, Expedition 390/393. cps = counts per second. See Figure F10 for lithologic symbol descriptions.

Figure F9. Visual aid for identification of bioturbation intensity, Expedition 390/393. Modified after Pemberton et al. (2009). BI = bioturbation index.

Figure F10. Symbols used for sediment VCDs, graphic logs, and hole summaries, Expedition 390/393.

Figure F11. Sedimentary lithology naming conventions based on relative abundances of grain and clast types, Expedition 390/393.

Figure F12. Relationship between bulk carbonate ($CaCO_3$) content measured using coulometry and calcite abundance estimated with XRD data using Rietveld fitting, Holes U1558F and U1583C.

Figure F13. Example hard rock VCD showing petrologic logging data downhole and summary text, Expedition 390/393.

Figure F14. Symbols used for hard rock VCDs, Expedition 390/393.

Figure F15. Alteration and mineral fill logs illustrating approach taken to constrain proportion of alteration/secondary minerals though detailed quantitative logging, Expedition 390/393.

Figure F16. Definition of upper and lower intervals and width measured for simple and more complicated veins, Expedition 390/393. Reproduced and adapted from Kelemen et al. (2020).

Figure F17. Vein fill textures, morphologies, and connectivities referred to during vein logging, Expedition 390/393. Reproduced and adapted from Expedition 335 Scientists (2012a).

Figure F18. Schematic explanation of hard rock sample bins and measurement of piece lengths, Expedition 390/393. Core pieces are pushed to top of their respective bins in core liner, and their bottom interval in core is read off. Difference between this and curated top interval (measured from the bin) gives piece length.

Figure F19. Annotated whole thin section image showing approach taken to defining alteration domains within sections (393-U1560B-23R-2, TS181).

Figure F20. A–C. Reference frame and method of measuring orientation of planar feature, Expedition 390/393. If piece is cut perpendicular to strike of feature, dip angle and dip direction can be measured directly. If structural feature is oblique to cut face, two separate measurements must be made. Figure adapted from Kelemen et al. (2020).

Figure F21. Microfossil datums used during Expeditions 390C, 395E, 390, and 393 with calcareous nannoplankton and planktic foraminiferal zonation schemes for most of Cenozoic (from Danian to recent). LCO = last common occurrence, S-D = sinistral–dextral, FCO = first common occurrence, X = abundance crossover.

Figure F22. A. Coordinate system for IODP paleomagnetic measurements (Top: working half; Bottom: archive half) (modified from Expedition 335 Scientists, 2012a). B. Sample holder for AGICO JR-6A dual-speed spinner magnetometer. Yellow = sample coordinate system, red = JR-6A coordinate system, solid arrow = upcore direction. C. Discrete sample examples (Left: Natsuraha-Giken sample cube; Right: saw-cut hard rock material). D. Coordinate system for SRM on *JOIDES Resolution*.

Figure F23. Magnetic shield casing covered with μ-metal foil used during Expedition 393 while drying hard rock cube samples that were shared with MAD measurements.

Figure F24. A. DMT digital color imager in *JOIDES Resolution* core laboratory. B. Example of how core pieces unable to roll cleanly during scanning were held in place, Expedition 390/393. Core supports were cropped from images immediately after scanning. C. Diagram of typical section of basement core comprising two continuous subpieces with splitting lines. Red line = cut line for dividing core piece into working (W) and archive (A) halves, blue lines = base of core (parallel to cut line) and aided in reconstruction of composite images (perpendicular to cut line) for pieces >25 cm long requiring multiple DMT scans to generate images at 40 pixel/mm resolution. D. Geographic coordinate system for IODP CRF (modified from Expedition 335 Scientists, 2012a). Splitting plane is oriented along a plane striking 090°–270°. E. Plane separating working and archive halves with coordinates of 090° in CRF.

Figure F25. A. Example of curated section containing common pieces within a bin, Expedition 390. B. Examples of how to scan each bin type. Red lines = cutting, blue lines = cropping, green boxes = DMT scanner's 25 cm wide field of view. Examples include naming convention for image files: (i) single piece <25 cm, (ii) one continuous fragmented piece >25 cm, (iii) piece with foam in place of sample removed prior to scanning, and (iv) continuous unfractured piece > 25 cm.

Figure F26. Schematic of cored material, compositing, and generation of a composite section or "splice," Expedition 390/393. CSF-A depth scale was created by combining DSF depth with curated core length. APC recovery was typically >100% due to expansion of cored material (orange bars), hence there is overlap between cores. CCSF depth scale resolves this; we found common stratigraphic features within multiple holes (tie points, red lines) and shifted depths of individual cores relative to each other (compositing), aligning the cores, and thus creating a vertical offset between CSF-A and CCSF depth scales for each core. A composite record (Hole A and B) or a splice was constructed using selected intervals between tie points to avoid coring gaps, which provides a continuous section of recovered core material.

Figure F27. Wireline tool strings, Expedition 390/393. Some tool combinations were modified at some sites, based on real-time conditions. Images are not perfectly to scale. LEH-QT = logging equipment head-Q tension, EDTC = Enhanced Digital Telemetry Cartridge, HNGS = Hostile Environment Natural Gamma Ray Sonde, APS = Accelerator Porosity Sonde, HLDS = Hostile Environment Litho-Density Sonde, HRLA = High-Resolution Laterolog Array, MSS = Magnetic Susceptibility Sonde, FMS = Formation MicroScanner, DSI = Dipole Shear Sonic Imager, GPIT = General Purpose Inclinometry Tool, UBI = Ultrasonic Borehole Imager.

Figure F28. ICP-AES calibration curves for Na and K analytical wavelengths, Expedition 393. Each exhibits nonlinearity issues. A. 588.995 nm (Na). B. 330.298 nm (Na). C. 589.592 nm (Na). D. 766.491 nm (K).

Figure F29. Raw elemental concentration data for rock standard BHVO-2 measured by Olympus pXRF, plotted relative to date of analysis, Expedition 390/393. A. Ti. B. Sr. C. Zr. D. K. Red lines = averages and standard deviations, blue lines = preferred standard values. Note significant offset in measured and accepted values, particularly for K.

Figure F30. Raw pXRF concentrations vs. ICP-AES data, Expedition 390/393. A. Ti. B. Zr. C. K. D. Sr. Blue lines = linear regressions, black line = 1:1 correlation, red line = second-order polynomial regression of Ti data.

Figure F31. $[Zr/Ti]_N$ for solid core surface vs. $[Zr/Ti]_N$ for ICP-AES from working-half samples from same core interval, Site U1556. Single outlier data point is from 390-U1556B-39R-1 (Piece 8, 99–101 cm). Dotted line = 1:1 correlation.

Figure F32. Calibration curves for elements deemed reliable for analysis using Bruker pXRF system, Expedition 393. A. TiO_2. B. MnO. C. Fe_2O_3. D. CaO. E. K_2O. F. Ni. G. Zn. H. Cu. (Continued on next page.)

Figure F32 (continued). I. Rb. J. Y. K. Sr. L. Zr. M. Cr. N. V.

Figure F33. pXRF setup and rock surface standards. A. Bruker Tracer 5g pXRF used to measure rock surfaces. Cores were placed flat side down on Ultralene film. B. Rock surface standards. Left: microcrystalline (393-U1559B-11R-1, 6–13 cm); Right: cryptocrystalline (5R-1, 106–112 cm) mounted in 3-D-printed holders. C. Whole-rock powders from material cut from back of rock surface samples, pressed into a holder, and covered with Ultralene film.

Figure F34. pXRF analyses of microcrystalline rock surface standard (393-U1559B-11R-1, 6–13 cm) over course of Expedition 393. A. TiO_2. B. Fe_2O_3. C. K_2O. D. CaO. E. V. F. Sr. G. Cr. H. Y. I. Zr.

Figure F35. pXRF analyses of cryptocrystalline to microcrystalline rock surface standard (393-U1559B-5R-1, 106–112 cm) over course of Expedition 393. A. TiO_2. B. Fe_2O_3. C. K_2O. D. CaO. E. V. F. Sr. G. Cr. H. Y. I. Zr.

Figure F36. A. Microbiology sampling setup, Expedition 390/393. Rock box is shown between KOACH units, along with (right) chisels used for basement samples and (left) hammer. Antistatic bar is behind the rock box, with white Foldio unit used as backdrop for Foldio images in back. B. Foldio sample imaging setup. Two white free-standing lights are held in place using Velcro, which was left on the bench between samples to provide consistent lighting. (Photo credits: M. Takada, Y. Wang, and IODP JRSO.)

Figure F37. A. Collecting drilling fluid on rig floor, Expedition 390/393 (photo credit: J.B. Sylvan and IODP JRSO). B. Pump that delivers PFMD to drilling fluid (photo credit: E.R. Estes, IODP JRSO).

Figure F38. A. Slurry used for enrichment experiments, Expedition 390/393. B. Inoculated agar plates used for enrichment experiments. C. Samples of stable isotope incubations using hard rock. D. Sediment sampling from interior of whole round using cut-tip syringe. E. Stable isotope incubation samples in vials after adding labeled substrates. F. Flushing SIP experiments with nitrogen gas. (Photo credit for A-F: M. Takada and IODP JRSO.)