

Figure F1. Lithostratigraphic summary, Hole M0077A.

Figure F2. Petrographic variations of granitoids, Hole M0077A. A. Coarse-grained granite (97R-3). B. Red alkali-feldspar granite (296R-2). C. Altered granite with pink quartz (272R-1). D. Dark green heavily altered granite (168R-3).

Figure F3. Dikes, Hole M0077A. A. Aplite dike (147R-2). B. Pegmatitic dike (114R-1).

Figure F4. Dacite and felsite, Hole M0077A. A. Dacite, showing a contact with the granitoid on the left (246R-3). B. Thin section overview (246R-3, 77–78 cm). C. Dacite groundmass and shocked (toasted) quartz. D. Kinked biotite in dacite (cross-polarized light [XPL]). E. Decorated planar deformation features (two sets) in quartz (XPL). F. Felsite (239R-2). G. Thin section scan (234R-3). Image contrast is modified.

Figure F5. Diabase/dolerite, Hole M0077A. A, B. Porphyritic diabase/dolerite: (A) line-scan image (169R-2), (B) optical micrograph showing large plagioclase lathes (Pl) and pyroxene (Px) (169R-3). C, D. Aphanitic diabase/dolerite: (C) line-scan image (162R-1), (D) optical micrograph showing submillimeter-sized plagioclase lathes (Pl) (221R-3). Image contrast is modified.

Figure F6. Suevite, Hole M0077A. A. Line-scan image (268R-1). B, C. Photomicrographs (268R-1, 31–33 cm). In A and B, the polymict nature (mainly black impact melt rock fragments and granite clasts) of the suevite and its fine-grained matrix can be seen. C. Two sets of decorated planar deformation features in quartz (XPL).

Figure F7. Suevite, Hole M0077A. A. Line-scan image (280R-3). B–E. Photomicrographs (280R-3, 66–68 cm). In A and B, the polymict nature (mainly black and reddish brown impact melt fragments, granitoids, and other types of clasts) can be seen, as well as the flow texture. C. Nondigested rock clast within a reddish brown melt rock fragment (plane-polarized light [PPL]). D. Reddish brown and black melt rocks in contact, both of them with nondigested clasts (PPL). E. Shocked feldspar grain (XPL).

Figure F8. Representative CT scans, Hole M0077A. CT-A is the uncalibrated effective atomic number (Z_{eff}); CT-D is the uncalibrated bulk density (ρ_b). Higher Z_{eff} and ρ_b values are red; lower values are green to blue.

Figure F9. Traces of SPO of rock-forming minerals in a granitoid (red lines) (265R-1). Note the parallelism between the traces of SPO and impact-induced discontinuities.

Figure F10. Microstructural characteristics of alkali-feldspar and quartz displaying evidence of pre-impact deformation under high temperature (XPL), Hole M0077A. A. Grain-boundary migration in clouded alkali-feldspar (97R-1, 117–120 cm). B. Incipient subgrain formation at grain boundary of clouded perthite (122R-3, 44–45 cm). C, D. Serrated grain boundaries of shocked quartz, typical for dynamic recrystallization (122R-3, 44–45 cm).

Figure F11. Microscopic evidence for impact-induced deformation and shock metamorphism in granitoid target rocks, Hole M0077A. A. Fractures in plagioclase displacing twin lamellae (199R-2, 115–117 cm; plane-polarized light [PPL]). B. Kinked biotite (125R-3, 61–63 cm; XPL). C. Cataclastic deformation of plagioclase and quartz (97R-1, 117–121 cm; XPL). Black zone is ultracataclasite. D. Decorated planar deformation features (two sets) in quartz (108R-3, 61–62 cm; XPL).

Figure F12. Pervasive grain-scale cataclastic deformation of granitoid (122R-3, 44–45 cm). A. PPL. B. XPL.

Figure F13. A. Shatter cone in an amphibolite clast (81R-1, 110–116 cm). B. Felsite (237R-1).

Figure F14. Mesoscopic impact-induced structures in granitoid, Hole M0077A. A. Hairline fracture typical for weakly strained material (129R-2). B. Crenulated foliation of moderately strained material (181R-3). C. Ultracataclasite typical for localized high strains (168R-1). D. Zone of cataclasite truncated by shear fault (176R-2). E. Margins of an aplite dike (red lines) displaced on shear fault (216R-1).

Figure F15. Strong mesoscopic (drill-core scale) to macroscopic strain gradient in granitoid (265R-2). Upper close-ups show weakly and highly strained material. Lower close-ups show suevite entrained in convoluted deformation fabrics of the granite.

Figure F16. (A, B) Impact-induced versus (C, D) seismically induced shear faults (slickensides), Hole M0077A. A. Shear fault surface (272R-2, 2–4 cm). Note pronounced ridges and grooves on the sheared surface. B. Shear fault surface displaying striations with two orientations (red lines) (153R-1). C. Post-impact slickensides in carbonate rock marked by steps in carbonate fibers. D. Post-impact slickensides in the norite of the Sudbury Igneous Complex. Note oriented growth of chlorite fibers on the fault surface. Diameter of coin = 3 cm. (D courtesy of U. Riller.)

Figure F17. Ductile band structures with C-S fabric geometry in granitoid and suevite, Hole M0077A. Yellow arrows = components of local shortening and extension directions, red arrows point toward top of drill hole. A. C-S fabrics in granitoid (272R-2, 2–4 cm). B. C-S fabrics in granitoid (273R-2). C. Shear zone in impact melt rock (289R-1). Sigmoidal layering is defined by impact melt mixed with suevite.

Figure F18. Truncation of cataclasite by shear faults in Sections (A) 364-M0077A-298R-2, (B) 176R-2, and (C) 298R-3. D. Cataclasite zone reactivated by shear fault.

Figure F19. Structural relationships between diabase/dolerite veins, shear faults, cataclasite, and suevite, Hole M0077A. A. Shear faults displace diabase/dolerite vein margins (272R-2, 2–4 cm). B. Suevite emplaced in dilation zone constrained by shear faults (262R-1). C. Granitoid clast (G) in impact melt rock (290R-1; width = ~8 cm). Note the difference in the orientation of striations in the clast and the melt rock matrix. D. Cataclasite band in granitoid fragment (arrow) truncated by suevite (286R-1).

Figure F20. Open fracture with hydrothermal mineralization, Hole M0077A.

Figure F21. Preliminary results of fault-slip inversion in terms of principal strain axis orientations based on the numerical dynamic analysis, Hole M0077A.

Figure F22. AF demagnetization behavior, Hole M0077A. A, B. Granitoids (107R-2, 10–12.5 cm, and 285R-2, 18–20.5 cm). C. Pre-impact dikes (169R-2, 120–122.5 cm). D. Suevite (268R-1, 72–74.5 cm).

Figure F23. Magnetostratigraphic plots, Hole M0077A. A. Lithologic units. B. Magnetization intensity. C. Magnetic inclination. D. Magnetic susceptibility. MSCL magnetic susceptibility values measured within 2 cm of paleomagnetic sampling.

Figure F24. Major element compositions, Cores 364-M0077A-96R through 303R (747.02–1334.69 mbsf).

Figure F25. Carbon and sulfur contents, Cores 364-M0077A-96R through 303R (747.02–1334.69 mbsf).

Figure F26. Trace element compositions, Cores 364-M0077A-96R through 303R (747.02–1334.69 mbsf).

Figure F27. Trace element compositions, Cores 364-M0077A-96R through 303R (747.02–1334.69 mbsf).

Figure F28. Bulk mineralogy, Cores 364-M0077A-96R through 303R (747.02–1334.69 mbsf). Other minerals = those occurring at <15%.

Figure F29. *P*-wave velocity, porosity, density, thermal conductivity, and resistivity from discrete core samples and downhole measurements, Hole M0077A. mbsf = discrete samples and MSCL data, WSF = downhole logs. Yellow curves = downhole measurements of sonic velocity and resistivity (converted from conductivity).

Figure F30. Magnetic susceptibility, NGR, and L*, a*, and b* values from discrete core samples and downhole measurements, Hole M0077A. mbsf = discrete samples and MSCL data, WSF = downhole logs. cps = MSCL values, API = downhole measurements.

Figure F31. Wireline downhole log data, Hole M0077A. RLLS = shallow-reading resistivity, RLSD = deep-reading resistivity, Res from IL = resistivity from induction, IL = conductivity, V_p = *P*-wave velocity, MSUS = magnetic susceptibility, GR = total gamma ray, $T^\circ(\text{fluid})$ = borehole fluid temperature, Cond(fluid) = borehole fluid conductivity, Magn. Field = local magnetic field, ABI TT = traveltime acoustic image, ACCAL-mean = mean borehole diameter, OBI = optical borehole image, ABI TT cross section = traveltime cross section of the borehole. See Downhole logging in the Expedition 364 methods chapter (Gulick et al., 2017a) for tool descriptions.

Figure F32. Core-log integration data between downhole logging amplitude ABIs (ABI amplitude; WSF), OBI (OBI; WSF), and core line-scan images (mbsf), Hole M0077A. Core images should be shifted downward by as much as 0.7 m to align them with the wireline data.

Figure F33. VSP, Hole M0077A. A. Vertical component data recorded by receivers located at depths of between 745.0 and 1325.0 m WSF. Noisy traces were removed. Data are stacked and plotted with an automatic gain control. A top mute was applied to remove noise prior to the first breaks. T = tube waves, arrow = direction of reflections. B. One-way traveltime for first-break picks. C. Differential *P*-wave velocity.

Figure F34. VSP, Hole M0077A. Horizontal component data recorded by receivers located at depths of between 745.0 and 1325.0 m WSF. A. Radial time. B. Azimuthal time. Noisy traces were removed. Data are stacked and plotted with an automatic gain control.