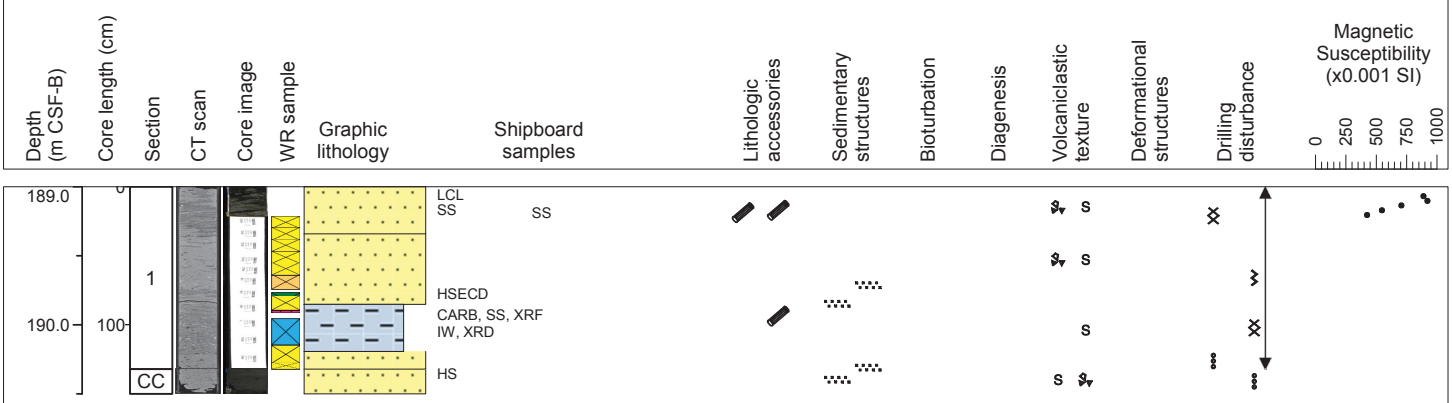
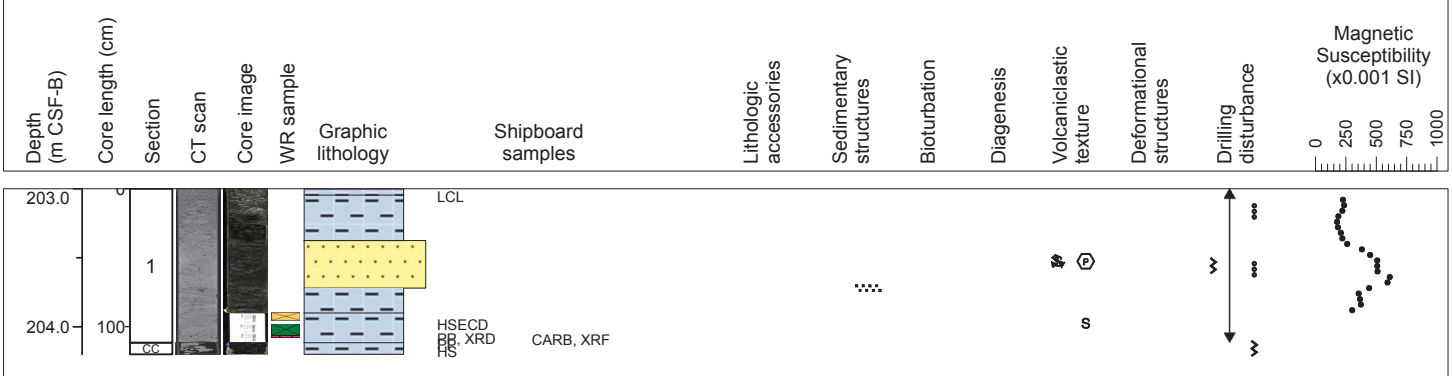
Hole C0023A Core 1F, interval 189–190.5 m (core depth below seafloor)

Drill breccia of mud within a sand and gravel matrix.
Sand comprises igneous and volcanic lithic fragments with an intermediate mineralogical composition (biotite, plagioclase and brown amphiboles).
Fine grained vitric-volcanic glass, black-colored pumice and scoria present in both mud and sand.
Mud contains angular silt grains and the clay fraction is the most abundant.



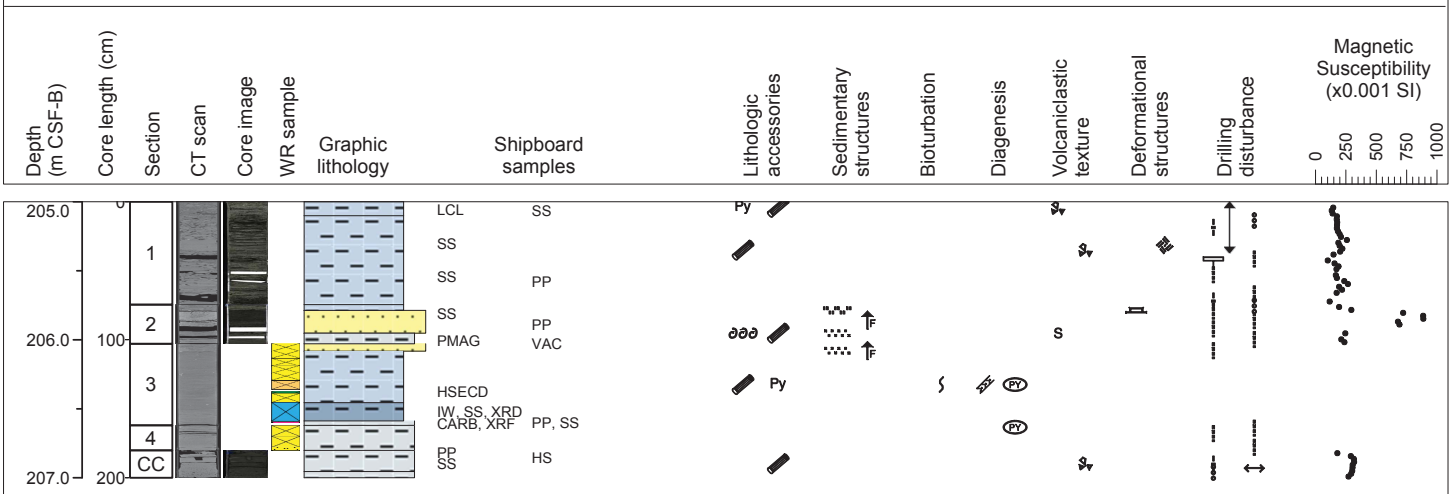
Hole C0023A Core 2F, interval 203–204.2 m (core depth below seafloor)

Drill breccias comprising clasts of mud within a sand matrix of volcaniclastics. Fragments of metal are observed. The sand interval is clast-poor and contains few clasts of mud. Drilling disturbance evident in sand as spherical voids. Similar to 1R-1.
Compared to core 4F beneath, the gravel and sand present in core 2F is distinct in containing more scoria, pumice, and lava with mineralised vesicles. Small gravel clasts of both jasper and epidote present. A notably broad variety of lithoclasts.



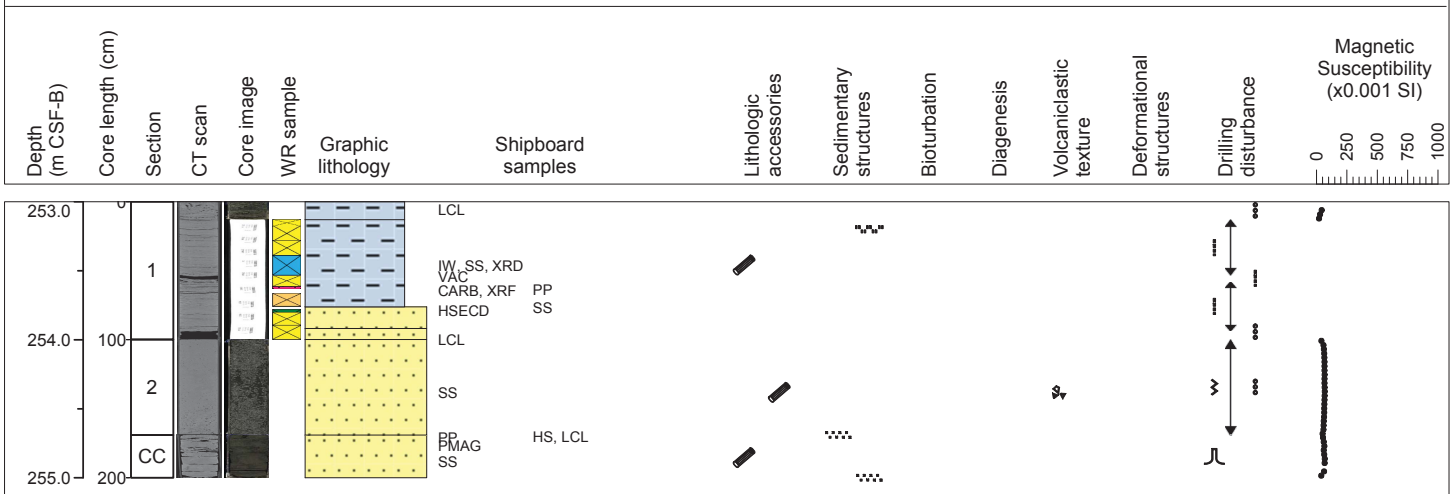
Hole C0023A Core 3F, interval 205–207 m (core depth below seafloor)

Mud and muddy silt. Some mud is similar to cores 1F and 2F; silt-sized clasts of volcanic glass and many grains are near-euhedral igneous crystals (biotite and plagioclase). Other mudstones contain more pelagic grains, pyrite and organic matter than cores 1F and 2F.
Units of sand in core 3F are poorly sorted with gravel-bases. Gravel-clasts include scoria, pumice and lava with mineralised vesicles.
A soft sediment pyrite-vein (ptygmatic morphology and evidence of "toothpasting") cuts lamination.



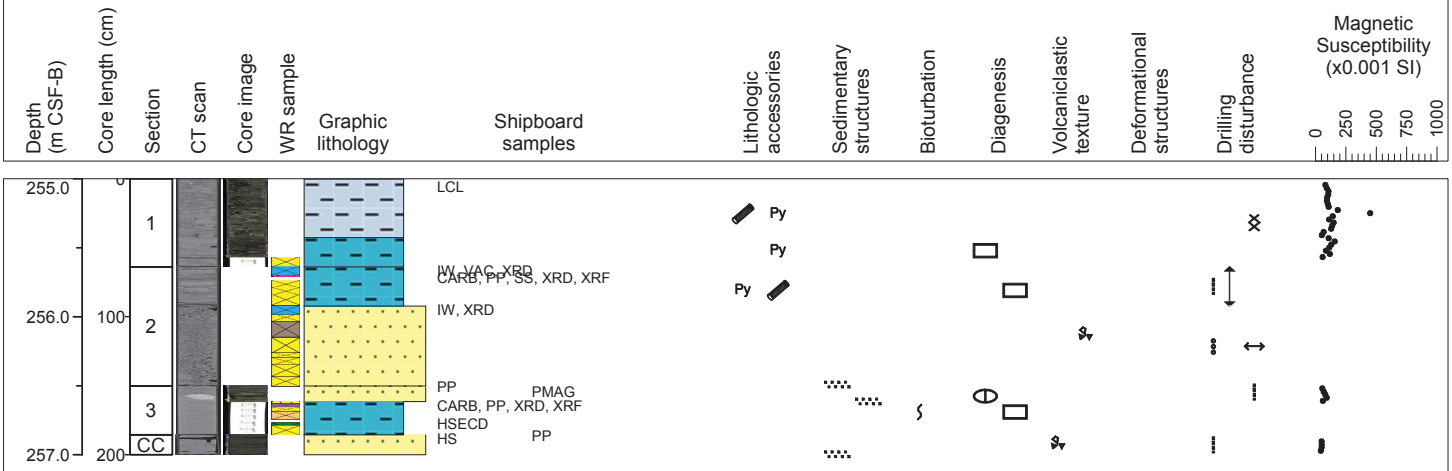
Hole C0023A Core 4F, interval 253–255 m (core depth below seafloor)

Mud contains clay, biotite and muscovite, but very few volcaniclasts compared to cores 1F to 3F. Silt sized quartz is sub-rounded to angular. A high proportion of siliceous bioclasts and amorphous grains are present.
Sand comprises coarse to fine clasts of volcanic or igneous rocks (e.g. scoria and pumice is infrequent). The fine sand is both texturally and mineralogically very immature and contains both plagioclase and biotite, in addition to both siliceous and calcitic bioclasts. Vitric volcanic glass uncommon. Sand has no observable structure and is assumed to have been fluidized during drilling.



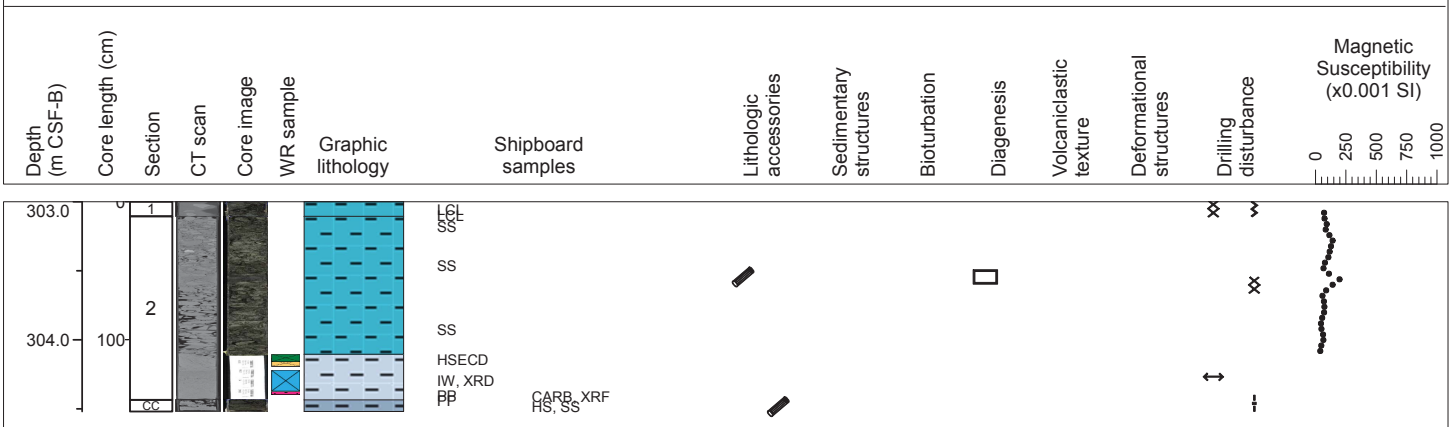
Hole C0023A Core 5F, interval 255–257 m (core depth below seafloor)

Hemipelagic mud in this interval is similar to 4F in containing both silt and pelagic grains, but patches are notably calcareous, many are cemented and sufficiently indurated to be referred to as mudstone.
Sand in this interval is similar to that found in 4F-CC; coarse clasts of volcanic or igneous rocks are not present (e.g. scoria and pumice is infrequent). It is not consolidated. Vitrified volcanic glass is present but not a major constituent. The sand is both texturally and mineralogically very immature and contains both plagioclase and biotite, in addition to both siliceous and calcitic-bioclasts.



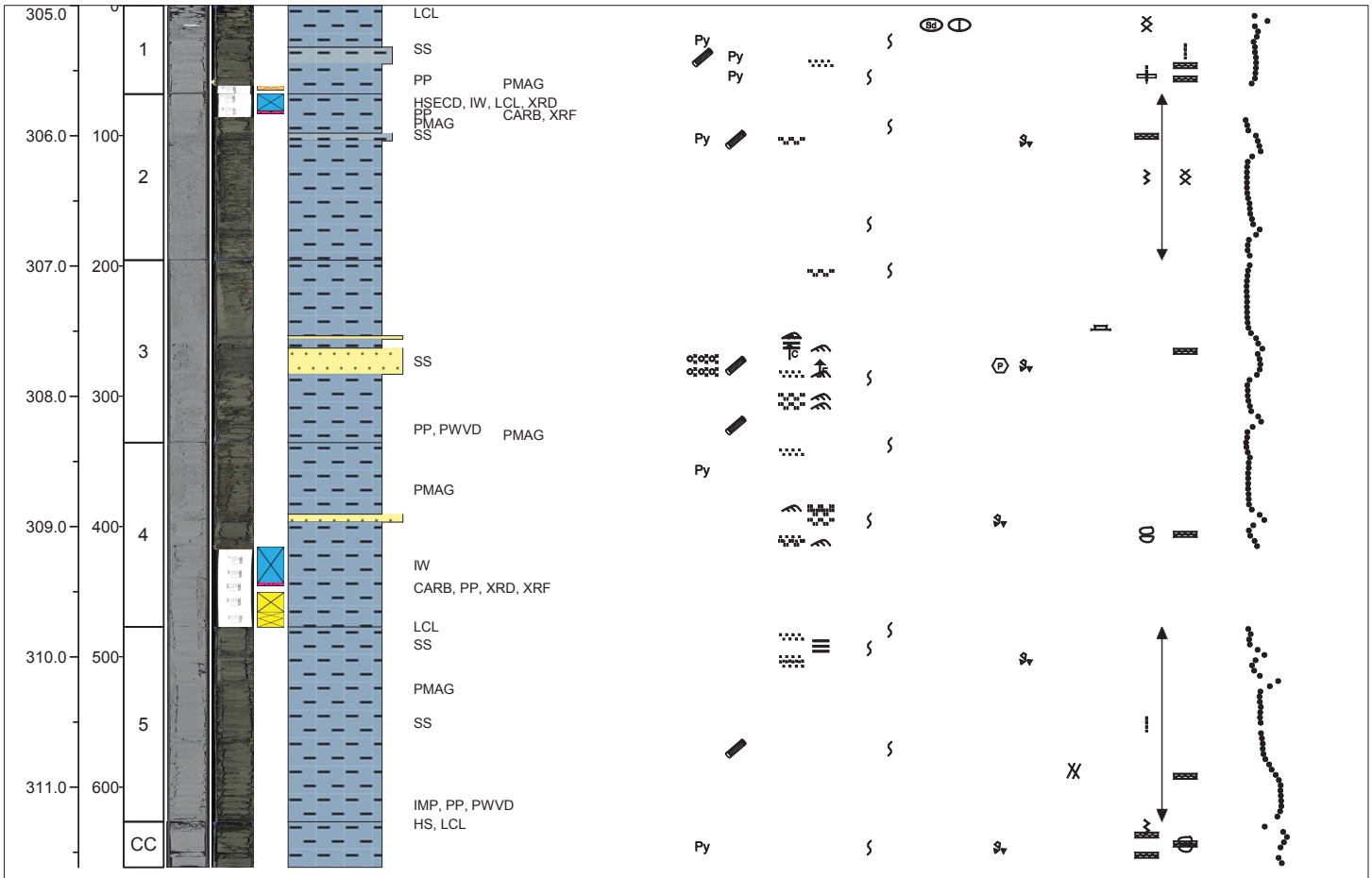
Hole C0023A Core 6F, interval 303–304.52 m (core depth below seafloor)

Drill breccia comprising clasts of calcareous mudstone with a low silt content. Silt content consists of biotite, muscovite, feldspar, quartz, mafic grains, organic matter, vitric volcanic glass, diatoms, sponge spicules, pyrite and some carbonate. Mud in this core is lithified and cemented - often breaking and brecciating into angular fragments.



Hole C0023A Core 7X, interval 305–311.615 m (core depth below seafloor)

Hemipelagic mudstones, muddy-turbidites and turbidite-deposited muddy-sand.
Mudstones are less cemented than core 6F and sand is only partially indurated likely reflecting its mud-content. Mudstones have both a high-silt content and sand/silt laminae that often form low angle asymmetrical ripples or planar lamination. The tops of many debris flows amalgamate into other muddy debris flows, several are bioturbated. Better examples of muddy turbidites and debris flows are seen in 16R.
Healed deformation bands present, and can be seen in X-CT image.
Injection of drilling-mud along sand-bearing laminae and biscuiting (rotation of core) have disrupted intervals fracturing the core parallel to bedding planes.



Hole C0023A Core 8F, interval 314.5–315.3 m (core depth below seafloor)

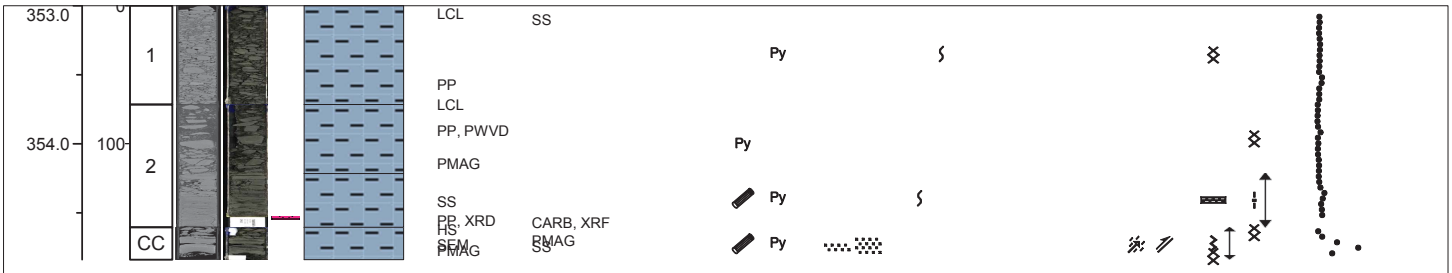
Drill breccia comprising clasts of mudstone in a gravel matrix. Most of the mudstone clasts are hemipelagic with a high silt content and pelagic grains (Similar to 7X-3). Other mudstone clasts are calcite cemented and rounded with less silt (see 6R-1).
Healed deformation bands observed at the base of core (8F-CC).

Hole C0023A Core 9F, interval 316.5–318.5 m (core depth below seafloor)

Drill breccia containing clasts of hemipelagic mudstone and an unconsolidated sand.
Mudstone clasts are predominantly hemipelagic mudstone with silt, silt-sized vitric volcanic ash, sponge spicules and other pelagic grains.
Unconsolidated sand is medium to coarse grained with gravel-sized fragments of pumice at the base and a high mud content throughout. Clasts include angular biotite, feldspars and carbonate bioclasts. Sand is soupy throughout.
Healed deformation bands observed 9F-1.
Outer Trench Wedge

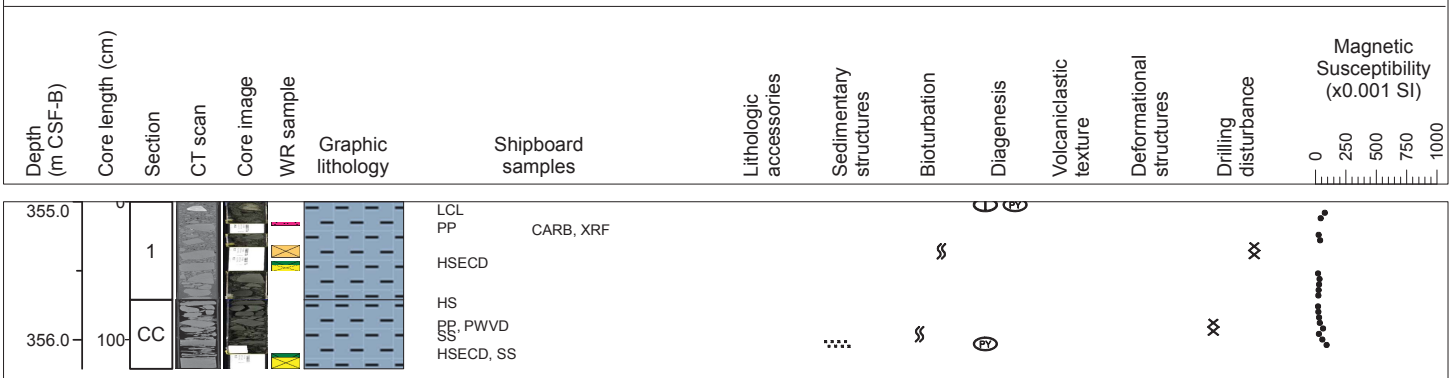
Hole C0023A Core 10F, interval 353–354.84 m (core depth below seafloor)

Drill Breccia. Clasts are pelagic mudstone with low silt content. The sub-silt sized grains are predominantly pelagic (bioclasts, notable nano-fossils, amorphous silica). Fine burrows are visible in split core image and there is pyritisation of grazing trails Pyrite and sponge spicules are common. Vitric volcanic glass are uncommon. Several sand laminae present at the lowest section of core (10F-CC) but have been disrupted by drilling.
Some reverse faulting with slickenlines observed at the base of core (10F-CC).



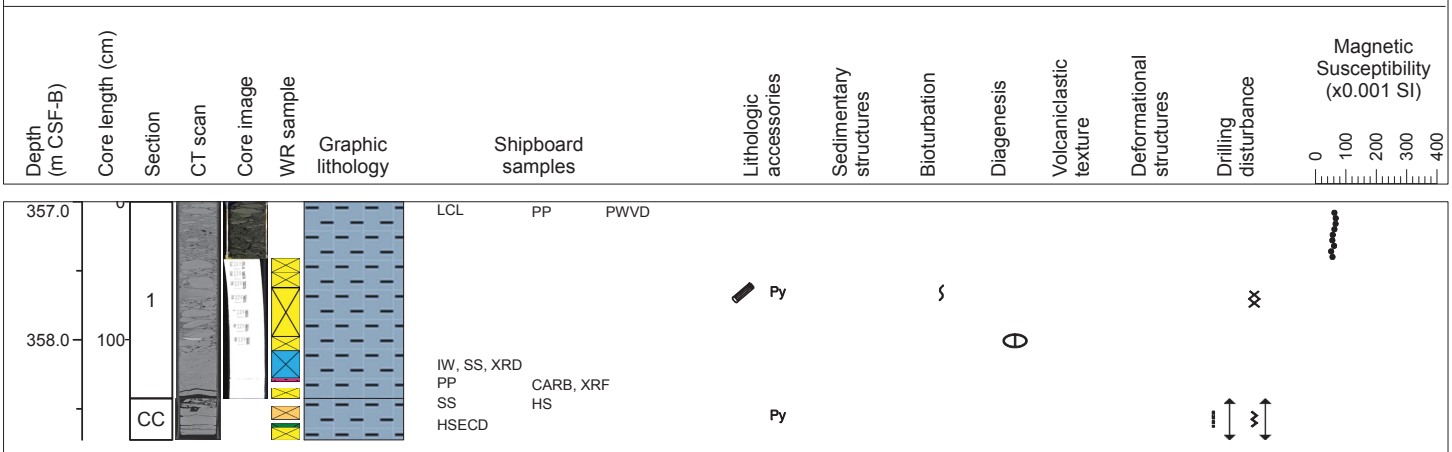
Hole C0023A Core 11F, interval 355–356.21 m (core depth below seafloor)

Drill Breccia similar to 10F. Clasts of hemipelagic mudstone and carbonate-cemented mudstone. Mudstone contains both detrital silt and pelagic mud grains. Instance of pyrite mineralization tracking sand lamination.



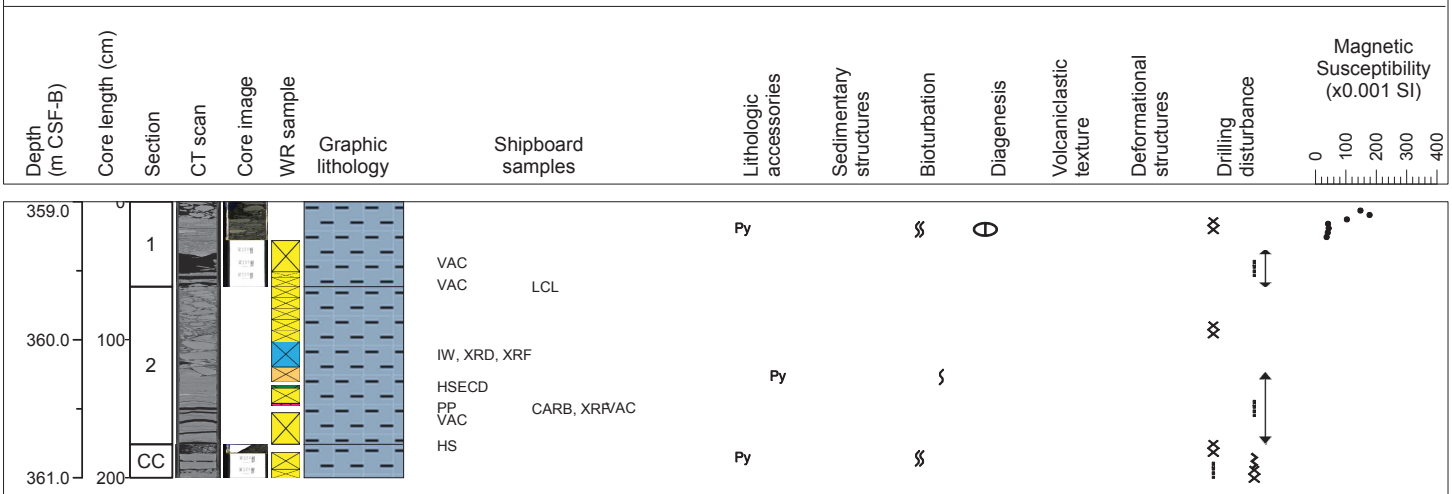
Hole C0023A Core 12F, interval 357–358.725 m (core depth below seafloor)

Drill breccia similar to 10F and 11F. Clasts of hemipelagic mudstone and carbonate-cemented mudstone. Relative to 10F and 11F the sub-silt fraction contains more pelagic grains and fewer silt-sized clasts. Most of the siliceous content is amorphous and bioclastic (not visible in XPL).



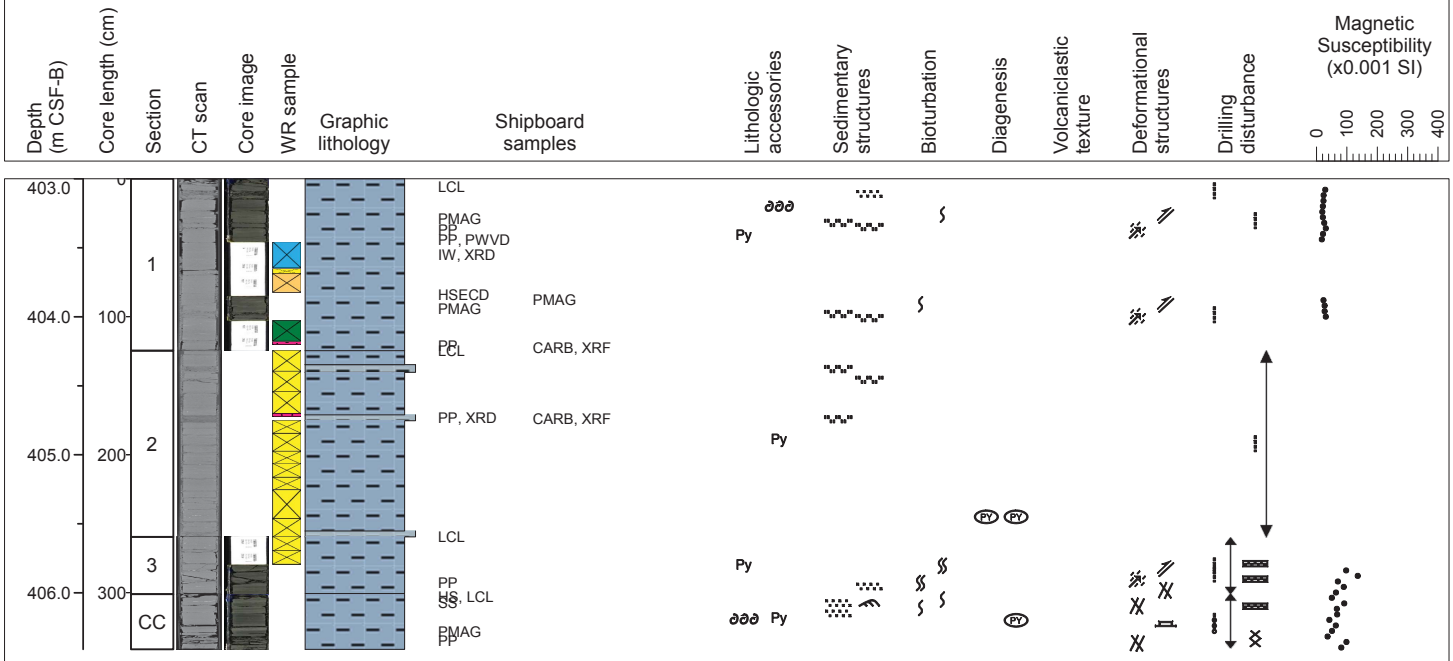
Hole C0023A Core 13F, interval 359–361 m (core depth below seafloor)

Drill breccia similar to 10F, 11F, 12F. Clasts of hemipelagic mudstone and carbonate-cemented mudstone. Some of the hemipelagic mud-clasts have fabrics indicative of bioturbation (primarily burrows) and patchy pyritisation along grazing trails. The silt content is low and most of the siliceous silt-content is bioclastic (amorphous silica phases not visible in XPL). The patchy pyritisation along grazing trails is similar to that seen in the fragmented clasts of mudrock seen in 14X-1.
Sandy lithologies not observed.



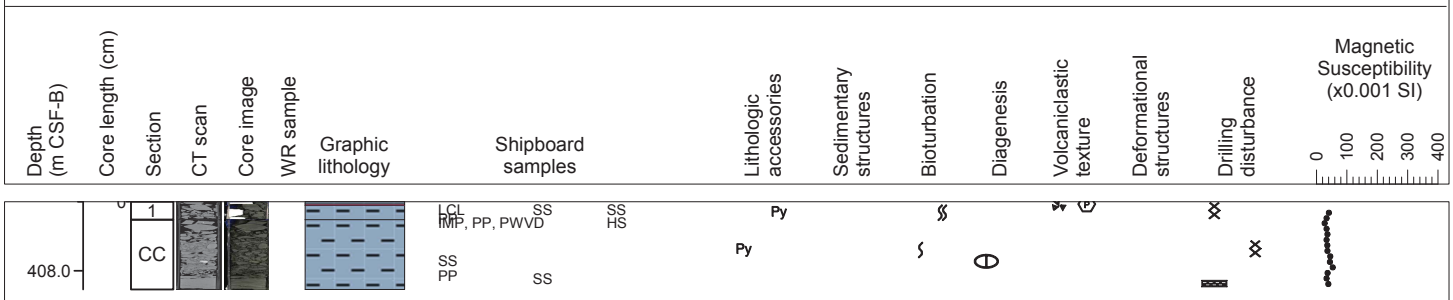
Hole C0023A Core 14X, interval 403–406.41 m (core depth below seafloor)

Black pelagic mudstone, similar to cores 11F, 12F, 13F. Low silt-content outside of silt laminae. Burrows are both horizontal and vertical and several are pyritised. Some silt-laminae evidence ripples and other flow structures. Bioturbation can be intense leading to a mottled appearance. Burrows are pyritised.
Some reverse faulting with slickenlines (14X-1), healed deformation bands observed at the base of core (14X-3). Bedding is horizontal. Possible repetition of units based on repetition of silt-lamina sets and pyritised-ichnofabrics.



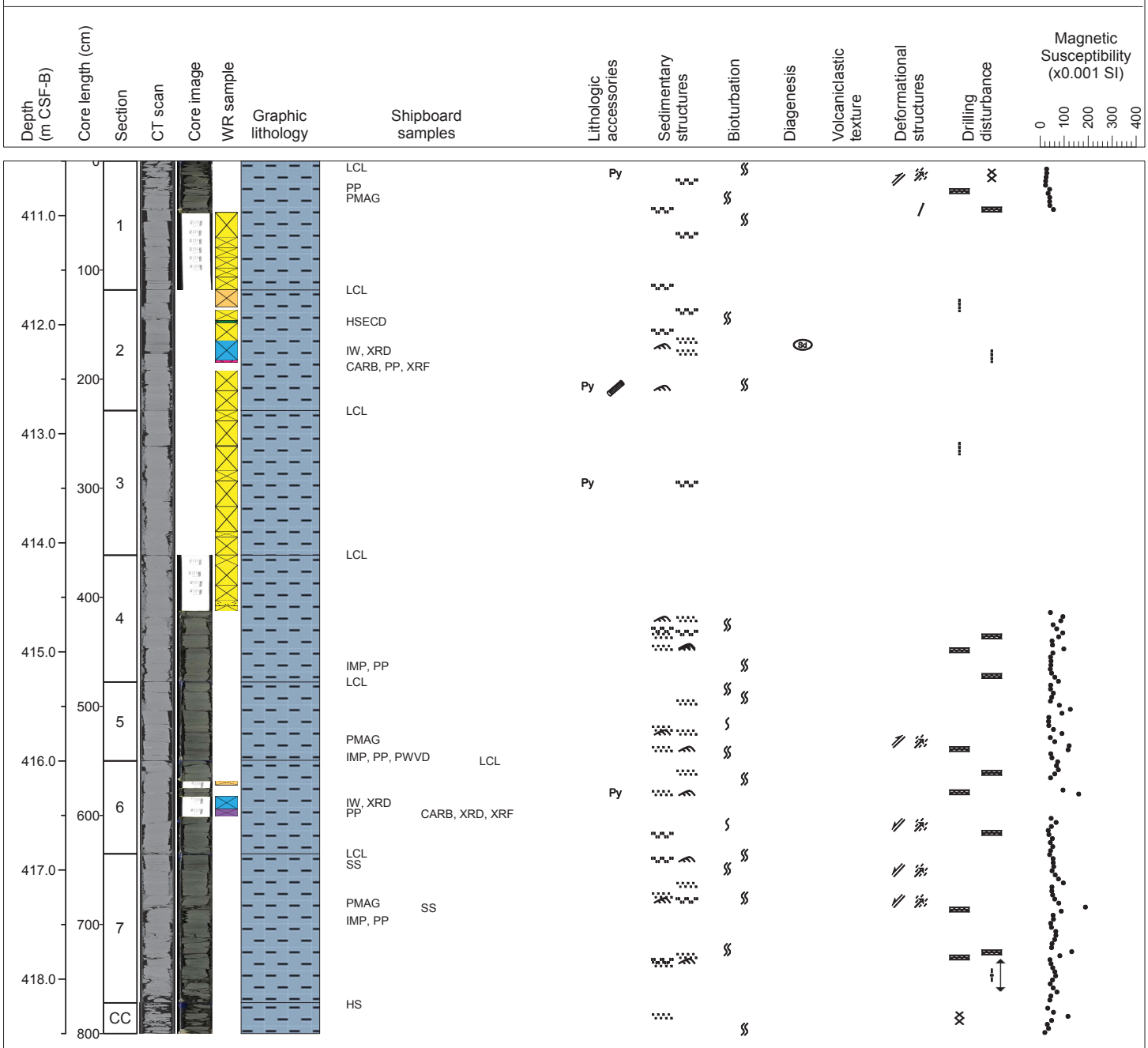
Hole C0023A Core 15F, interval 407.5–408.135 m (core depth below seafloor)

Drill breccia containing clasts of pelagic- and turbidite-mudstone, same as seen in core 14X. Mudstones have generally low silt content, except where silt is localized within laminae. A mudstone-clast with a tuffaceous-sand filling a burrow is seen in 15F-1. The burrow's sand-fill includes vitric volcanic glass and angular quartz.



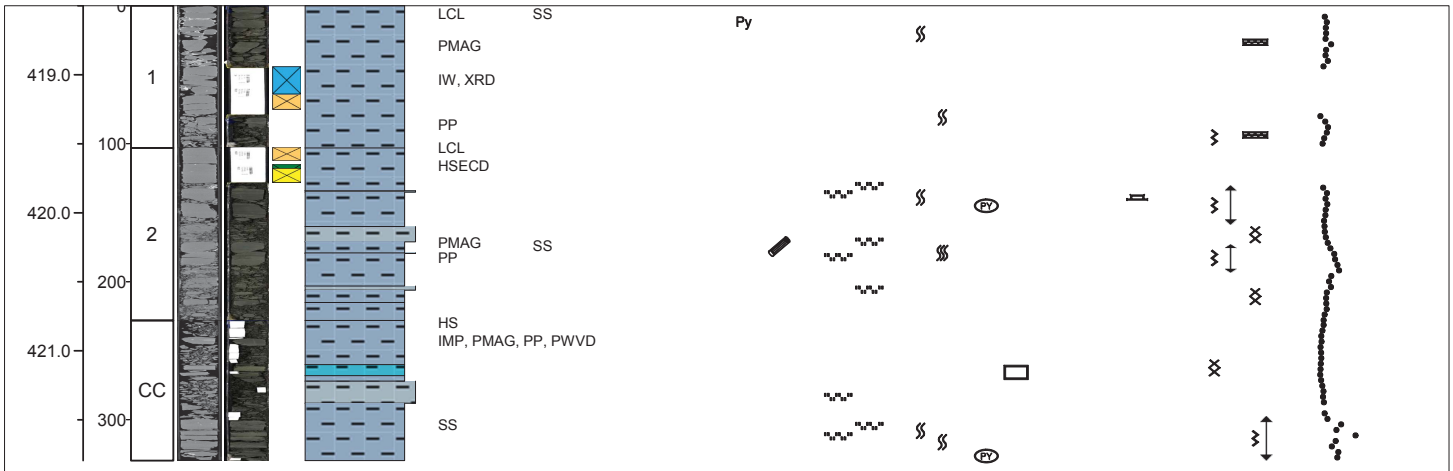
Hole C0023A Core 16R, interval 410.5–418.5 m (core depth below seafloor)

Black and gray-colored mudstones with thin silt and sand laminae that often have current features such as asymmetrical low angle ripples and parallel lamination. Interpreted as debris flows and turbidites that either amalgamate or are bioturbated at the top. Black mudstones often have pyritisation and a lesser silt content. Gray mudstones evidence bioturbation at the top of beds and have a higher silt content that includes quartz, calcite and vitric volcanic glass.
Reverse faulting with slickenlines observed 16R-1, some normal faulting with slickenlines observed in cores 16R-5–16R-7.



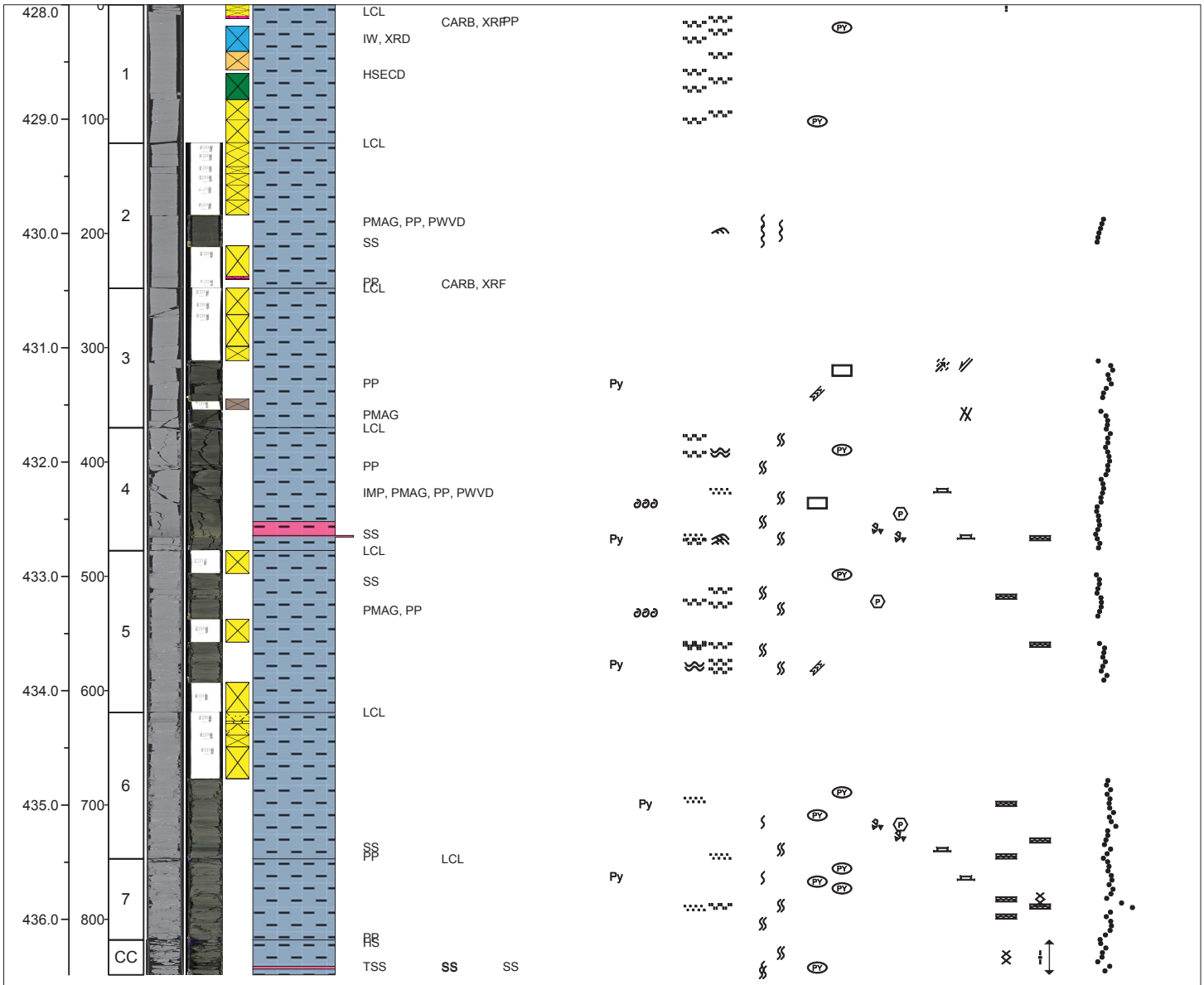
Hole C0023A Core 17R, interval 418.5–421.795 m (core depth below seafloor)

Drill breccia comprising clasts of mudstone and muddy-siltstone, with some undisturbed intervals. Both the mudstone and breccia-clasts are the same lithology as 16R; mudstones have silt-laminae, some of which exhibit current structures. Bioturbation by burrows is common and likely marks the top of debris flows or turbidites. Silt content varies and is typically sub-angular quartz with minor plagioclase. Volcanic clasts are less common. Some clasts of mudstone are calcareous and cemented by calcite.
Horizontal bedding inferred from lamination 17R-2.



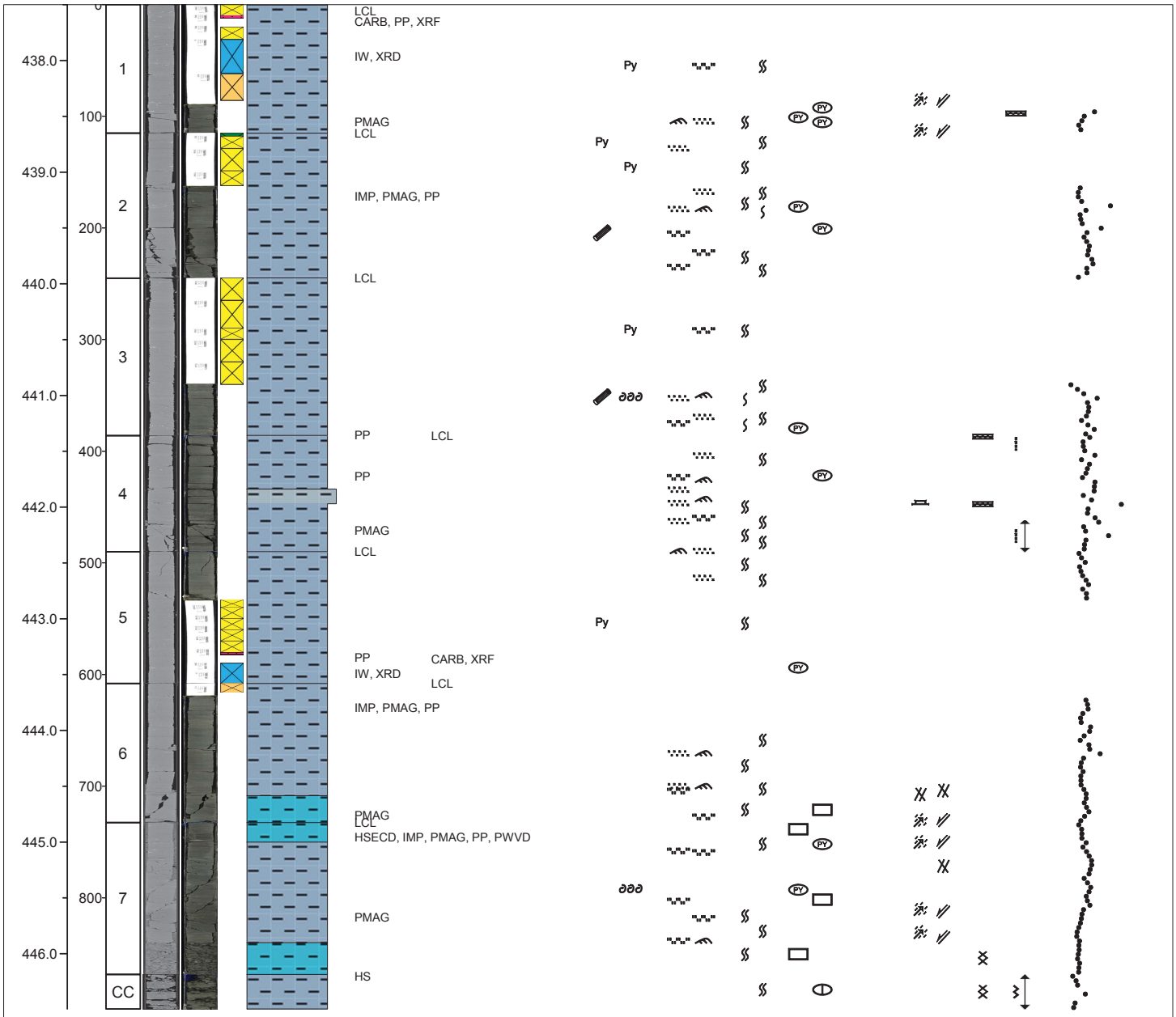
Hole C0023A Core 18R, interval 428–436.485 m (core depth below seafloor)

Hemipelagic mudstones, turbidite-deposited mudstones (similar to other muddy-turbidites found in cores 10F–17R) and volcanic sandstone with current structures in its base grades that grades to a volcaniclastic-mudstone. Grading is spatially linked to bioturbation and burrows. Volcanic sandstone contains a high proportion of volcanic ash, angular and sub-angular quartz, as well as a small proportion of detrital igneous crystals (silt-sized albite and amphibole). Clay and opaque minerals are present along cross-lamination. A ptygmatic-vein with pyrite-mineralization is associated with a muddy turbidite and likely represents dewatering.
Normal faulting with slickenlines observed in 18R-3, 65–69 cm and a healed deformation band observed 18R-3, 106–114 cm.



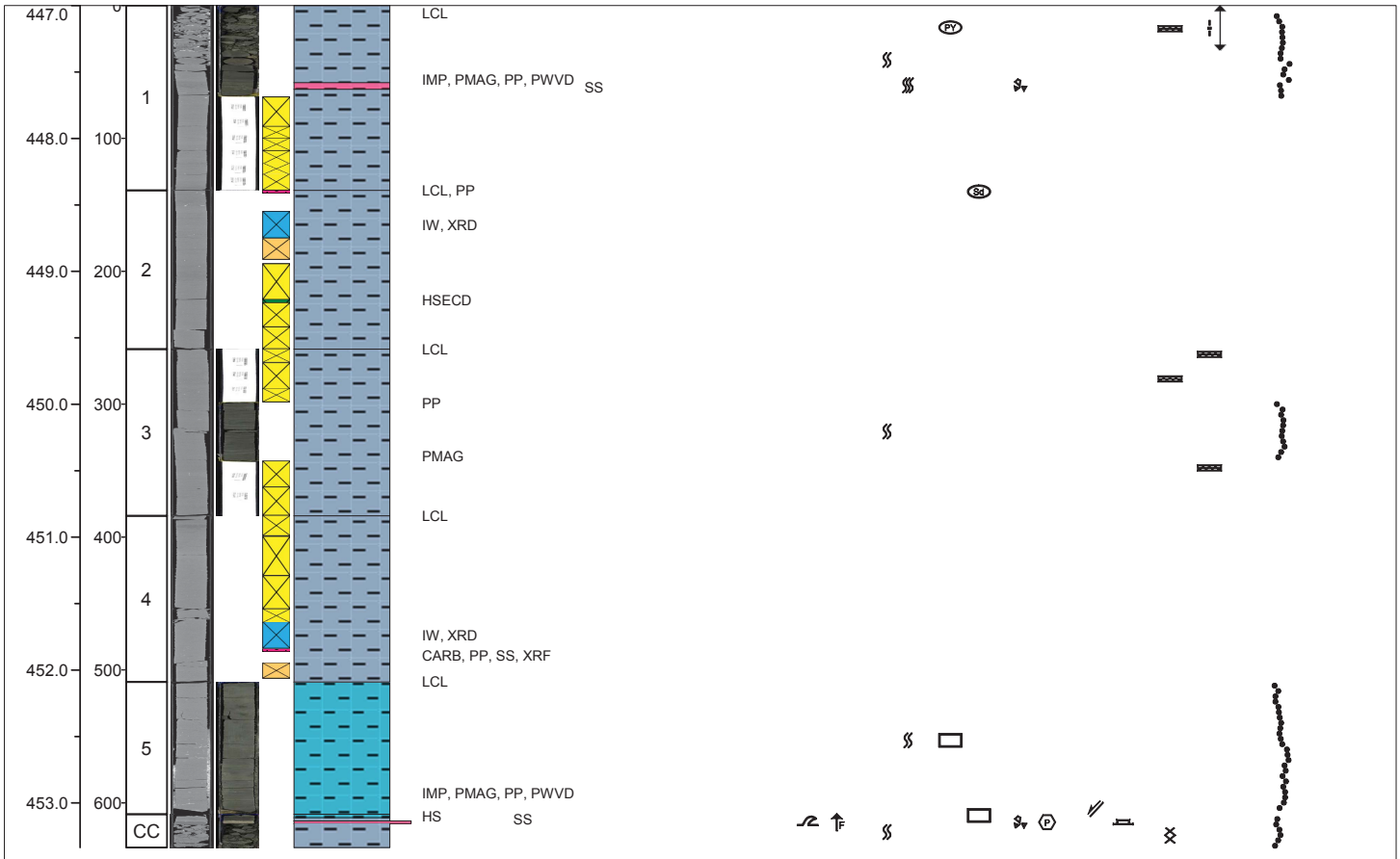
Hole C0023A Core 19R, interval 437.5–446.495 m (core depth below seafloor)

Hemipelagic mudstone and turbidite-deposited mudstones. Silty and sandy laminations as well as bioturbation is common throughout. Many silt laminations evidence current-bedforms (e.g. ripples and low angle planar lamination). In some places silt-laminae are cut by bioturbation.
Some normal faulting with slickenlines observed in the top and base of core (e.g. 19R-1, 89–102 cm and 19R-6, 107 cm to 19R-7, 98 cm.)



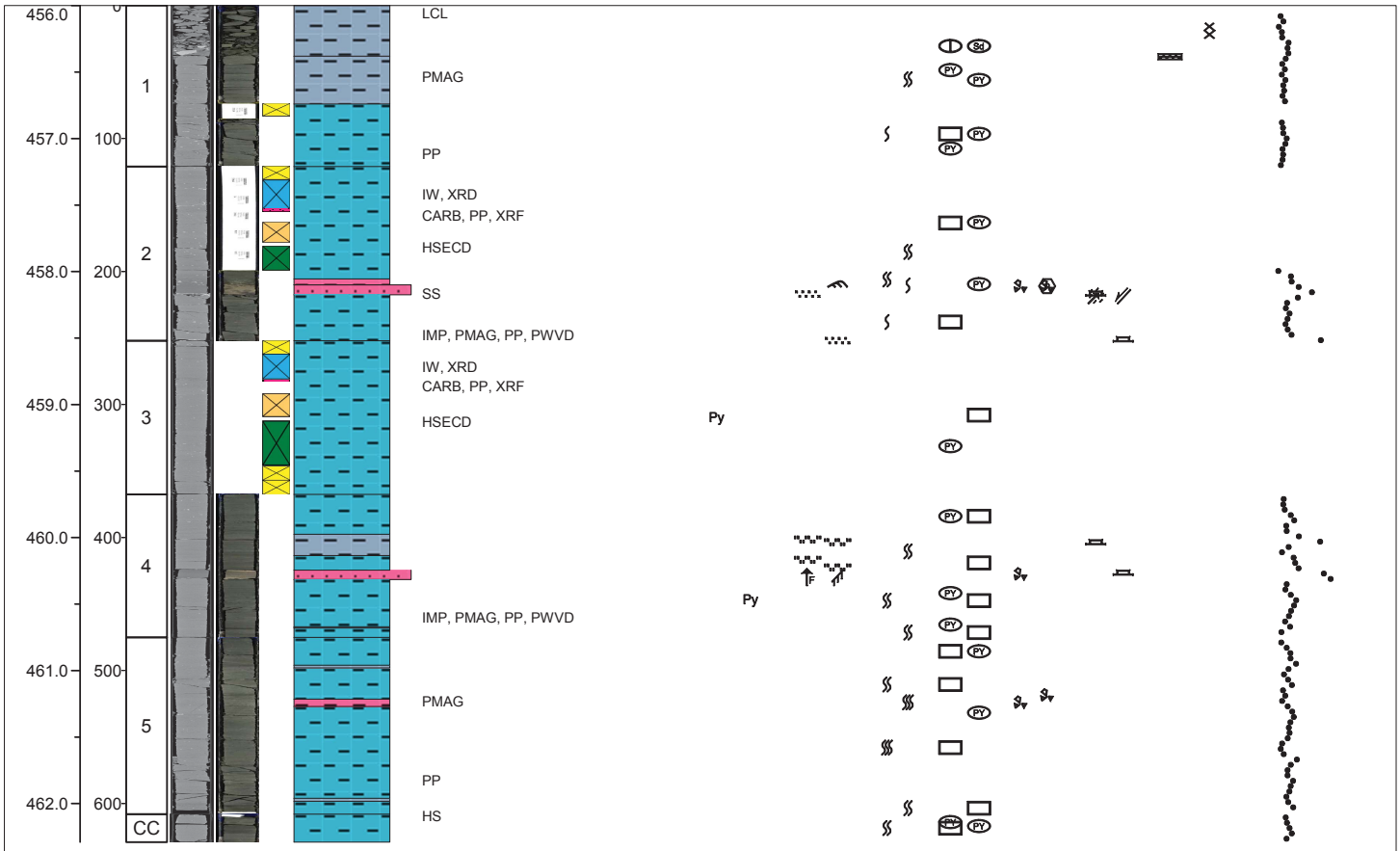
Hole C0023A Core 20R, interval 447–453.335 m (core depth below seafloor)

Bioturbated mudstones, calcareous mudstones and a volcaniclastic sandstone and volcaniclastic mudstone. Bioturbation is notably heavy to the extent that silt-laminae are often discontinuous across the width of the core. The tuffaceous mudstone in 20R-1 is bioturbated to the extent that burrows are the only remaining sedimentary structure. The main components of the volcanic sandstone is vitric-volcanic glass, quartz and plagioclase with a range of grain sizes from silt to medium sand.
Normal faulting with slicken lines observed in 20R-5, 94–97 cm.



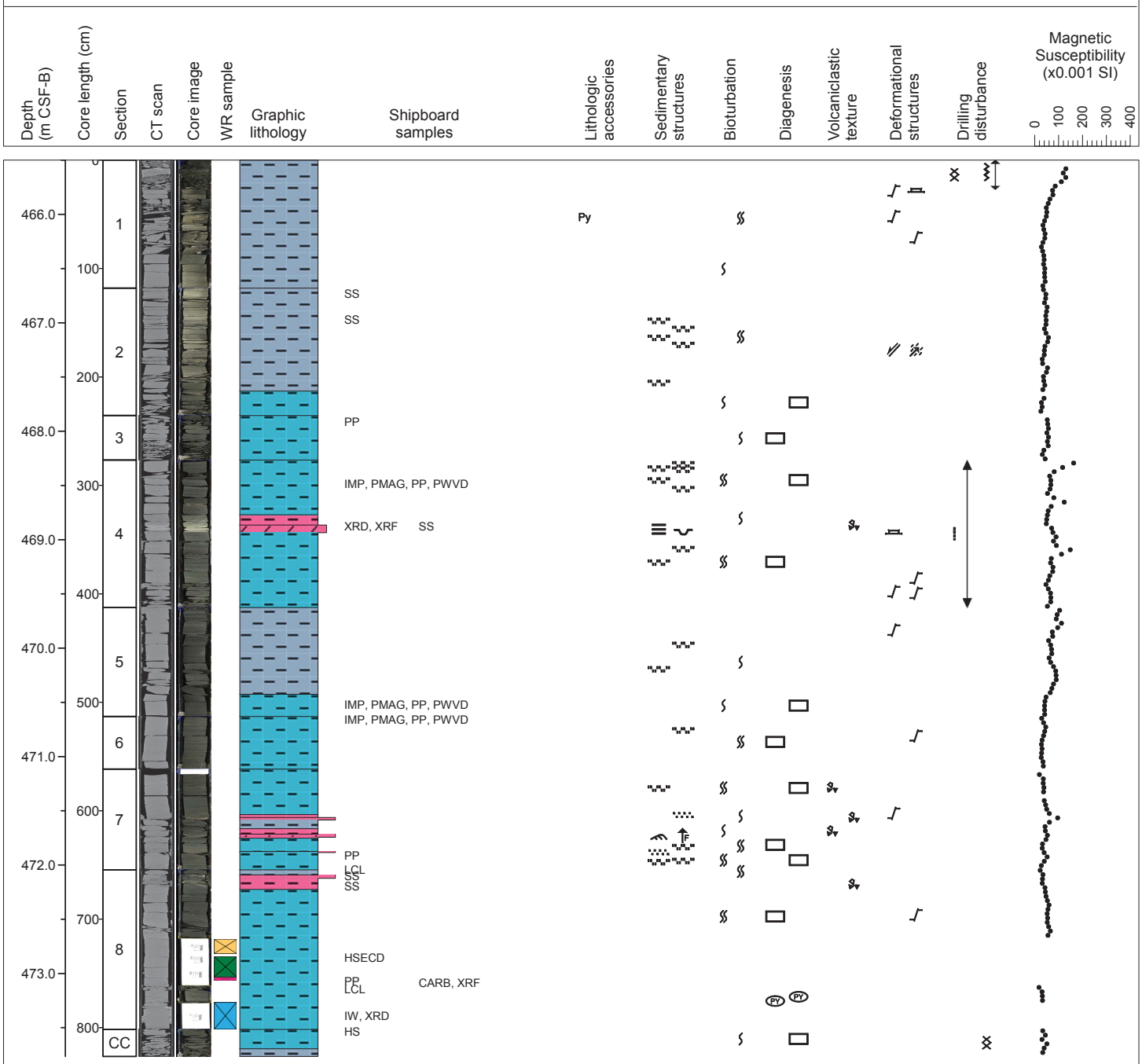
Hole C0023A Core 21R, interval 456–462.29 m (core depth below seafloor)

Bioturbated mudstones and calcareous mudstones. Silt content includes quartz and volcanic glass and igneous grains (biotite and plagioclase) as well as bioclasts (spicules). Bioturbation is common, silt laminae are discontinuous and burrows are filled with ash and carbonate. Volcanic sandstones with and without current-structures (cross lamination) are present. Main volcanic clasts are pale-white quartz, vitric-volcanic glass and darker glass (crushed pumice and amphibole). White-colored laminae often grade in and out of dark laminae. Heavily bioturbated volcaniclastic mudstones are also present. One overlies a volcaniclastic sandstone, the other does not implying the complete reworking of an ash layer by bioturbation.
Normal faulting with slickenlines observed in 21R-2, 66–69 cm.
Pyritisation along the base of volcanic sandstone at 21R-2 and 21R-4



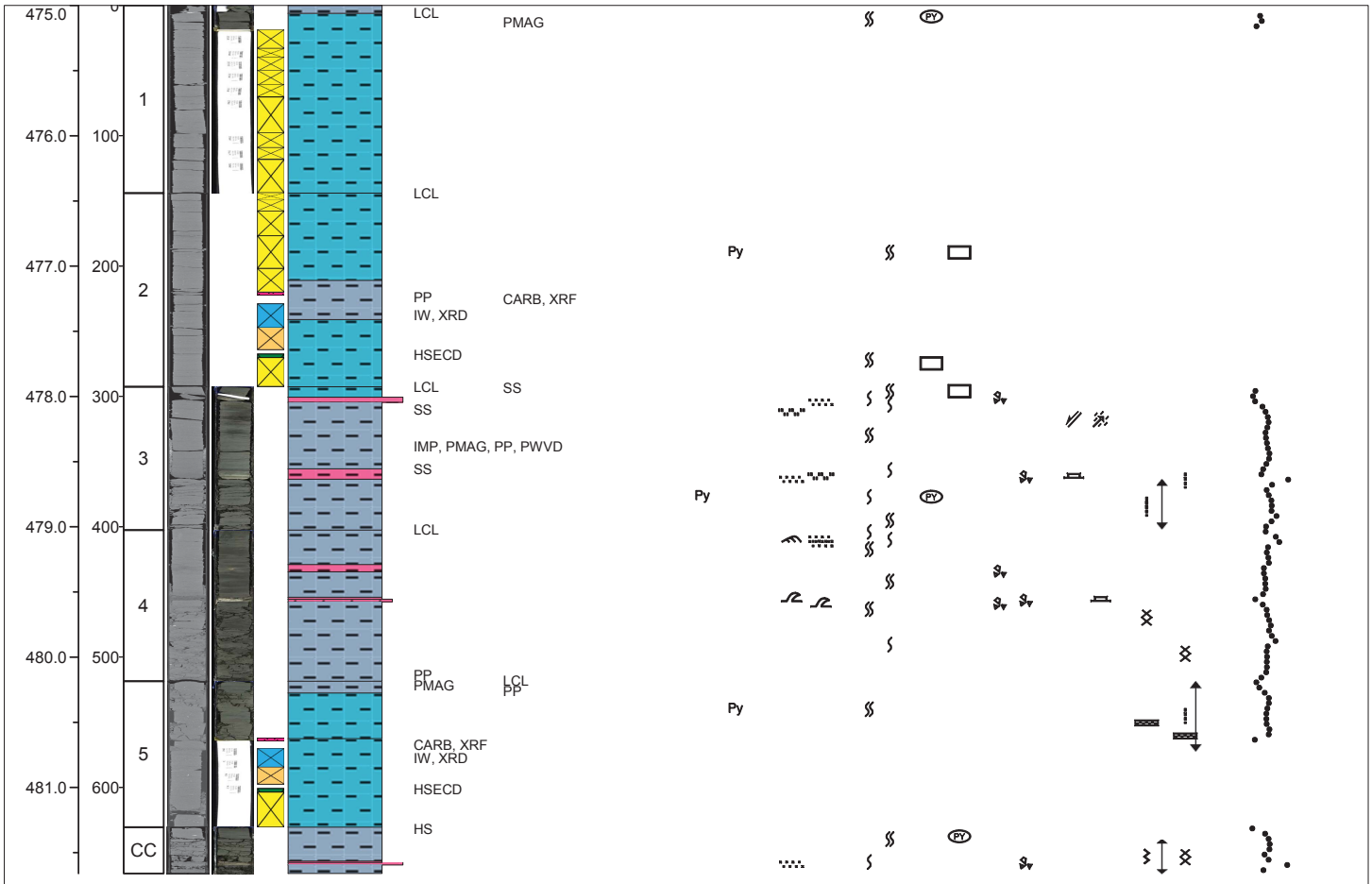
Hole C0023A Core 22R, interval 465.5–473.765 m (core depth below seafloor)

Bioturbated mudstones and calcareous mudstones with thin beds of volcaniclastic sandstones and mudstones. (Similar to 21R). Bioturbation is common and many silt laminae are discontinuous because they are cut by burrows. Burrows are filled with ash and carbonate bioclasts within a muddy matrix. Many volcanic sandstones have current structures and pass upwards into bioturbated volcaniclastic mudstones. Both white and black-colored volcaniclastics are observed in units that appear both light and dark in VCD.
Some healed faulting observed; it has normal displacement and cuts bedding. Normal faulting with slickenlines observed in 22R-2, 56–58 cm. Shear fractures present throughout core.



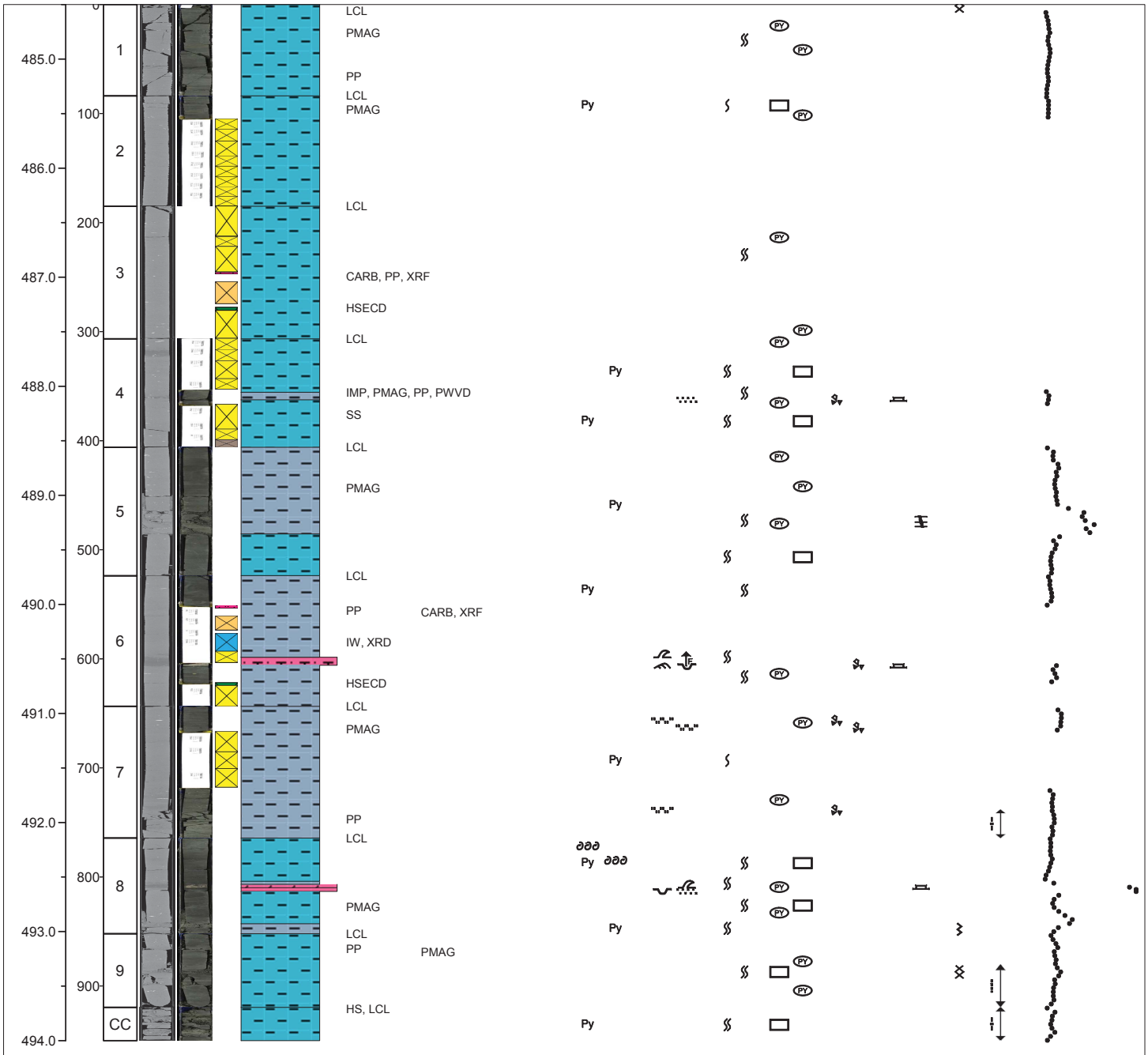
Hole C0023A Core 23R, interval 475–481.66 m (core depth below seafloor)

Hemipelagic mudstones, mudstones deposited by turbidites, heavily bioturbated and calcareous over several meters. (Similar to 21R and 22R). Several volcaniclastic beds present. Most beds have flow structures and gradationally pass upwards into bioturbated volcaniclastic mudstones. Both pale and dark volcanic ash observed.
Normal faulting with slicken lines observed in 478.1 DSF(m).



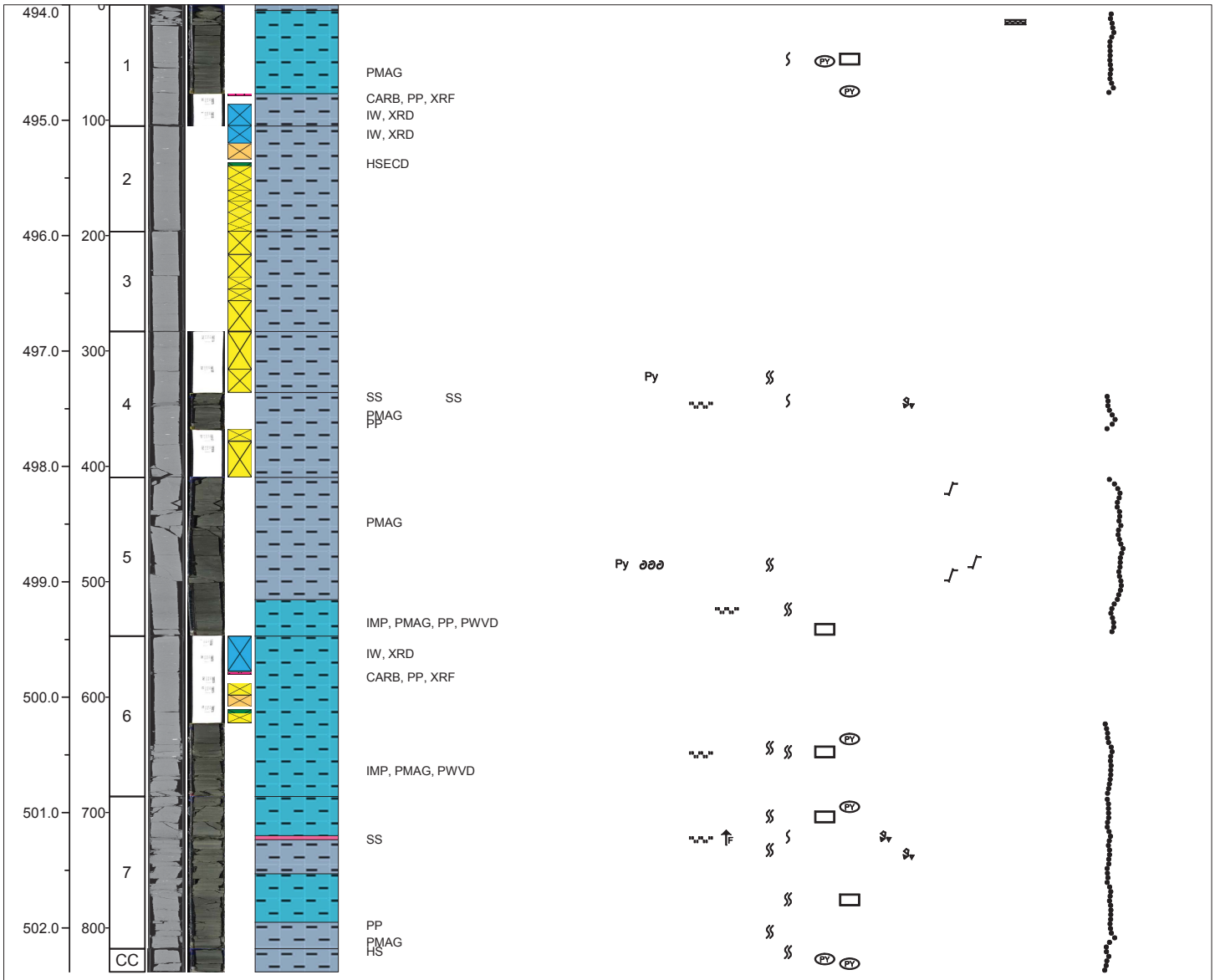
Hole C0023A Core 24R, interval 484.5–494 m (core depth below seafloor)

Hemipelagic mudstones, mudstones deposited by turbidites, and calcareous mudstones (Similar to 23R). Several volcaniclastic beds present. Tuff and ash beds evidence bedforms (ripples, low-angle laminations and cross-lamination) and gradationally pass upwards into bioturbated volcaniclastic-mudstones. Both pale and dark volcanic ash observed. Fluidized sand bed at 24R-5, 73 cm contains volcanic clasts and rounded quartz.



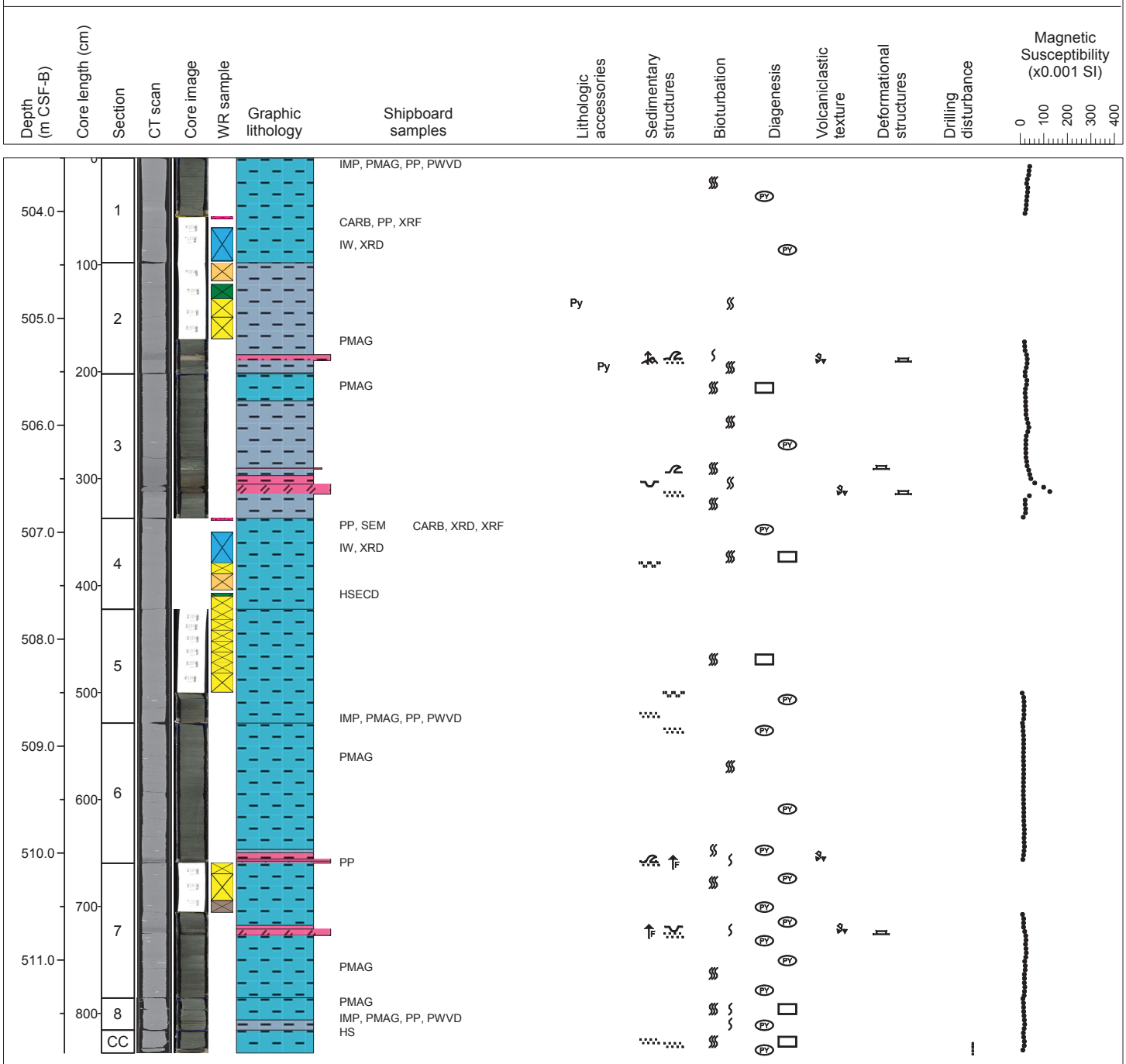
Hole C0023A Core 25R, interval 494–502.38 m (core depth below seafloor)

Bioturbated mudstone and calcareous mudstones with sparse silt laminae. A small amount of dark igneous clasts including glass, biotite and amphiboles are present in siltstone-beds, silt-laminae and volcaniclastic-sandstones. Burrows are filled with quartz, vitric-volcanic glass and dense opaque minerals. Bioturbation truncates many laminae and other ichnofabrics.
Healed faulting observed in 25R-5, 0–89 cm. One fault cuts a trace fossil and shows 8.5 cm displacement with a normal sense of movement.



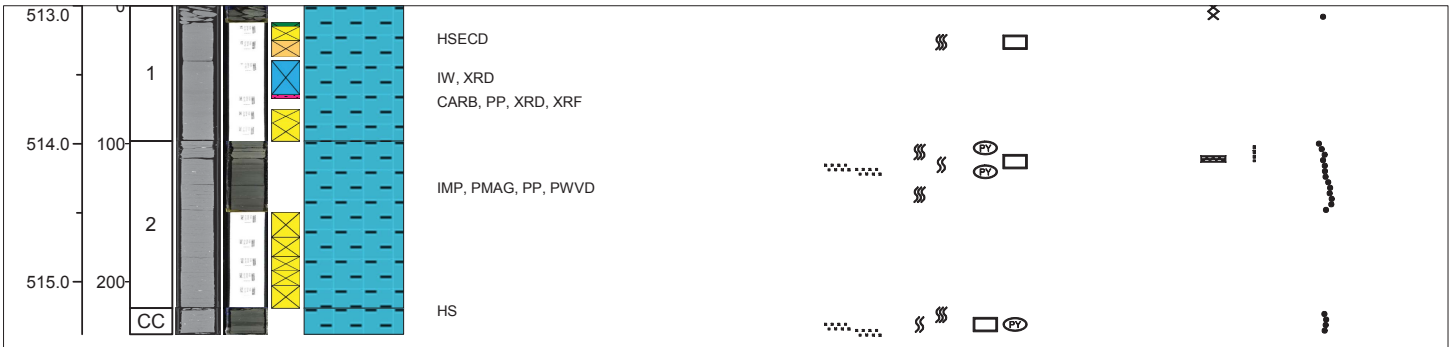
Hole C0023A Core 26R, interval 503.5–511.87 m (core depth below seafloor)

Calcareous bioturbated mudstones, bioturbated mudstones and beds of volcaniclastics (lithologies similar to 21R-25R). Nearly all the beds of volcaniclastics have bedforms close to their base indicating deposition from moving fluids (debris flow or turbidite-origin) and bioturbated tops. Silt laminations are present in hemipelagic mudstones but in many cases silt laminae are cut by burrows and bioturbation. Volcanic mudstone at 26R-3, 89–90 cm disrupted by bioturbation across its entire thickness.



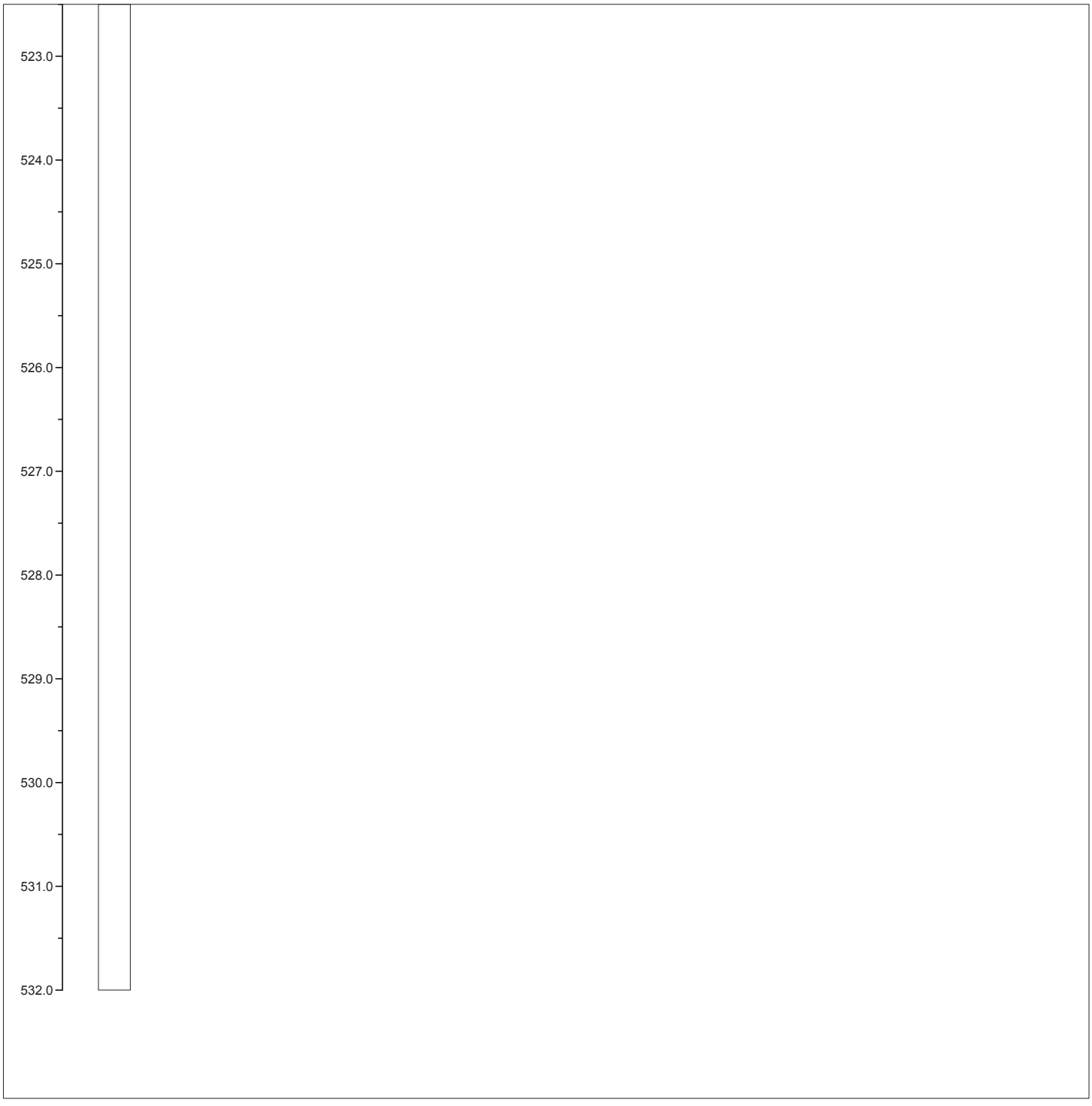
Hole C0023A Core 27R, interval 513–515.38 m (core depth below seafloor)

Bioturbated calcareous mudstone. Mudstones are similar to 26R but silt and sand laminae are infrequent and not thick - e.g. pelagic grains are common and the silt fraction is often sparse and mostly comprises bioclasts, with minor quartz and micrite.



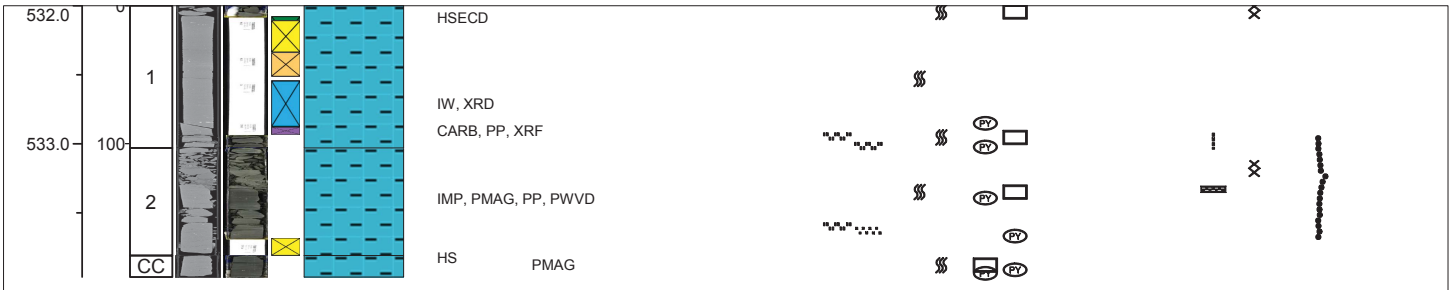
Hole C0023A Core 28R, interval 522.5–532 m (core depth below seafloor)

NO RECOVERY



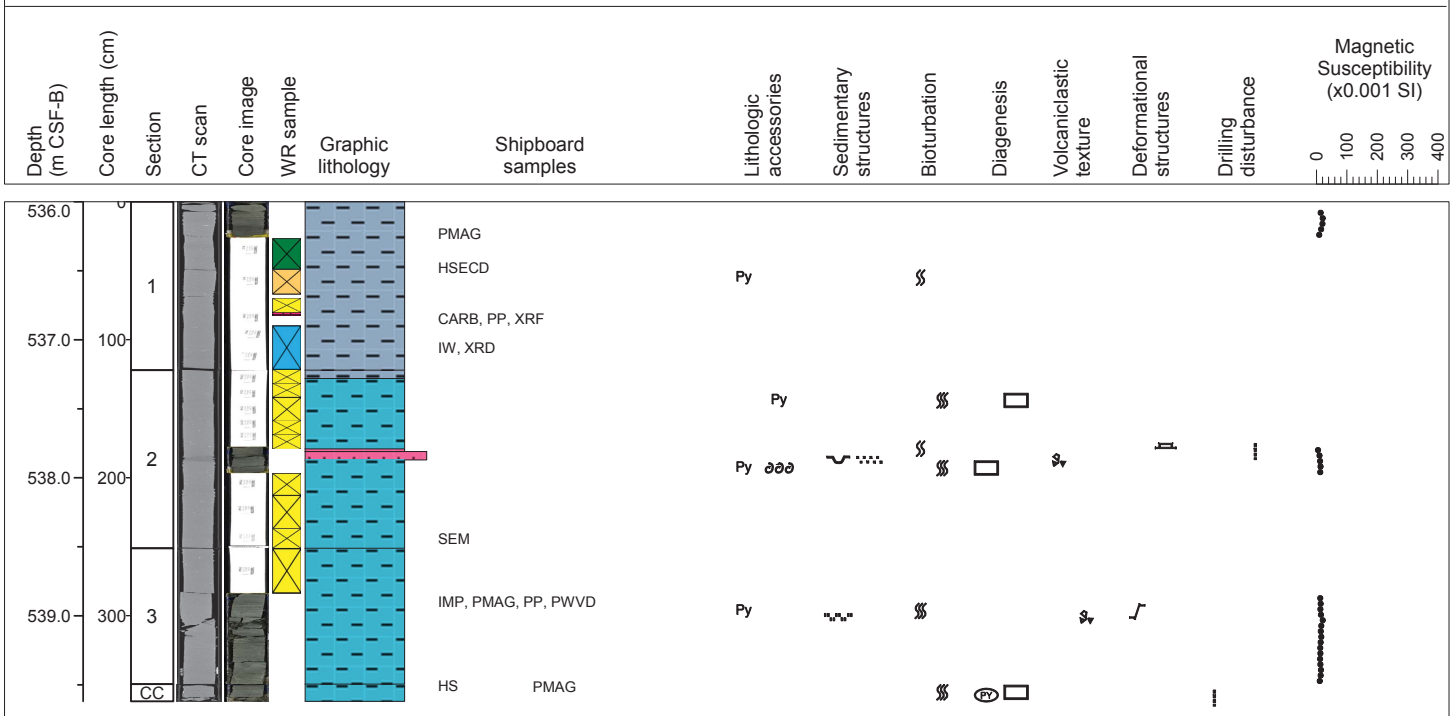
Hole C0023A Core 29R, interval 532–533.965 m (core depth below seafloor)

Heavily bioturbated calcareous mudstone similar to 27R. Silt laminae are infrequent and where present are cut by burrows or are discontinuous or wispy. The first occurrence of Trench-style turbidites (muddy turbidites with silt and sand laminations), taken as boundary between Transitional facies and Upper Shikokou Basin facies.



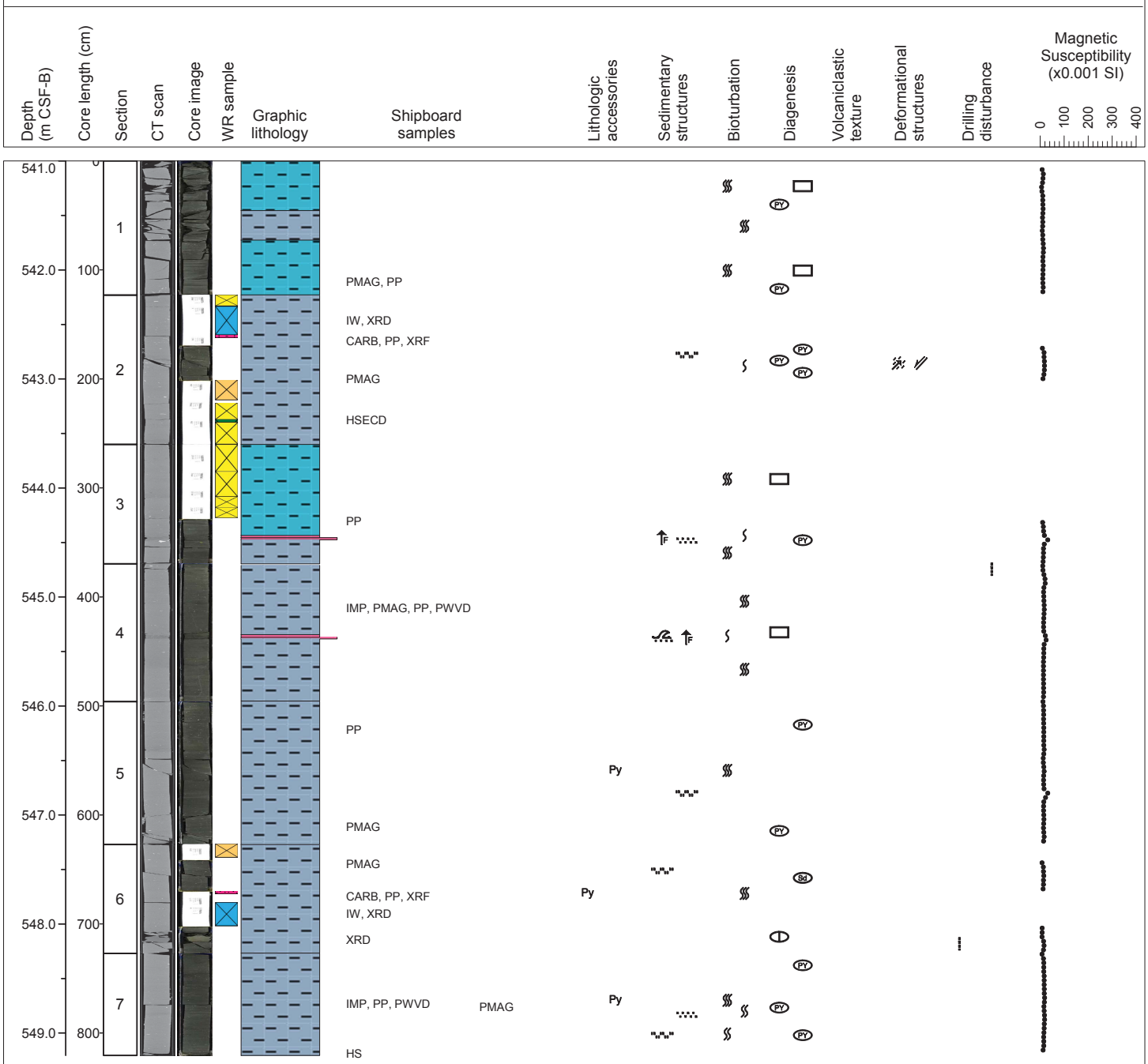
Hole C0023A Core 30R, interval 536–539.62 m (core depth below seafloor)

Heavily bioturbated mudstone and calcareous mudstone with dark tuffaceous sandstone layer. The tuffaceous sandstone has sole marks at base and is a mixture of vitric-volcanic ash fragments and intermediate mafic volcaniclastics (e.g. biotite and plagioclase) along with mud.
Healed faulting observed 30R-5, 37–55 cm.



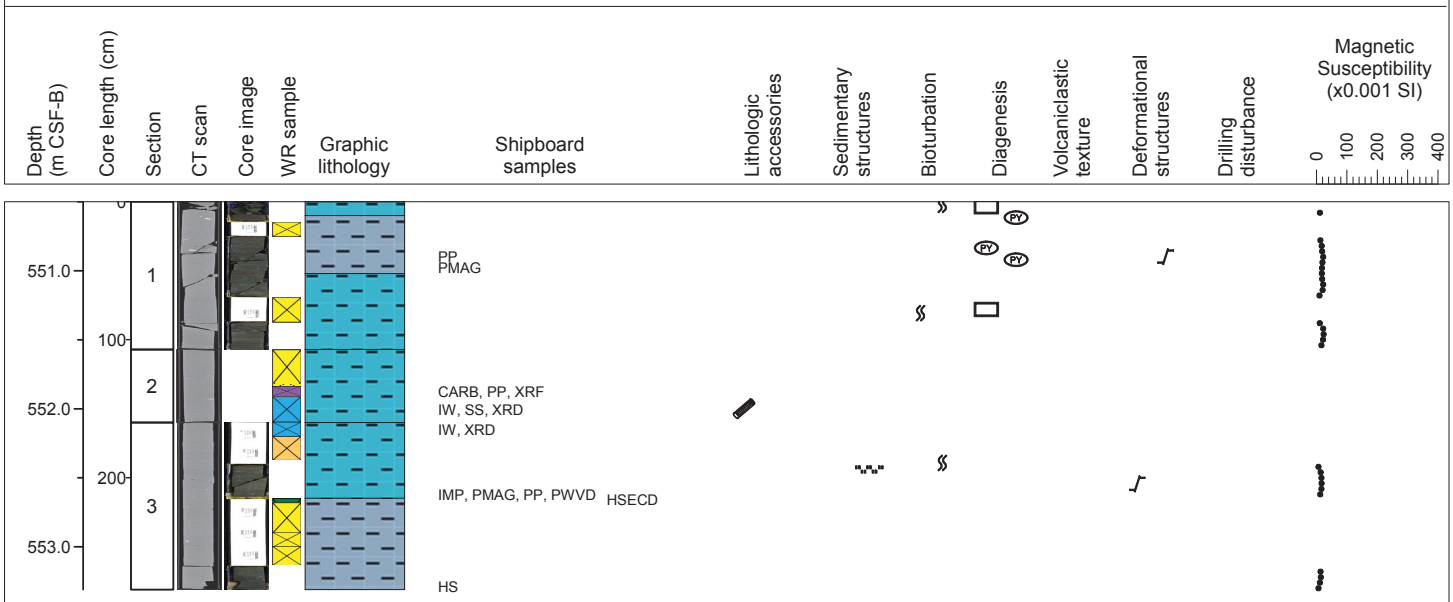
Hole C0023A Core 31R, interval 541–549.205 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with volcaniclastic sandstones and mudstones (Similar to 30R). Tuffs and volcaniclastic sandstones and mudstones are the same as for previous sections where bioturbation mixes the tops of beds with overlying mudstones. Silt content is concentrated in burrows and contains ash and bioclasts. Normal faulting with slickenlines observed 31R-2, 59–66 cm.



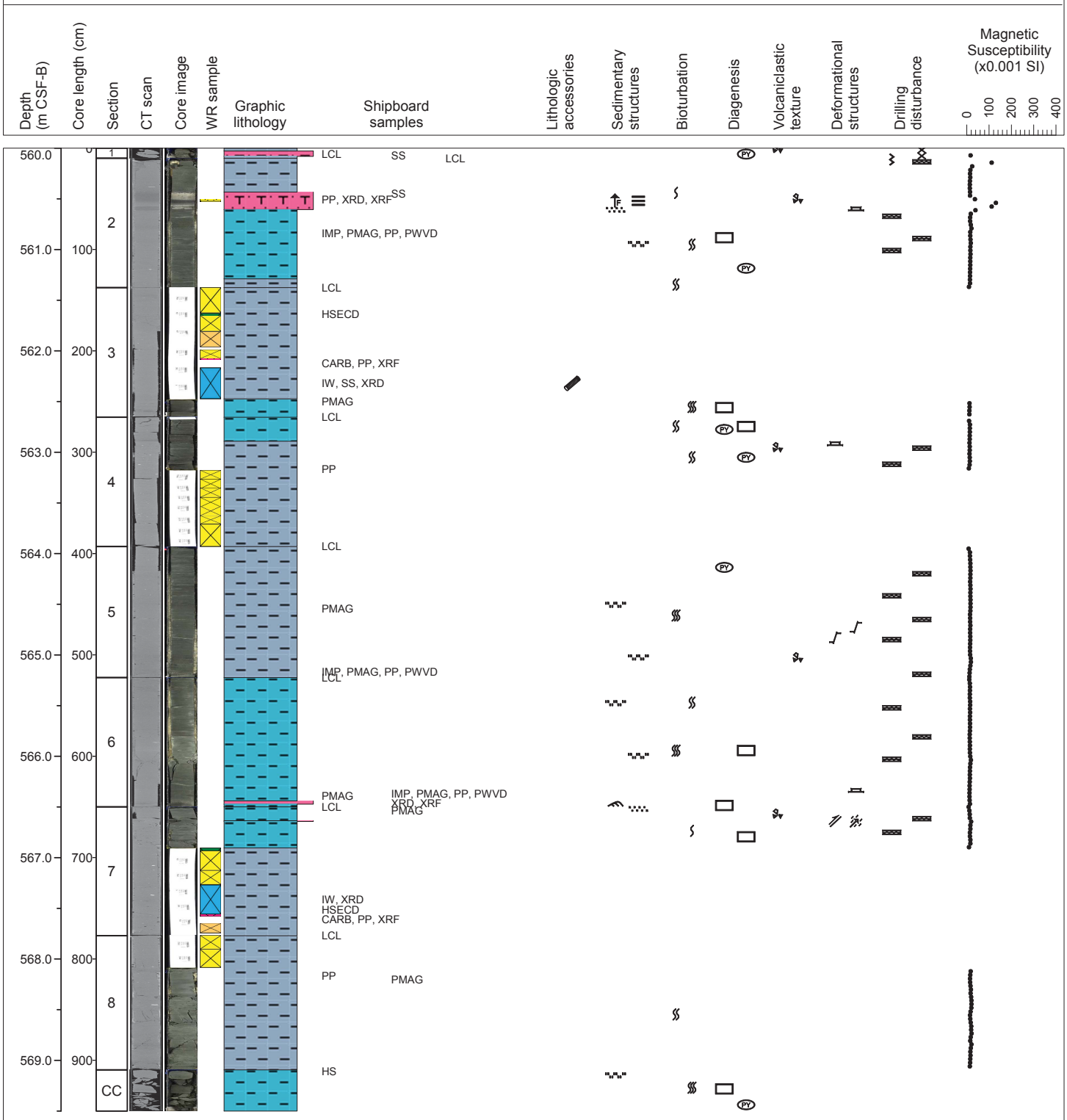
Hole C0023A Core 32R, interval 550.5–553.31 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones. Burrows are often filled with calcite, vitric-volcanic glass and pyrite. Numerous isolated, mm-size aggregates of sponge spicules.
Healed faulting observed at 32R-1, 34–44 cm to 32R-3, 41–48 cm.



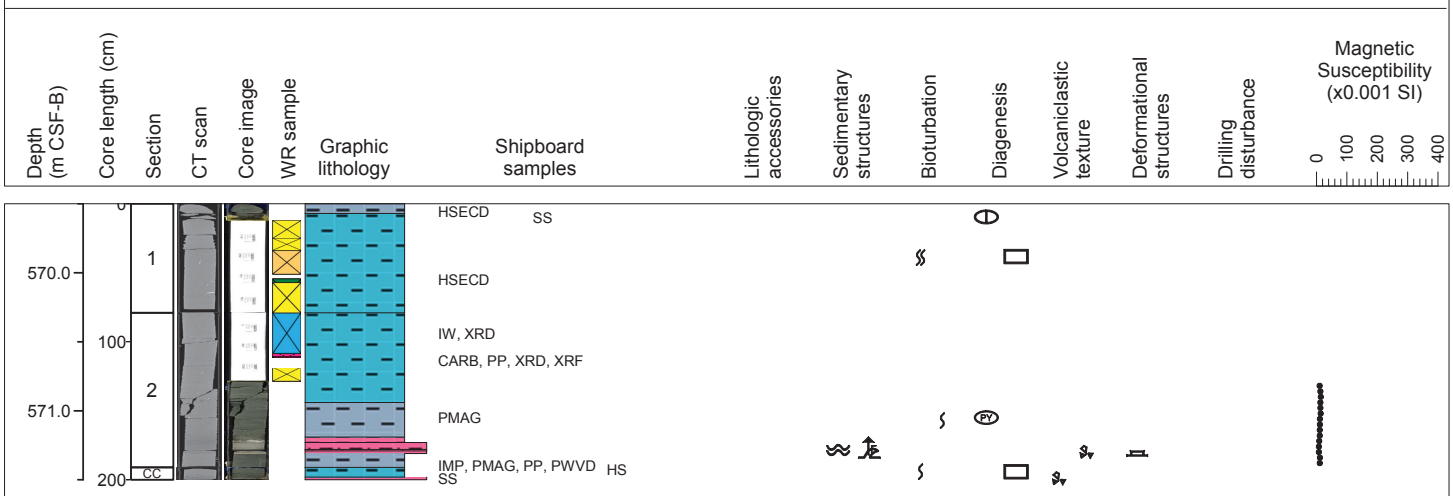
Hole C0023A Core 33R, interval 560–569.5 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with volcaniclastic sandstones and mudstones (Similar to 30R). Tuffs and volcaniclastic sandstones and mudstones are the same as for previous sections where bioturbation mixes the tops of beds with overlying mudstones. Thick tuff-bed in 33R has compositional grading and the dark and light layers are compositionally similar to 36R.
Healed faulting observed in 33R-5, 84–105 cm. and normal faulting with slickenlines observed in 33R-7, 12.5–19 cm.
This core was drilled with high-density drilling mud (milky orange in color).



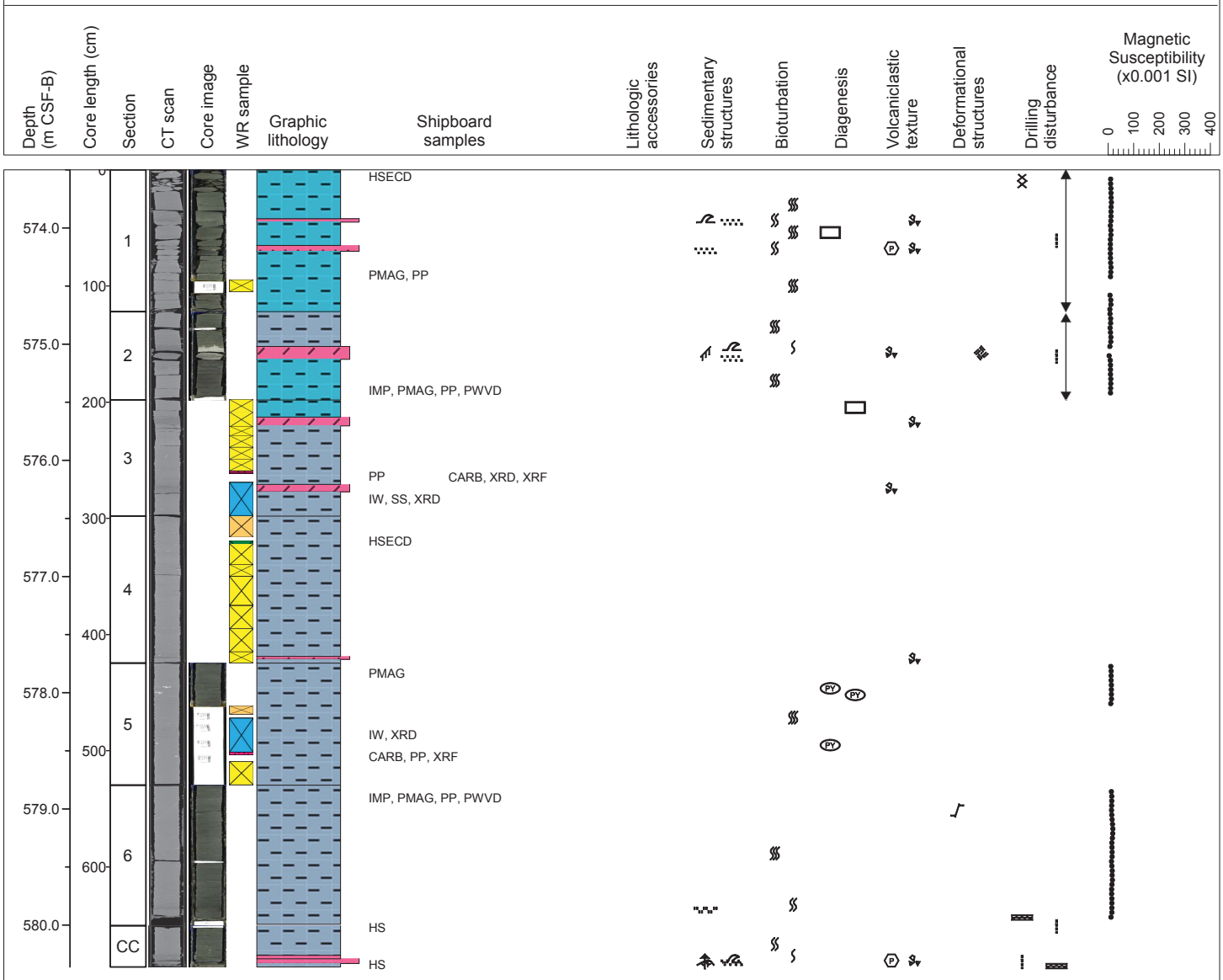
Hole C0023A Core 34R, interval 569.5–571.5 m (core depth below seafloor)

Heavily bioturbated mudstones, calcareous mudstones and a 20 cm thick tuffaceous sandstones (Similar to 30R). The tuff contains gravel-sized clasts of pumice, and a darker layer richer in opaques and clay minerals. Evidence of grading within the bed. Similar to 31R.



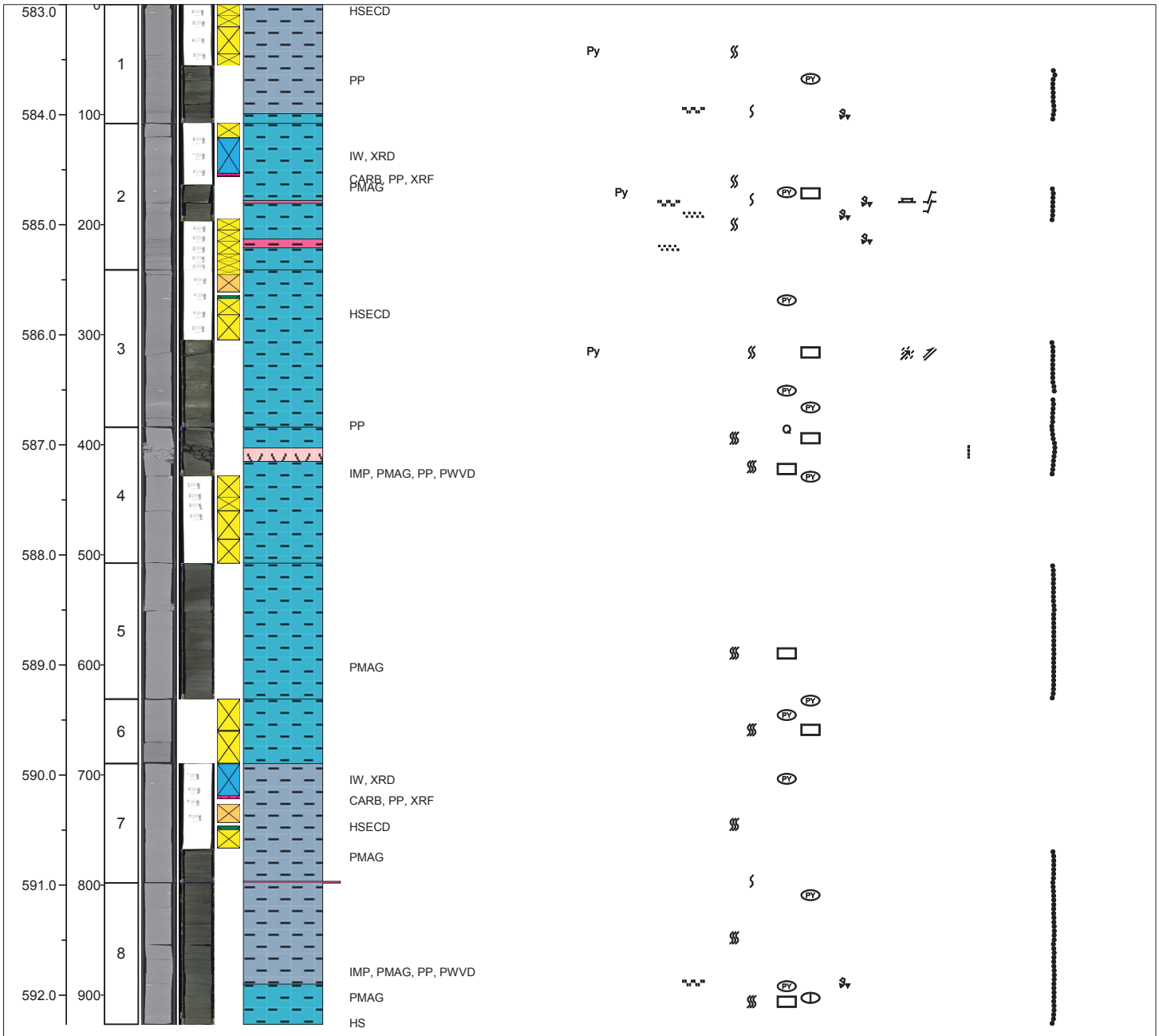
Hole C0023A Core 35R, interval 573.5–580.36 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with volcaniclastic sandstones and mudstones (Similar to 30R and 31R). Ash layers contain black-colored glassy -and dark mud-clasts. Cross-lamina within tuff are picked out by opaque minerals and clay. Tuff-bed grades into overlying mudstone.
Micro faults within tuff at 35R-2, 46–50 cm. Injected sand vein at 35R-2, 50–55 cm. Has ptygmatic structures and sand as is same as in 35R-1.



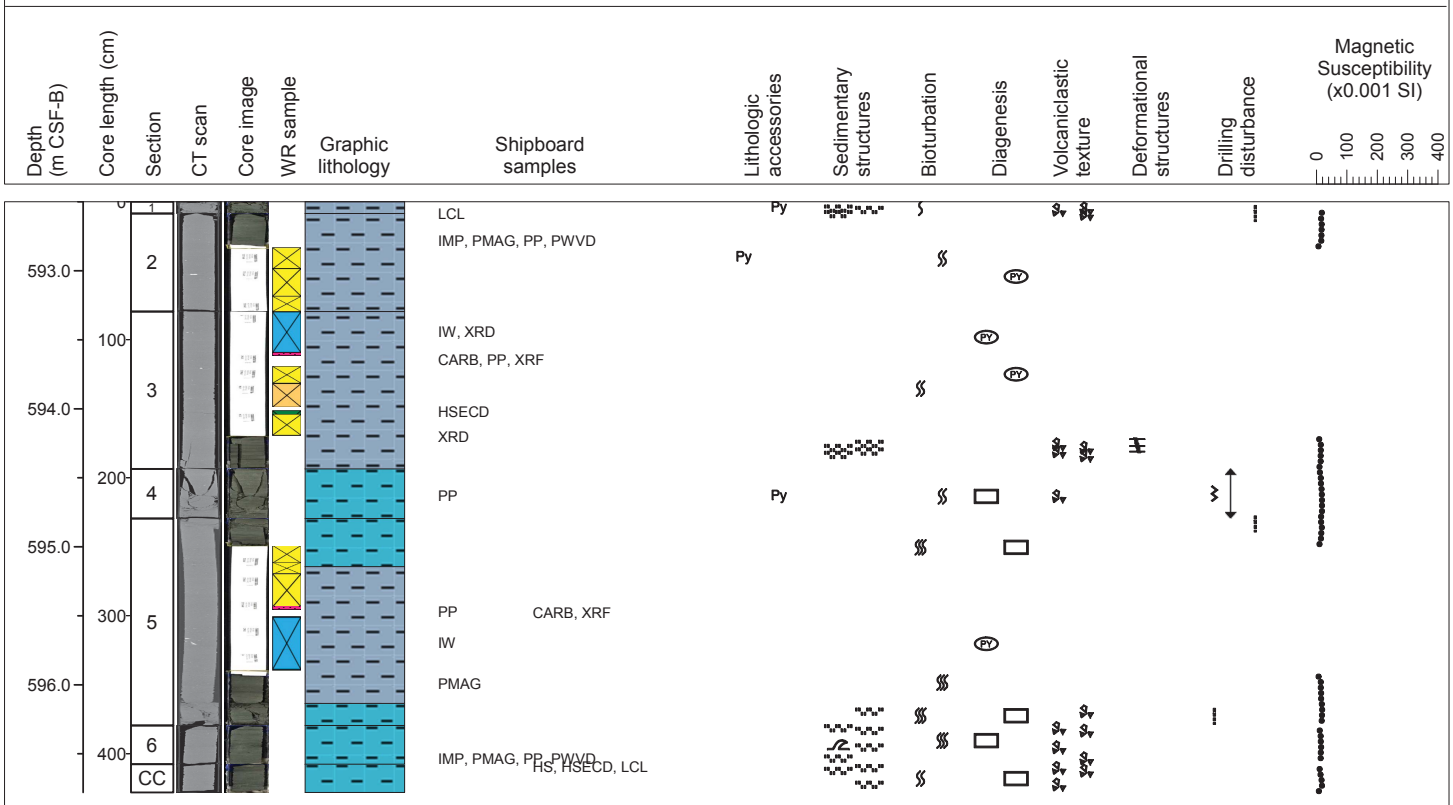
Hole C0023A Core 36R, interval 583–592.265 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with volcaniclastic sandstones and volcaniclastic mudstones (Similar to 30R, 31R and 35R). The few beds of volcaniclastics in core 36R are affected by bioturbation. The intraformational breccia is found in a section affected by drilling disturbance (fracturing). The breccia contains angular clasts of the mudstone found in adjacent formations.
Healed faults observed 36R-2, 62–76 cm and reverse fault and slickenline 36R-3, 74–79 cm.



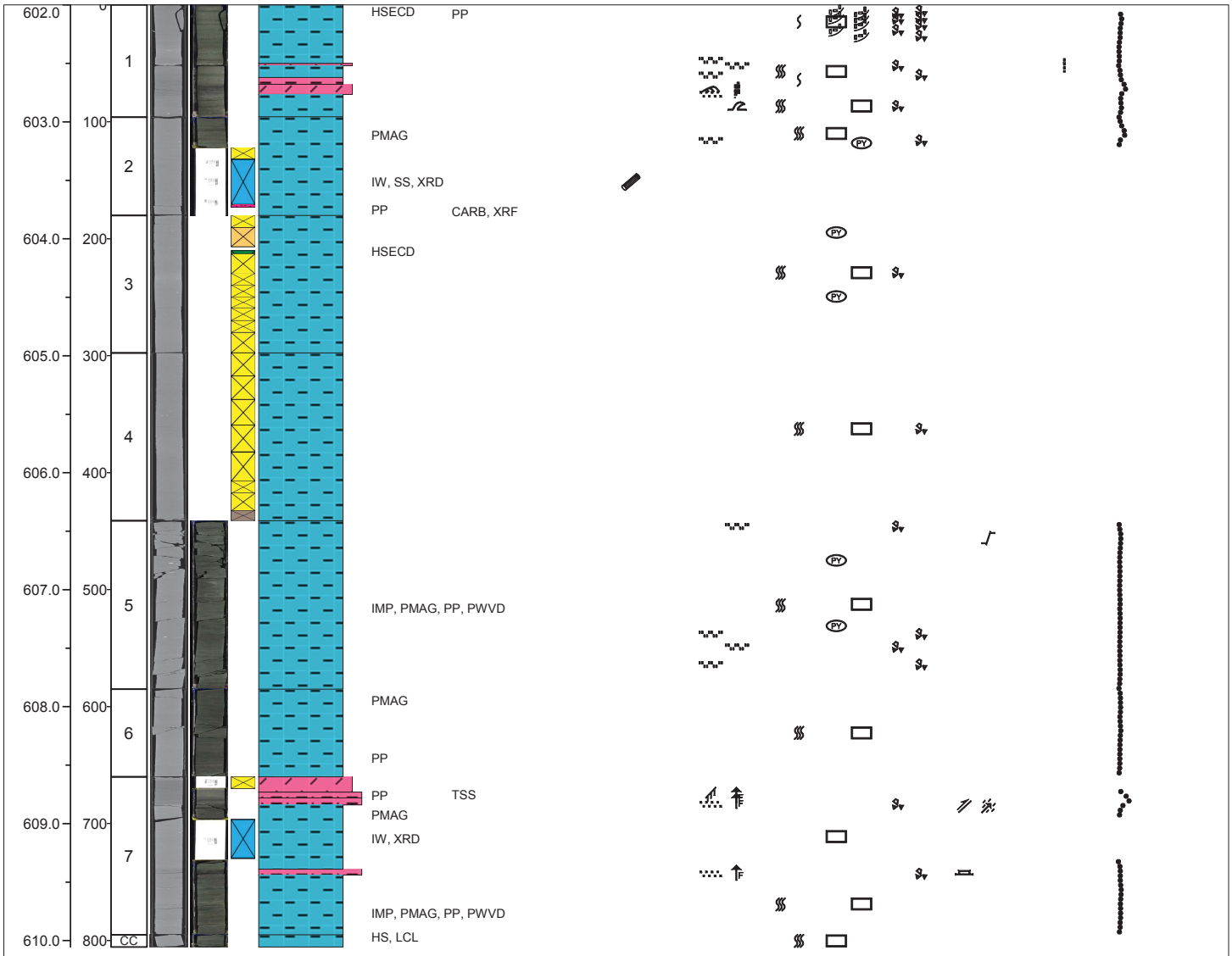
Hole C0023A Core 37R, interval 592.5–596.78 m (core depth below seafloor)

Bioturbated mudstones and calcareous mudstone with volcanic ash layers. Ash layers are present as laminae or less than 2 cm thick that are typically disrupted by burrowing.



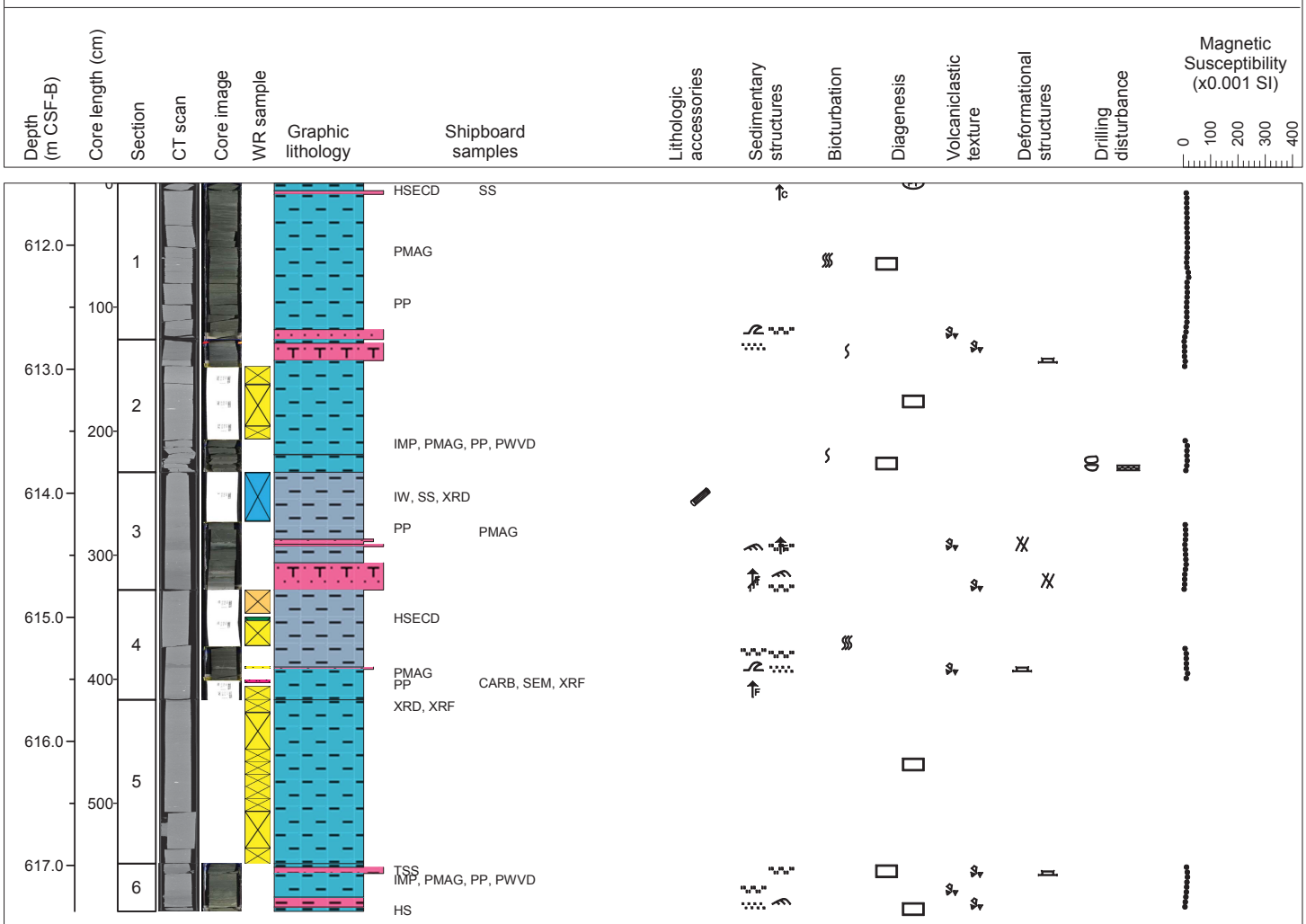
Hole C0023A Core 38R, interval 602–610.055 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with volcaniclastic sandstones and volcaniclastic mudstones (Similar to 30R, 31R and 35R). Graded bedding and cross bedding are present in volcanic sandstone along with other bedforms. Most volcanic sandstones grade into volcanic mudstones due to bioturbation. Many single-lamina green bentonite beds present.
Healed faulting observed in, reverse faulting with slickenlines observed in 38R-7, 21–29 cm.



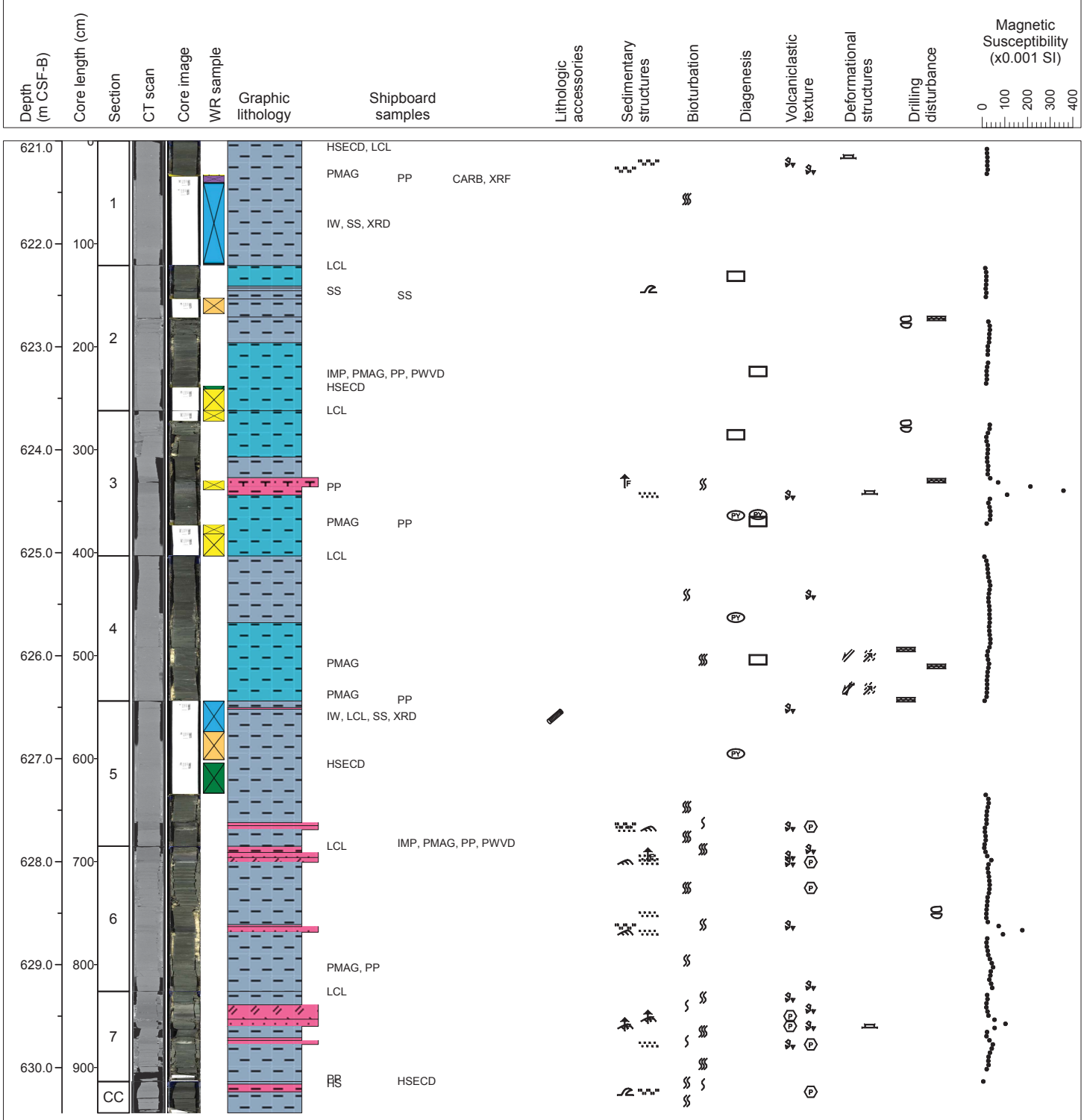
Hole C0023A Core 39R, interval 611.5–617.37 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with volcaniclastic sandstones and volcaniclastic mudstones (Similar to 30R, 31R, 35R, and 38R). Within the tuffs and volcanic sandstones are ripples, lenticular bedding/ripples and cross lamination (the tuff also has deformation bands). The beds have pronounced grading in both clast type and grain size (more large igneous crystals at base and more ash at the top). Bioturbation at the top mixes volcaniclastics into overlying mudstone.
Missing intervals inferred from adjacent intervals and XCT image.
Deformation band in ash layers at 39R-3, 73–95 cm.
Pyrite mineralization at base of tuff 39R-3, 93-95 cm.



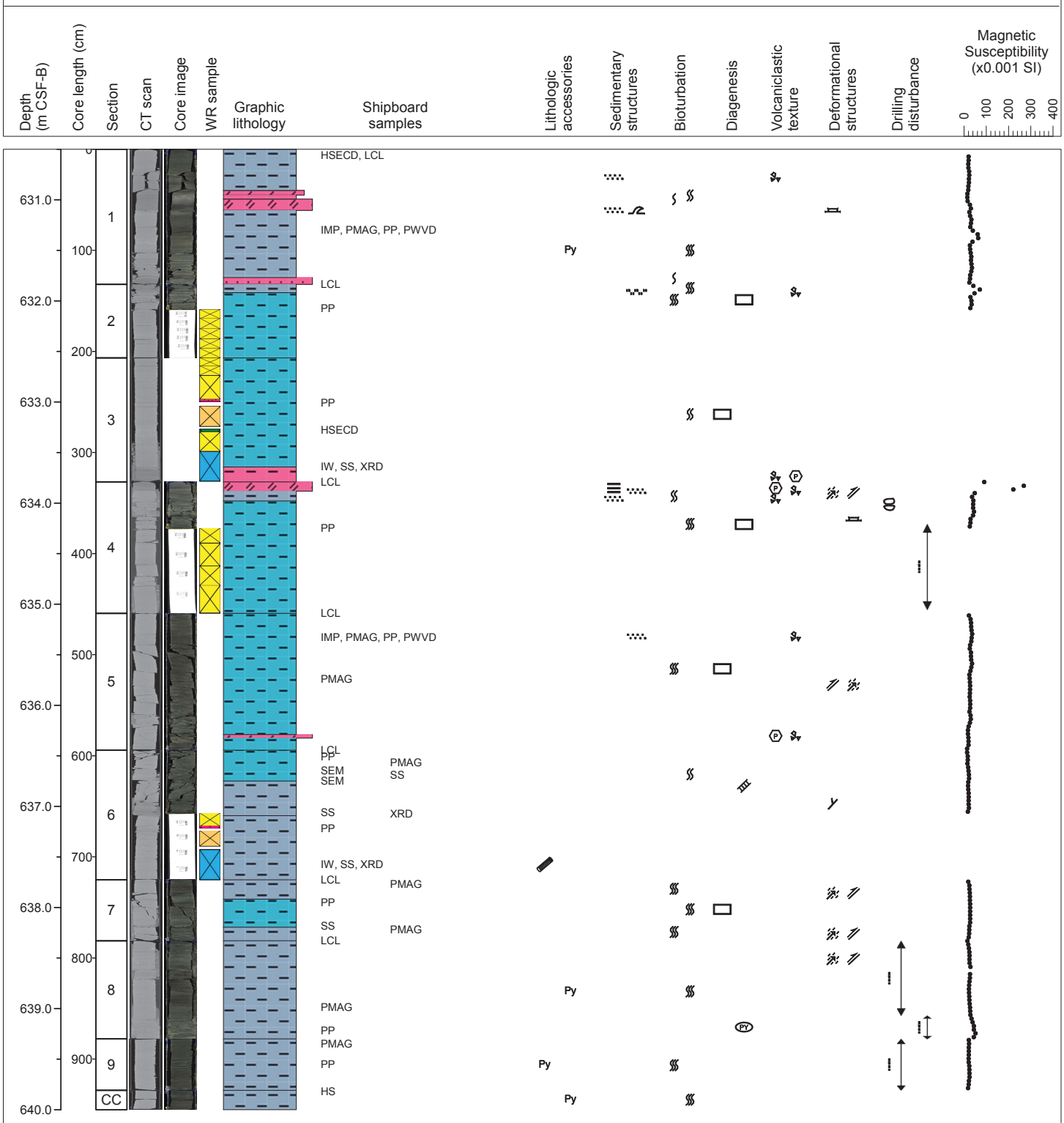
Hole C0023A Core 40R, interval 621–630.44 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with volcaniclastic sandstones and volcaniclastic mudstones. Core 40R is a clear example of the two varieties of volcaniclastics present. One is felsic and pale, the other is intermediate in composition (plagioclase and biotite rich) with clasts of black-colored glassy pumice and amphibole (in many instances one tuff-type grades into the other). Towards the base of the core mudstones are calcareous and contain more ash. Detrital clasts of dark black-colored pumice are also present in the mudstone.
Healed faulting observed in 40R-5, 93–101 cm, normal faulting with slickenlines observed in 40R-5, 93–133 cm.



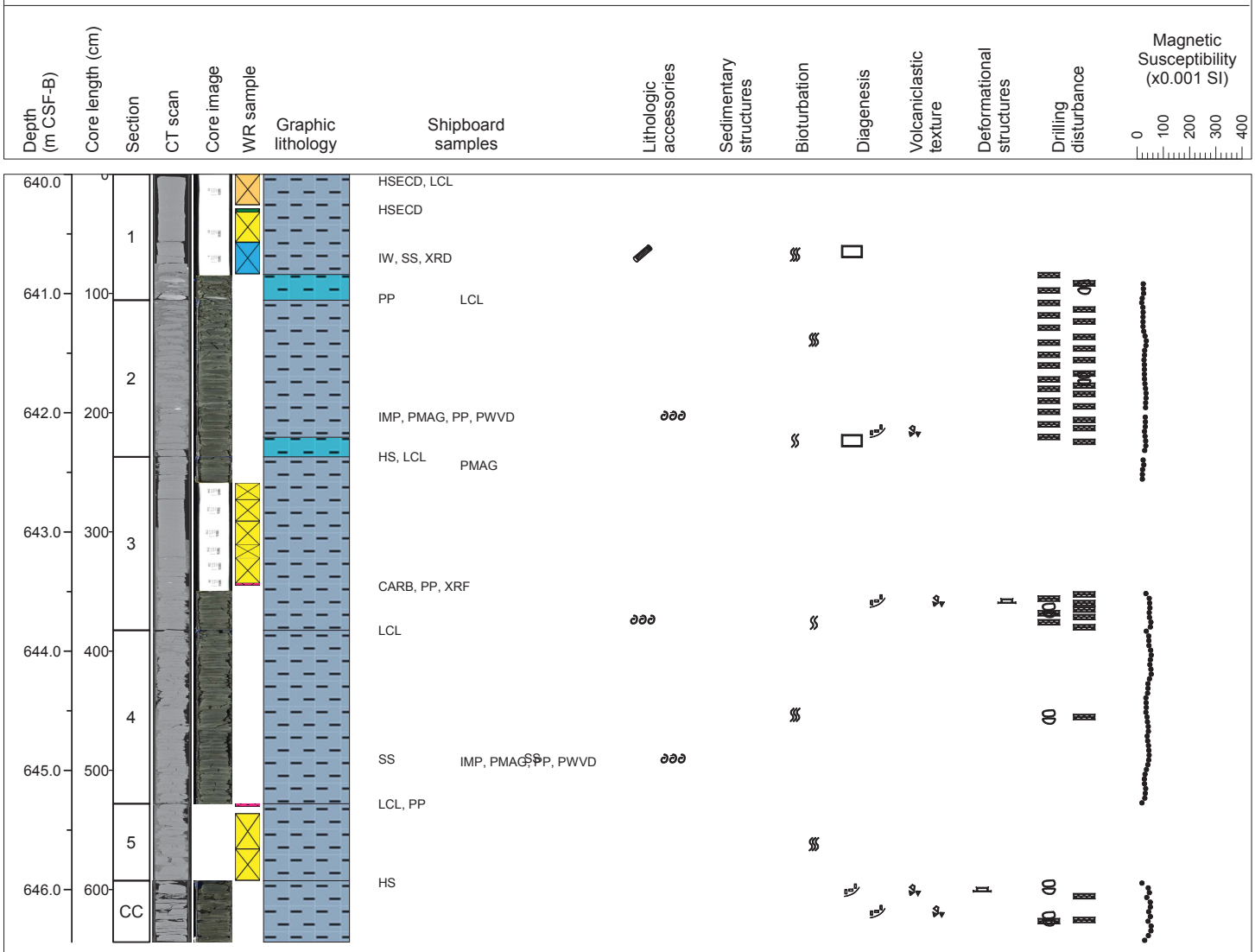
Hole C0023A Core 41R, interval 630.5–640 m (core depth below seafloor)

Bioturbated mudstones and calcareous mudstones. Above 41R-6, 70 cm the volcaniclastics are present and the mudstone contains green-colored ash-rich laminae (many are cut by burrows). Beneath 637 mbsf there is sharp diagonal contact and volcanic ash becomes rare. Separating the layers is a black-colored homogenous mudstone that contains numerous slickened surfaces.
In the upper part, horizontal bedding is horizontal inferred from contact between ash and underlying mudstone. In the lower part, slightly dipping bedding inferred from contact between ash layer and underlying mudstone. Throughout the core reverse faulting with slicken lines is observed.



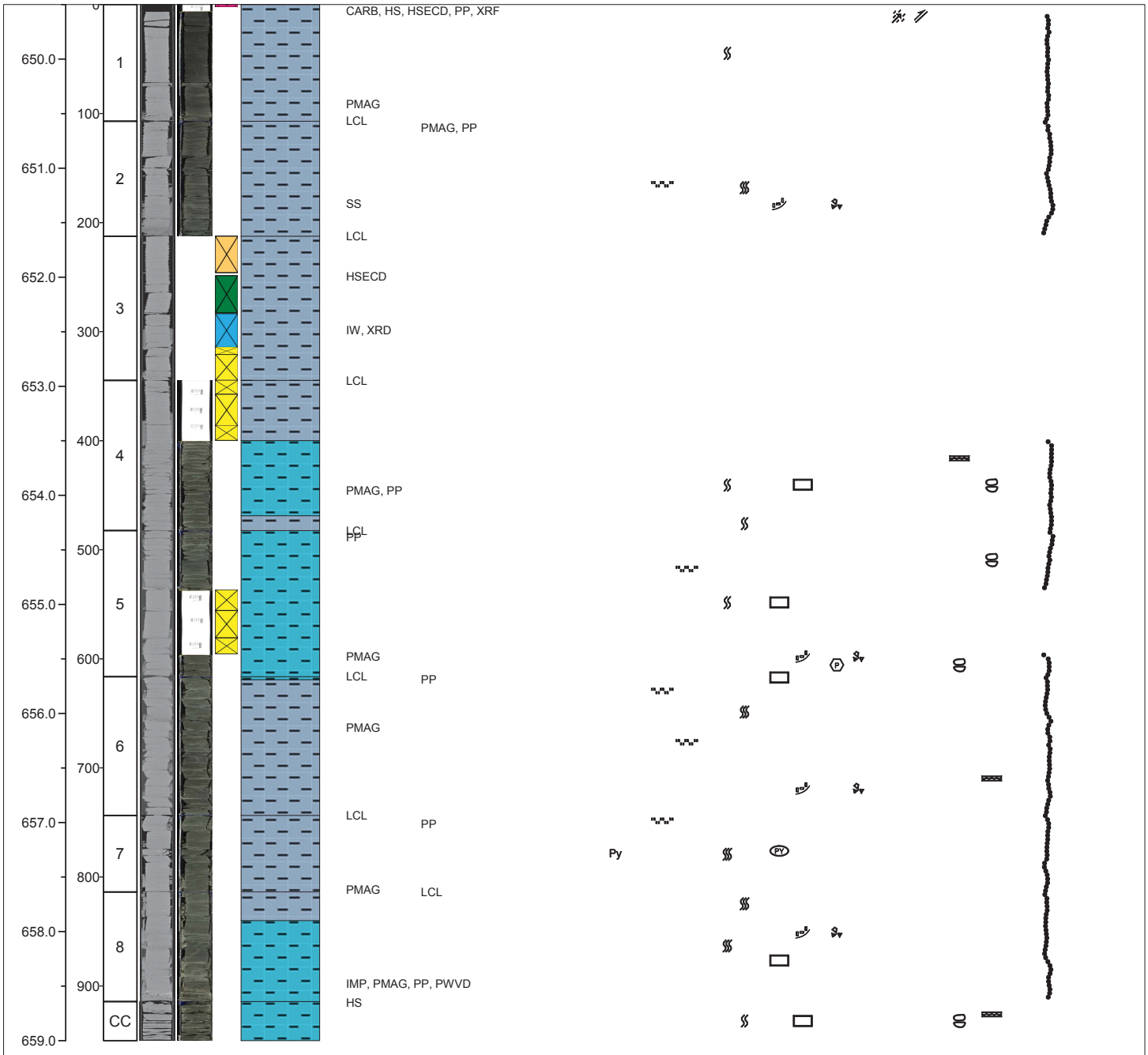
Hole C0023A Core 42R, interval 640–646.44 m (core depth below seafloor)

Heavily bioturbated mudstones with distinct lithological differences between burrows and host lithology (described core 43R); burrows contain coarser silt-sized clasts. High number of green-bentonite ash laminae in core may reflect lesser level of bioturbation.
Horizontal bedding deduced from lamination.



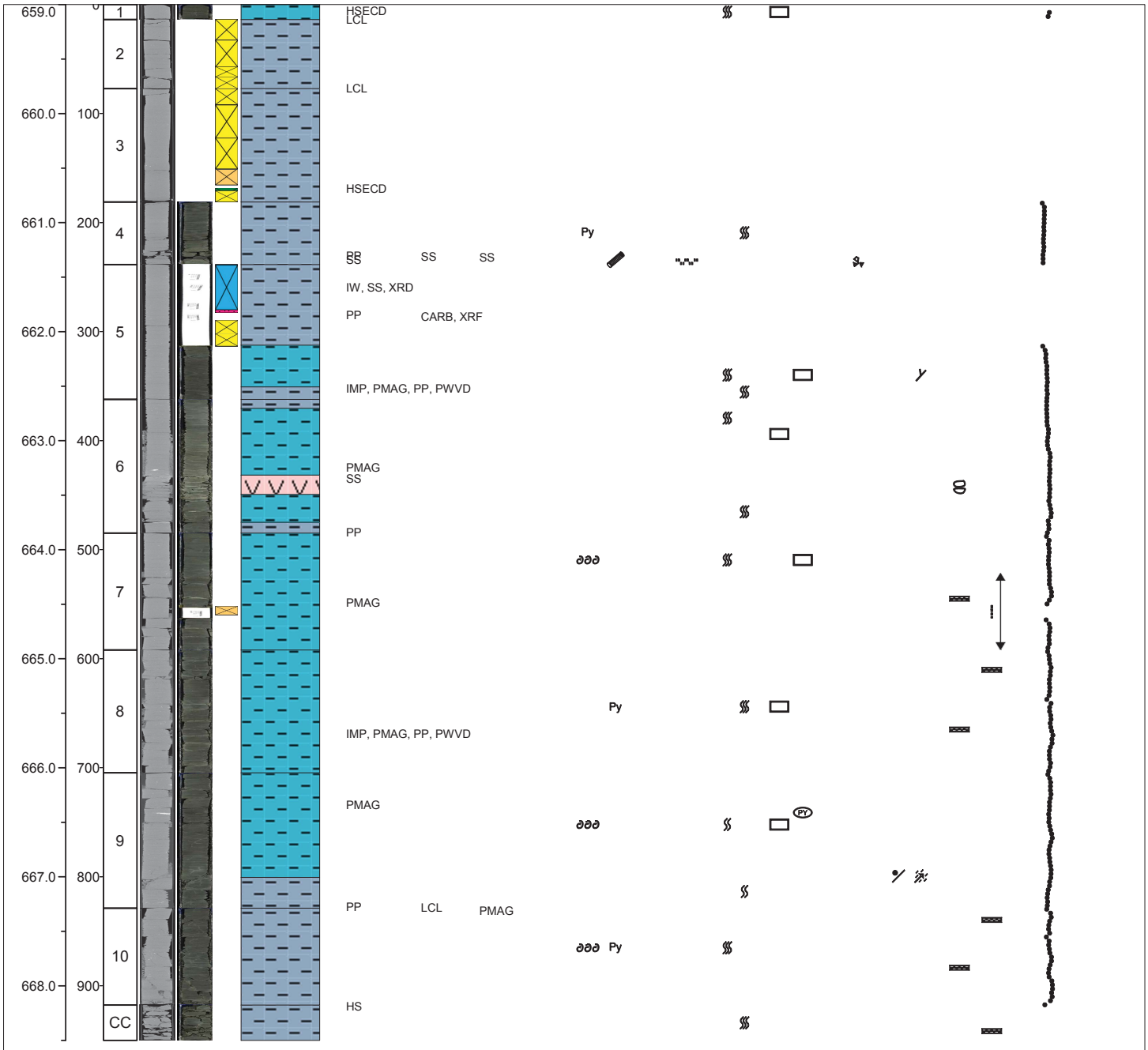
Hole C0023A Core 43R, interval 649.5–659 m (core depth below seafloor)

Heavily bioturbated mudstones with distinct lithological differences between burrows and host lithology. Host lithology has high proportion of microcrystalline quartz. Authigenic illite flakes are present but often light brown in color. Opaque content; pyrite, clay (possibly devitrified ash). Very minor Vitric ash and carbonate content. Burrows contain a muddy sand- and silt-bearing fill; light brown in color, high bioclast content, sub-angular quartz and plagioclase, illite flakes (authigenic) and small black pieces of volcanic glass (Pumice).
Green-bentonite ash layers are present, bur frequently are wispy or cut by burrows. Sparse silt-and clay-laminae.
Reverse faulting with slickenlines observed at top of core (43R-1, 11–13 cm).
Drilling speed was reduced so there is less biscuiting than former core.



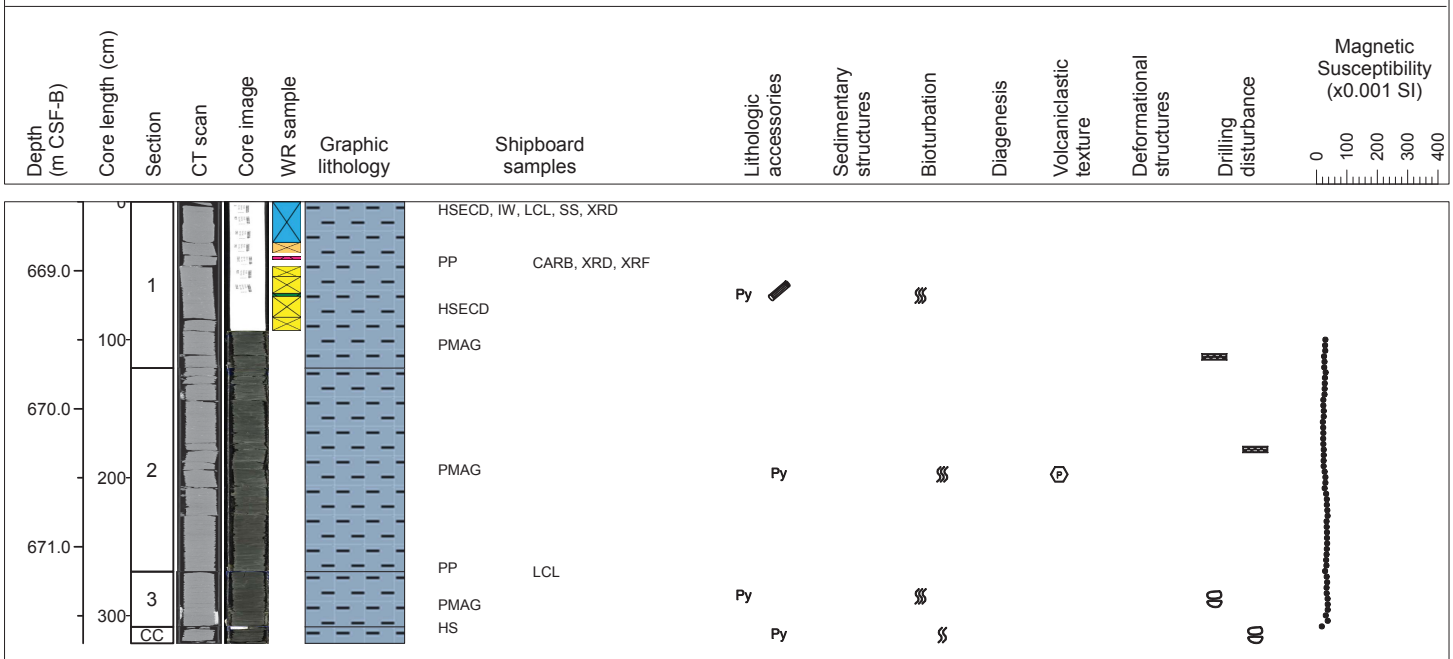
Hole C0023A Core 44R, interval 659–668.5 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous mudstones with distinct lithological differences between burrows and host lithology as described for 43R. The core has a high proportion of burrows and green-bentonite ash is observed only as discontinuous wispy laminations, cut by burrows.
Strike slip faults, slicken lines 44R-9, 90–110 cm.



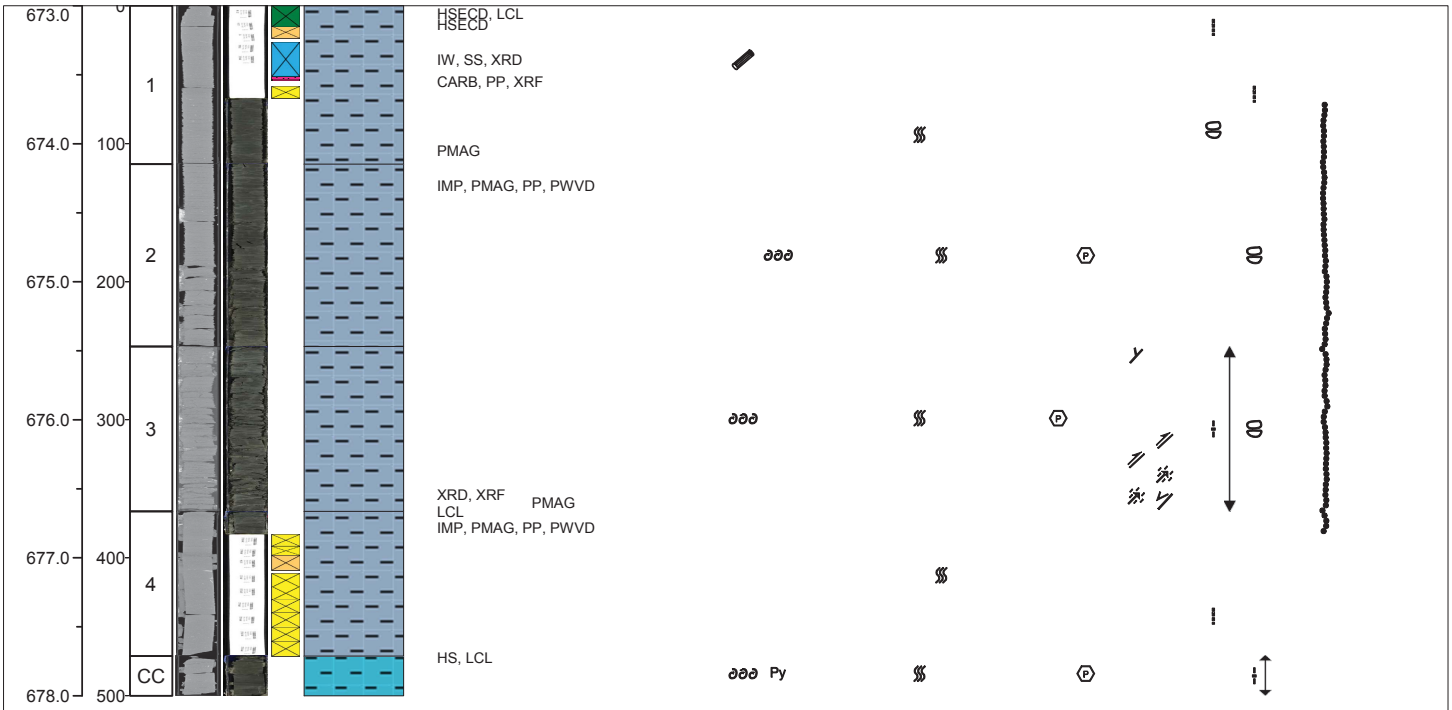
Hole C0023A Core 45R, interval 668.5–671.7 m (core depth below seafloor)

Heavily bioturbated mudstone with a sparse silt and gravel content that includes pumice (dark black-colored rough glassy clasts), pyrite, plagioclase, (presumed authigenic) illite, opaque minerals and bioclasts. Interpreted to be caused by the amalgamation of burrows. No continuous green-bentonite ash layers observed (only patches). Little continuous lamination is present although burrow outlines and traces can be seen.



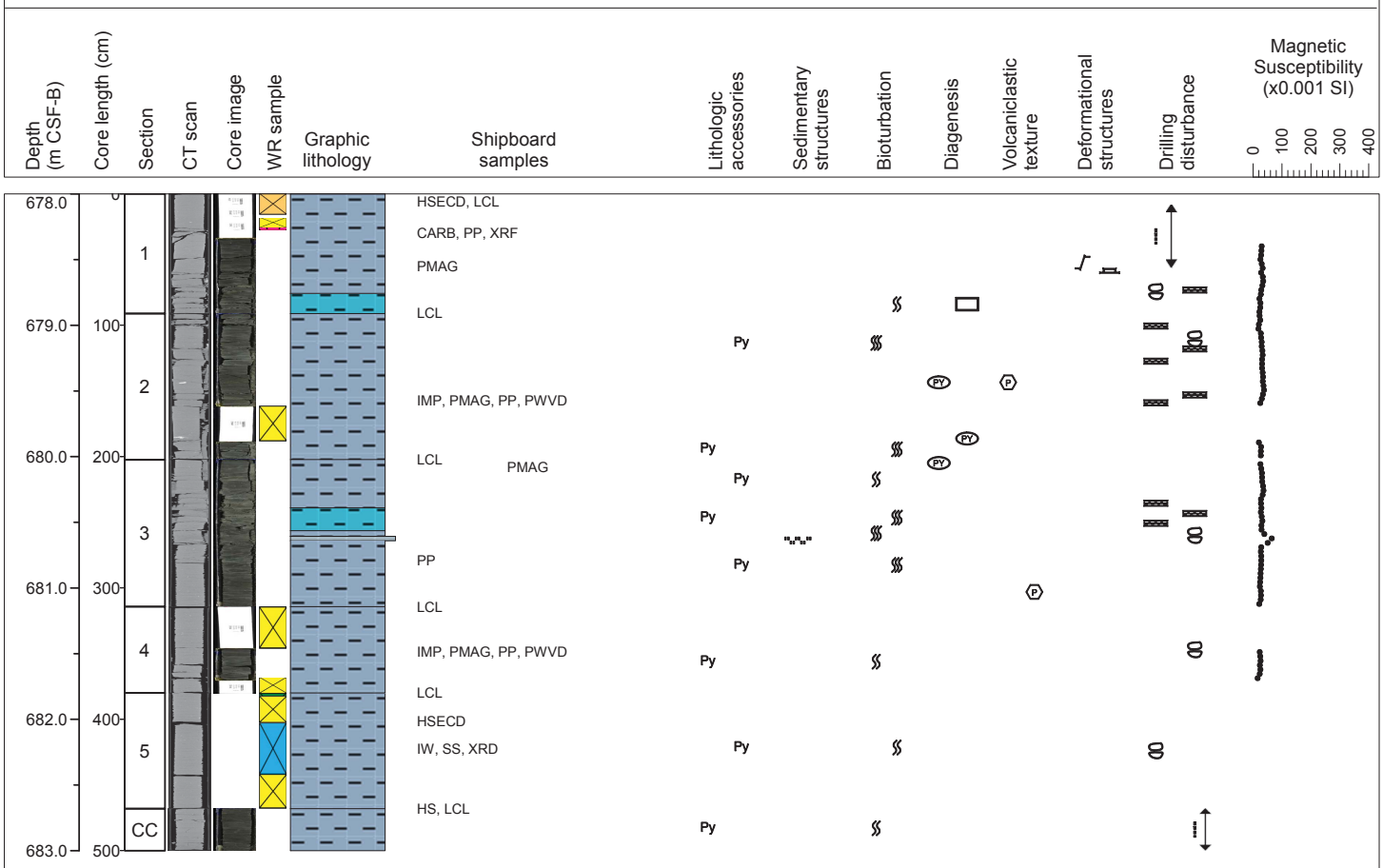
Hole C0023A Core 46R, interval 673–678 m (core depth below seafloor)

Heavily bioturbated mudstone and calcareous mudstone with patchy silt and gravel content that includes pumice (dark black-colored rough glassy clasts), pyrite, plagioclase, illite, opaque minerals and bioclasts. Little continuous lamination present, although burrow outlines and traces can be seen. Intervals with a high silt content are interpreted to be caused by the amalgamation of burrows. No continuous green-bentonite ash layers observed (only patches).
Some reverse faulting and oblique slip fault with slicken lines observed at 46R-4, 68–88 cm.



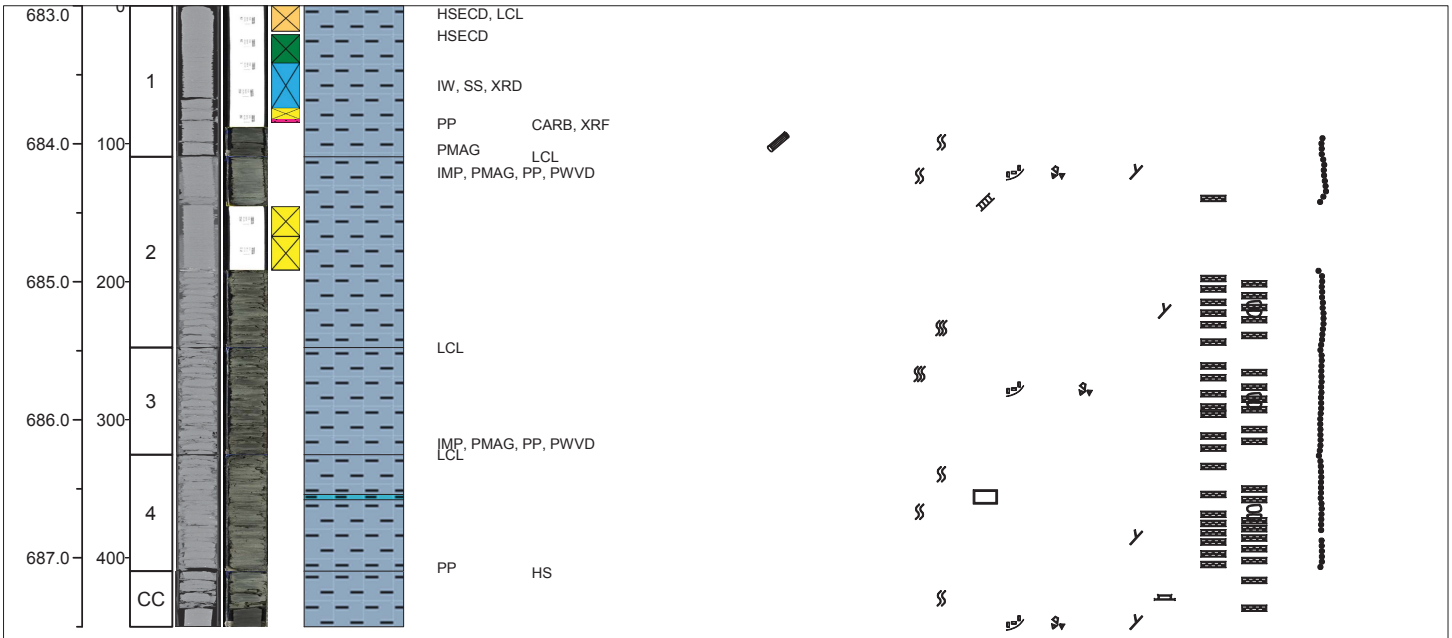
Hole C0023A Core 47R, interval 678–683 m (core depth below seafloor)

Heavily bioturbated mudstone and calcareous mudstone with a thin gravelly siltstone bed; gravel content includes pumice (dark black-colored rough glassy clasts), and opaque minerals. Bedforms lost due to bioturbation. Burrows contain high silt content that includes calcite and bioclasts.
47R-1, 51–72 cm. Healed faulting system showing normal displacement observed. It shows 2 mm displacement on the splitting plane by cut bedding.



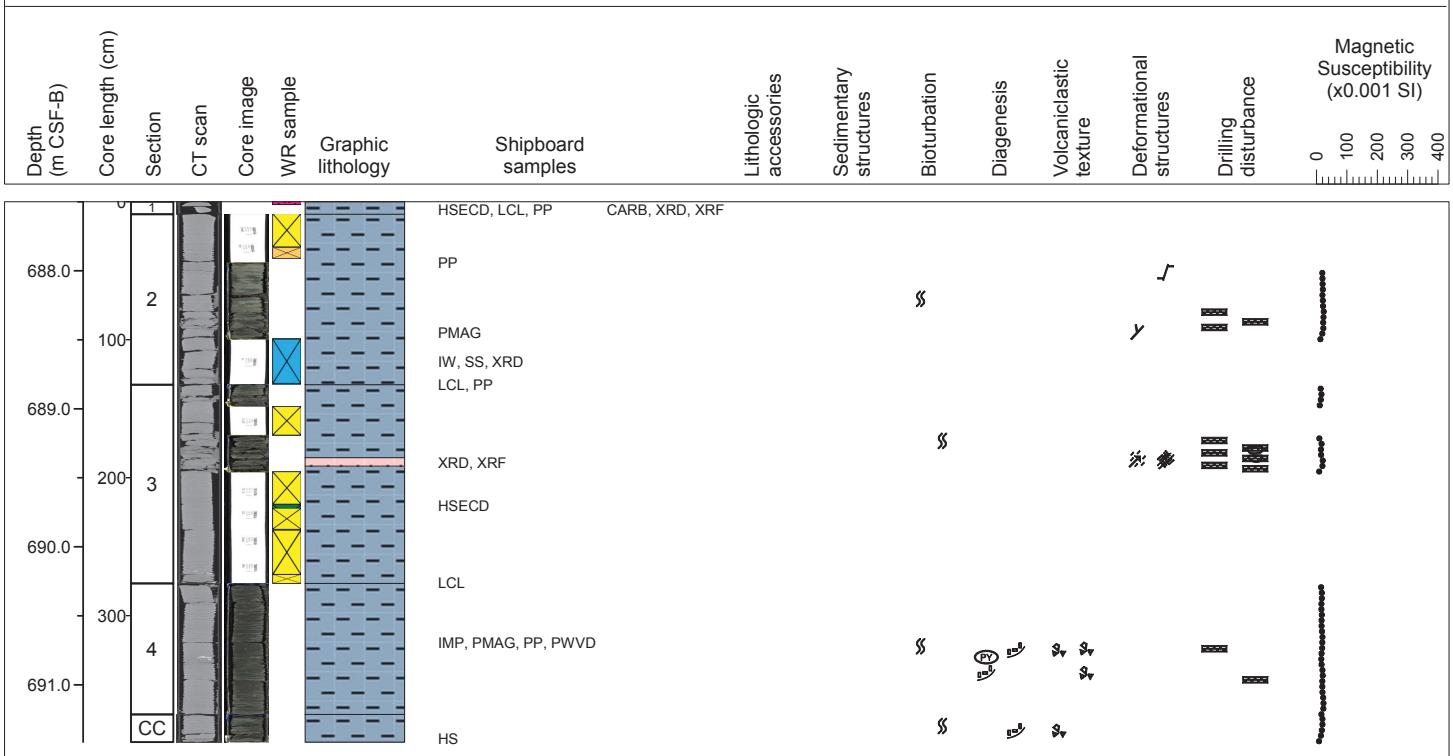
Hole C0023A Core 48R, interval 683–687.5 m (core depth below seafloor)

Heavily bioturbated mudstone and a thin calcareous mudstone. Similar to 46R except bioturbation is less and some green-colored volcanic ash beds survive. Slightly dipping bedding deduced from lamination.
Sub-vertical healed faulting observed in 48R-4, 20–70 cm. Quartz vein observed 48R-2, 24–34 cm.



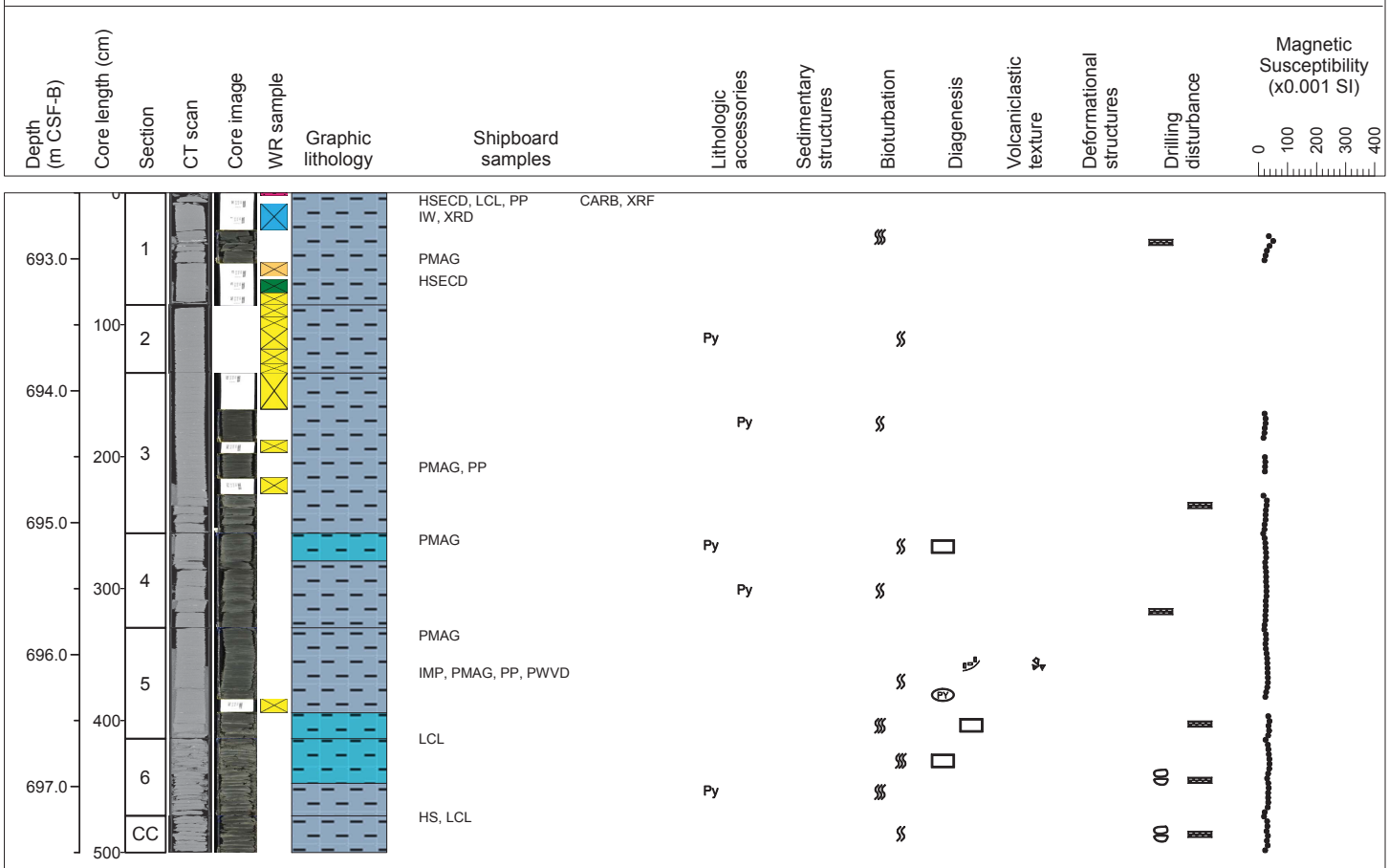
Hole C0023A Core 49R, interval 687.5–691.415 m (core depth below seafloor)

Bioturbated mudstone and calcareous mudstone with intervals where bioturbation is reduced and green-bentonite ash laminae are preserved. Brecciated interval associated with faulting.
Sub-vertical healed faulting observed in 49R-1, 36–47 cm. A fracture zone showing reverse fault sense by slicken lines observed in 49R-3, 45–63 cm.



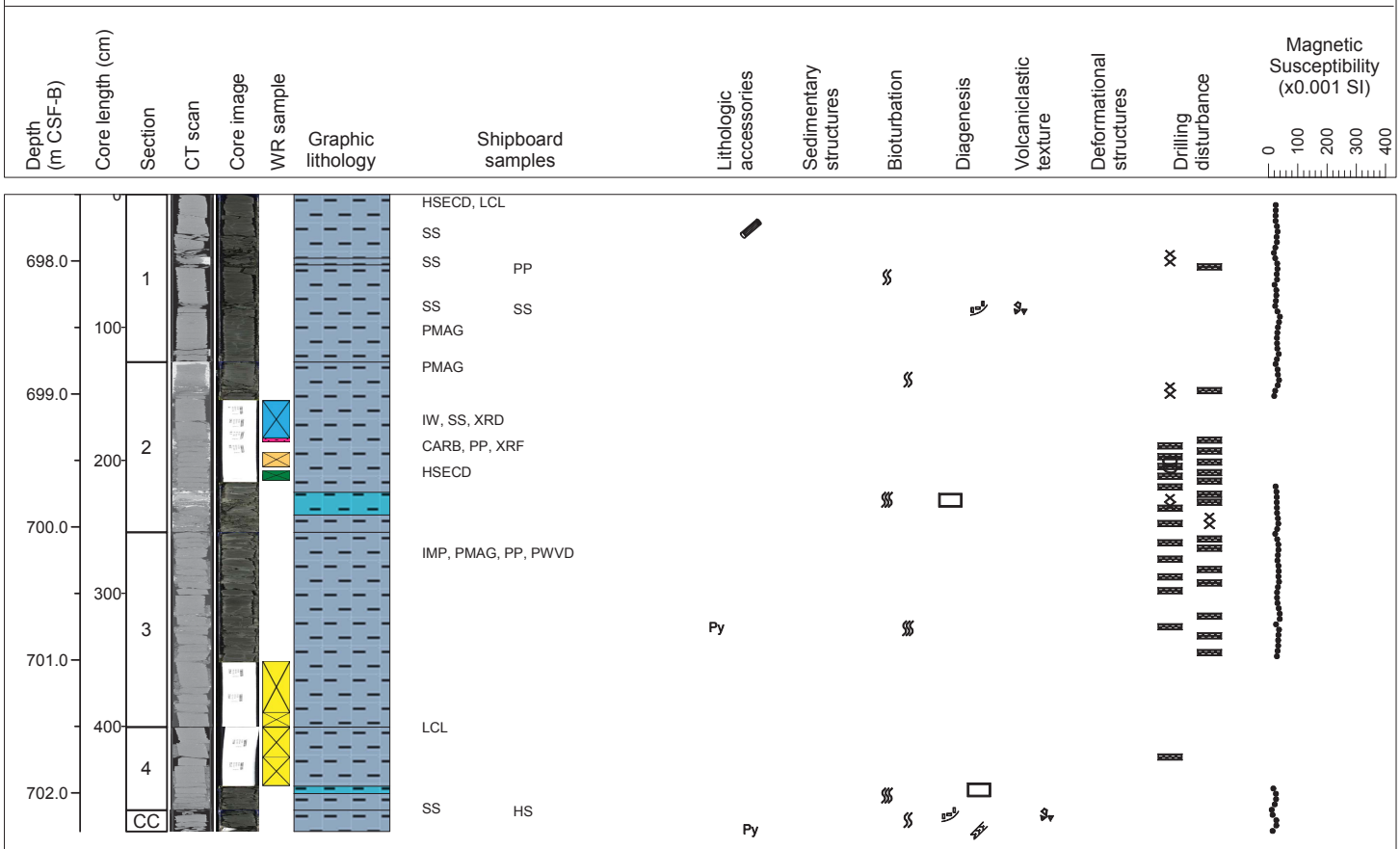
Hole C0023A Core 50R, interval 692.5–697.5 m (core depth below seafloor)

Heavily bioturbated mudstone and calcareous mudstones. Burrows contain high silt content that includes calcite and bioclasts. In places green-colored bentonite ash laminae survive, but in most places bioturbation disrupts lamination. Similar to 45R and 46R.



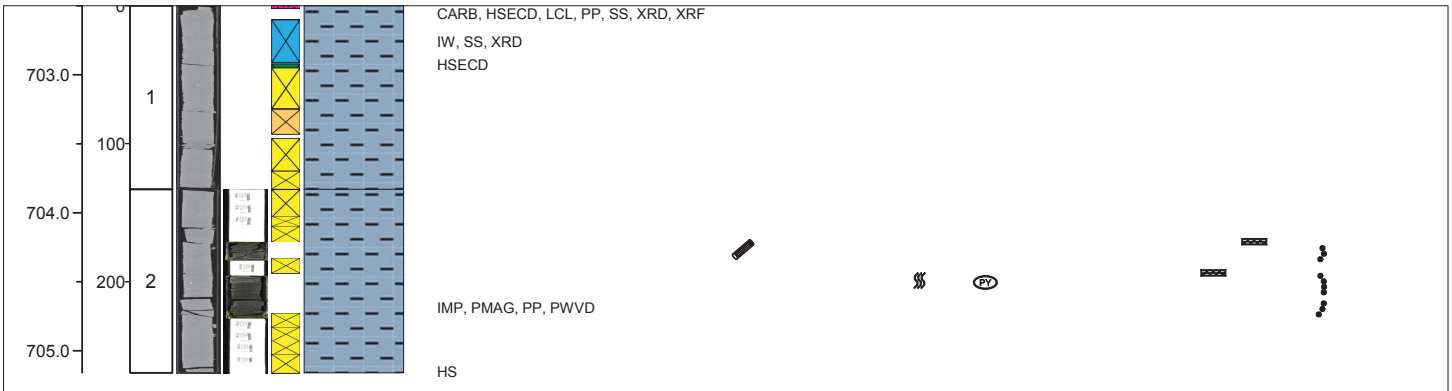
Hole C0023A Core 51R, interval 697.5–702.29 m (core depth below seafloor)

Heavily bioturbated mudstone and thin calcareous mudstones. Burrows contain high silt content that includes calcite and bioclasts. Muddy areas contain less silt and bioclasts and more clay, vitric volcanic ash and pelagic grains (calcitic and siliceous nano fossils). In places green-colored bentonite ash laminae survive but they are disrupted by drilling.



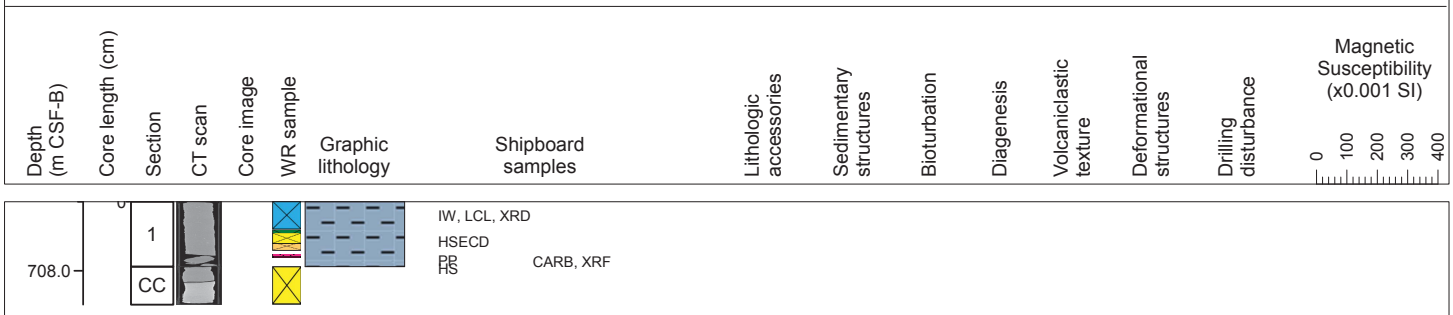
Hole C0023A Core 52R, interval 702.5–705.16 m (core depth below seafloor)

Heavily bioturbated mudstone and thin calcareous mudstones. Burrows contain high silt content that includes calcite and bioclasts. Similar to 51R.



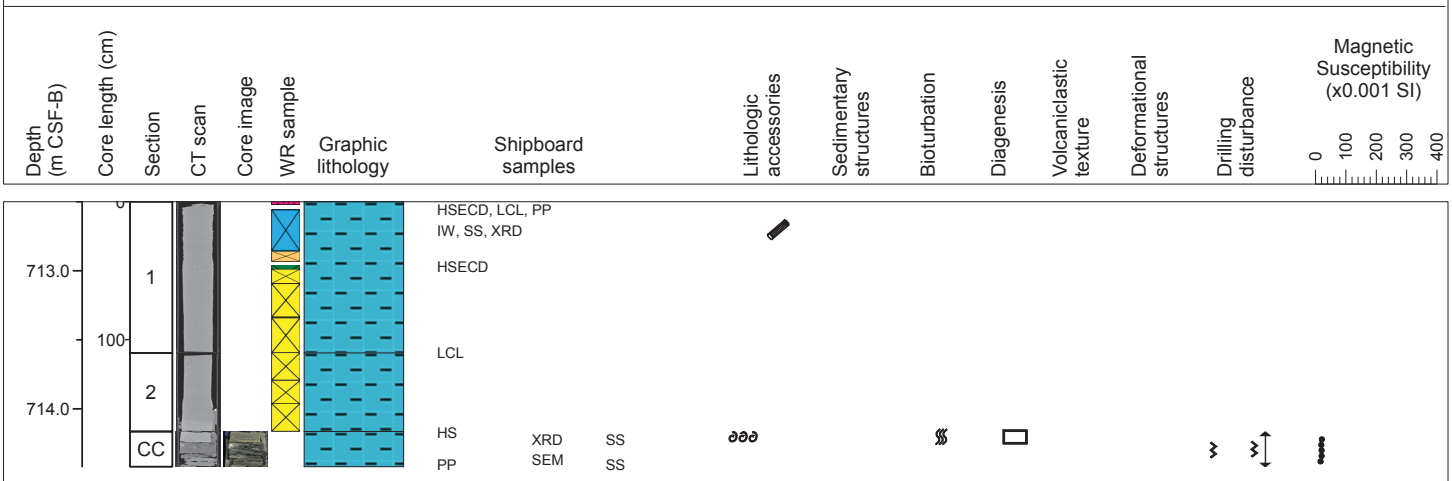
Hole C0023A Core 53R, interval 707.5–708.245 m (core depth below seafloor)

Core not seen: Heavily bioturbated mudstone and calcareous mudstones. Based on X-CT and residues.



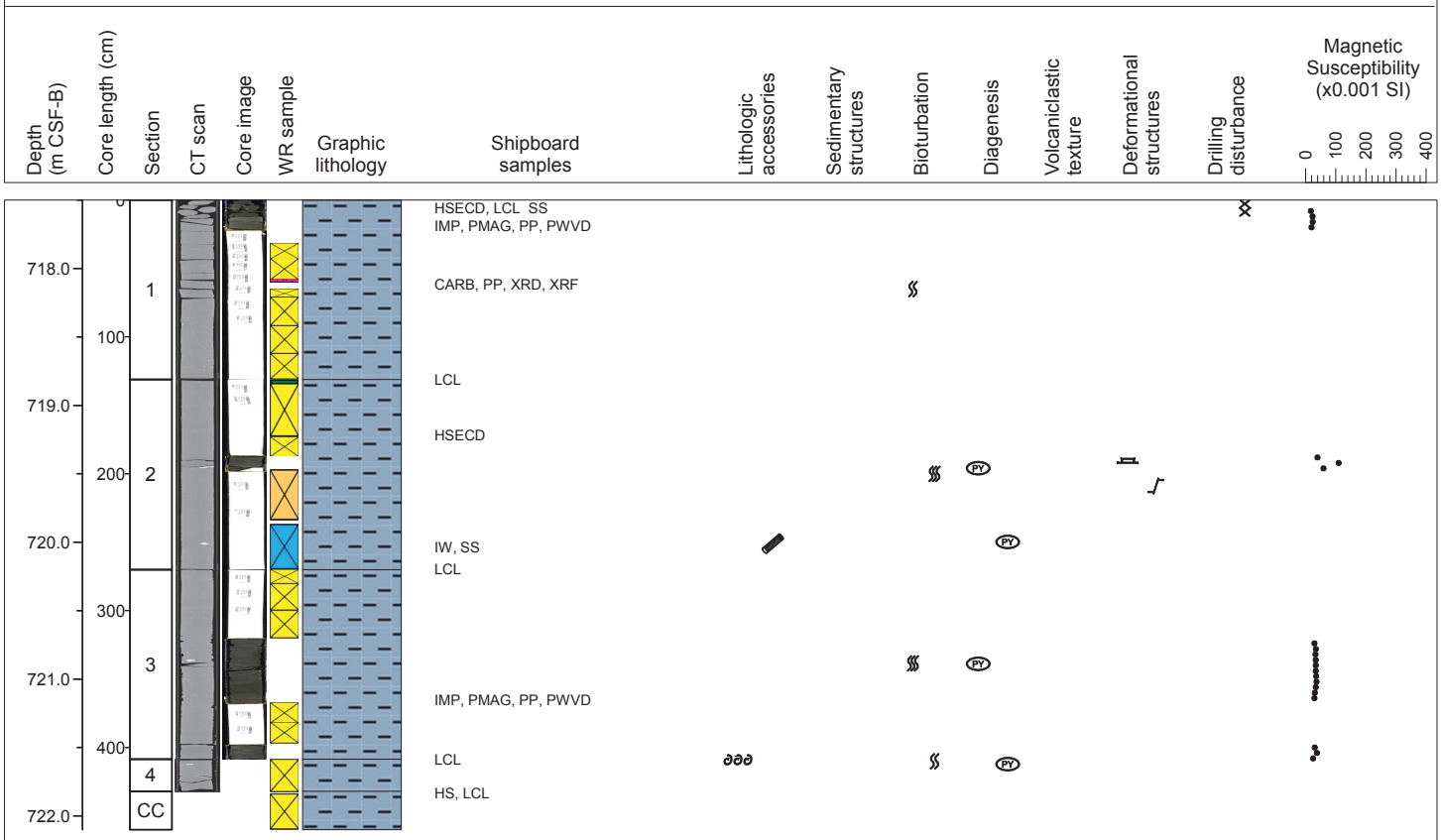
Hole C0023A Core 54R, interval 712.5–714.42 m (core depth below seafloor)

Heavily bioturbated calcareous mudstones. Burrows contain high silt content that includes calcite and bioclasts. Similar to 51R. Based on sample residue and core catcher observation.



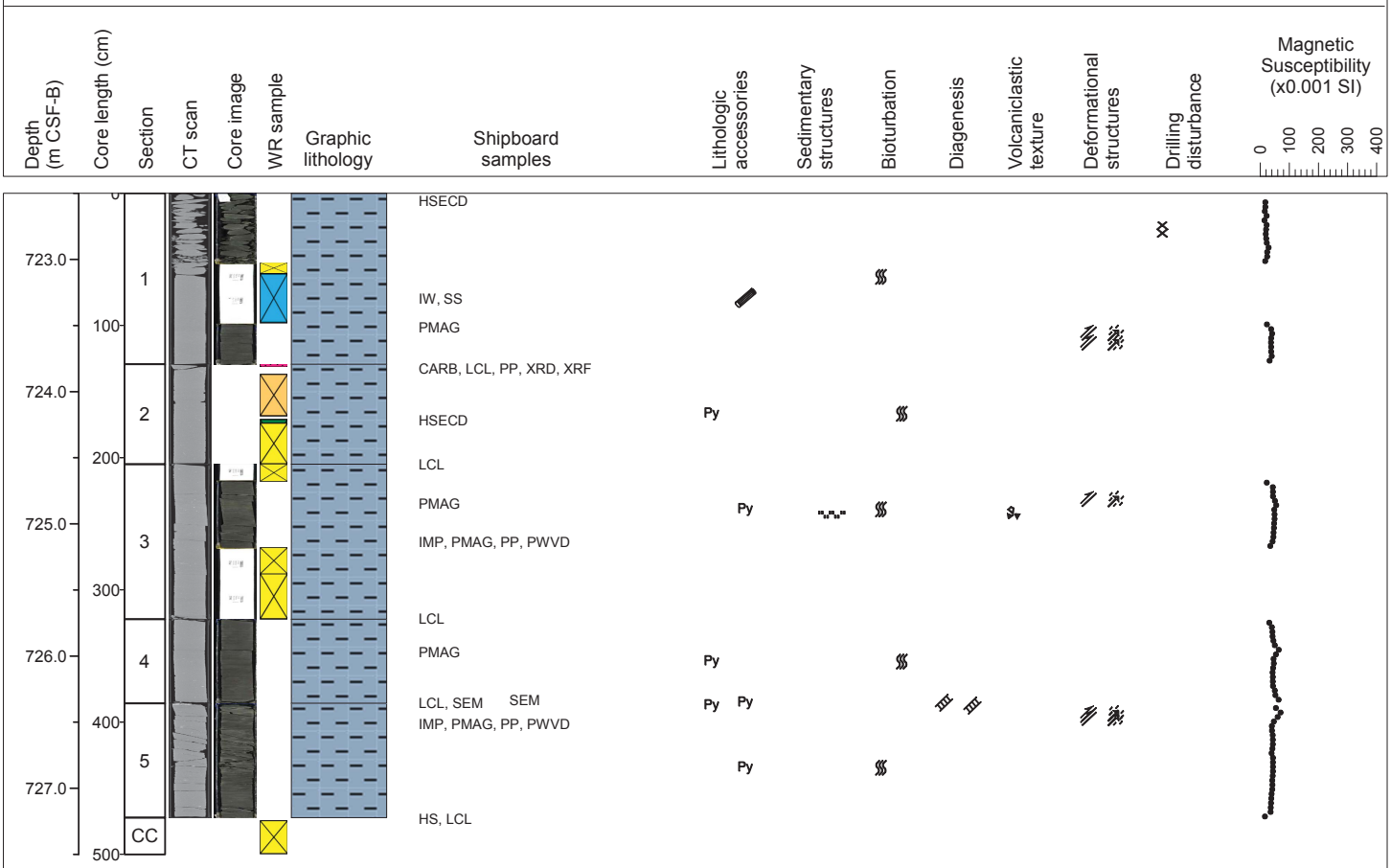
Hole C0023A Core 55R, interval 717.5–722.1 m (core depth below seafloor)

Heavily bioturbated mudstone. Burrows contain high silt content that includes calcite and bioclasts. Similar to 51R.
Healed reverse fault 55R-2, 73–82 cm.



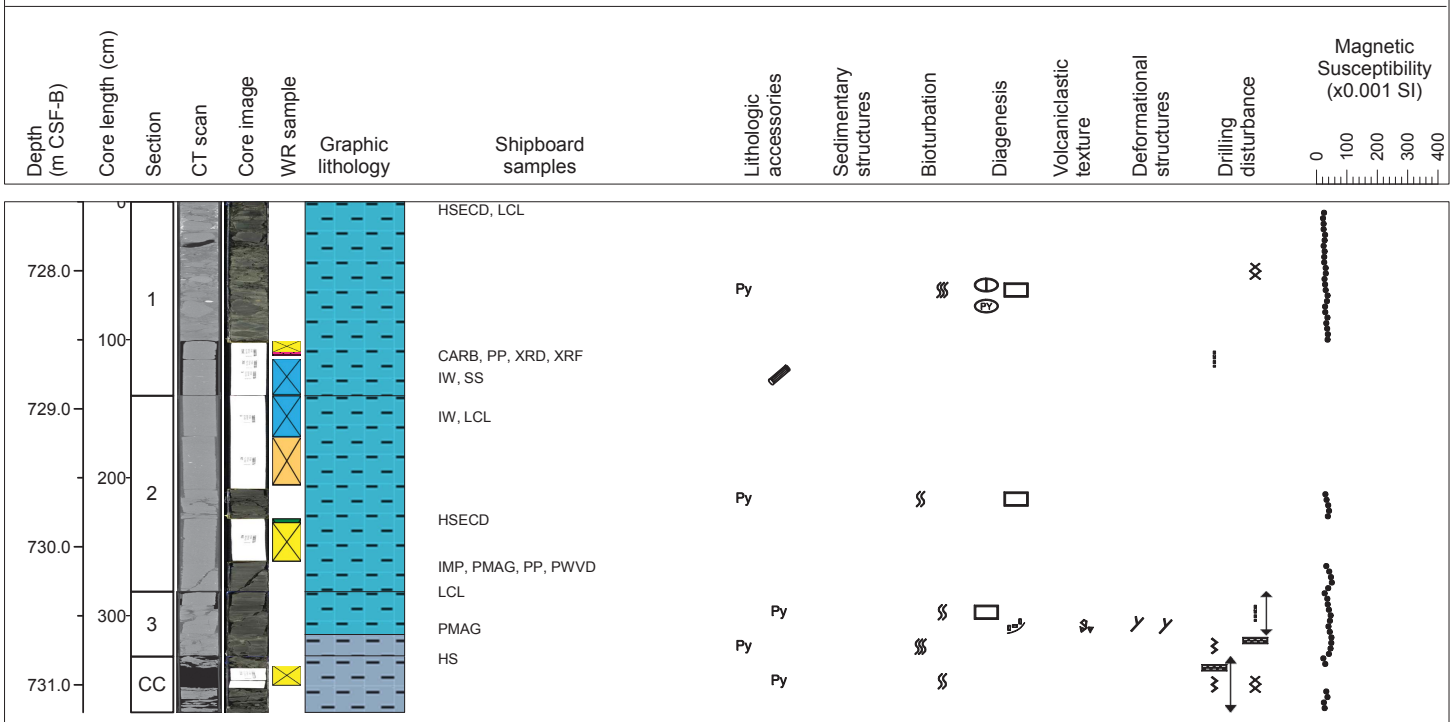
Hole C0023A Core 56R, interval 722.5–727.5 m (core depth below seafloor)

Heavily bioturbated mudstone. Burrows contain high silt content that includes calcite and bioclasts. Similar to 51R. Sandy pyrite vein present , similar to 61R-2. Vein is split between 56R-4 and 56R-5 and is chloritized at margins.
Several reverse faulting with slicken lines (56R-5, 7–15 cm).



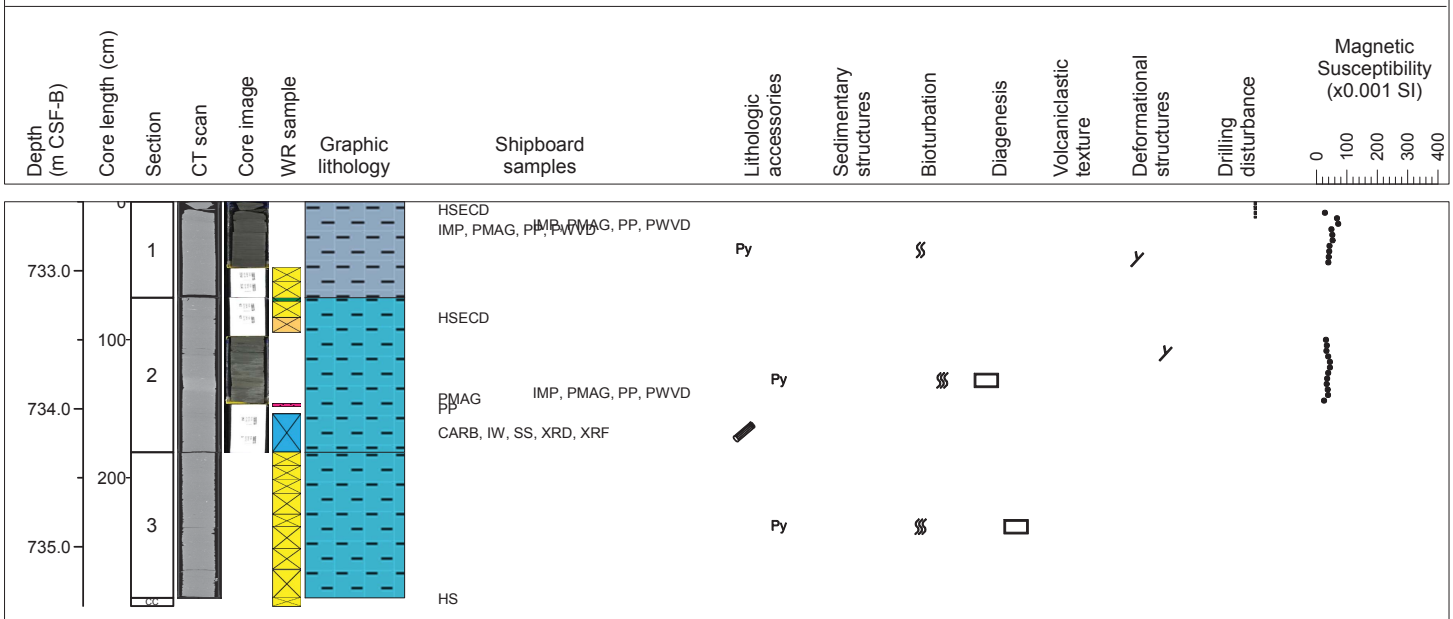
Hole C0023A Core 57R, interval 727.5–731.2 m (core depth below seafloor)

Bioturbated mudstone and calcareous mudstone with intervals where bioturbation is reduced and green-bentonite ash laminae are preserved.



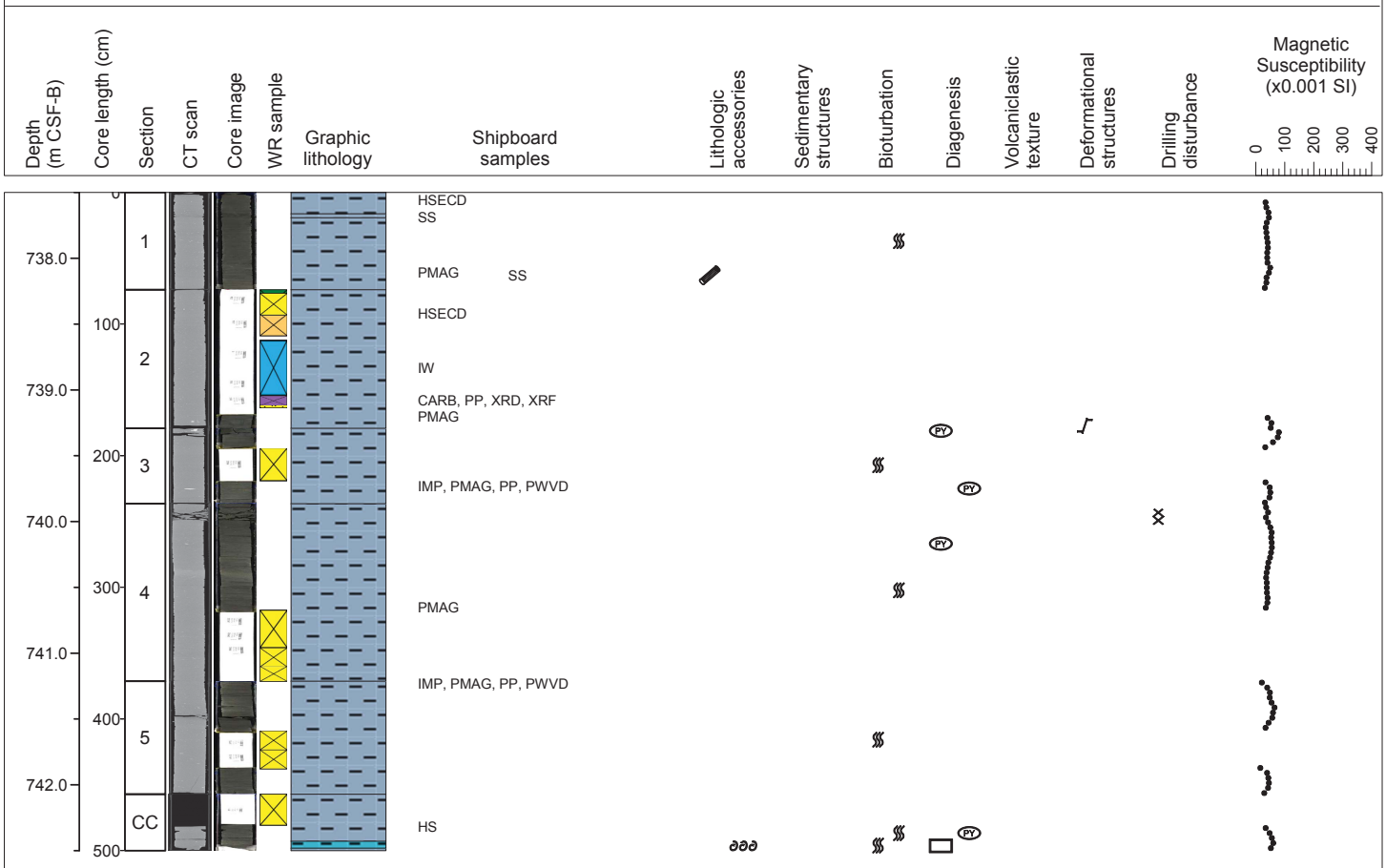
Hole C0023A Core 58R, interval 732.5–735.43 m (core depth below seafloor)

Heavily bioturbated mudstone and thin calcareous mudstones. Burrows contain high silt content and muddy areas contain less silt and bioclasts and more clay, vitric volcanic ash and pelagic grains (calcitic and siliceous nano fossils). Similar to 51R.



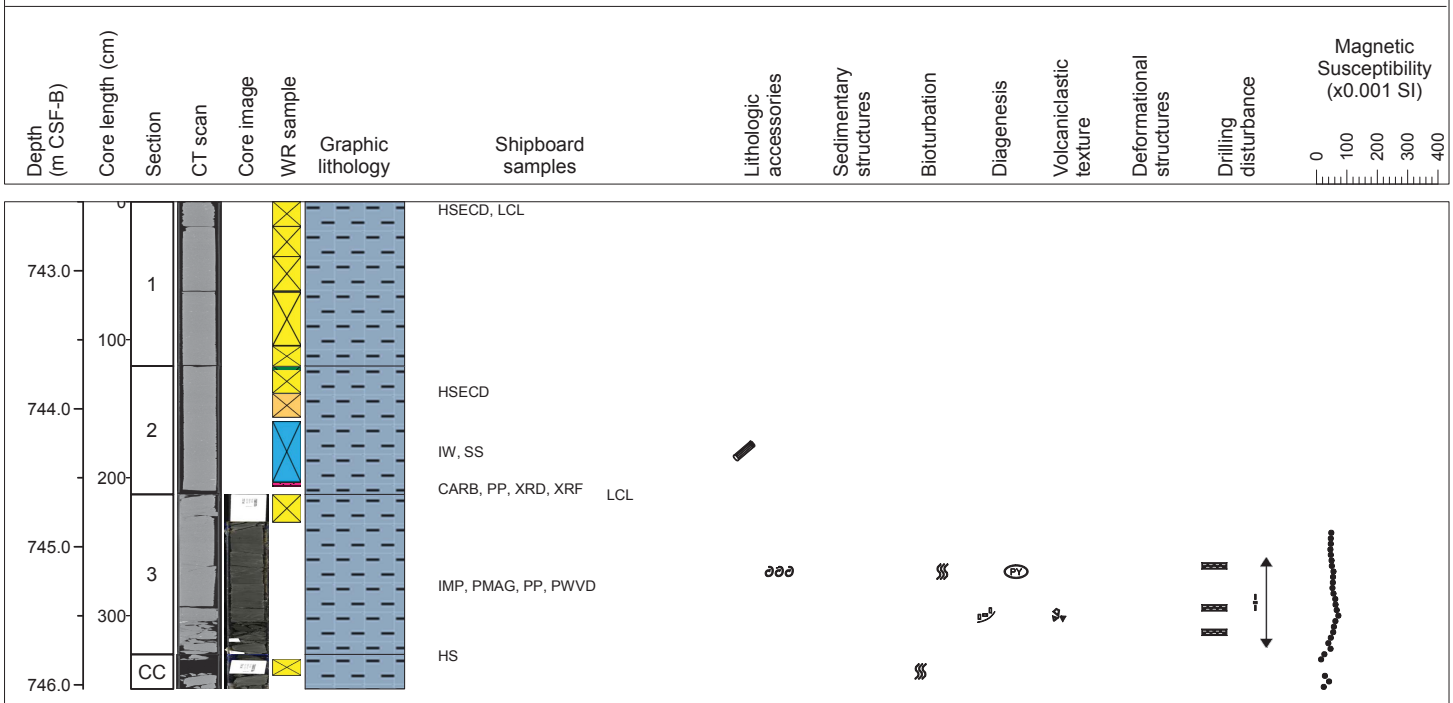
Hole C0023A Core 59R, interval 737.5–742.5 m (core depth below seafloor)

Heavily bioturbated mudstone and calcareous mudstone. Carbonate and pyrite replacement is notable in burrows. Similar to Core 51R.
Healed fault observed 59R-3, 108–109 cm.



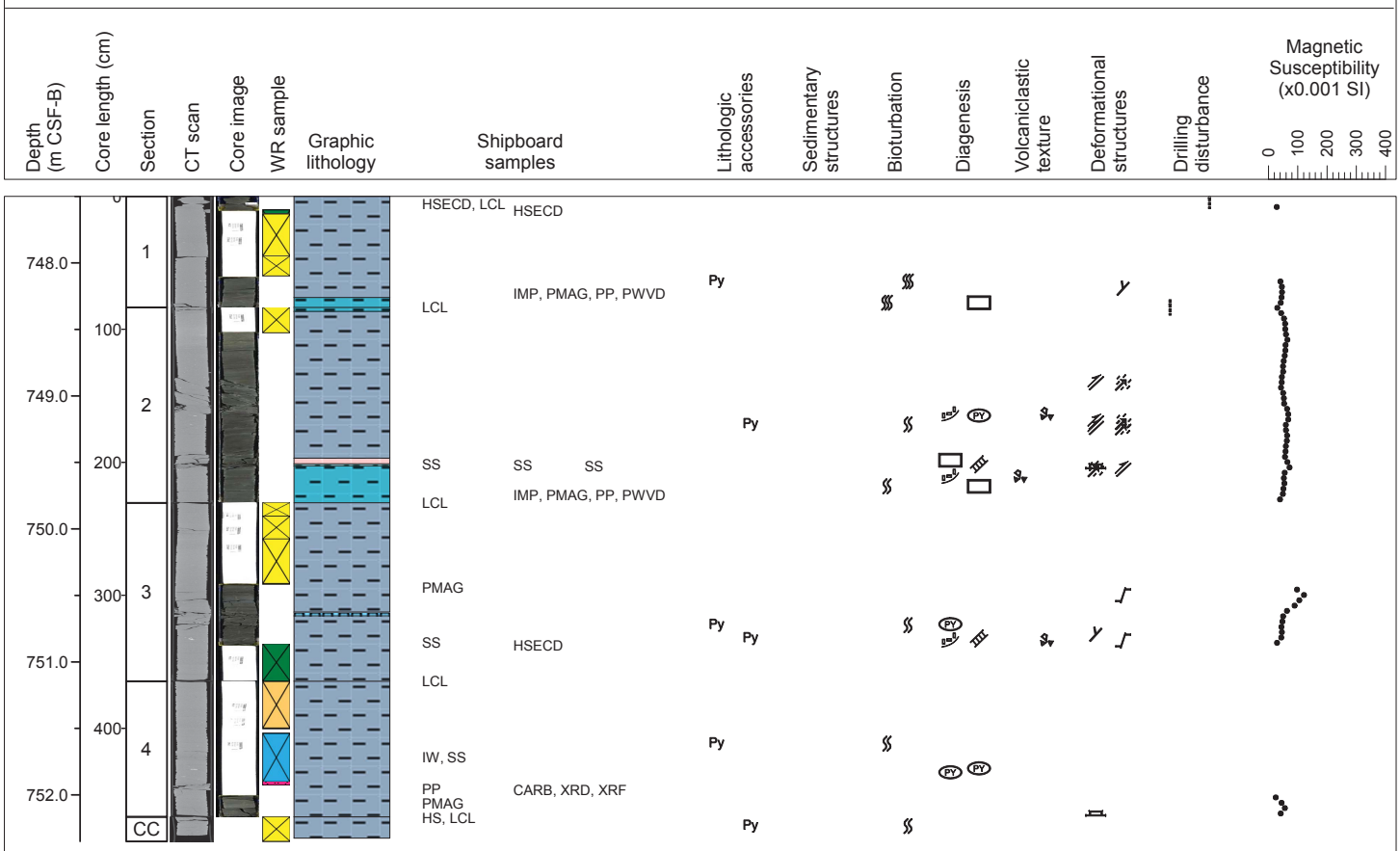
Hole C0023A Core 60R, interval 742.5–746.03 m (core depth below seafloor)

Heavily bioturbated mudstone. Mud component contains a small amount of silt and fine sand; angular quartz, slightly devitrified volcanic glass, minor microcrystalline calcite. Burrows contain shelly bioclasts. Patches of green-colored vitric volcanic ash are often wispy and cut by burrows. Similar to Core 51R.



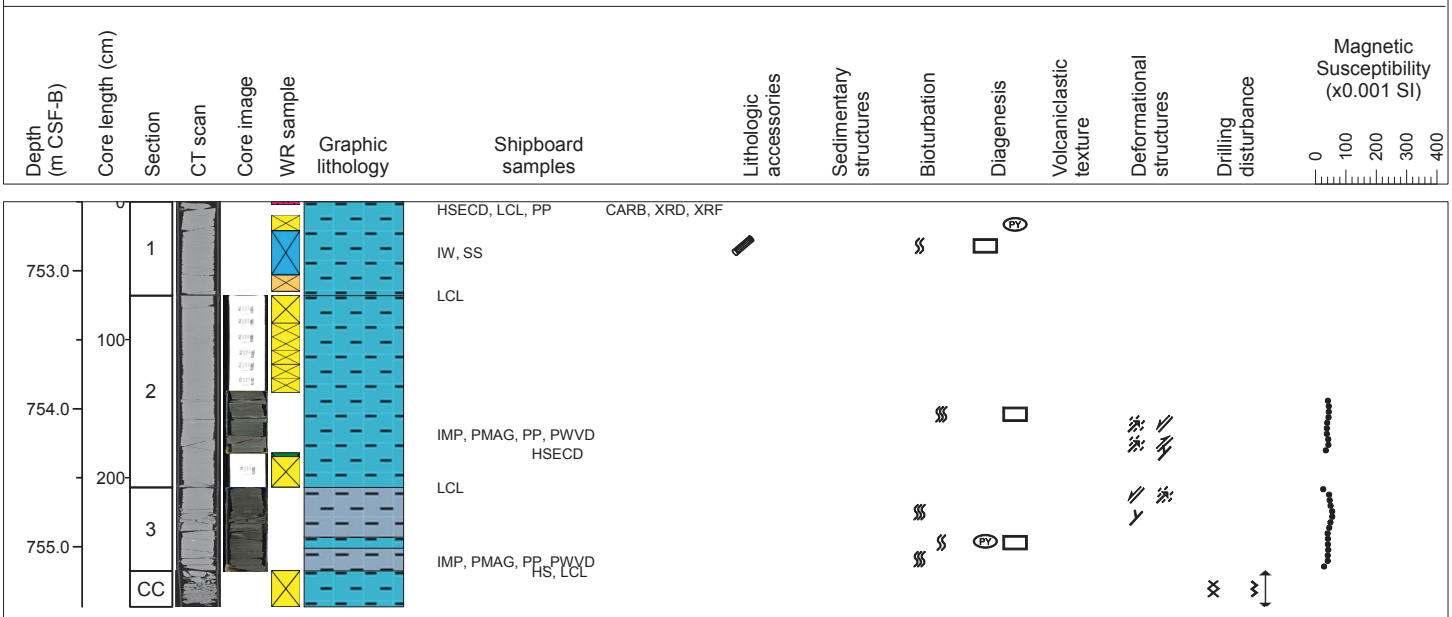
Hole C0023A Core 61R, interval 747.5–752.35 m (core depth below seafloor)

Bioturbated mudstones, calcareous mudstones and intraformational breccias (a breccia comprising clasts of stratigraphically adjacent mudrock). The intraformational breccia. Comprises a mud matrix with larger clasts of burrows(silt-filled bioclast-rich). This breccia is similar to 44R-6 rather than the fault damage zones described later.
Several reverse fault with slicken lines observed 61R-2, 53–122 cm and change in bedding between 61R-2 and 61R-3. Healed faults observed 61R-3, 69–103 cm.
Bedding parallel seam of poorly consolidated silt, sand and pyrite a muddy matrix (61R-2, 117–119 cm), similar to 56R and later observations including 63R and 71R.



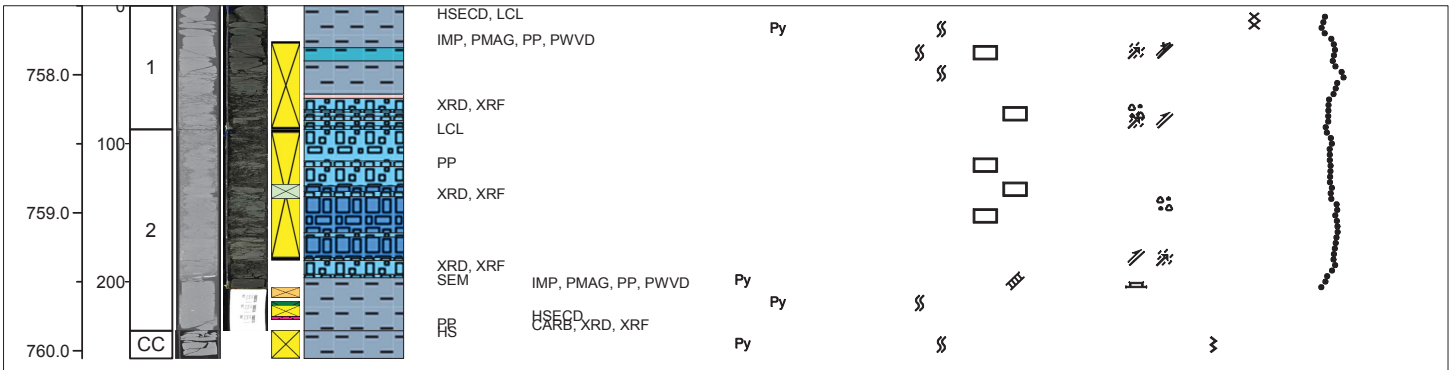
Hole C0023A Core 62R, interval 752.5–755.435 m (core depth below seafloor)

Bioturbated mudstones, calcareous bioturbated mudstones (similar to 60R) and unconsolidated, clast-supported intraformational breccia. The comprising clasts of mudstone that range in size from coarse sand to clasts 3 cm diameter. Carbonate is common within clasts the sand between clasts.
Normal and reverse faults with slicken lines observed 62R-2, 92 cm to 62R-3, 7 cm and bedding dips slightly.



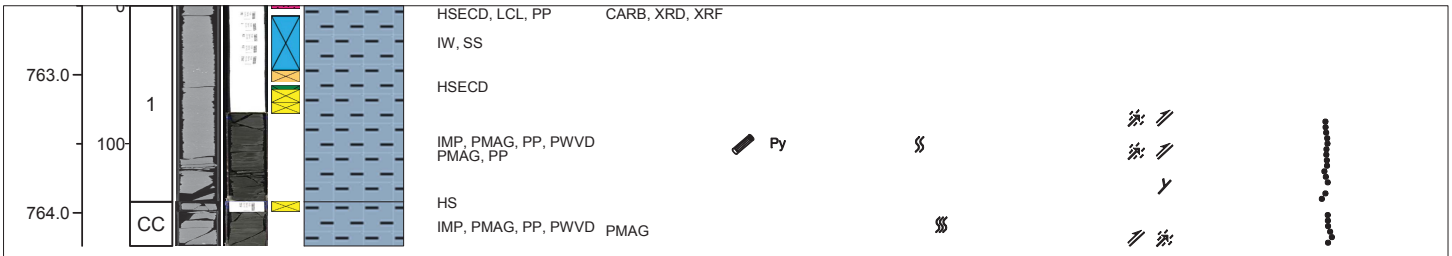
Hole C0023A Core 63R, interval 757.5–760.055 m (core depth below seafloor)

Bioturbated mudstones, bioturbated calcareous mudstones (similar to 60R) cm and unconsolidated and clast-supported intraformational breccia comprising clasts of mudstone. Clasts range in size from coarse sand to clasts > 3 cm width, but clasts size varies to create intervals of a single predominant size range. Clasts have a "jigsaw-fit" and are imbricated along their long axis.
Breccia between 63R-1, 64 cm to 63R-2, 108 cm fault damage zone.
Bedding parallel seam of sand and pyrite mineralization similar to 56R and 61R-2. Some green-colored smectite mineralization 63R-2, 45–48 cm, but alteration minor compared to 71R.



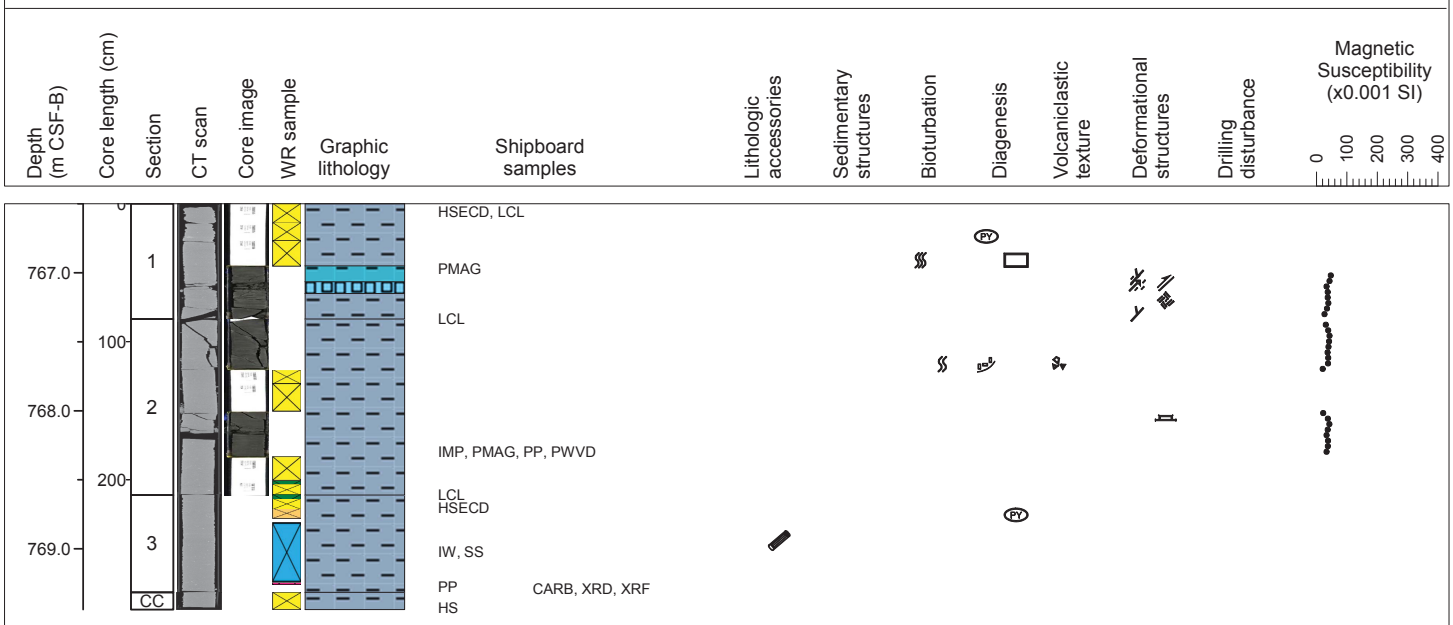
Hole C0023A Core 64R, interval 762.5–764.24 m (core depth below seafloor)

Heavily bioturbated mudstone similar to 60R.
Reverse faulting with slicken lines observed 64R-2, 78–105 cm and in 64R-CC. Slight dip in bedding deduced from lamination.



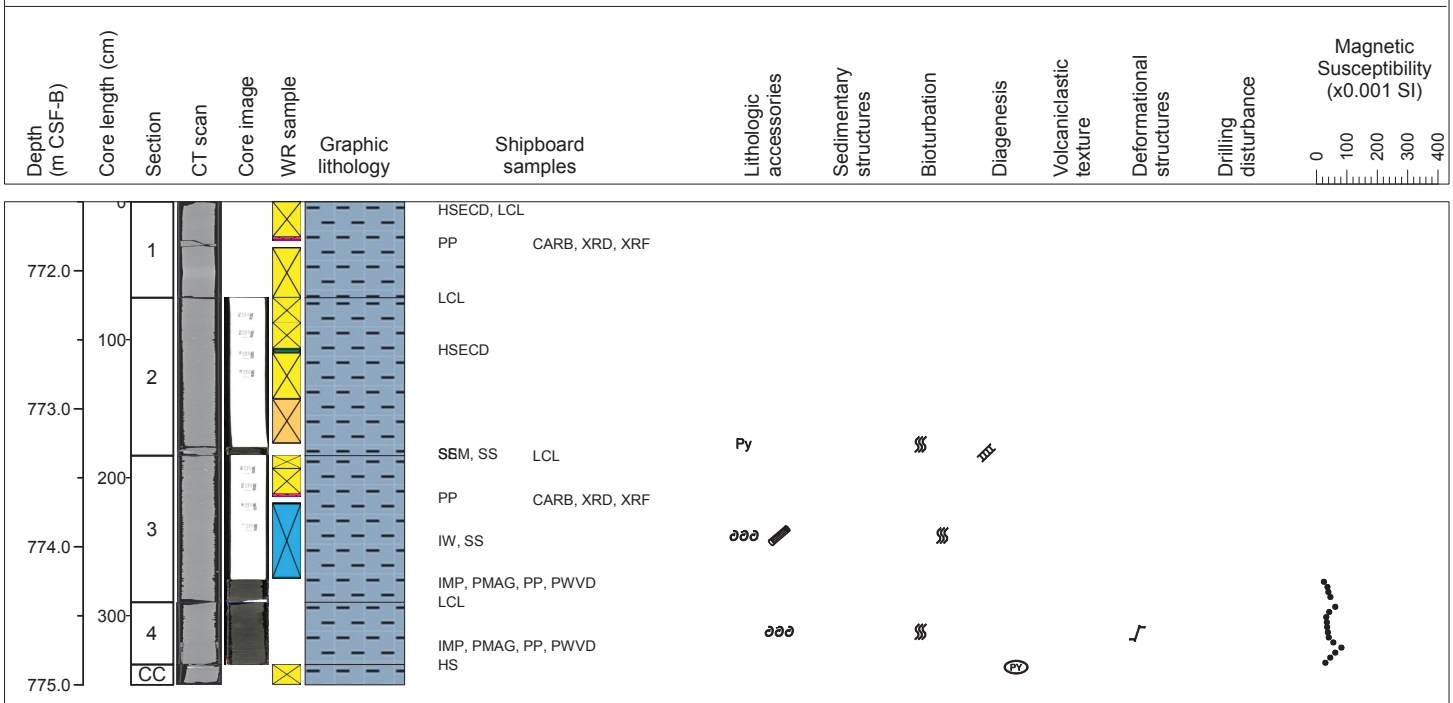
Hole C0023A Core 65R, interval 766.5–769.44 m (core depth below seafloor)

Bioturbated mudstones, bioturbated calcareous mudstones (similar to 60R) cm and unconsolidated, intraformational breccia with imbricated "jigsaw-fit" clasts of mudstone (similar to 63R).
Fracture zone coincides with breccia 65R-1, 65–75 cm and reverse faults with slicken lines.65R-1, 57–58 cm.



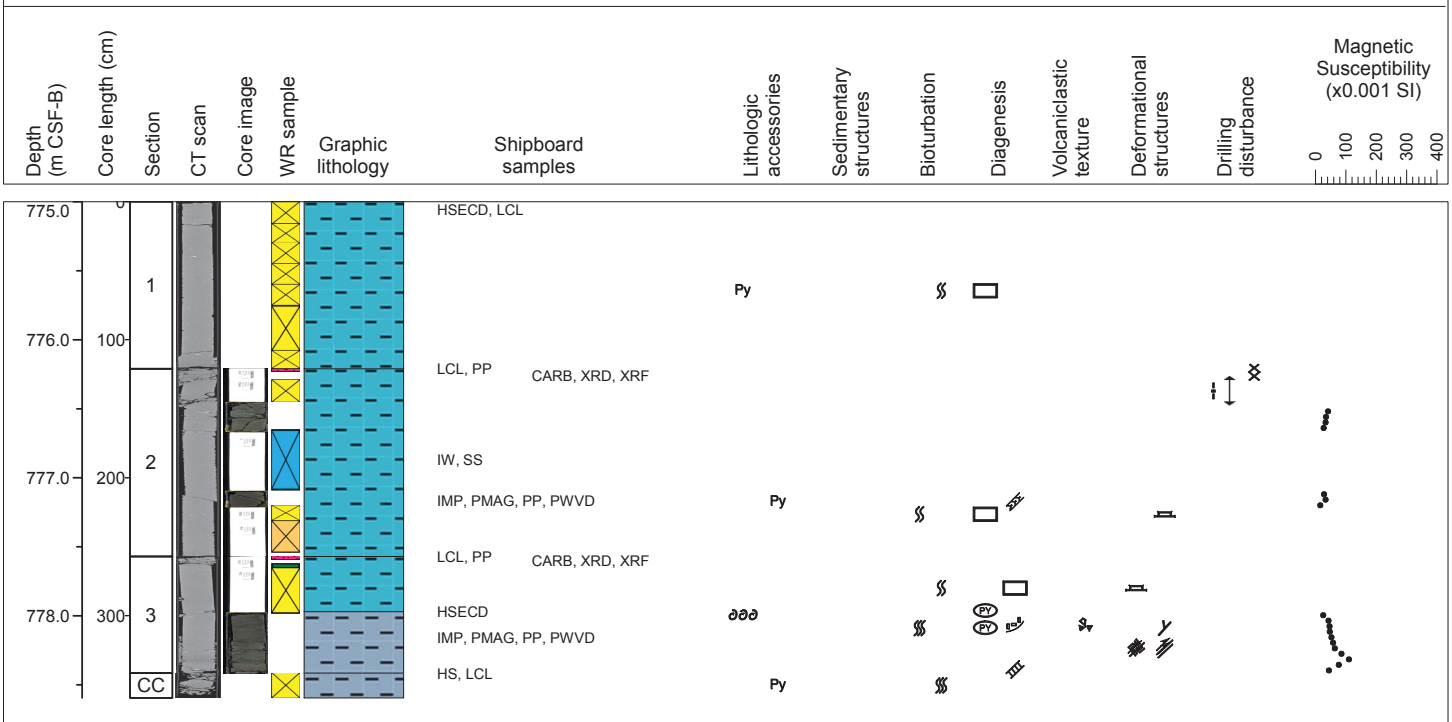
Hole C0023A Core 66R, interval 771.5–775 m (core depth below seafloor)

Heavily bioturbated shelly mudstone similar to 60R except for shell-content. Most of the shell content is within burrows.
Healed fault observed at 66R-4, 17–32 cm
Pyrite and sand seam at 66R-1, 117.5–124.5 cm has morphology of burrow fill. Compare to similar veins core 56R and also 63R-2, 106–108 cm, 67R-3, 81–82 cm, 67R-CC, 5–8 cm.



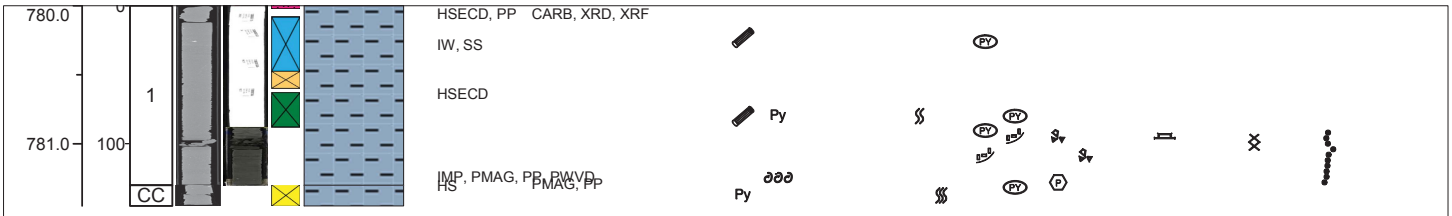
Hole C0023A Core 67R, interval 775–778.595 m (core depth below seafloor)

Bioturbated mudstones and calcareous bioturbated mudstones with some green-colored ash layers preserved.
Bedding is generally horizontal except for the lower part of 67R-3 which dips slightly and in which burrows look elongated and strained. Fracture network with reverse faults and slicken lines 67R-3, 64–68 cm.
Anhydrite/Barite vein at 67R-2, 31 cm and tigmatic clay-vein filled with red silt (low pyrite content). 67R-3, 81 cm.



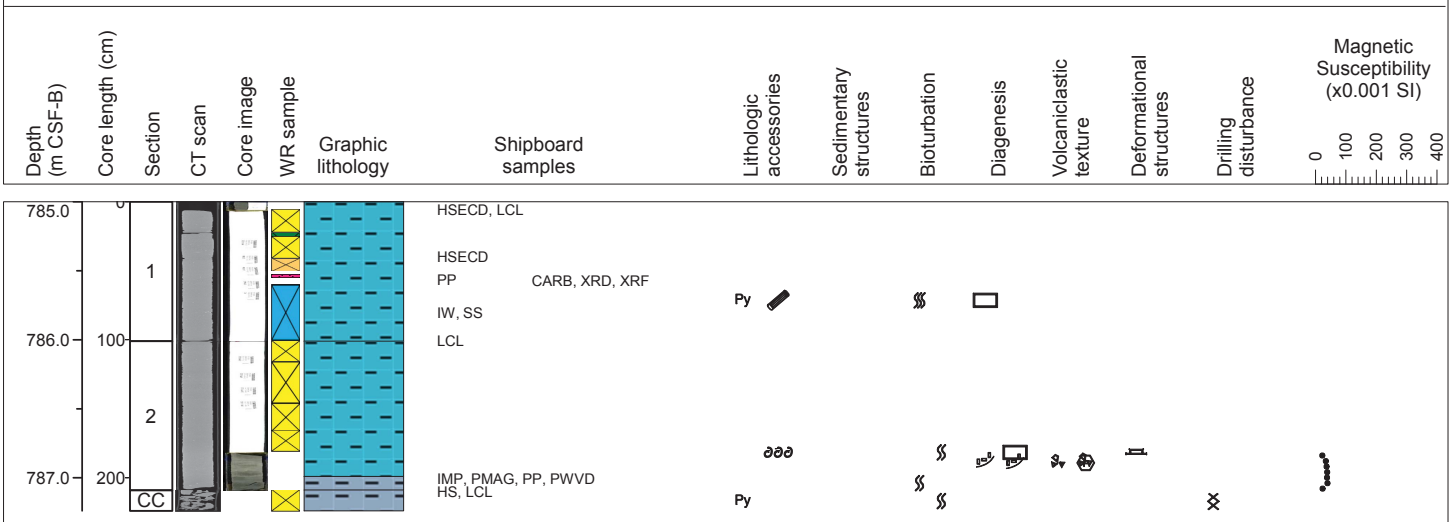
Hole C0023A Core 68R, interval 780–781.45 m (core depth below seafloor)

Heavily bioturbated mudstone (similar to 41 to 45 R) where there is a distinction between burrow content and mudrock. Burrow fill includes silt and sand-sized bioclasts, ash and volcaniclastics (often detrital igneous crystals). Burrowing disrupts other burrows and ash layers.
Bedding is generally horizontal.



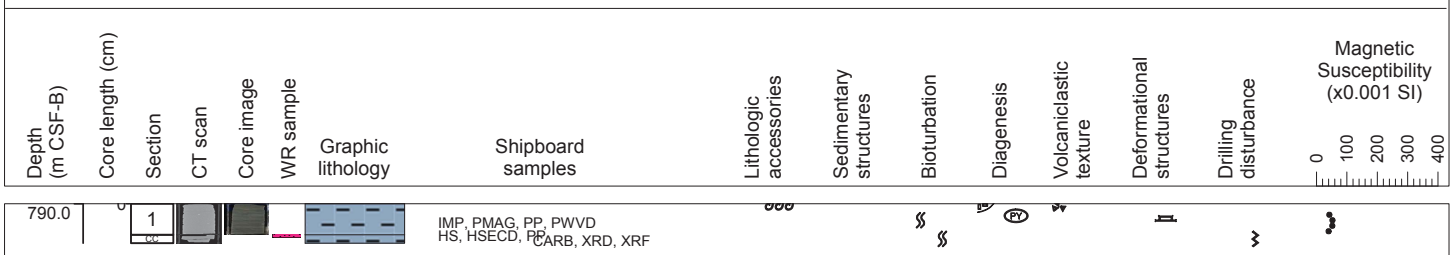
Hole C0023A Core 69R, interval 785–787.24 m (core depth below seafloor)

Bioturbated mudstone and calcareous bioturbated mudstone. Preservation of some green-bentonite ash layers. Note abrupt color change from calcareous mudstone to mudstone on 69R-2.
Bedding is horizontal.



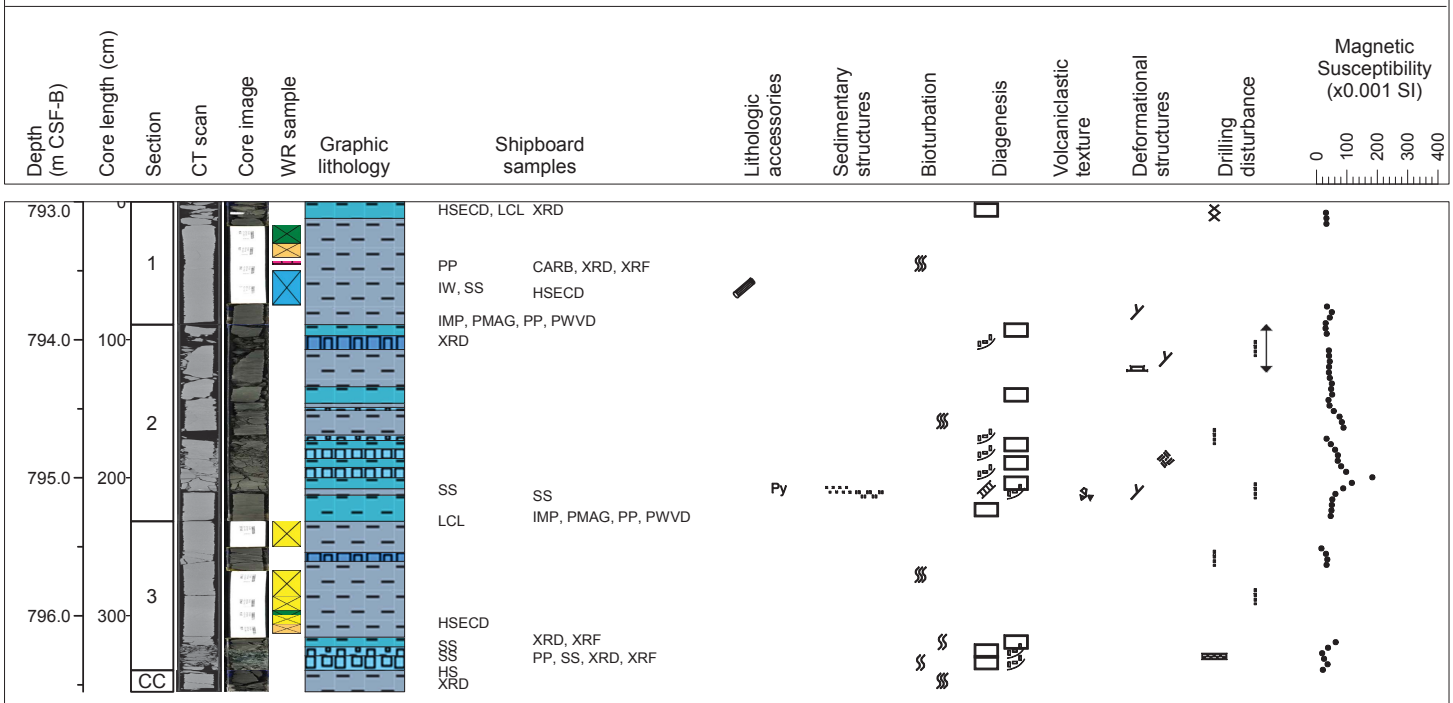
Hole C0023A Core 70R, interval 790–790.285 m (core depth below seafloor)

Bioturbated mudstone with burrows similar to 60R.
Ichnofabric and green-volcanic ash laminae suggest bedding horizontal.



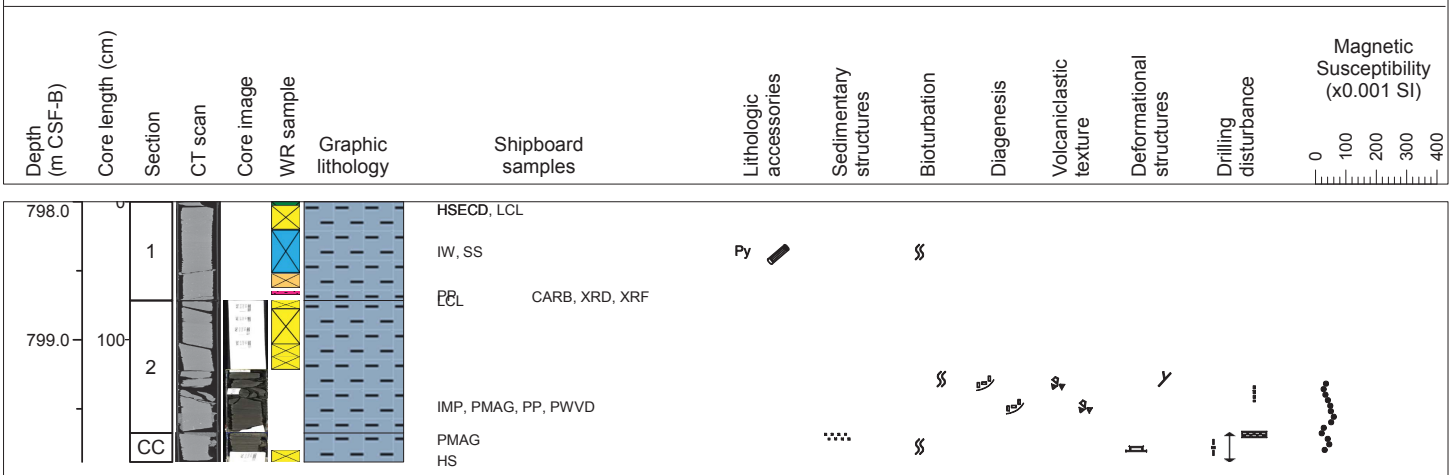
Hole C0023A Core 71R, interval 793–796.55 m (core depth below seafloor)

Heavily brecciated interval of bioturbated mudstone with zones of pervasive clay alteration. The mudstone is similar to that seen in cores 43R–69R, and contains two lithological elements; intervals of silty burrow-fill and host mudrock. In this interval calcite cementation is pervasive. Many breccia horizons are present and chloritization and the formation of green-colored smectite is common within these intervals. The clast size of breccia fragments varies from a few mm to 10's of mm. The surface of individual clasts is slick, and breccia-clasts have an imbricated "jigsaw-like" fit in X-CT images prior to core splitting.
A fracture network with a shear fabric is present 71R-2, 88–107 cm.



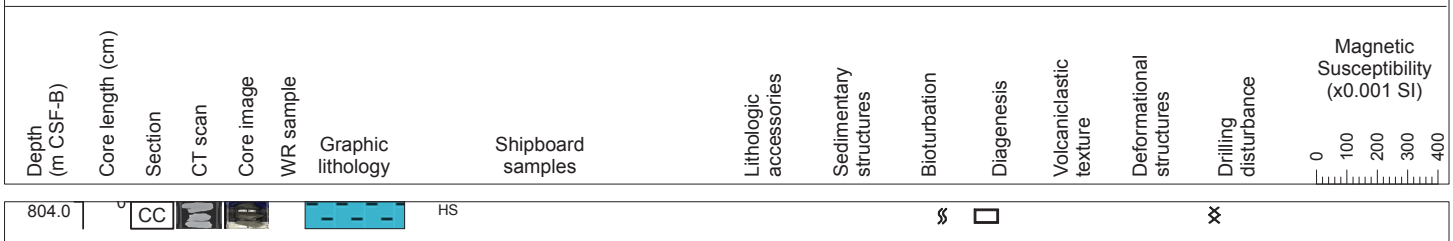
Hole C0023A Core 72R, interval 798–799.885 m (core depth below seafloor)

Bioturbated mudstone and calcareous bioturbated mudstone. Preservation of some green-bentonite ash layers. Note abrupt color change from calcareous mudstone to mudstone on 69R-2.
Bedding is horizontal.



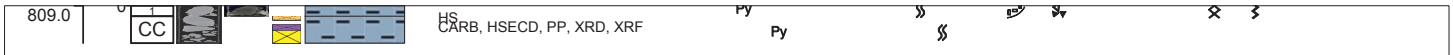
Hole C0023A Core 73R, interval 804–804.195 m (core depth below seafloor)

Three clasts of calcareous mudrock similar to previous calcareous mudrock in 71R.



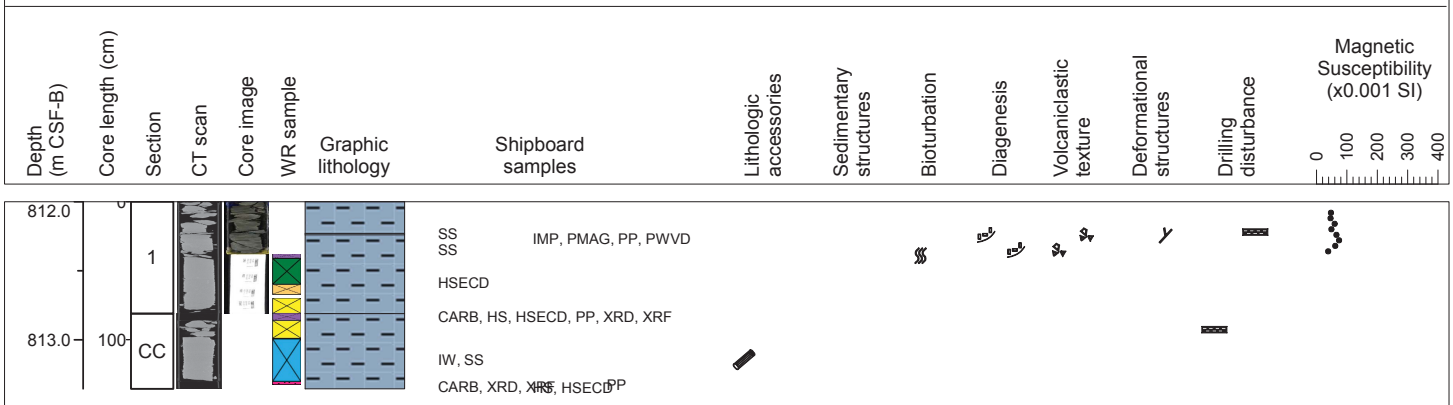
Hole C0023A Core 74R, interval 809–809.27 m (core depth below seafloor)

Drill breccia comprising a few 5-10 cm length clasts of bioturbated mudrock (less bioturbated and green-bentonite ash layer present) similar to 72R-CC mudstone, as opposed to calcite cemented clasts from 73R.



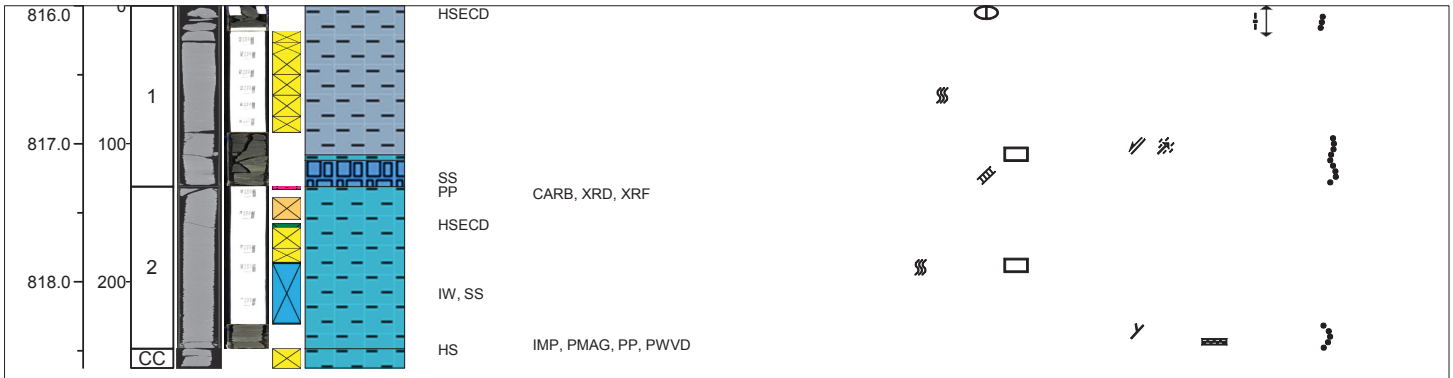
Hole C0023A Core 75R, interval 812–813.355 m (core depth below seafloor)

Bioturbated mudstone and calcareous bioturbated mudstone. Preservation of some green-bentonite ash layers. The ash layer is predominantly clay and contains fine vitric-volcanic ash. A patch in 75R-1, 23-24 cm is pale yellow in color and appears altered but does not contain chlorite. Based on XRD analysis this may be a thin clay-alteration zone. Injected black-colored clastic vein at 75R-1, 24 cm (floating clasts of surrounding wall rock and some pyrite within. See clastic vein at 76R-1, 122.5 cm).
Bedding plane dips slightly.



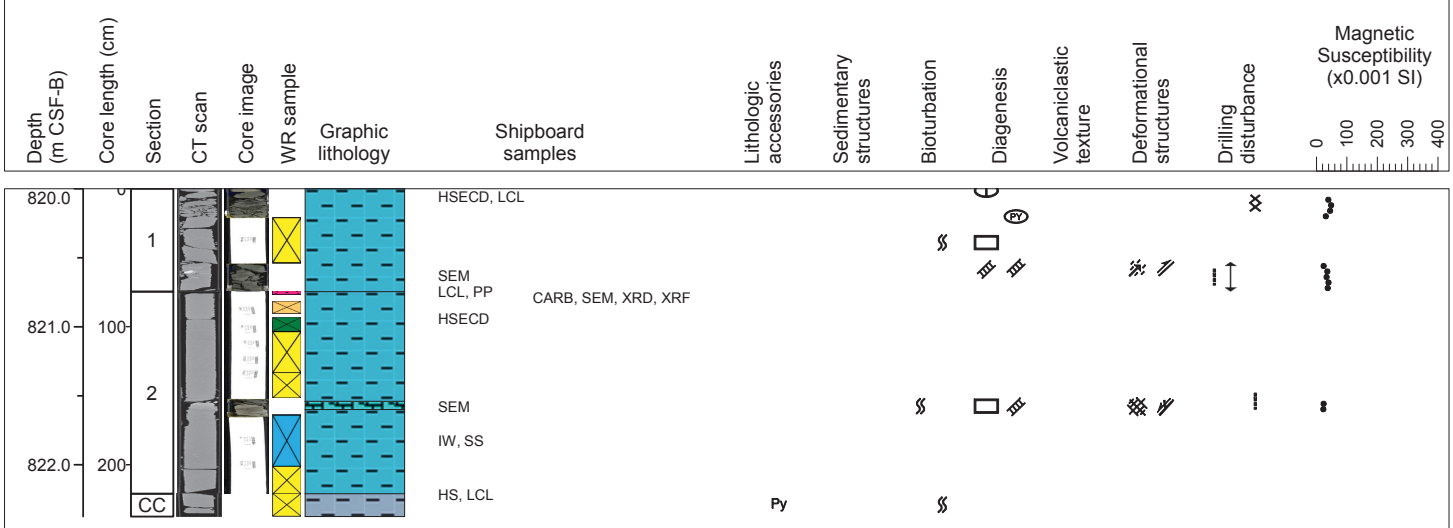
Hole C0023A Core 76R, interval 816–818.625 m (core depth below seafloor)

Bioturbated mudstones and bioturbated calcareous mudstones. A brecciated and well cemented interval is present 76R-1, 112-129 cm; it comprises matrix supported carbonate clasts. The clasts contain numerous nanofossils including discoasters and forams, and microcrystalline carbonate. A dark vein with an injection morphology is present within the breccia (about 1 cm diameter). The vein is clastic and has fine sand to silt sized clasts of pumice and scoria (small red fragments).
76R-1, 93–110 cm normal faulting with slickenlines.



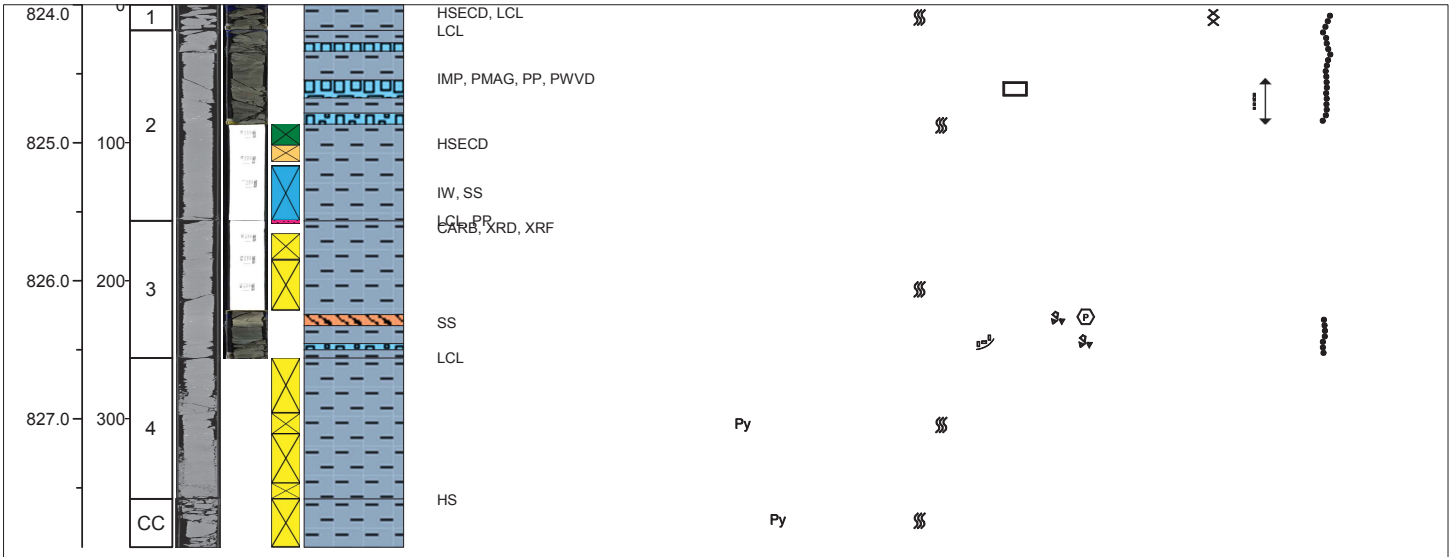
Hole C0023A Core 77R, interval 820–822.375 m (core depth below seafloor)

Bioturbated calcareous mudstone and bioturbated mudstone. Pervasive calcite and sulfate mineralization. In difference to shallower cores calcite cementation overprints ichnofabrics at 77R-2, 77 cm. Additionally there is also anhydrite and barite. Sulfate mineralization also occurs along veins parallel to slickened surfaces, and takes the form of seams 2 mm thick. Within are euhedral rhombic calcite crystals (< 100 um), and massive barite crystals (massive - two cleavages visible in rectangular cross section and bright on X-CT). Smectite, barite and calcite mineralization also found within beds.
Reverse faulting and slickenlines at 77R-1, 55–60 cm and 77R-2, 81–86 cm.



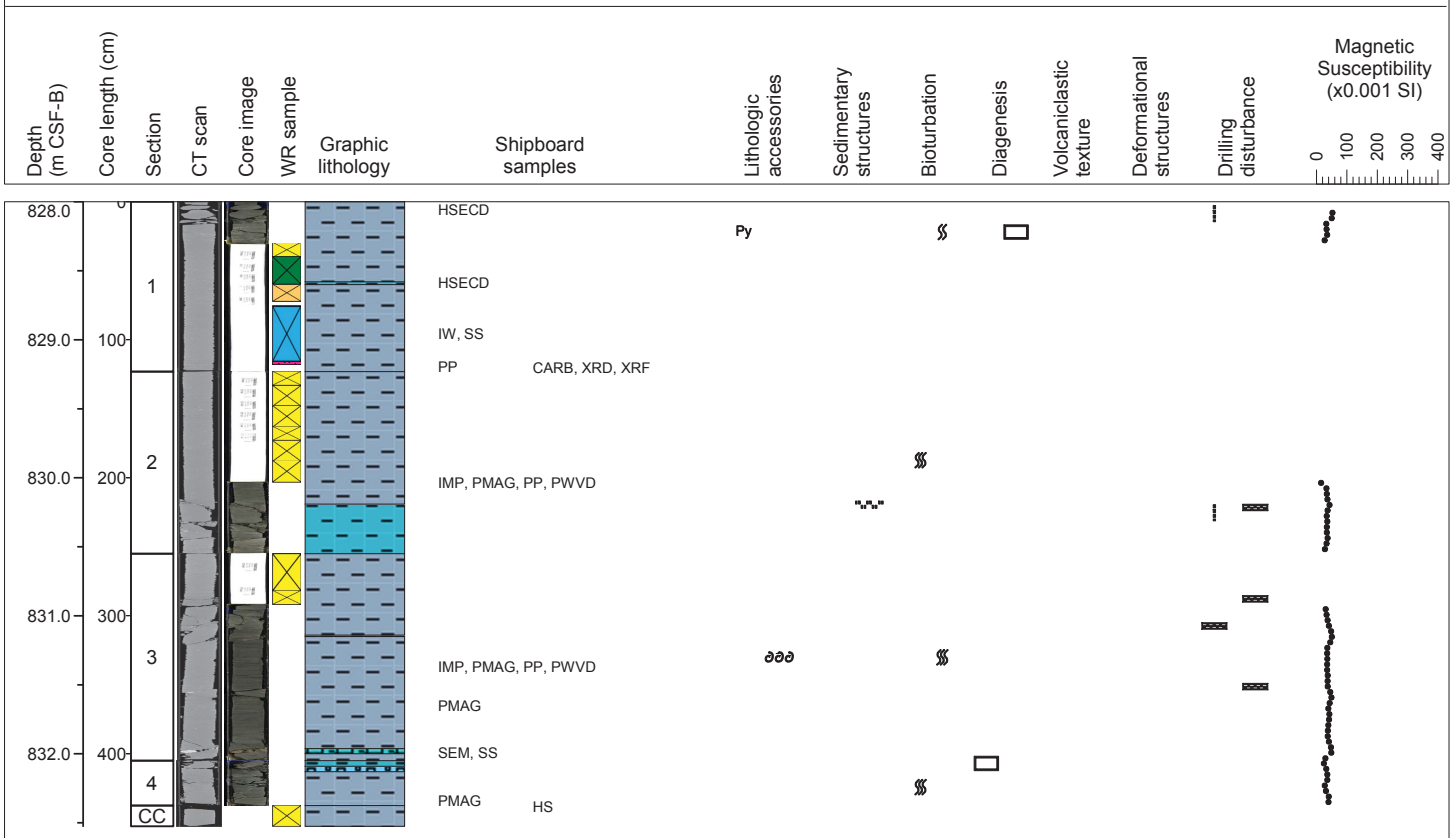
Hole C0023A Core 78R, interval 824–827.93 m (core depth below seafloor)

Bioturbated mudstone with patches of brecciating and strata-associated hydrothermal alteration. Within the hydrothermal-alteration patch there is no strong reaction with HCl, and no bright zone on X-CT.
XRD suggest clay and smectite alteration.



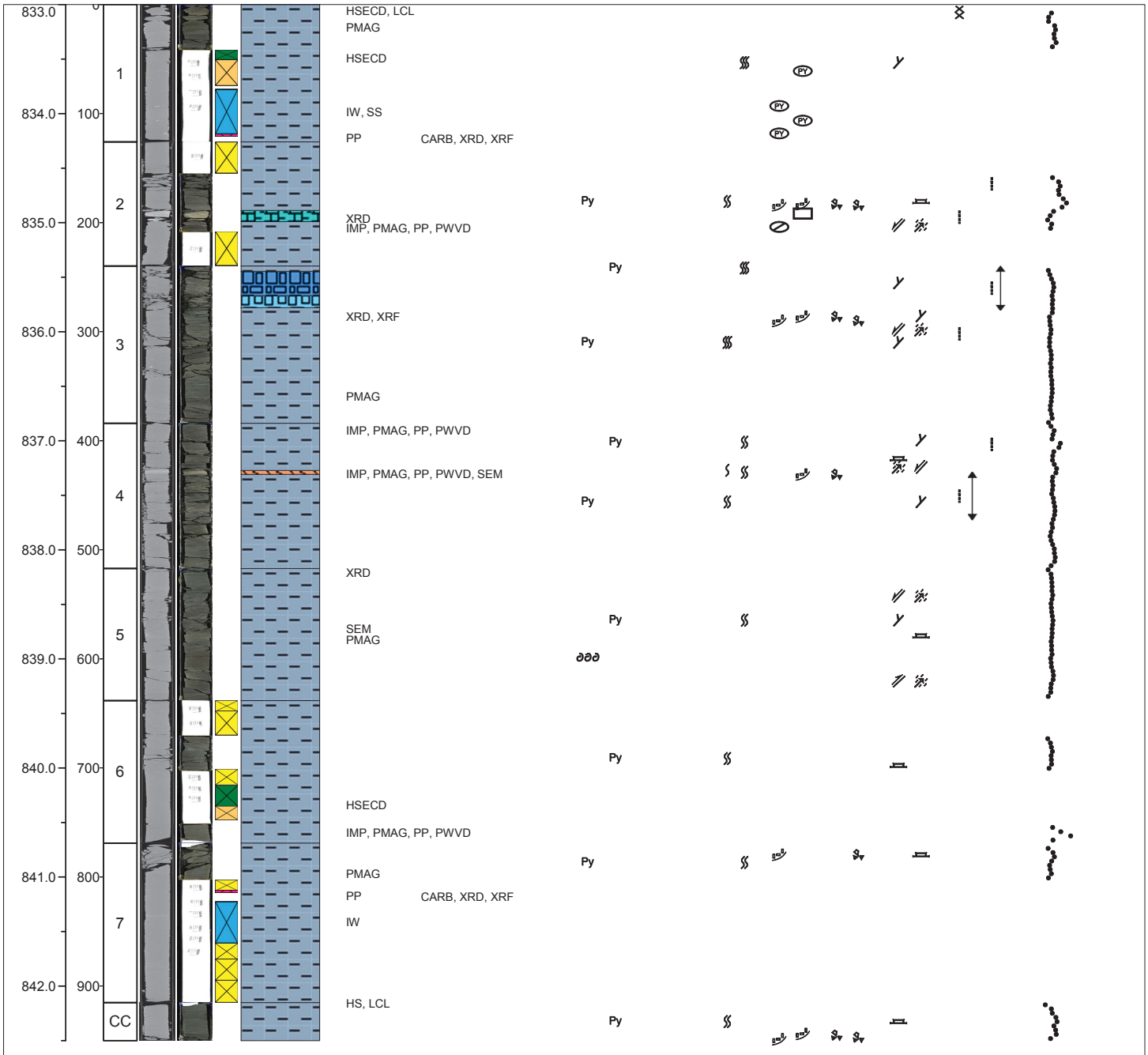
Hole C0023A Core 79R, interval 828–832.525 m (core depth below seafloor)

Bioturbated mudstone with patches of brecciation and strata-associated and vein- hydrothermal alteration. 79R-3 interval with numerous cm-sized burrows filled with shelly fragments. Dense yellow clay-rich interval at the base of 79R-3 contains smectite, illite, rhodochrosite, anhydrite, pyrite, and calcite.



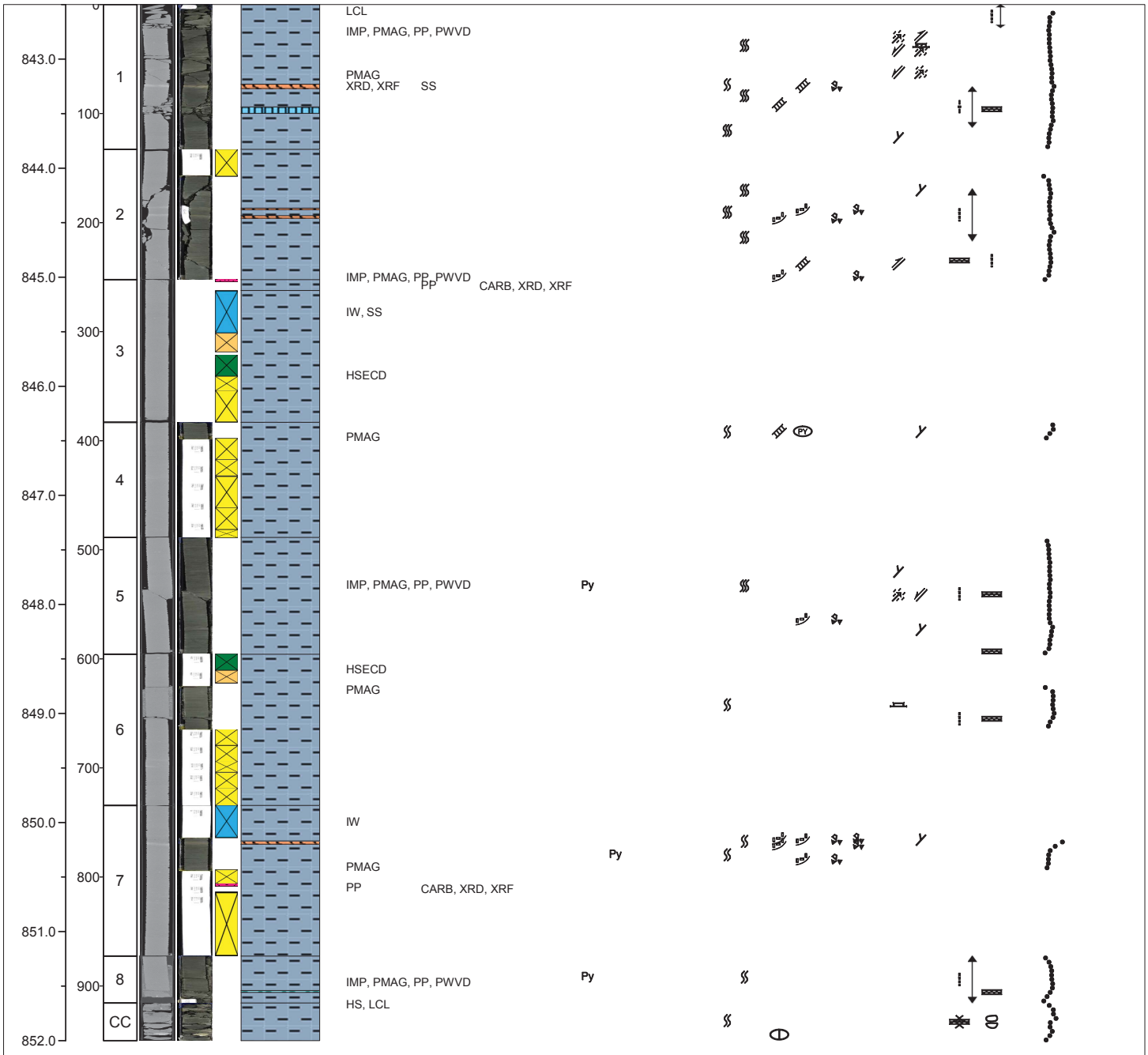
Hole C0023A Core 80R, interval 833–842.5 m (core depth below seafloor)

Bioturbated mudstone with patches of strata-associated hydrothermal alteration and intraformational breccias. Pale white barite and calcite cementation at 80R-2, 65–75 cm is similar to cemented interval in 77R-2, 77–90 cm. Alteration preferentially picks out burrows. XRD and SEM show that the cement consists of smectite, illite, magnesian-calcite, rhodochrosite and carbonate-fluorapatite.
Fault (vein) associated sulfate mineralization (anhydrite, barite, carbonate) 80R-5, 4 and 61 cm
Normal faulting with slickenlines observed 80R-2 to 80R-5 and reverse faulting with slicken lines also observed base of 80R-5. Horizontal and slightly dipping beds are repeated several times.



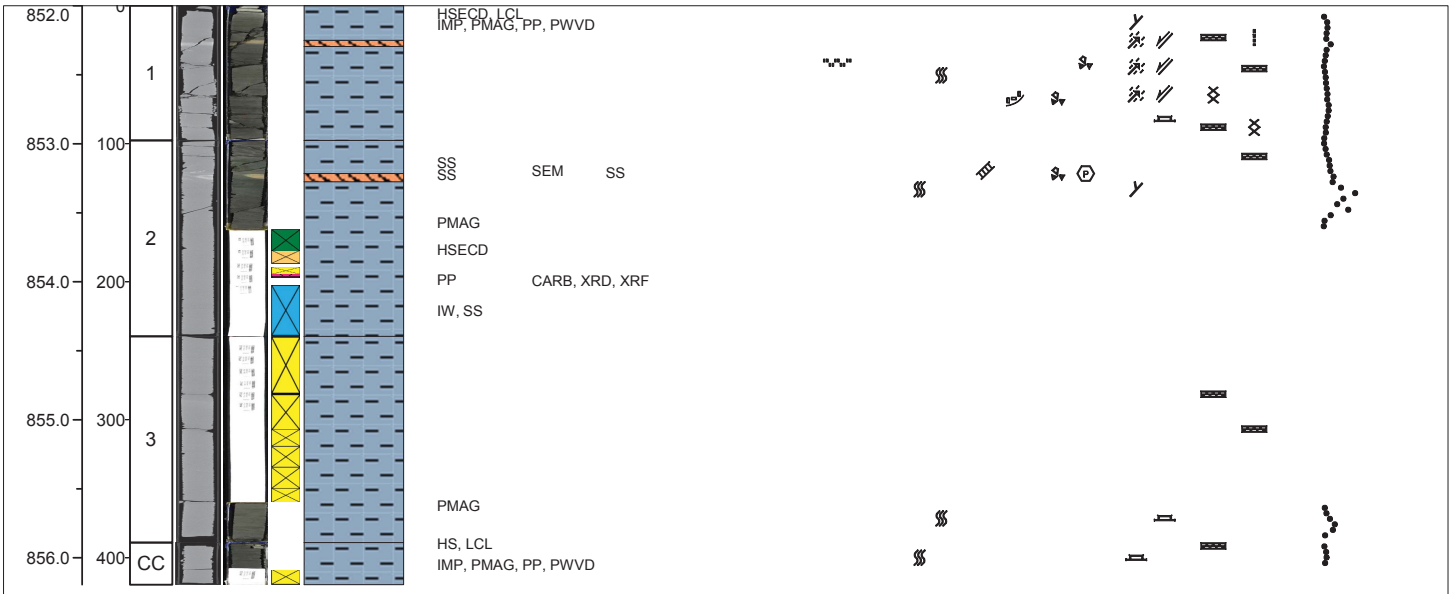
Hole C0023A Core 81R, interval 842.5–852 m (core depth below seafloor)

Bioturbated mudstone with laminae of green-bentonite volcanic ash. Sulfate and sulfide mineralization occurs within ash and volcaniclastics-rich layers and also within faulted and slickened surfaces. Layers containing ash and other volcaniclastics are often altered to pale yellow in color. Within these intervals black-colored silt-sized clast of opaque pumice and white-colored igneous volcaniclastics are more noticeable. Euhedral Anhydrite and Framboidal Pyrite are present (about 5–15 %). Sulfate (barite and anhydrite) crystals and veins cut mineralised interval. Veins are muddy and in many cases same color as grey country rock. Comparable to 78R, 80R, and 83R.
Normal and reverse faulting with slicken lines is observed and at 81R-2, 106.5 cm dolomite is present along slickenside (reverse fault). Beds dip slightly.



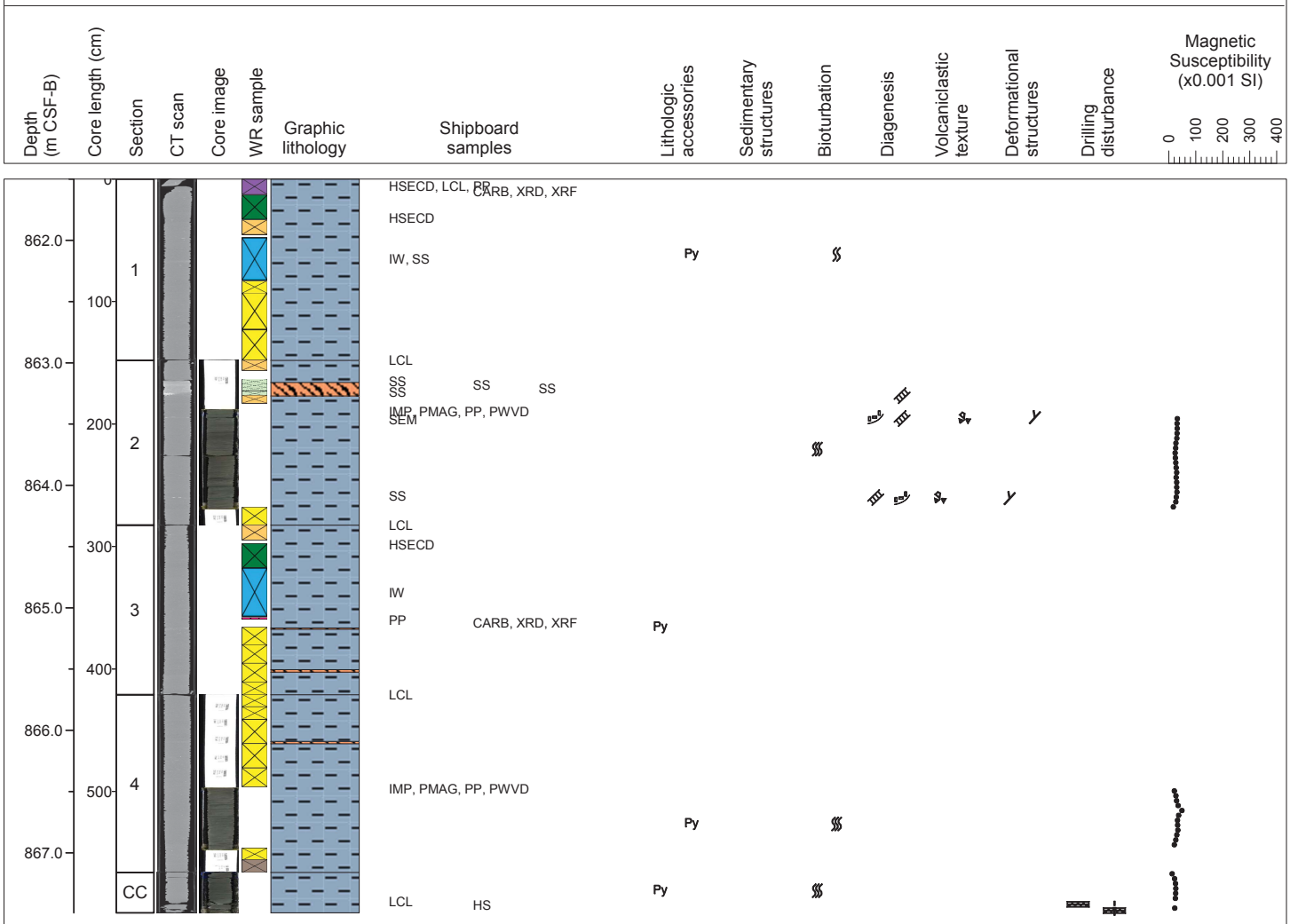
Hole C0023A Core 82R, interval 852–856.195 m (core depth below seafloor)

Bioturbated mudstone with several instances of pale-yellow colored alteration patches. Within the patches dark-angular-glass is more noticeable. Main alteration minerals include anhydrite clay and calcite (little pyrite). Between patches and country rock there is a gradational change in color and the outline of burrows is preserved. See also 78R-3, 80R-4, 81R-1, 81R-2, 81R-7.
Normal faults with slickenlines observed 82R-1.



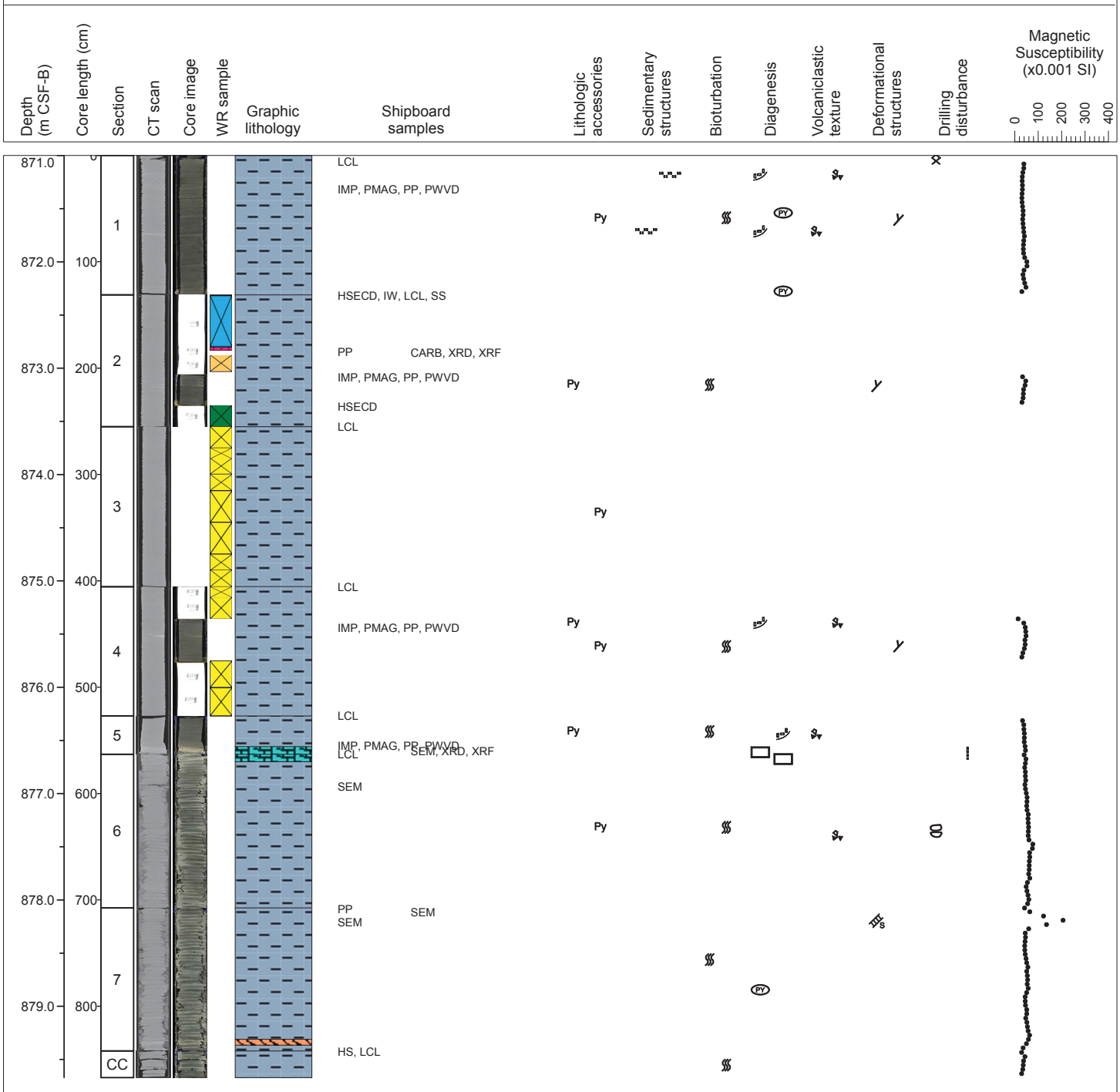
Hole C0023A Core 83R, interval 861.5–867.49 m (core depth below seafloor)

Bioturbated mudstone with patches of strata-associated hydrothermal alteration
At 83R-2, 19–29 cm is a zone of pervasive strata-bound sulfate and clay mineralization (Anhydrite or Barite). A vein (2 cm thick) of barite and anhydrite cuts into the bedding plane and zone of mineralization. At 83R-2, 47 cm is a bedding parallel vein (1 cm thick) of octahedral pyrite with partially anhedral calcite and a strong green coloration (likely chlorite given context). SEM found abundant pyrrhotite to be present.
Beds dip slightly.



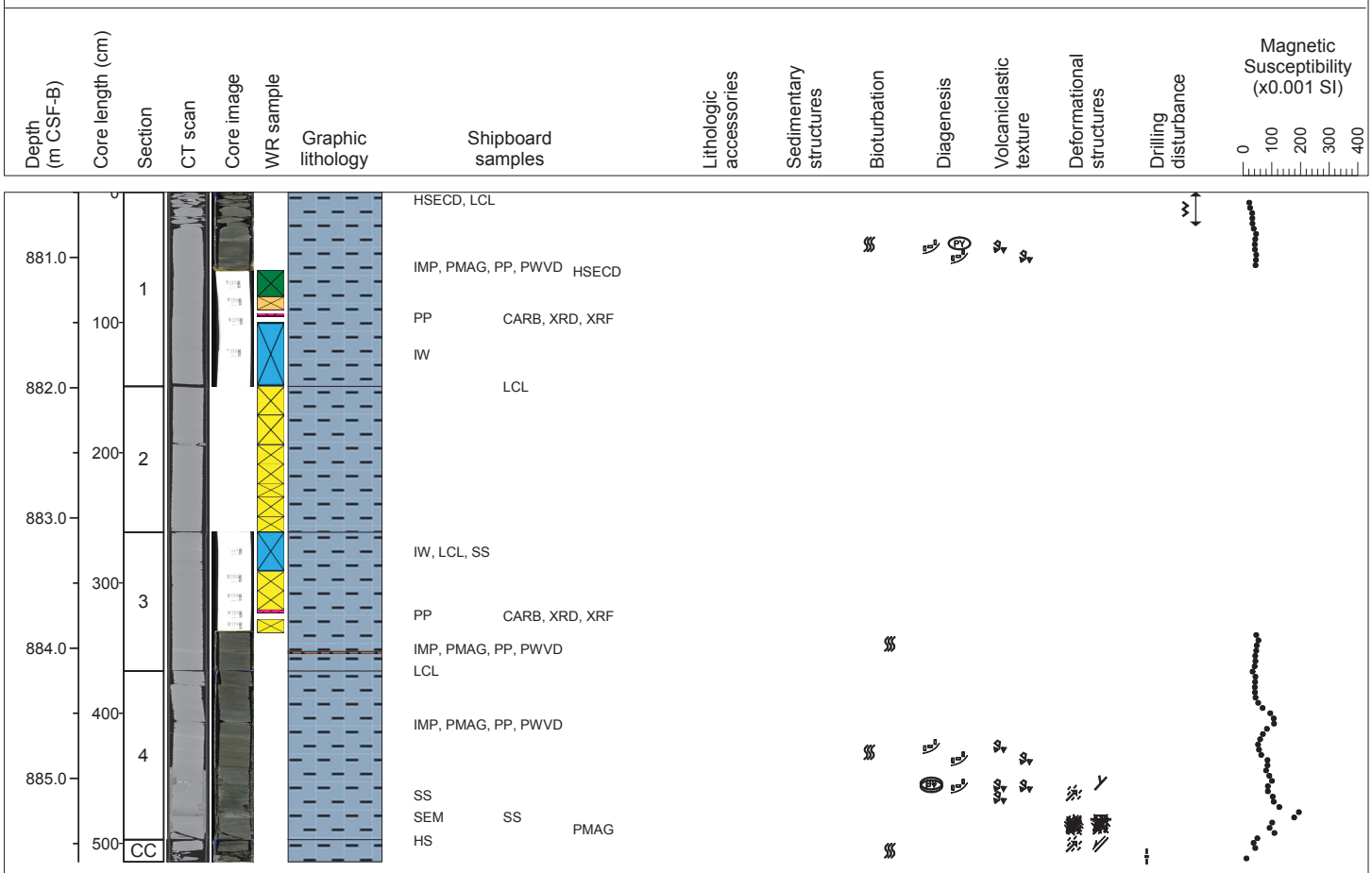
Hole C0023A Core 84R, interval 871–879.67 m (core depth below seafloor)

Heavily bioturbated mudstones with distinct lithological differences between burrows and host lithology. Host lithology has high proportion of microcrystalline quartz. Authigenic illite flakes are present but often light brown. Opaque content; pyrite, clay (possibly devitrified ash). Very minor Vitric ash and carbonate content. Burrows contain a muddy sand- and silt-bearing fill; light brown in color, high bioclast content, sub-angular quartz and plagioclase, illite flakes (authigenic) and small black pieces of volcanic glass (Pumice). Green-bentonite ash layers present. Pyritised burrows are notably vuggy. Small patches of alteration in comparison to cores 81R to 83R.
Sand-filled vein 84R-7.



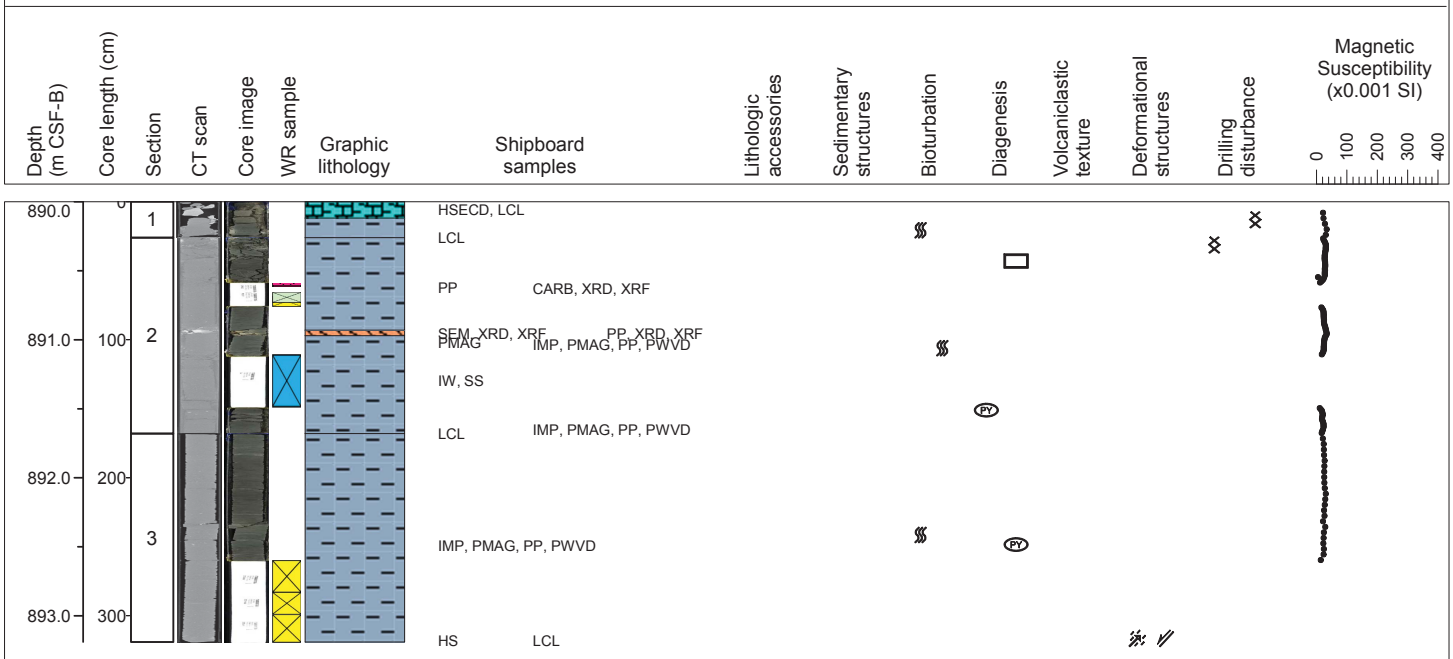
Hole C0023A Core 85R, interval 880.5–885.64 m (core depth below seafloor)

Heavily bioturbated mudstone with laminae of green-bentonite volcanic ash. Minor patches of hydrothermal alteration along burrows (similar to 84R). Alteration patches contain clay and calcite. Similar to margins of alteration zone 84R-2.
Normal faulting with slickenlines 85R-4 and 85R-CC. Mineral veins present. Beds dip slightly.



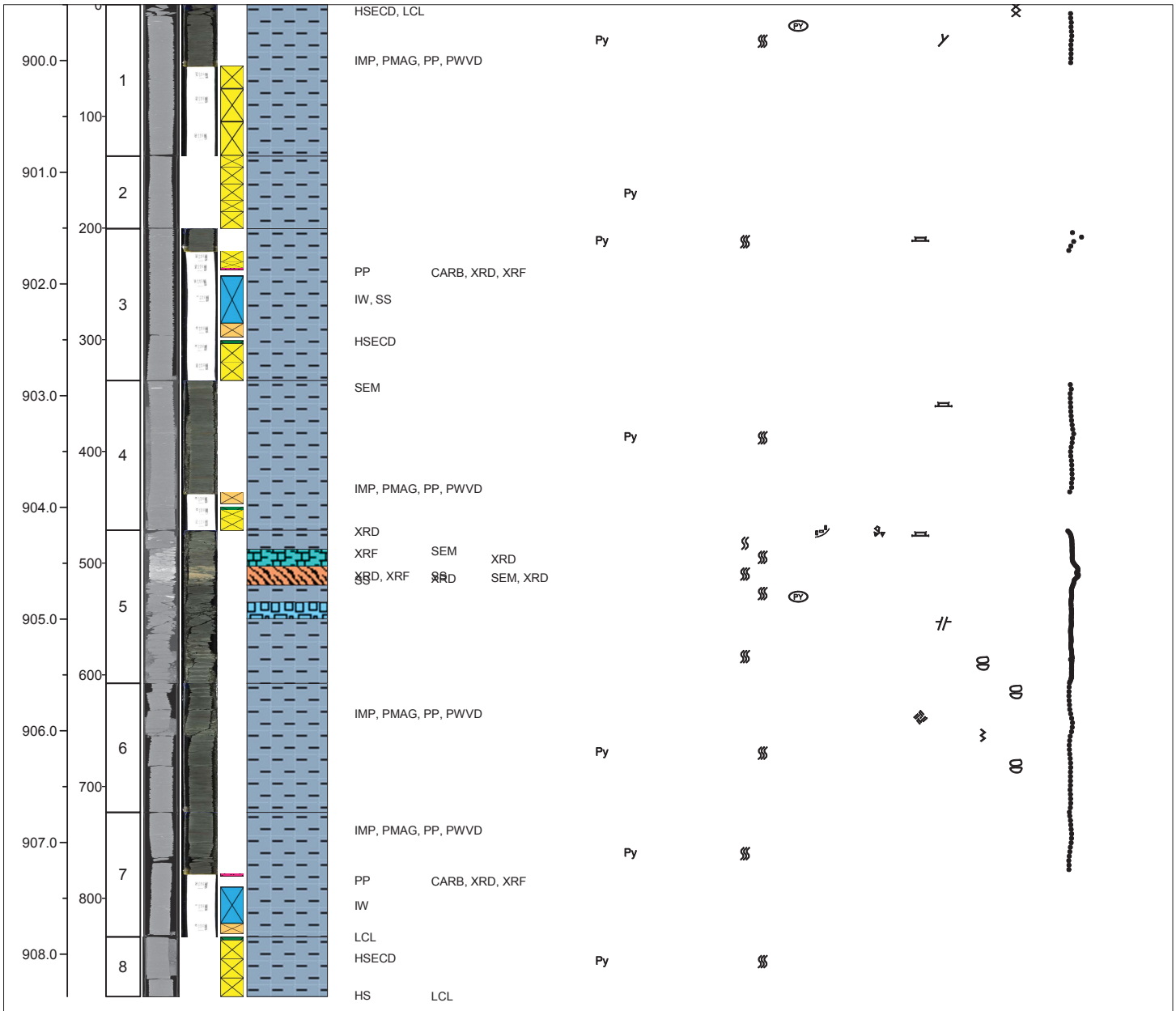
Hole C0023A Core 86R, interval 890–893.19 m (core depth below seafloor)

Bioturbated mudstone with a barite-rich rhodochrosite alteration patch. The patch is pale-yellow in color and the main alteration minerals are calcite, barite, rhodochrosite, dolomite, apatite and fluorapatite, with some green-colored chlorite and smectite. There is a sharp boundary beneath the patch likely indicating stratigraphic control. At the boundary euhedral barite crystals have formed (0.1–0.2 cm in size).
Normal faulting with slickenlines (86R-3, 146–151 cm).



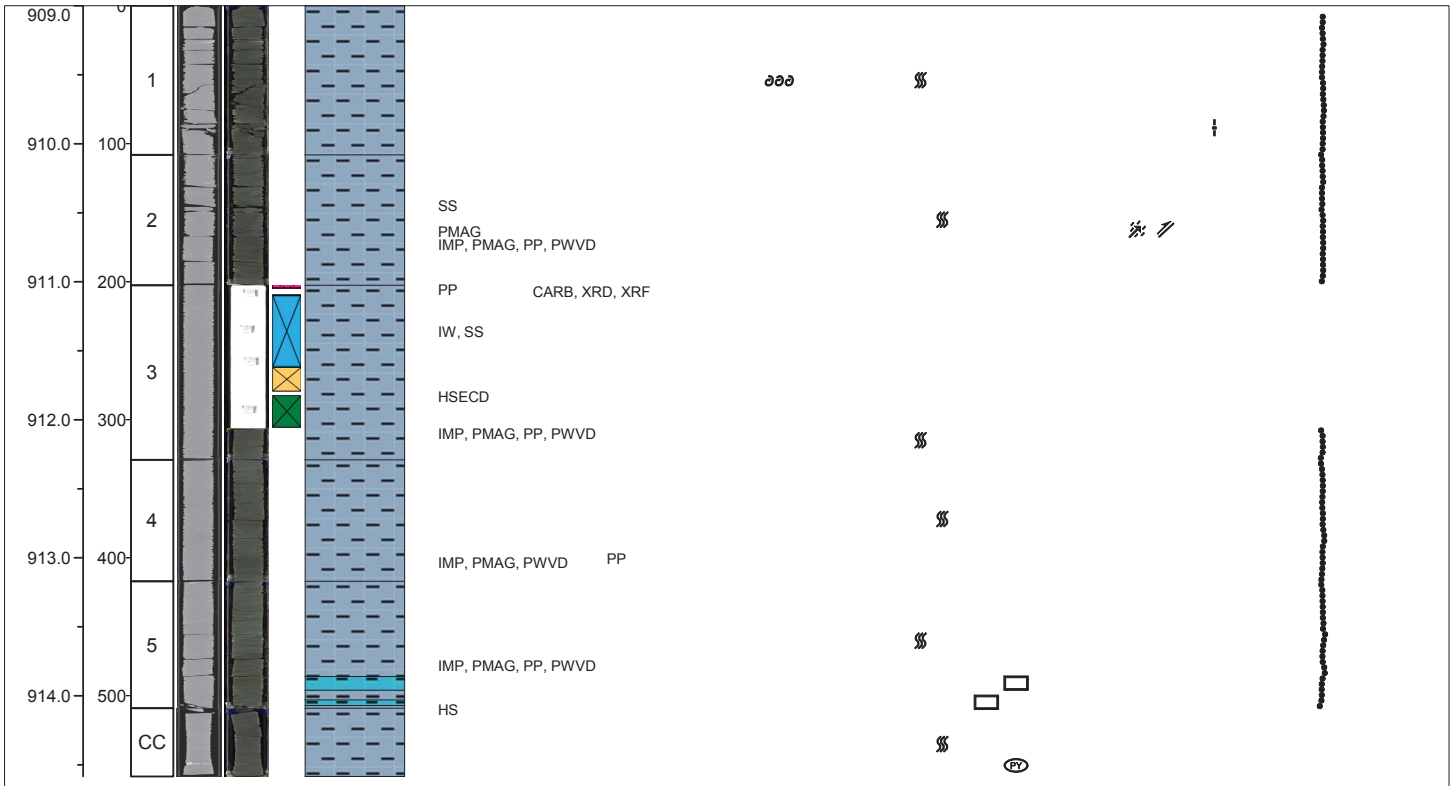
Hole C0023A Core 87R, interval 899.5–908.38 m (core depth below seafloor)

Bioturbated mudstone with alteration patches and intraformational breccia. Alteration patches are stratiform and comprise two zones in 87R-5. The topmost zone 87R-5, 17–32 cm has carbonate, sulfate and clay mineralization. Whereas mineralization located above the breccia (lower zone 97R-5, 32–49 cm) and a zone of hydraulic fracturing has anhydrite, rhodochrosite (with minor dolomite/siderite) and minor barite and pyrite. Within burrows replacement of shells and bioclasts leaves small pink and orange-colored crystals that psuedomoprh after the original bioclast, whilst the muddy matrix of the burrow reddens or turns orange or pink. Outside of burrows the country rock is altered slightly green, and contains anhydrite which during core description is evident a white-colored paste that dissolves in cold water. Both pyrite and barite also replace bioclasts within burrows (compare to growth of euhedral crystals in veins or other intervals
Bedding parallel seam of sand and pyrite-mineralization similar to 56R, 61R-2 and 63R-2. Healed extensional fracture (87R-5, 79–88 cm) and fracture-network (87R-6, 17–44 cm).



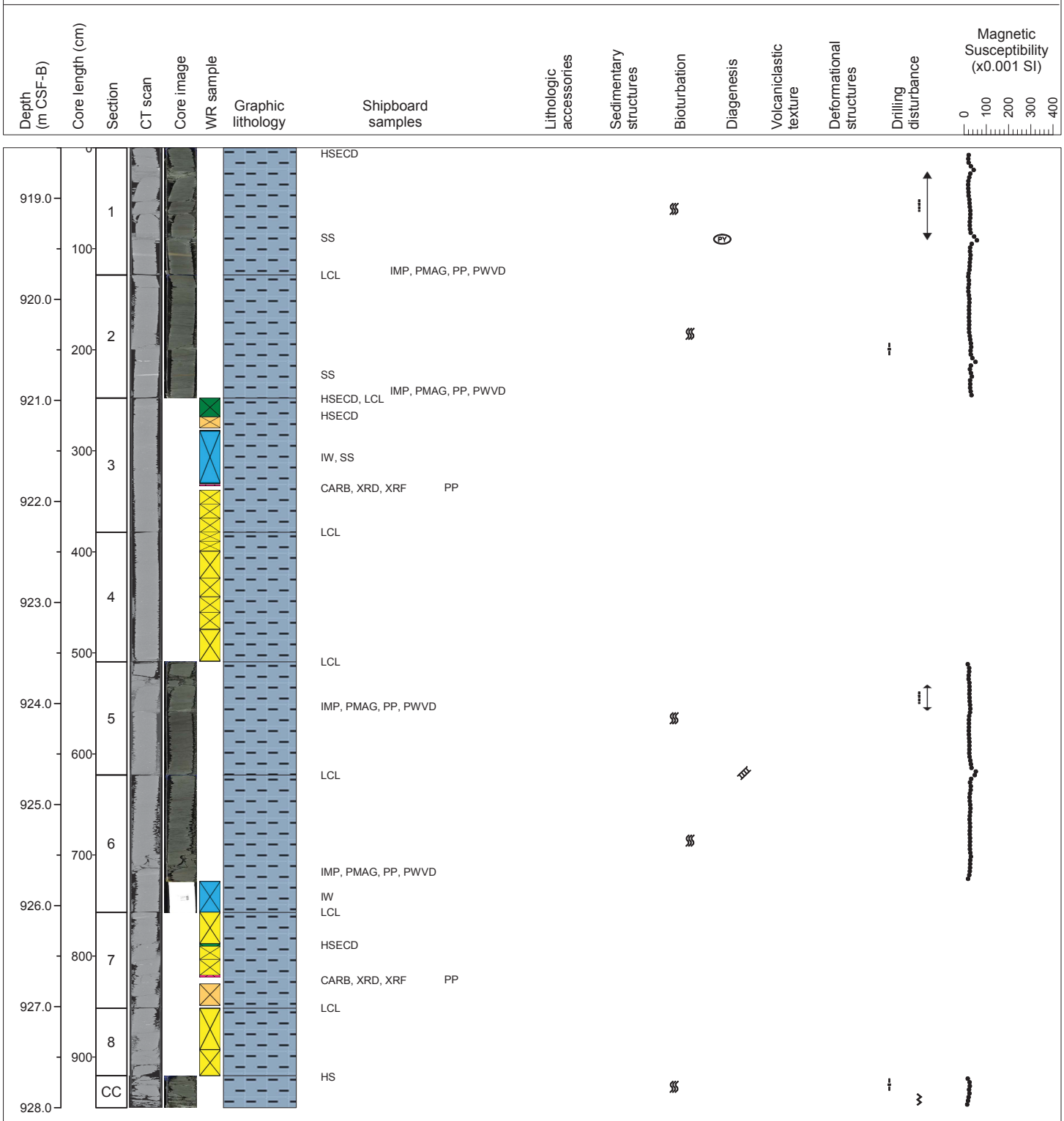
Hole C0023A Core 88R, interval 909–914.585 m (core depth below seafloor)

Bioturbated mudstone with alteration patches that are mostly confined to burrows. Stratiform alteration patches are dark red in color and slightly dense on X-CT. Burrows contain rhodochrosite and calcite, that often replaces shells and fossils turning them pink or orange in color.
Reverse faulting with slickenlines (88R-2, 52–55 cm).



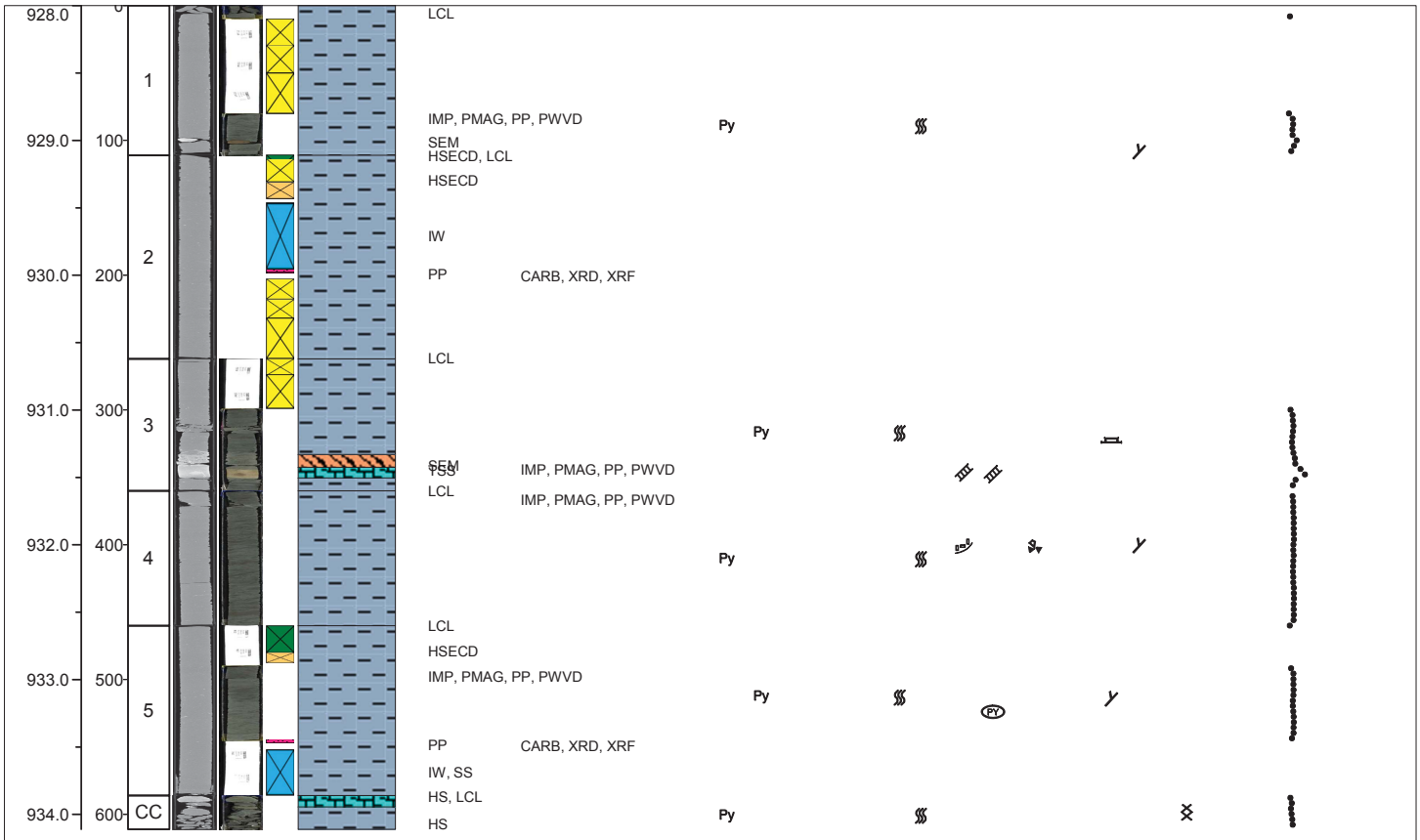
Hole C0023A Core 89R, interval 918.5–928 m (core depth below seafloor)

Bioturbated mudstone with alteration patches that are mostly confined to burrows. Stratiform alteration patches are dark red in color and slightly dense on X-CT. Burrows contain rhodochrosite and calcite (similar to 88R).



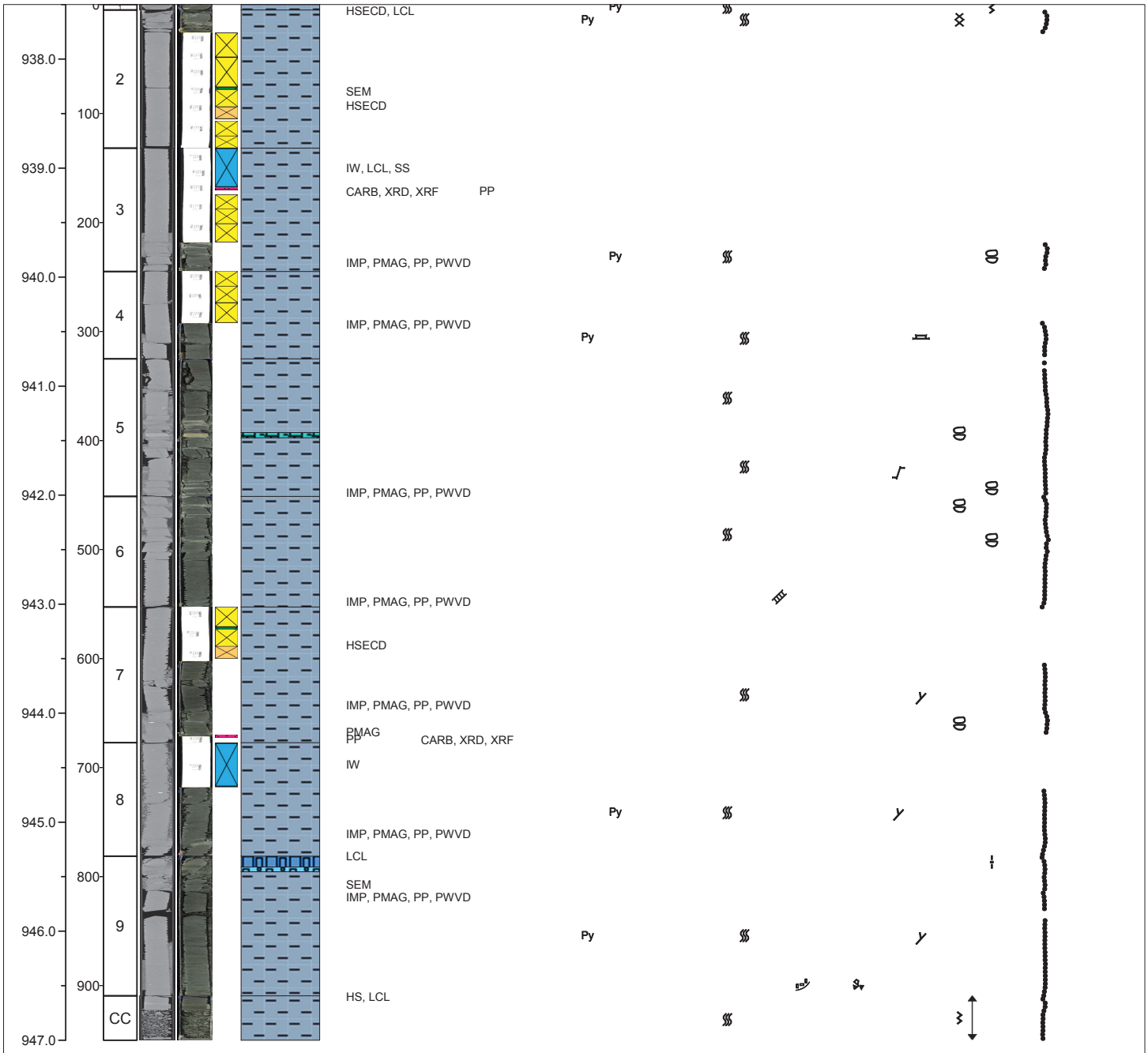
Hole C0023A Core 90R, interval 928–934.11 m (core depth below seafloor)

Bioturbated mudstones and stratiform (burrow) carbonate, sulfate and clay mineralization. A patch 90R-3, 71–91 cm is hydrothermally altered to a high level with a chlorite and anhydrite, beneath which is a rhodochrosite bearing interval. Barite is present as euhedral crystals along with rhodochrosite (and associated minerals listed for 80R) mineralization which replaces fossils and other small clasts concentrated within burrows. Veins of barite cut strata-bound mineralization. Veins of pyrite (or other dark metallic sulfide) cut both stratiform disseminated mineralization and barite.
High angle dipping veins, some of which have a slight horizontal dip (90R-3, 80–89 cm).



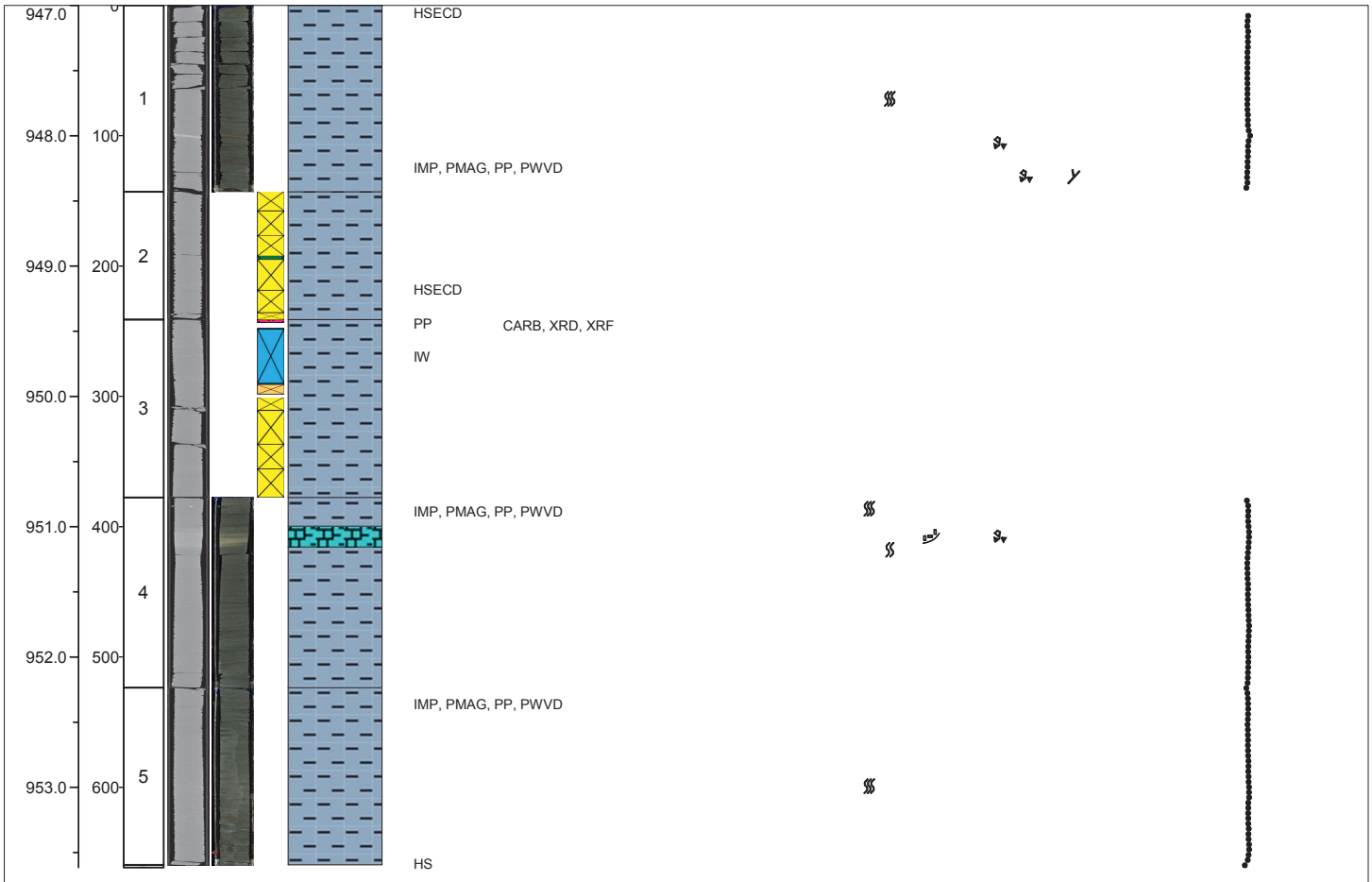
Hole C0023A Core 91R, interval 937.5–947 m (core depth below seafloor)

Bioturbated mudstones and minor alteration patches of carbonate and clay mineralization. Many burrows are reddened and have had their fill replaced with calcite and rhodochrosite.
Small pyrite veins in straight sided fractures parallel and perpendicular to bedding are present 91R-6, 94–110 cm.
Small seams of sand and pyrite-mineralization are similar to 56R, 61R-2, 63R-2 and 87R.
Healed fault observed (91R-5, 4–23 cm). Bedding dips slightly.



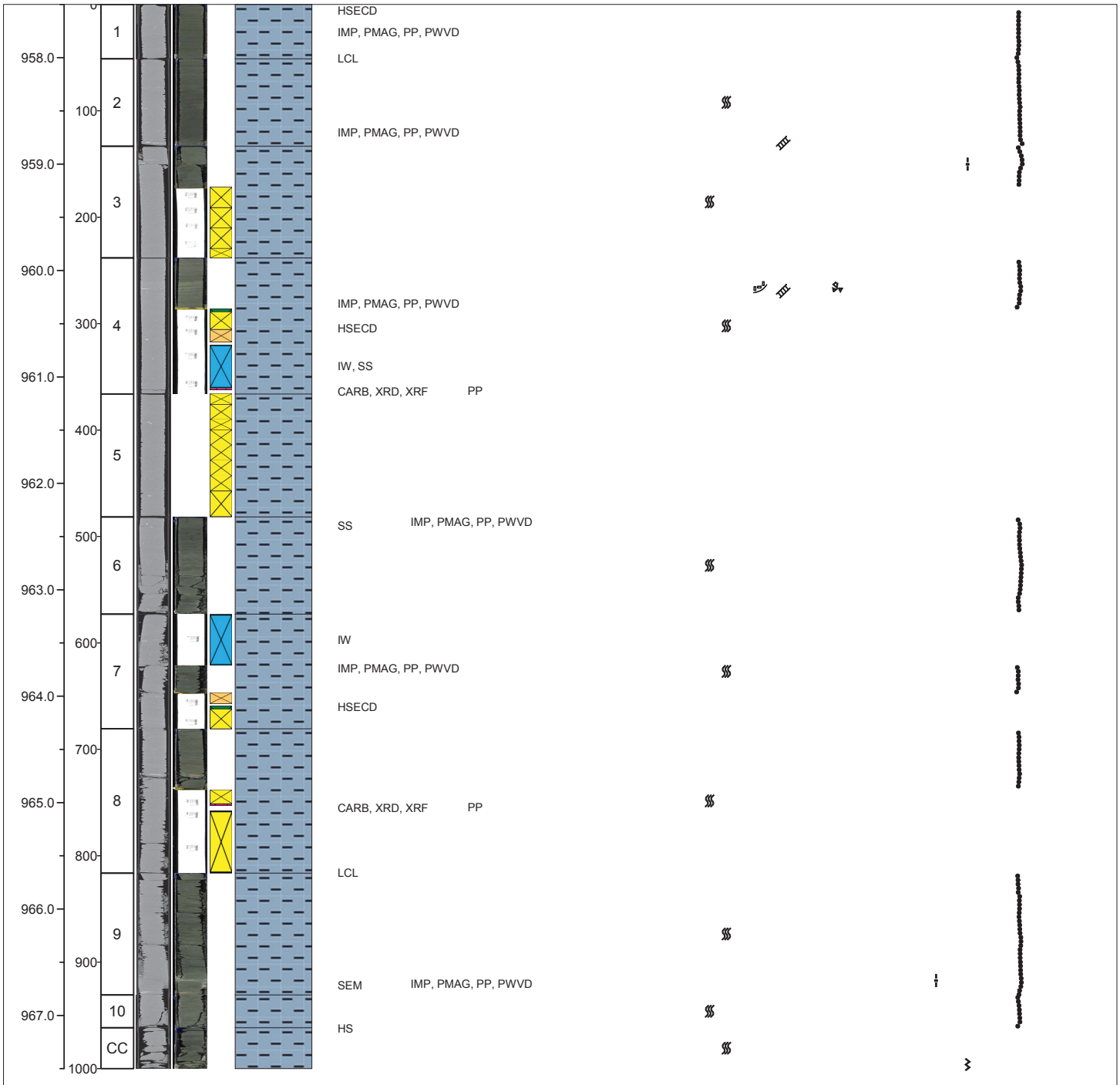
Hole C0023A Core 92R, interval 947–953.615 m (core depth below seafloor)

Bioturbated mudstone with alteration patches that are mostly confined to reddened burrows and a carbonate alteration patch at 92R-4 (original ichnofabrics masked by alteration). Burrows contain rhodochrosite and calcite (similar to 88R); replacement of shells and bioclasts to small pink and orange crystals that psuedomoprh after the original bioclast. Within burrows there is some replacement by barite and pyrite also.
Bedding dips slightly.



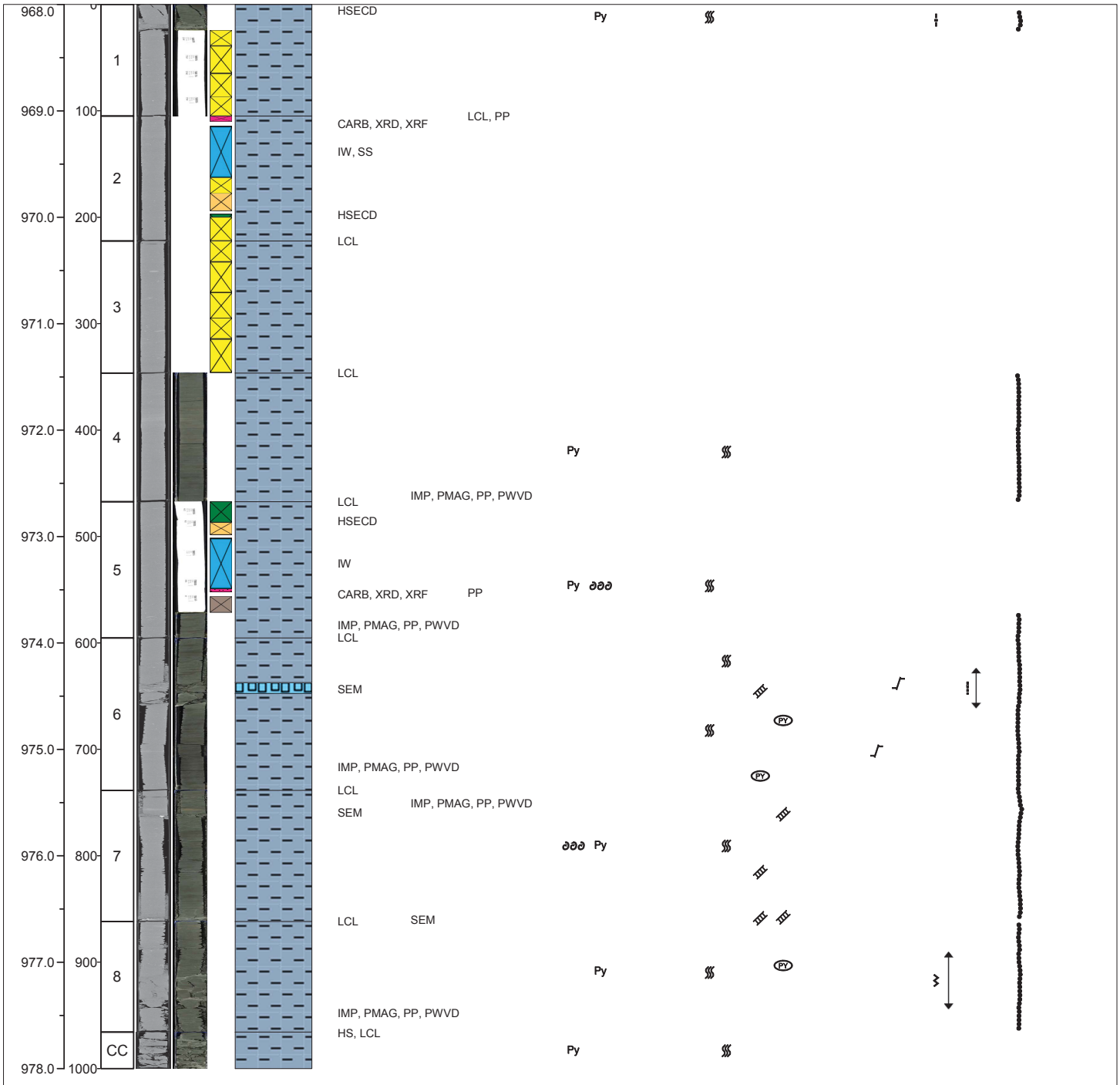
Hole C0023A Core 93R, interval 957.5–967.5 m (core depth below seafloor)

Bioturbated mudstones in which many burrows are reddened and have had their fill replaced with calcite and rhodochrosite. Several burrows have pale yellow colored alteration halos giving the impression of a level of alteration slightly lesser than that seen in the type of alteration patch present in core 82R-1 or 87R-5. Small sandy pyrite veins in straight sided fractures parallel and perpendicular to bedding are present 91R-6, 94–110 cm similar to small seams of sand and pyrite-mineralization in 56R, 61R-2, 63R-2 and 87R.
Slightly dipping pyrite vein with some white materials which is probably anhydrite (93R-2, 82.5–83.5 cm).



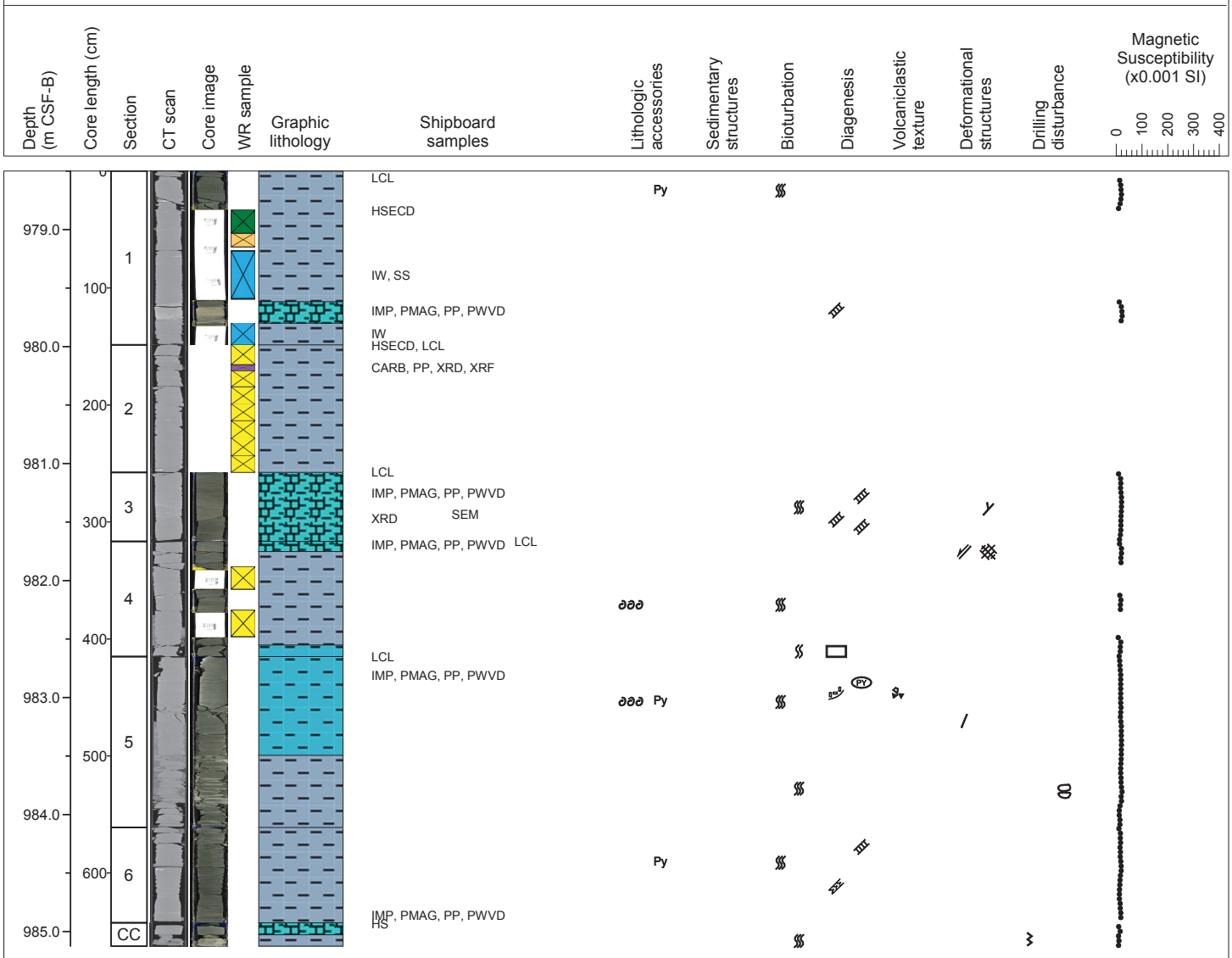
Hole C0023A Core 94R, interval 968–978 m (core depth below seafloor)

Heavily bioturbated mudstones with distinct lithological differences between burrows and host lithology. Relative to cores 90R-91R alteration and mineralization within burrows in 94R is minor. Small pyrite veins and barite veins present. Also present in 94R-6 and 94R-7 are small seams of sand and pyrite-mineralization similar to those in 56R, 61R-2, 63R-2 and 87R.
Some healed faults observed (94R-6, 43–45 cm, 108–111 cm).



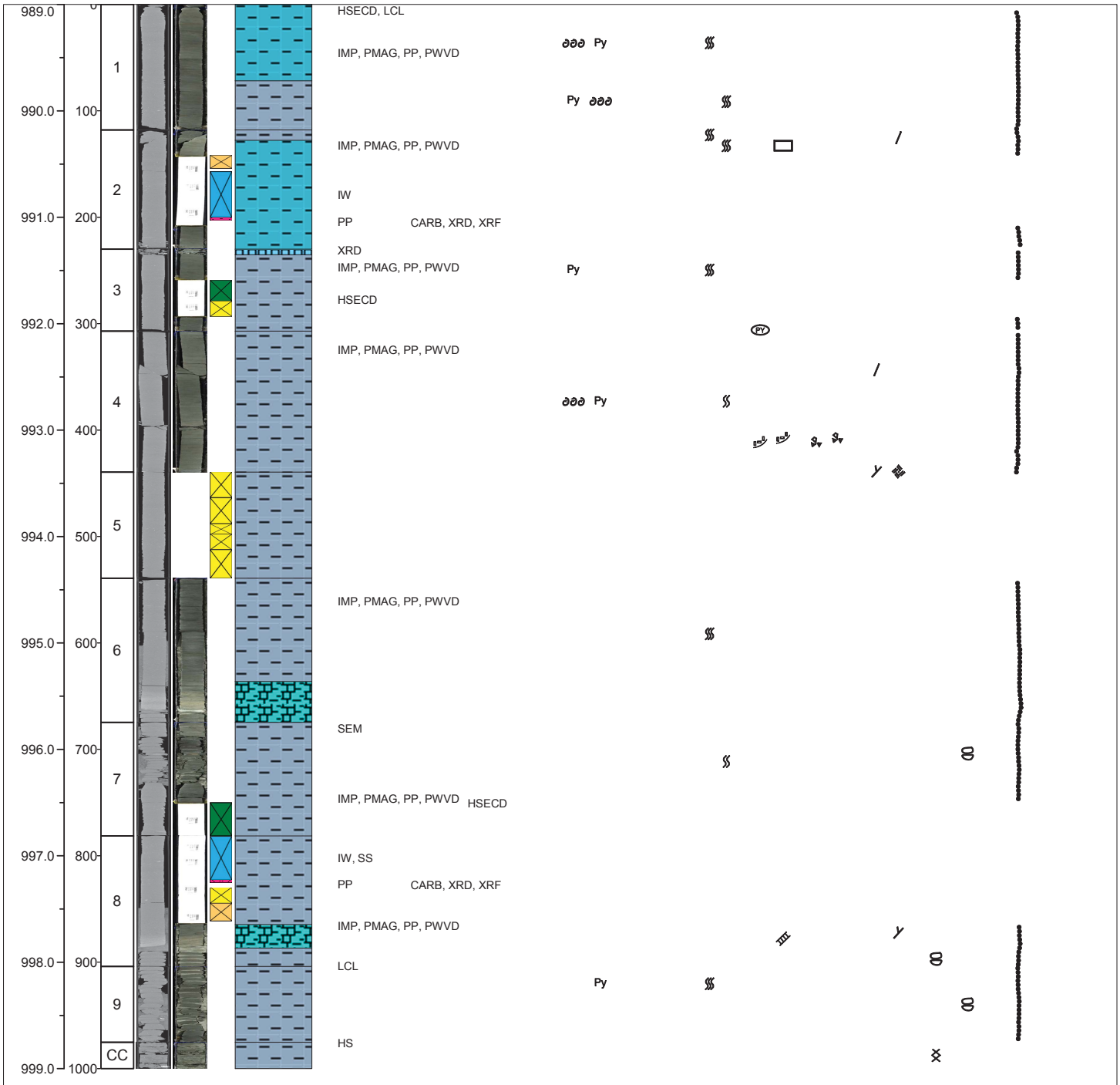
Hole C0023A Core 95R, interval 978.5–985.125 m (core depth below seafloor)

Heavily bioturbated mudstones with distinct lithological differences between burrows and host lithology. Relative to core 94R rhodochrosite and sulfate mineralization is more developed and alteration patches are present (areas of intense mineralization, with diffuse margins, that mask sedimentary fabric). Replacement by rhodochrosite and associated minerals (rhodochrosite, Mn-Calcite, magnesian-calcite, carbonate-fluorapatite) is pervasive and in some places small orange-colored veins of rhodochrosite have been created by the intersection of replaced clasts and small veins.
Mineral vein 95R-3, 37–41 cm and normal faulting with mineral veins 95R-4, 8–10 cm. Bedding dips slightly.



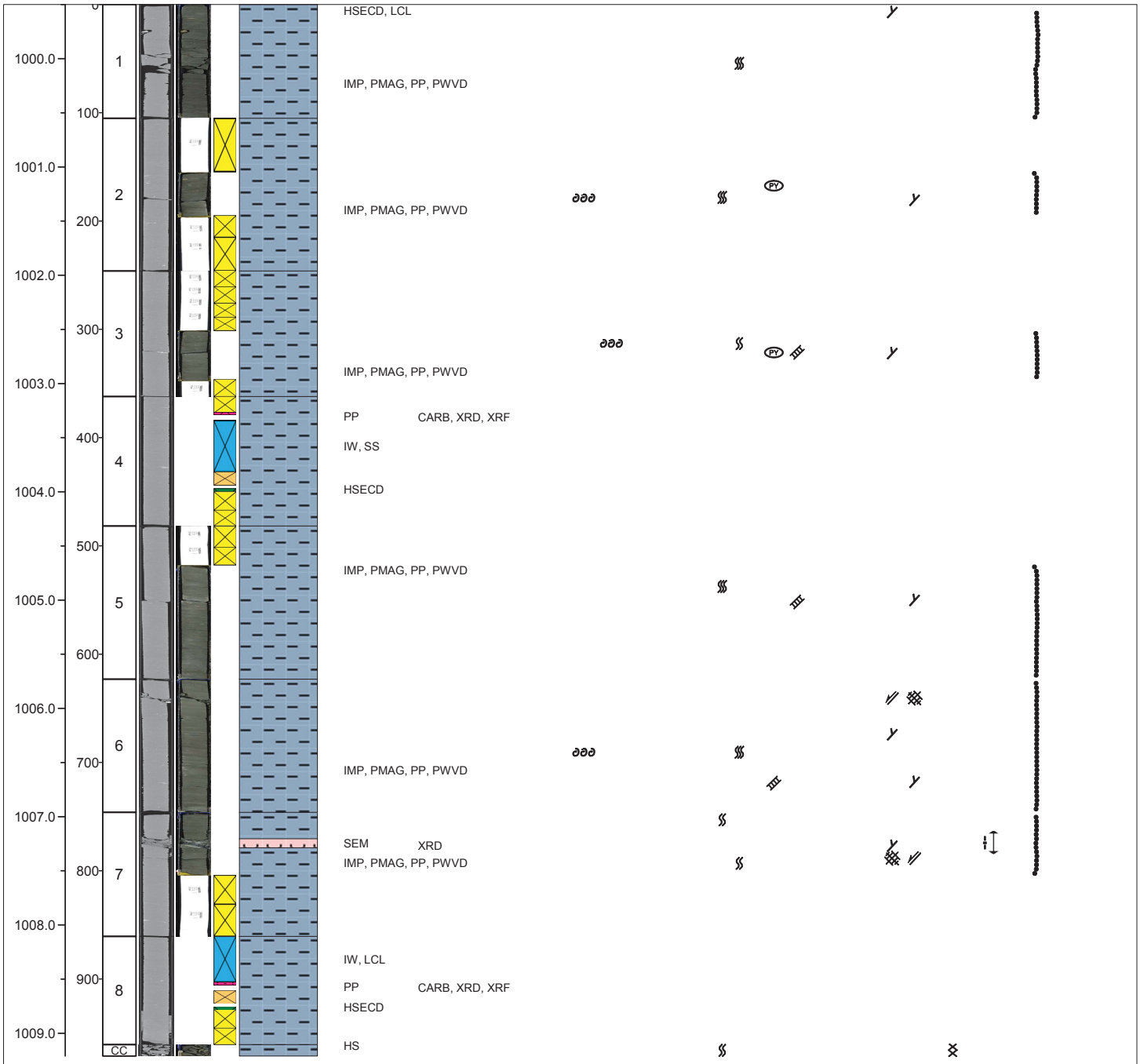
Hole C0023A Core 96R, interval 989–999 m (core depth below seafloor)

Heavily bioturbated mudstones with distinct lithological differences between burrows and host lithology. Relative to core 95R rhodochrosite and sulfate mineralization is less pronounced at the top of the core and the veinlets are regions of intense replacement are less common.
Dip-slip faulting with mineral vein along fault plane 96R-2, 3–12 cm; 96R-4, 34–41 cm. Healed extensional fracture network (96R-4, 135–136 cm). Bedding dips slightly.



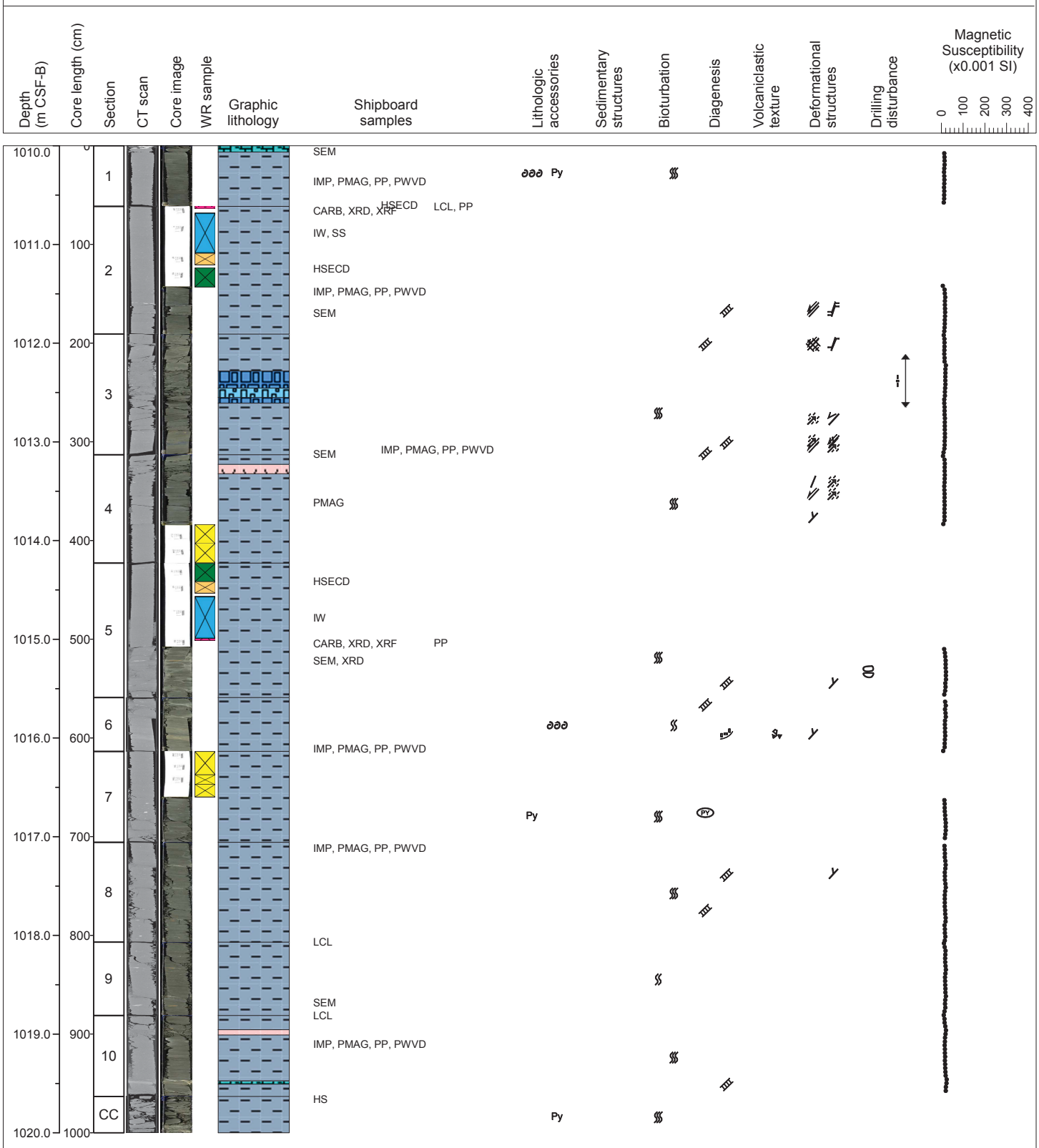
Hole C0023A Core 97R, interval 999.5–1009.21 m (core depth below seafloor)

Heavily bioturbated mudstone with minor alteration and mineralization along burrows. Several stratiform zones of pyrite and clay mineralization (sandy seams of pyrite) similar to the type seem in 61R-2. Very thick seam found in 97R-7 (clay similar to 96R-3). Mineralized clasts in 97R-CC match to barite mineralization in 98R-1 suggesting the existence of a vein between the two cores (97R and 98R).
Normal faulting with mineral veins along fault plane (98R-6, 14–21 cm; 98R-7, 42–43 cm). Obliquely dipping bedding deduced between mudstone and overlying black-sandy pyrite seam (97R-7, 29–33 cm).



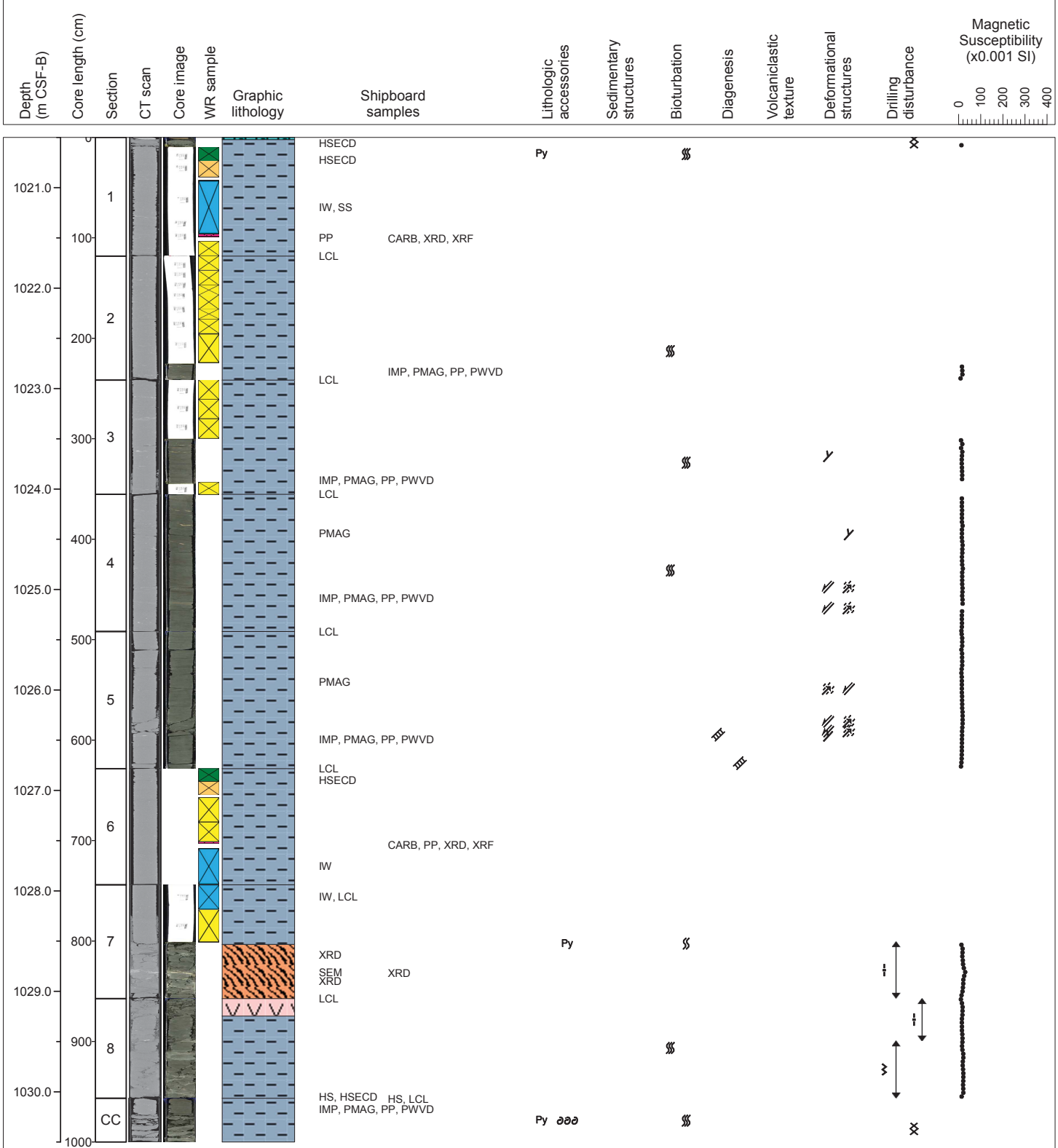
Hole C0023A Core 98R, interval 1010–1020 m (core depth below seafloor)

Heavily bioturbated mudstone with significant alteration-mineralization along burrows. Many instances of Rhodochrosite mineralization and calcite mineralization in burrows as described for 92R. Large clast of fibrous vein barite at top of 98R-1. Several smaller barite and clay veinlets present.
Several bedding instances of the near bedding parallel pyrite-mineralization found in 56R, 61R-2, 63R-2 and 87R except that green clay is present instead of sand.
Several healed faults showing normal sense (from 98R-2, 106 cm to 98R-4, 43 cm). Mineral veins observed along many fault planes by X-CT. Healed fault showing normal sense (from 98R-2, 106 cm to 98R-4, 43 cm).



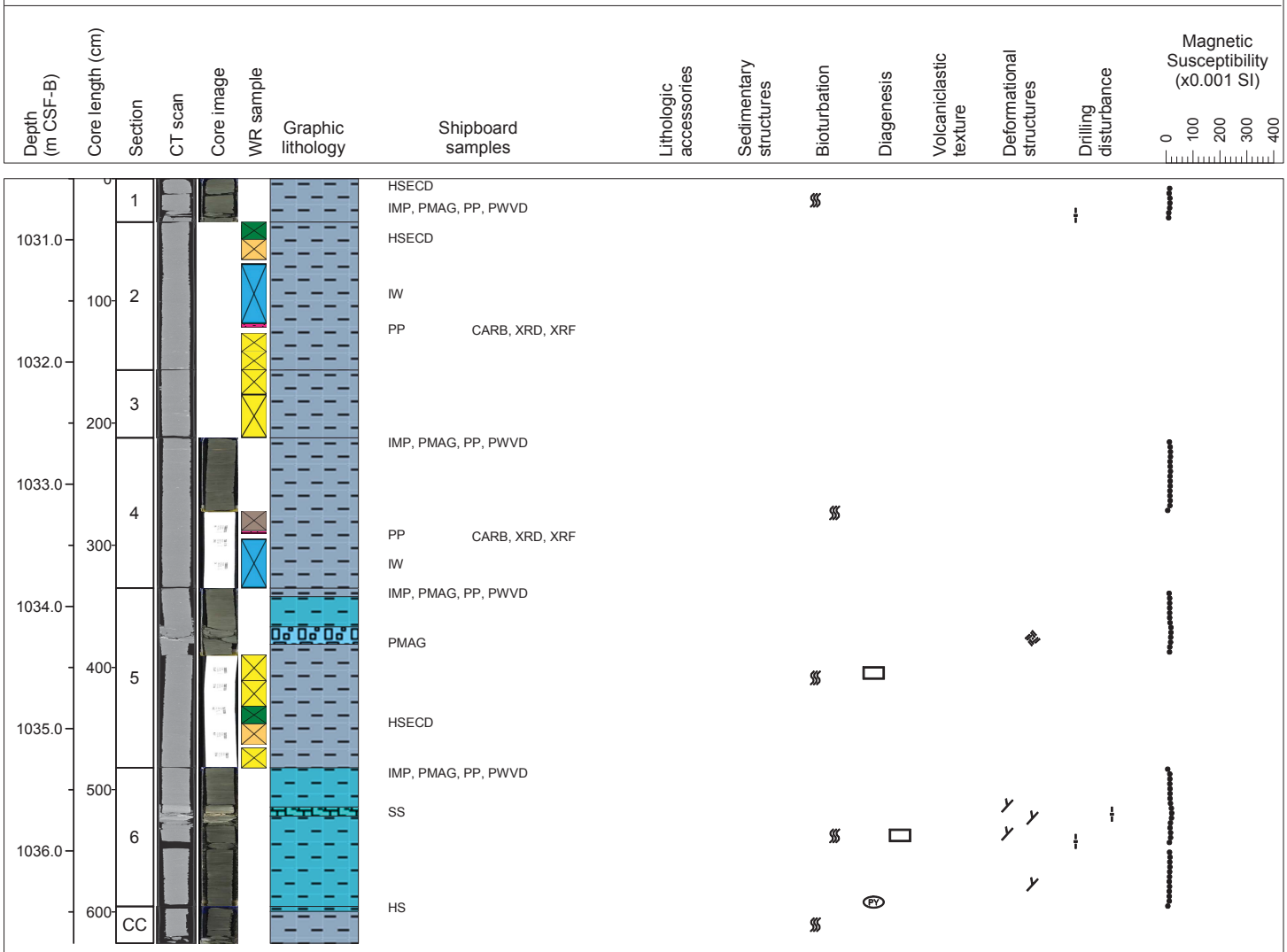
Hole C0023A Core 99R, interval 1020.5–1030.5 m (core depth below seafloor)

The top of 99R is heavily bioturbated mudstone with significant alteration and mineralization along burrows. Many instances of rhodochrosite mineralization and calcite mineralization in burrows as described for 92R–98R. A different style of mineralization is present in In 99R-7 where the mudstone is less indurated and has been disturbed by drilling. A distinct patch of grey-green smectite, chlorite and calcite mineralization (99R-7, 70 cm) is found above a pale yellow colored patch of smectite, chlorite, calcite and carbonate fluorapatite (99R-7, 90 cm). Beneath this is a grey area with smectite, chlorite, calcite, rhodochrosite (99R-7,99 cm). Instances of the near-bedding parallel pyrite-mineralization found in 56R, 61R-2, 63R-2 and 87R are also present. Beneath this interval there is some brecciation.
Normal faulting with slickenlines (from 99R-4, 95–118 cm to 99R-5, 58–105 cm). Mineral veins observed along the fault plane by XCT images.



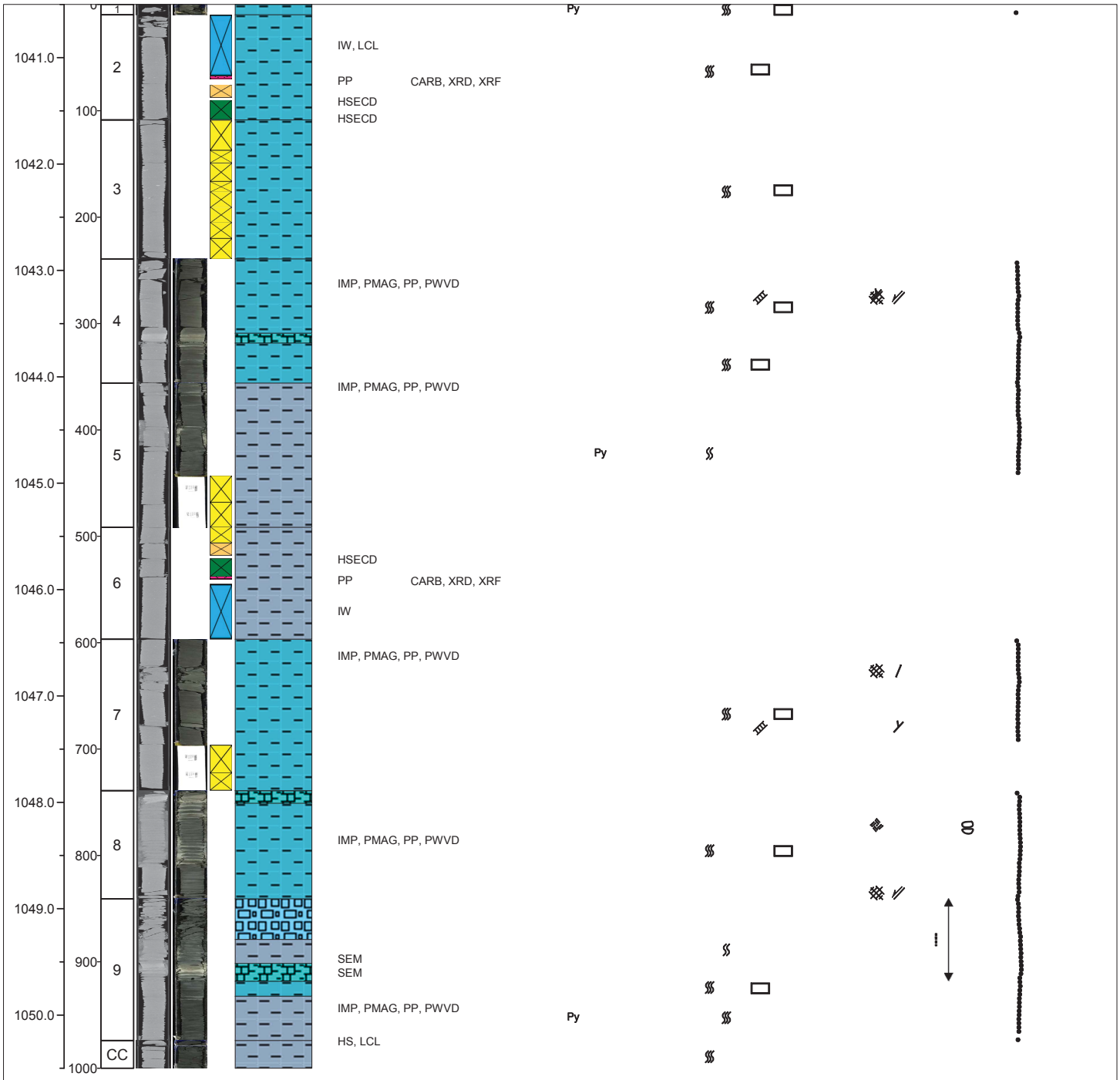
Hole C0023A Core 100R, interval 1030.5–1036.755 m (core depth below seafloor)

Heavily bioturbated mudstone with significant rhodochrosite and carbonate alteration and mineralization within burrows. Alteration patch is present 100R-6, 32–39.5 cm. Within the patch there is a gradational changes from grey to yellow in color. The base of the patch is not sharply defined and barite is present at the base.
Healed extensional fracture network (100R-5, 37–45 cm). Many instances of oblique bedding.



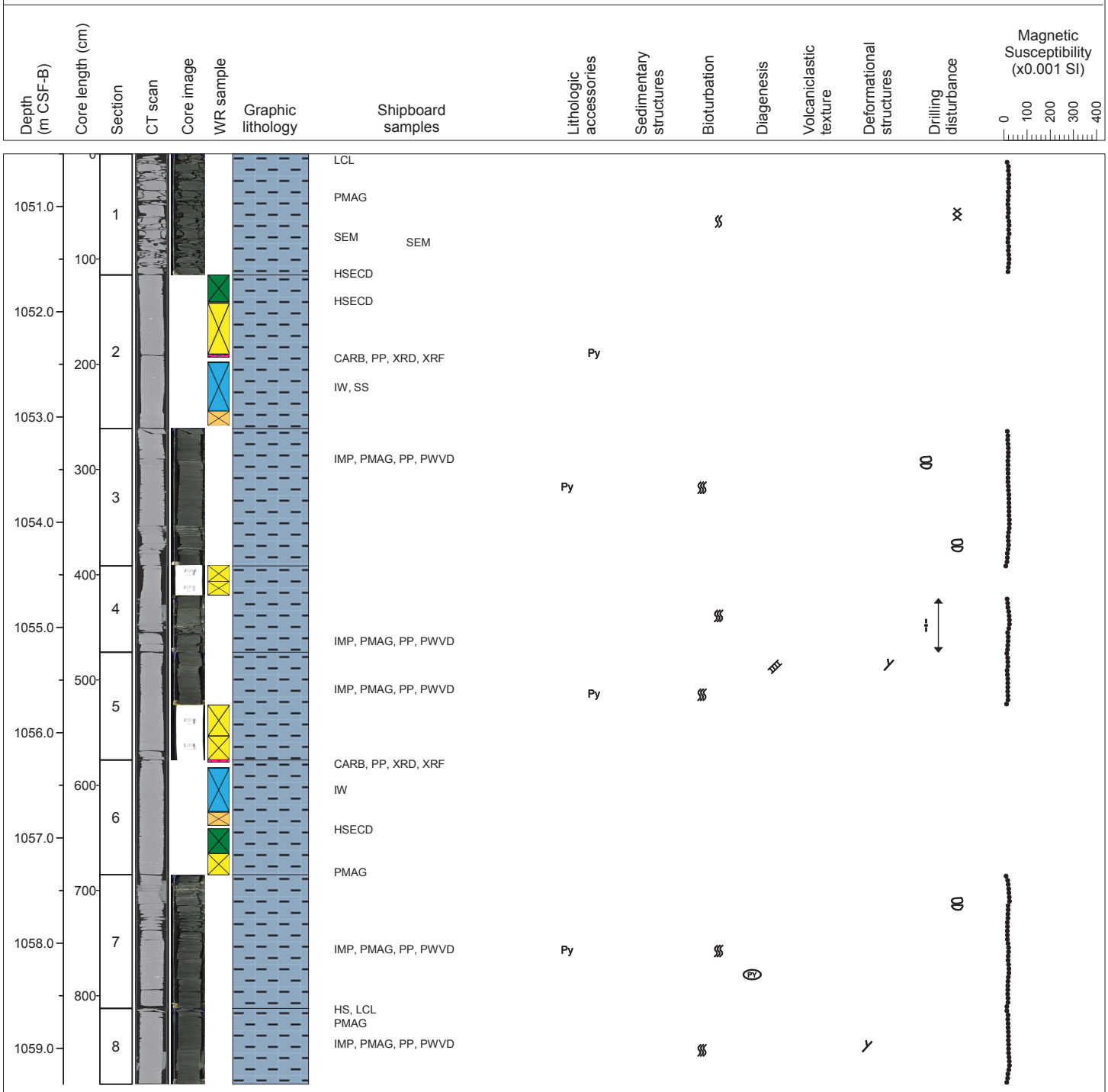
Hole C0023A Core 101R, interval 1040.5–1050.5 m (core depth below seafloor)

Heavily bioturbated calcareous mudstones with alteration patches containing rhodochrosite and calcite. Low pyrite, except for pyritisation along sandy pyrite veins in the style seen in 56R, 61R-2, 63R-2 and 87R.
Healed extensional fracture network (101R-7, 31–36 cm). Normal faults with slickenfibers (101R-4, 36–39 cm; 101R-8, 99–100 cm).



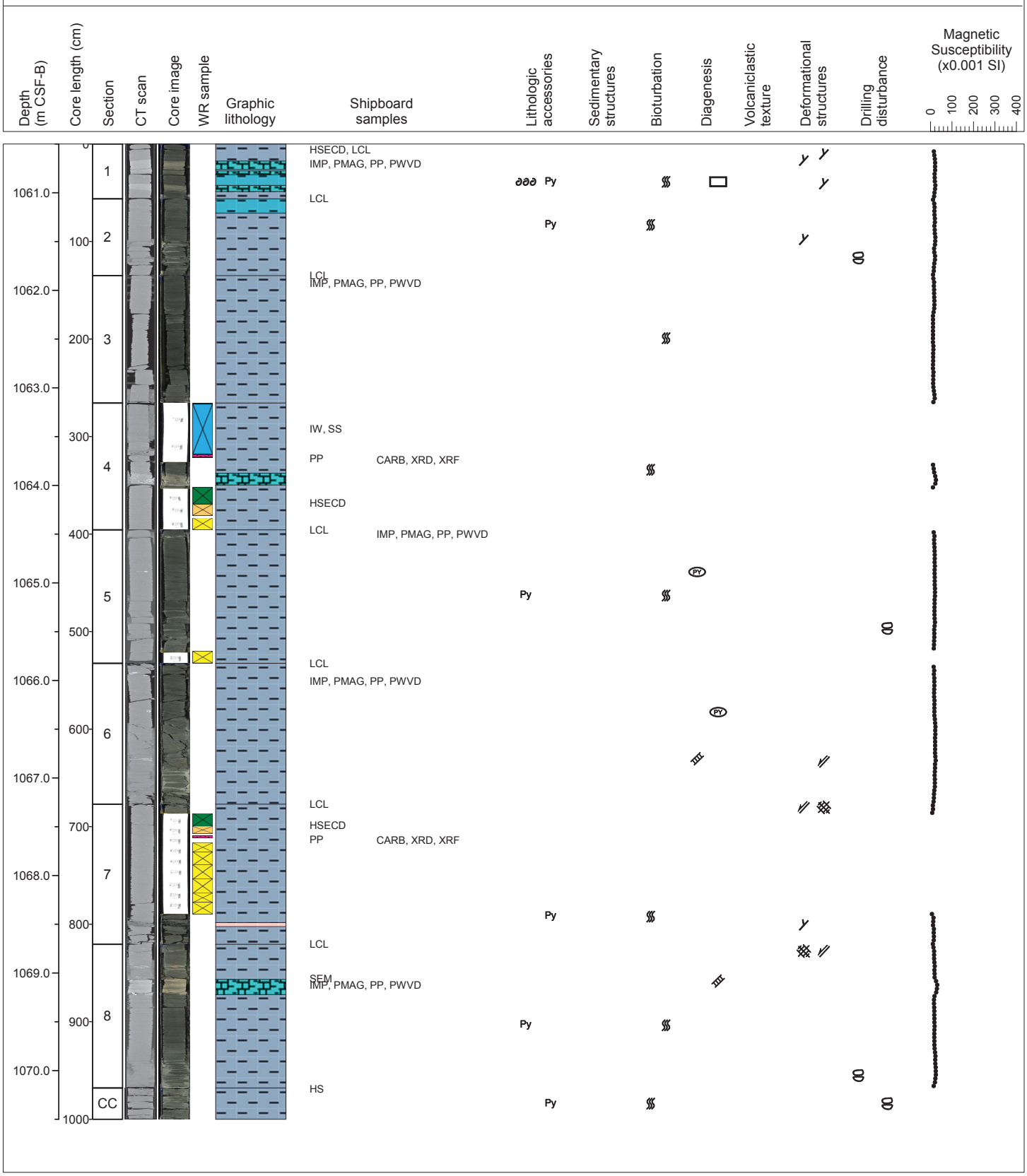
Hole C0023A Core 102R, interval 1050.5–1059.34 m (core depth below seafloor)

Heavily bioturbated mudstones with predominantly pyrite and rhodochrosite within burrows. No alteration patches are present. A small number of pyrite veins in the style seen in 56R, 61R-2, 63R-2 and 87R.



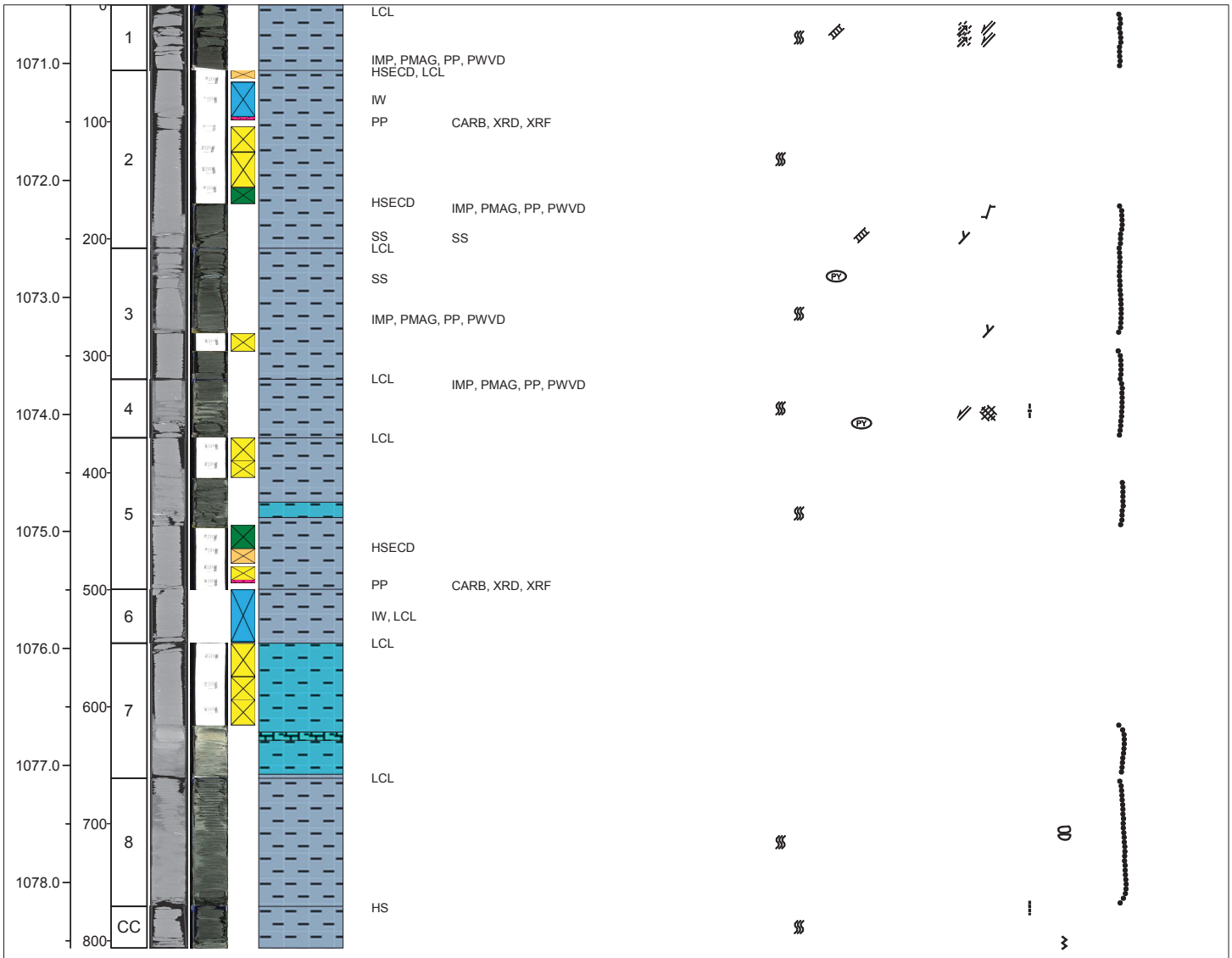
Hole C0023A Core 103R, interval 1060.5–1070.5 m (core depth below seafloor)

Heavily bioturbated mudstones with strata bound alteration patches of calcite, rhodochrosite and clay alteration. Barite veins cut mineralised-ichnofabrics (burrows) indicating a rough paragenesis. In 103R-8 the gradation form altered burrows to completely masked ichnofabrics can be seen . A dark thick metal sulfide vein is present 103R-8, 37 cm.
Normal faults with slickenfibers (103R-6, 102–108 cm, 108R-7, 2–5 cm, and 103R-8, 6–9 cm). Mineral vein which cuts one of above normal faulting (103R-6, 102–108 cm). Bedding dips moderately.



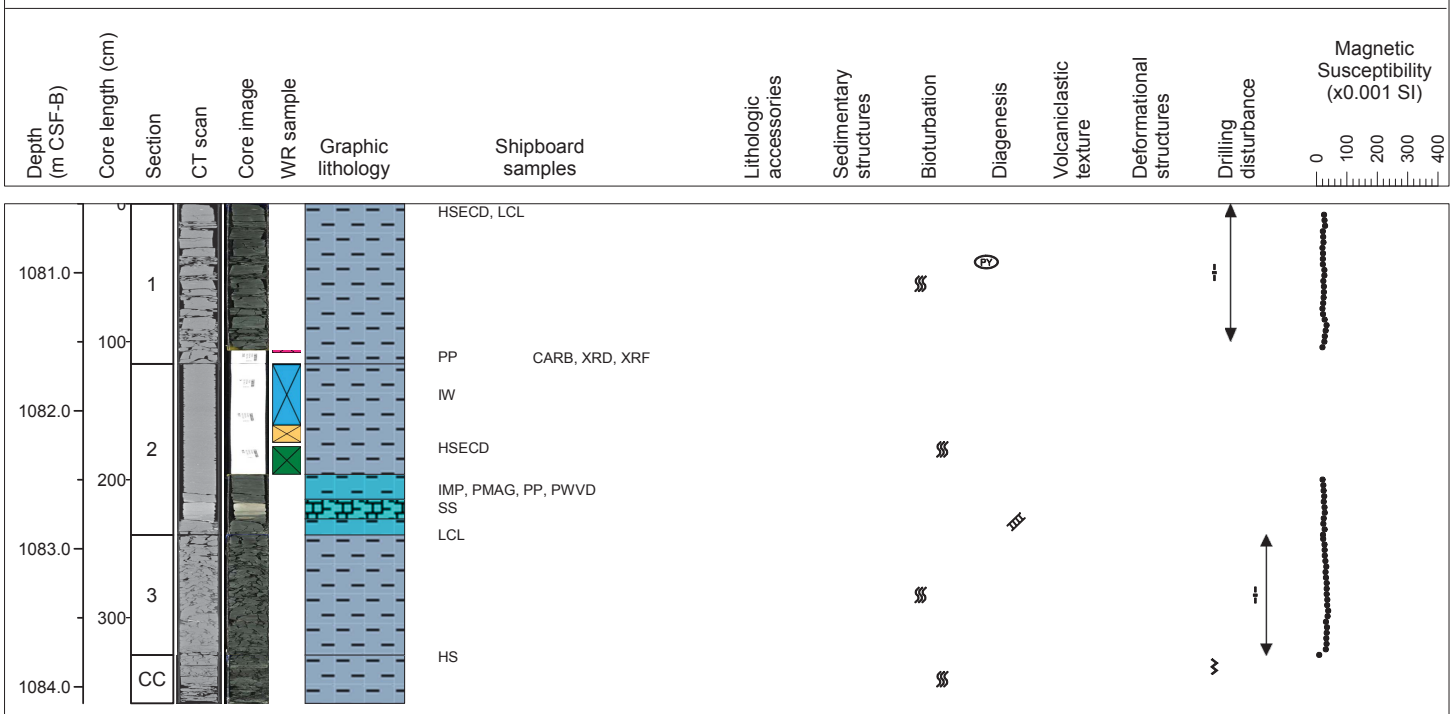
Hole C0023A Core 104R, interval 1070.5–1078.56 m (core depth below seafloor)

Heavily bioturbated mudstones with burrows that act as a locus for strata-bound alteration patches of calcite, rhodochrosite and clay alteration (similar to cores 100R to 103R).
Notable chlorite alteration within a poorly indurated interval 104R-7, 80 cm to 104R-8, 70 cm, that is heavily disturbed by drilling; similar to 99R.
Normal faults with slickenlines 104R-1, 19–31 cm and slickenfibers 104R-4, 28–30 cm. Fracture with mineral veins observed by X-CT image 104R-1, 21–25 cm. Healed fault with a normal faulting sense 104R-2, 118–124 cm. Mineral veins 104R-2, 141–141 cm.
Bedding dips moderately.



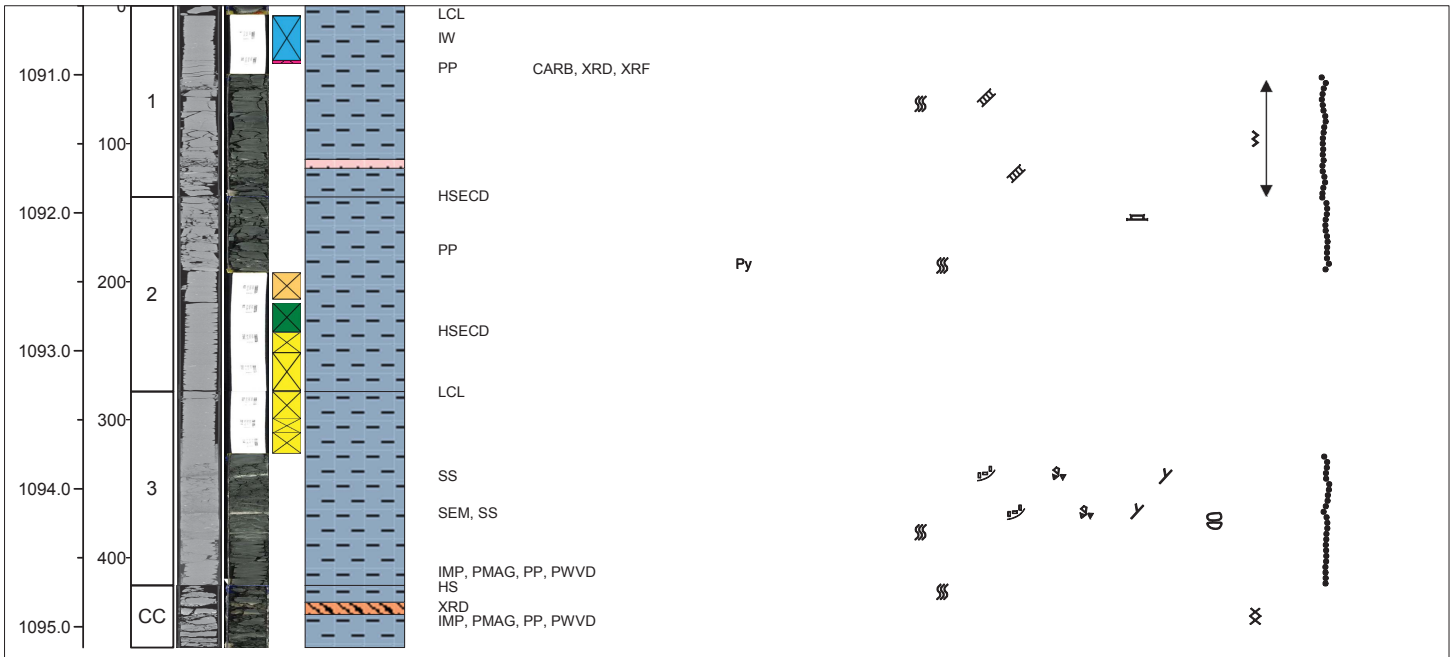
Hole C0023A Core 105R, interval 1080.5–1084.12 m (core depth below seafloor)

Heavily bioturbated mudstones and calcareous with burrows that act as a locus for strata-bound alteration patches of calcite, rhodochrosite and clay alteration (similar to cores 104R). Slightly more chlorite alteration than cores 100R–103R.
Mineral vein 105R-2, 114–115 cm.



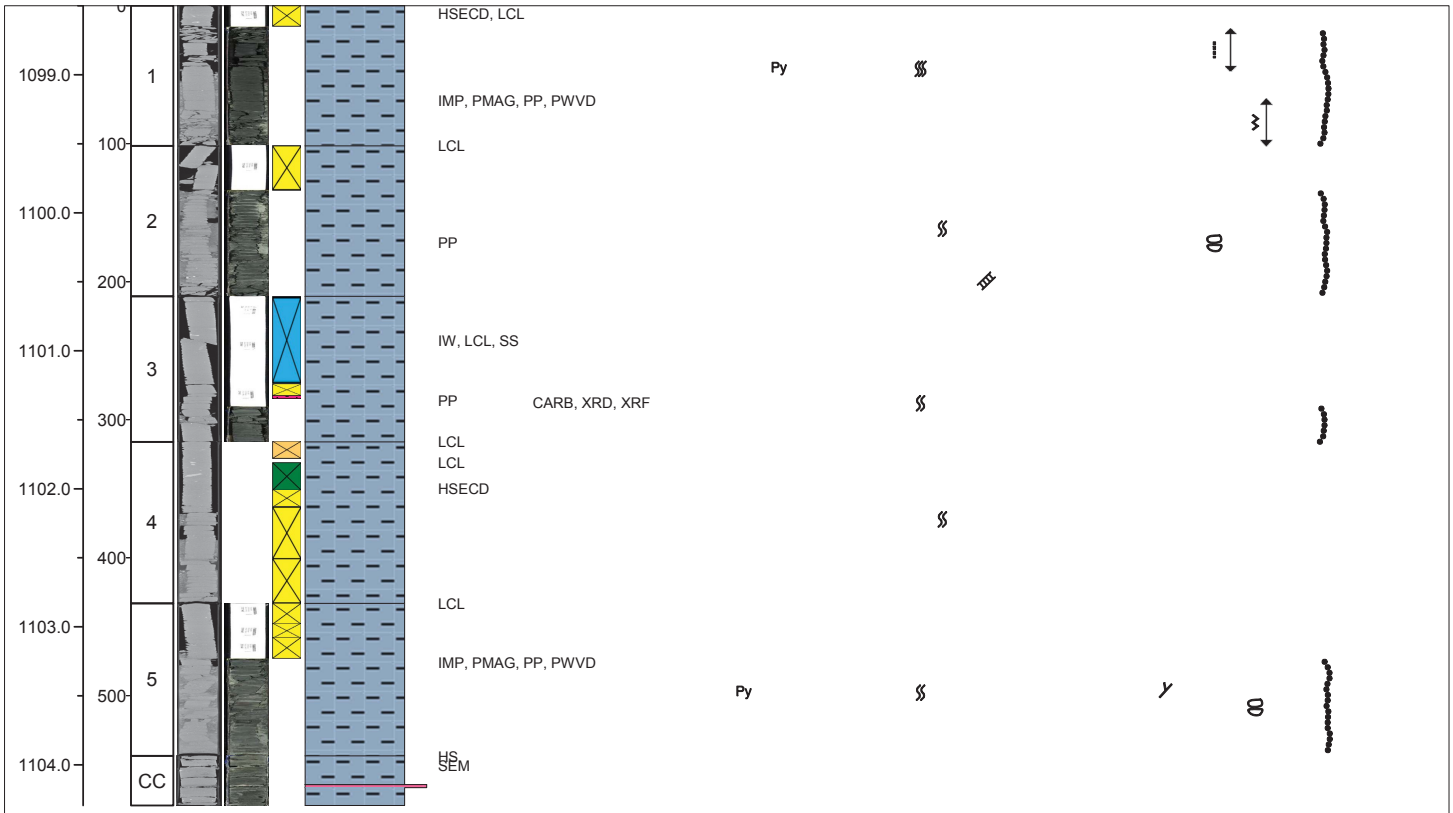
Hole C0023A Core 106R, interval 1090.5–1095.15 m (core depth below seafloor)

Heavily bioturbated mudstones with alteration patches of rhodochrosite, calcite and pyrite. Clay mineralization along ash/tuff layers in 106R-3. Ash is pale white (felsic) in color, not indurated or cemented and is disturbed by drilling. The green-colored chlorite bands are similar to that seen in cores 104R to 110R-3).
Horizontal mineral veins 106R-1, 66.5–67 cm and 121.5–122 cm. Bedding is horizontal in the upper part and dips moderately to slightly in the lower part.



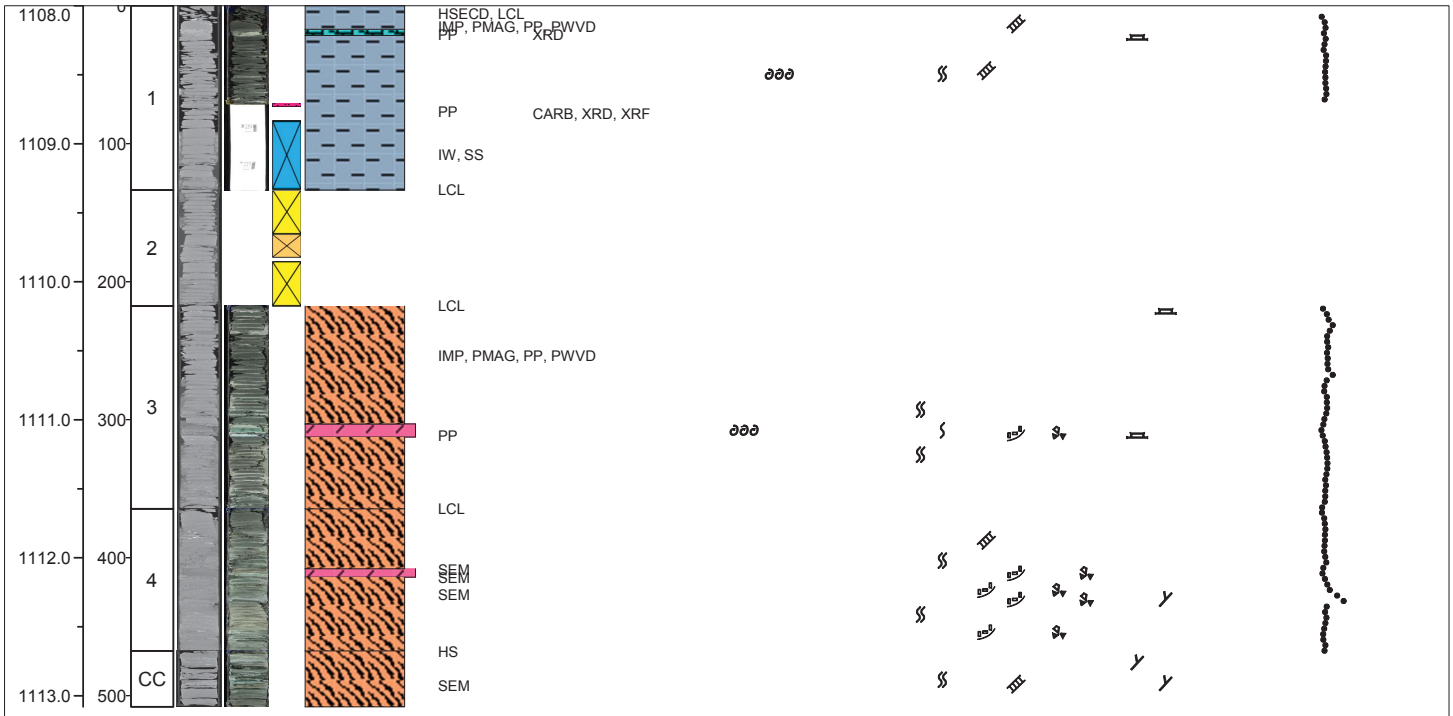
Hole C0023A Core 107R, interval 1098.5–1104.295 m (core depth below seafloor)

Bioturbated mudstone with minor calcite and barite mineralization within veins. Thin sandstone at base is slightly ashy and contains clasts of orthoclase, and euhedral and spherical quartz and plagioclase that look like igneous crystals. Interpreted as a medium grained volcaniclastic sandstone because of context. Relative to tuffs from higher units it is poorly lithified, and not as ash-rich as volcaniclastic sandstones from 106R-3 and core 110R-4.
Mineral vein high dip angle 107R-2, 96–100 cm.



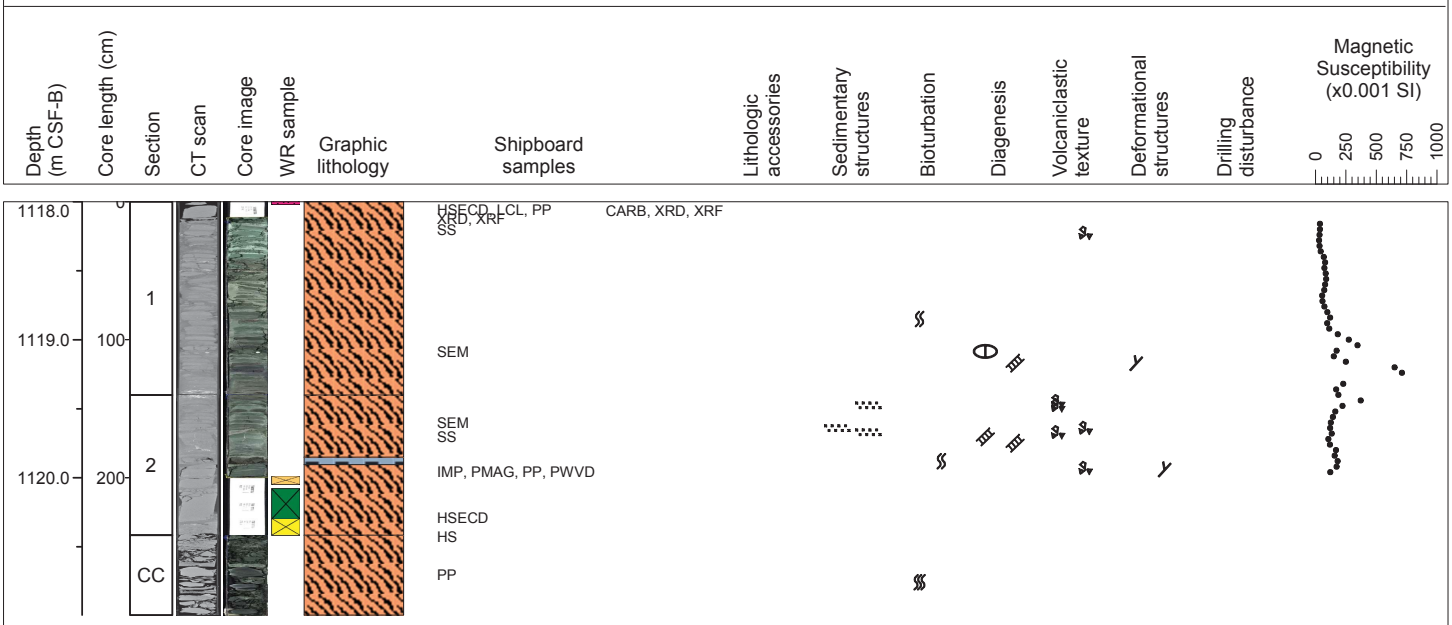
Hole C0023A Core 108R, interval 1108–1113.08 m (core depth below seafloor)

Bioturbated mudstone and altered bioturbated mudstone with patches of anhydrite mineralization (cryptocrystalline, white mineral that is dense in X-CT and dissolves in water/acid). Pervasive (e.g. nearly always present and a dominant visual characteristic of the rock) green-colored chloritization is present from 108R-3. Thin vitric volcanic ash beds are present; ash is angular and more devitrified than in previous cores and silt-sized euhedral feldspar and spherical quartz is present. Pyrite is uncommon and hard to detect. Small orange flakes are ubiquitous within Pale ash and mudstone horizons, SEM shows they are iron rich and maybe linked to higher magnetic susceptibility within this core.
Bedding is horizontal or dips slightly.



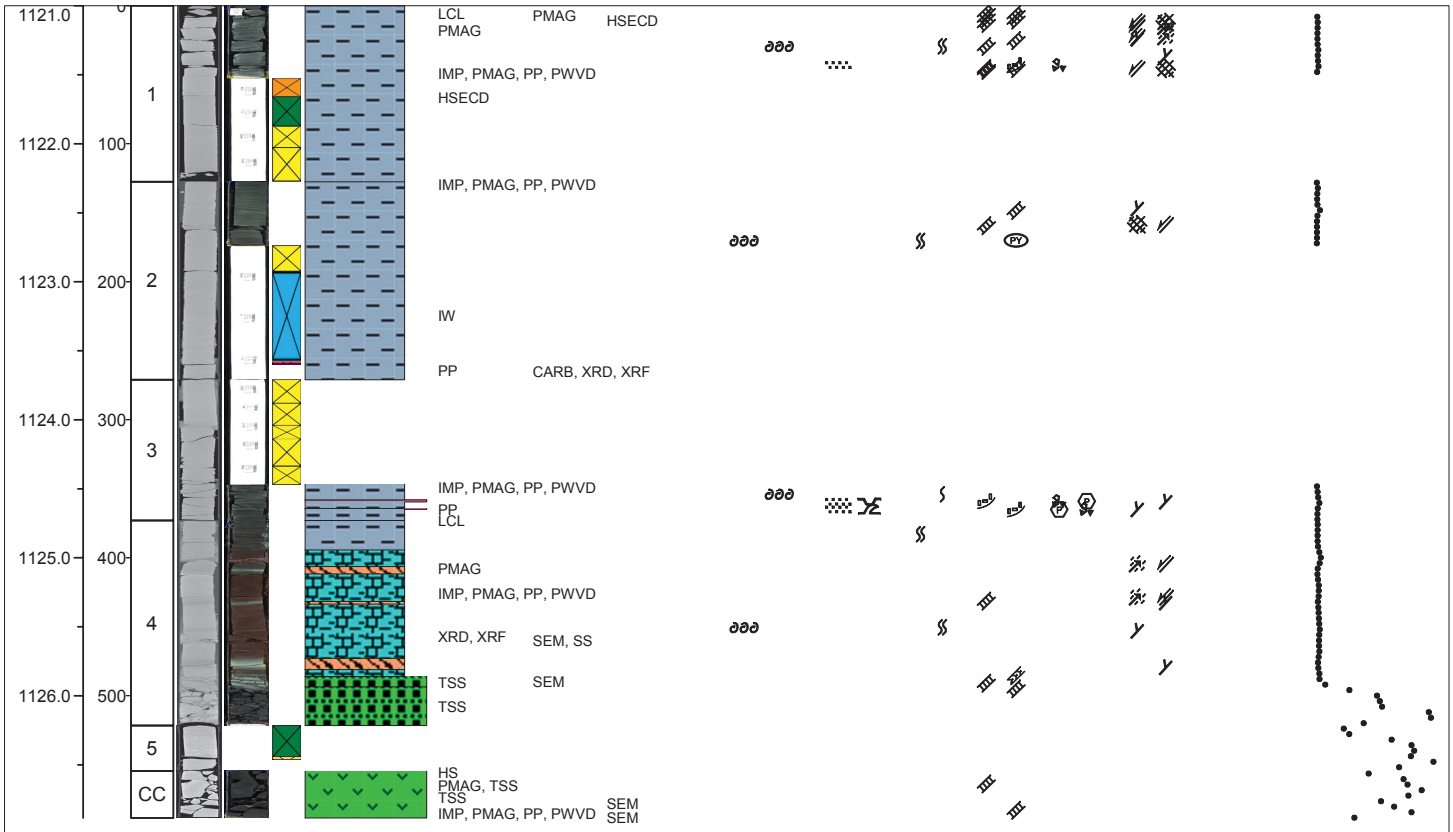
Hole C0023A Core 109R, interval 1118–1120.995 m (core depth below seafloor)

Chloritized bioturbated mudstone with patches of anhydrite mineralization (dense in X-CT and dissolves in water/acid). Thin vitric volcanic ash beds are present. The poorly consolidated ash is angular partially devitrified), and has small silt-sized euhedral feldspar and spherical quartz. Pyrite is uncommon and hard to detect, but small flakes of iron rich red clay are commonly disseminated throughout mud and pale volcanic ash. Original ichnofabrics visible in 109R-1, 116–122 cm.
Mineral vein with high angle of dip (109R-2, 27–34 cm).
Bedding is dips moderately.



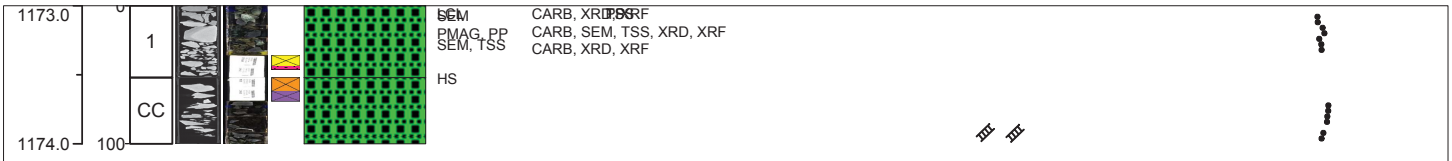
Hole C0023A Core 110R, interval 1121–1126.885 m (core depth below seafloor)

Reddened interval of calcareous mudstone (XRD confirms a relatively high proportion of goethite and hematite to be present). Greenish part fizz sparsely except when shells are present (XRD confirms high chlorite concentration). Green intervals are cut by calcite veins. There is an uneven contact at base between mudstone and basalt that does not evidence thermal alteration - enclaves of mud within the basalt are not baked. The mud overlies clasts of pale grey altered basalt and pale grey volcanic glass. Thin section analysis shows the basalt and glasses to contain acicular and bladed plagioclase as well euhedral plagioclase phenocrysts. Within basalt clay-alteration is common and replaces both olivine and amphiboles, as well as fills vesicles. Chlorite confirmed in thin section. The exterior of basalt clasts is rounded and some have hardened rims of glass or calcite.
Mineral veins with a slight to moderate dip (110R-1, 5–46 cm; 110R-4, 58–59 cm; 110R-CC, 7–34 cm). Several normal faults with slickenlines or slickenfibers (110R-1, 11–23 cm; 110R-2, 30–32 cm; 110R-4, 30–33 cm and 55–56 cm). Bedding dips slightly or moderately.



Hole C0023A Core 111R, interval 1173–1174 m (core depth below seafloor)

Hyaloclastite brecciated by drilling. Three main components: 1) Greenish glass with calcite psuedomorphing after plagioclase. Some glass-fragments have other enclaves of other components trapped within (typically plagioclase). 2) A single Feldspathic "basalt" piece that has a very thick (>4 cm) glassy exterior and can be interpreted as a pillow basalt. Plagioclase crystals are acicular blades and needles similar to 110R-4. Phenocrysts present in both basalt and glass. 3) Basalt fragments some of which have calcite on their exterior (like 110R-CC). Phenocrysts include euhedral plagioclase and chlorite psuedomorphing after olivine. Ground mass includes acicular plagioclase, brown in color, possibly microcrystalline hornblende and pyroxene.
Mineral veins along surfaces of clasts (111R-CC, 39–41 cm).



Hole C0023A Core 112R, interval 1176.5–1177 m (core depth below seafloor)

Basalt fragments some of which have calcite veins and red-colored rims within. Ground mass includes acicular plagioclase, with microcrystalline brown-colored hornblende and pyroxene. Less phenocrysts than 110R-1. SEM confirmed the presence of ferrous mineral phases.
Mineral veins along surfaces of clasts (112R-1, 2–16 cm).