Holes C0019A, C0019B, C0019C, and C0019D NO RECOVERY

Hole C0019E Core 1R, interval 176.5-185.235 m (core depth below seafloor)

Siliceous mudstone
Medium greyish olive clay to silt-sized siliciclastic material with minor diatoms, sponge spicules, and ash shards. Contains sporadic (<5%) subrounded pumice clasts up to 4 mm diameter, sometimes concentrated in cm-thick lenses. There are darker layers, laminae (that may be laterally discontinuous) and patches, ranging from olive brown to dark grey. Contacts between the various colors are rarely planar and may undulate up to 1 cm perpendicular to main bedding.

Ash (tuff)
Light grey to light olive grey ash. Contains >80% volcanoclastics from smear slide observations. May form cm-thick planar layers or discontinuous pods with interfingering boundaries with surrounding siliceous mud.

<table>
<thead>
<tr>
<th>Depth (m CSF-A)</th>
<th>Core length (cm)</th>
<th>Section</th>
<th>Core image</th>
<th>CT scan</th>
<th>Graphic lithology</th>
<th>Sedimentary structures</th>
<th>Lithologic accessories</th>
<th>Biohermal accessories</th>
<th>Deformations structures (tectonic)</th>
<th>Drilling disturbance</th>
<th>Shipboard samples</th>
</tr>
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<tbody>
<tr>
<td>176.5-185.235</td>
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<tr>
<td>Bedding parallel, discontinuous (lenses), curvy, black laminae, mm thickness. &lt;5% pumice fragments, rounded, elliptical, randomly aligned. Bedding orientation change. Bedding orientation change.</td>
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</table>
Mixed drilling breccia
Completely brecciated and disaggregated. Broken into sub mm to ~1 cm sized, angular to sub-rounded fragments. Larger fragments are sorted into axis of core. Fragments are in 4 compositions:
- dark gray (Munsell color 10G-3/1) silt with black slivers 3 mm long, <1 mm thick. Fragments tends to be sub-angular to sub-rounded
- medium gray (SB-7/1) sub-angular fragments
- brown (2.5Y-4/4) angular fragments
- pale gray (N-8/0), carbonates (verified with HCl), fragments from angular wafers.
All show a range of size distributions, except for the carbonate veins which are mm thickness.
Two lithologic units identified in coherent core sections. Ashy mudstone Medium gray (SB-5/1) ashy mudstone. Silt and clay grains with an overall speckled grey/black appearance. Mottled with patches of paler color where black grains are missing (from bioturbation). Contains 1-2 mm thick black, silt, (organic?), discontinuous laminations.
Red-Brown Silty Terrigenous claystone
Terrigenous component dominated (>70%), clay-rich, greyish-brown mudstone. Fossiliferous, ultra-fine grained (mostly < 60 micron) with patchy calcite cement (HCl). Archive half contains one macrofossil.

### Hole C0019E Core 2R, interval 648-651.635 m (core depth below seafloor)

<table>
<thead>
<tr>
<th>Depth (m CSF-A)</th>
<th>Core length (cm)</th>
<th>Core image</th>
<th>CT scan</th>
<th>Graphic lithology</th>
<th>Comments</th>
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<tbody>
<tr>
<td>648.0</td>
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<td>s t n e m m o Cy g o l o h t i l</td>
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<td>649.0</td>
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<td>Sedimentary structures</td>
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<td>650.0</td>
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<td>Lithologic accessories</td>
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<td>651.0</td>
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<td>Bioturbation Structures</td>
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<td>651.0</td>
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<td>Deformations (tectonic)</td>
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<td>Drilling disturbance</td>
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<td>651.0</td>
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<td></td>
<td>Shipboard samples</td>
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</table>

Possible bedding, becomes gradually darker towards the top of the core.
Mottled appearance.
Striae on surface indicate normal slip.
Mixed, fragmented, isolated, randomly oriented fossil pieces. Possible gastropod.
Calcite-coated fault surfaces ~1 mm thick. Offset by surrounding solution seams.
Darker seam that splays into 3 strands, 1.5 mm thick.
Pressure solution seam. Dark surfaces <1 mm thick. Also truncates burrows.

[Diagram of core sections and sedimentary structures]
Hole C0019E Core 3R, interval 653-659.65 m (core depth below seafloor)

Majority of core consists of fragmented, drilling induced breccia. Rock fragments in breccia consist of: a medium to dark grey mudstone, a light grey silty mudstone, a red-brown silty clay, and a brown to red-brown silty clay with coarser lithic fragments.

Two intact rock fragments were preserved in section 2.

Lithology 1:
medium grey mudstone, rich in terrigenous material, ~75% siliclastic grains and ~24% volcanic grains, and trace siliceous microfossils.

Lithology 2:
grey mudstone, dominantly terrigenous with high clay content, ~65% siliclastic grains, ~35% volcanic grains, and minor siliceous microfossils.

---

En-echelon band of dark grey, fine-grained material.

Dark seam observed in core. Possible result of pressure solution.
Black ashy mudstone

Dark gray to black, ultra-fine grained, laminated mudstone with dominant volcaniclastic component. Grain size is predominantly clay-sized, with scattered black silt-sized speckles. Bedding is defined by medium gray to black, 1-4 mm thick laminations (occasionally discontinuous). Rare elliptical, black, smudgy patches and sub-mm scale gray mottling may be worm burrows. Terrigenous component ~55% (dominated by clay), volcaniclastic ~44% (including pumice and glass fragments) and 1% biogenic fragments. Minor lithology is pale greenish-gray claystone containing >90% clay sized terrigenous particles. Forms few cm thick beds.

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<tbody>
<tr>
<td>689.0</td>
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<tr>
<td>690.0</td>
<td>100</td>
<td>1</td>
<td></td>
<td></td>
<td>Ashy Pale layer approximately parallel to axial plane of sheath fold.</td>
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<td>200</td>
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<td>Small fault that offsets laminations by ~3 mm.</td>
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<td>2</td>
<td></td>
<td></td>
<td>Fault cross-cutting the large darker gray inclusion.</td>
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</tbody>
</table>

- **Depth** (m CSF-A)
- **Core length** (cm)
- **Section**
- **Core image**
- **CT scan**
- **Graphic lithology**
- **Comments**

**Sedimentary structures**
- Lithologic accessories
- Bioturbation structures (tectonic)
- Drilling disturbance
- Shipboard samples

**Lithologic accessories**
- CARB, SS, XRD, XRF
- CARB, PMAG, XRD, XRF
- HPEWV, IMP, PWVD
### Major unit:
Inerbedded (cm or greater scale) dark grey mudstone with dark lamiae, ashy mudstone, and silty mudtone. Dark gray mudstone bedding defined by mm scale, wavy and anastomosing, dark black (organic?) compositional banding. Contains ~80% siliclastic grains and ~15% ash. Dark grey mudstone is interbedded with light green-grey, ashy, silty-sandstones with dominant volcaniclastic component (~40%), particularly at the uppermost interval (section 1, 1-55 cm). Minor interbeds of claystone contain 70% siliclastic grains and 29% volcanic grains. Silaceous fossil fragments occur in trace amounts through section with interbeds containing up to 15% silaceous material.

Unit contains trace pumice in isolated beds, and minor pyrite concretions often found in association with dark lenses.

Bedding in all lithologies commonly occur as anastamosing, boudined layers or losenges of variable thickness. Thin, planar, coherant laminated beds are present, but less common.

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<td></td>
<td>Sedimentary</td>
<td>Lithologic</td>
</tr>
</tbody>
</table>

1. Contact between coarse and fine mud
2. Bedding, Compositional banding
3. Bedding, Compositional banding and bed parallel fissional
4. Structural whole round, sub-horizontal shear band, anastomosing lozenges of CT bright material. Sharp upper surface burrow truncated at shear. Measured on CT.
5. 1-2 mm thick, very fine, dark grey band, possible dark gouge. Planar upper surface, corrugation at around 5mm length scale with amplitude of 1-2 mm on fault surface.
7. Dark shear band, anastomosing network truncates grey boudinaged lozenge (pinch and swell boudins) subparallel to shear zone.
8. Dark shear bands.
9. 2-3 cm thick olive-brown fine grained bed. Dark band truncating laminae.
10. Dark gray to black laminations sub-mm to 5 mm in thickness.
Mudstone
Very dark gray mudstone with black, few mm-scale laminae. Wavy and anastomosing banding defines bedding through most of the section. Small intervals display thin, planar, laminar bedding of interbedded brown-gray and dark horizons. Rare ash layers and horizons containing isolated pumice clasts.

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<td>706.0</td>
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- Isolated, 2-4 mm, subrounded pumice fragments.
- Mottled lenses of brown-gray in dark gray mudstone.
- Coarse silt-filled pods 2-6 mm.
- Very dark bed (rich in organic material?)
- Wavy and anastomosing dark horizons (organic rich?)
- Boundary between homogeneous dark gray muds and lenses of brown-gray and dark silty muds.
- Dark band, possible shear zone
- Dark bands at small angle to compositional banding
- Planar laminae of dark gray mud, brown gray mud and black mud.
- Lenses of ash.
- Mottled, anastomosing lenses of olive-gray to red muds.
Major lithology consists of interbedded dark grey mudstone with black laminations, ashy silty mudstone, and olive-grey mudstone.

The dominant lithology is a dark grey mudstone consists of ~70% siliclastic grains, 30% volcanic grains, and trace silaceous microfossils. Grey mudstone contains thin layers of dark grey to black (possibly organic rich) material (66% siliclastic grains, 33% volcanic and trace pelagic grains). Bedding is defined by interlayers of dark grey mudstone and is often wavy or flaser, with lateral thickness variations in the bedding plane.

Dark grey mudstone contains interbeds of olive-grey-brown mudstone. These horizons tend to be rich in clay relative to surrounding layers. Interbeds of silty-sand/ sandy-silt are present predominantly within the dark grey dominancy lithology. These layers contain ~85% siliclastic grains, 15% volcanic grains and trace silaceous fossils.

Discontinuous bedding and lenses of clay material may be the result of soft-sediment layer parallel shearing.
Major lithologies:

Dark grey mudstone interbedded with light green mudstone, dark (organic-rich) layers and silty mudstones. Dark grey mudstone contains 90% siliclastic grains and 10% volcanic grains. Dark (organic?) layers occur as flaser bedding, wavy laminae, and boudined lenses and losenges. Some contain pyrite concretions. Thin, planar, coherent laminated beds are present, but less common. Green-grey to light brown clay-rich mudstone is a secondary dominant lithology. Unit contains 90% siliclastic grains and 10% volcanic grains, with 70% of the material in the clay grain size fraction. Dark grey mudstone and green-grey mudstone lithologies are interbedded at the decimeter scale. Laminae and >cm thick beds of coarse silty mudstone and siltstone containing conspicuous quartz and feldspar are present through core. Sporadic concretions (few mm-1 cm diameter) and dark patches (organic materials, few mm) are present. All units contain trace to 15% siliceous fossils and fossil fragments.

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<tbody>
<tr>
<td>720.0</td>
<td>100</td>
<td></td>
<td></td>
<td>1</td>
<td>flaser, dark black (organic?) material.</td>
</tr>
<tr>
<td>721.0</td>
<td>200</td>
<td></td>
<td></td>
<td>2</td>
<td>reasonably planar bedding in ashy-clay rich layers. Fault &quot;sheath fold&quot; morphology.</td>
</tr>
<tr>
<td>722.0</td>
<td>300</td>
<td></td>
<td></td>
<td>3</td>
<td>compositional banding of bright grey to dark grey mudstones (1 mm-1 cm)</td>
</tr>
</tbody>
</table>

- Compositional variations between coarser silty grain size beds and finer mud.
- Silty lamina in mudstone.
- Pyrite-bearing concretion (1-2 mm thick deformation band marked by a layer of fine-grained, dark material)
- Pyrite-bearing concretion (7 mm)
- Pyrite-bearing seam (3 mm thick)
- Anastomosing shear bands. Total thickness ~3 cm.
- 5 mm thick dark seam
- Pyrite-bearing concretion
- Anastomosing network of shear bands, total width ~3 cm
- Pyrite bearing concretion (5 mm diameter)
Hole C0019E Core 9R, interval 724.5-725.165 m (core depth below seafloor)

Major lithology:
Dark grey-green mudstone (70% siliclastic and 25% volcanic) containing dark (organic?) lenses and layers. Upper portion of unit (17-27 cm) is dominated by a coarser grain-sized silty mudstone with siltstone laminae. Bioturbation present in clay rich intervals. Contains few mm-thick dark seams and some pyrite concretions (~1 cm diameter). Core contains the grey mudstone and ashy-silty mudstone lithologies of cores 7 and 8.
**Hole C0019E Core 10R, interval 770-772.35 m (core depth below seafloor)**

**Mudstone**
Same as previous. Contains sparse laminae of silty and sandy horizons with associated black bands.

**Interval 10R-1, 0.2-0.5**
Dark gray to gray, mudstone. Differentiated by dark, elliptical spots with long axes aligned to define a planar fabric. May be associated with pyritized burrows.

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<tbody>
<tr>
<td>771.0</td>
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<tr>
<td>772.0</td>
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<td>2</td>
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- Elliptical, mm sized dark spots, have aligned long axes loosely defining bedding
- Dark, anastomosing seams
- Dark, whispy lamination with silty-sand horizon
- Dark seams displacing sedimentary layering.
Hole C0019E Core 11R, interval 780.5-780.635 m (core depth below seafloor)

Blue gray siliceous mudstone
Pieces 1 (1-3 cm) and 3 (7-10 cm).
Silty mudstone (70% siliclastic) with abundant biogenic fragments including diatoms and sponge spicules (20-33%). Grain size is silty or smaller (70% clay). Faint laminations are defined by <<1 mm thin whispy laminations and bright X-CT numbers compared to predominant values. Piece #1 contains brecciated, sub-angular fragments of olive-brown-grey mudstone in a dark grey matrix.

Gray Siliceous mudstone
Pieces 2 (3-6 cm) and 4 (10-13 cm).
Homogeneous, gray siliceous mudstone with > 70% siliclastic grains, ~15% volcanic grains, and < 10% silaceous. Represented by a few biscuits in C11R. Contains few indications of bedding and no observed laminations. Mottled bedding. Numerous worm burrows are < 0.7 mm wide, dispersed and follow sinuous random tracks. No observed deformation in X-CT.
Hole C0019E Core 12R, interval 786-787.87 m (core depth below seafloor)

Dominant lithology:
dark grey green homogenous mudstone, with dominant (>90%) siliclastic grains, minor silaceous fossil fragments (>10%) and trace ash (1%). Mudstone is commonly biotubed and mottled. Mudstone is frequently interbedded with mm-cm scale silty laminae, with dominant (98%) siliclastic grains with abundant quartz and feldspar fragments, and trace ash and siliceous grains.

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<th>Comments</th>
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<tbody>
<tr>
<td>787.0</td>
<td>100</td>
<td>1</td>
<td>[Image]</td>
<td>[Image]</td>
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</tbody>
</table>

- bedding defined by ~cm thick silt bed. Bed is offset by a fault
- sub vertical silt laminae
- reverse fault that clearly offsets a nearly vertical ~1cm silt bed. 12 mm of separation along the fault in the split core face.
- 1 cm thick silt laminae, possible soft sediment loading structure indicates overturned bedding.
- sub vertical silt laminae
- near vertical bedding, defined by 1-2 mm thick silt bed
- steeply dipping bed is truncated at dark seam
Hole C0019E Core 13R, interval 801-802.895 m (core depth below seafloor)

Dominant lithology:
dark grey green homogenous mudstone, with dominant (>90%) siliclastic grains, minor silicaceous fossil fragments (>10%) and trace ash (1%). Mudstone is commonly biotrubed and mottled. Mudstone is frequently interbedded with mm-cm scale silty laminae, with dominant (98%) siliclastic grains with abundant quartz and feldspar fragments, and trace ash and silicaceous grains.

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<tbody>
<tr>
<td>802.0</td>
<td>100</td>
<td>1</td>
<td>1-1.5 cm thick dark band comprised of parallel anastomizing hairline bands, variable thickness with lens of pyrite. Thust sense of slip.</td>
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<td></td>
<td>100</td>
<td>2</td>
<td>1-3 mm thick anastomosing network of fine black shear band (dextral normal shear) enclosing lenses of host rock.</td>
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<td></td>
<td>100</td>
<td></td>
<td>Small fault with 3 mm offset.</td>
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<td></td>
<td>100</td>
<td></td>
<td>Several sediment-filled veins. Occur perpendicular to hairline fracture. Some are sigmoidal.</td>
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<tr>
<td></td>
<td>100</td>
<td></td>
<td>Coarse layer, underlies contact. Bed may be overturned(?). Measured in AH.</td>
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<tr>
<td></td>
<td>100</td>
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<td>5 mm thick zone made up of anastomosing network of mm-thick dark seams.</td>
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<td></td>
<td>100</td>
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<td>Still layer grades finer downwards. Contains grains of re-worked mudstone.</td>
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<td></td>
<td>100</td>
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<td>mm-thick, anastomosing, &quot;sidewall ripout&quot; (sensu Swanson, 1989), undulating with ~0.5 mm amplitude.</td>
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<tr>
<td></td>
<td>100</td>
<td></td>
<td>Anastomosing wispy seams.</td>
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13
Elliptical spots of pyrite and coarse grains in sediment have aligned long axes defining layering.

Anastomosing set of fractures, spaced at 0.5-3 cm.

Two parallel dark seams with normal sense of displacement. 1 mm offset of a pyrite ellipsoid.

Fracture with striated surface striations on dark anastomosing seams.

Shear band, sharply truncated bedding.

Shear band, truncated bedding.

Striations on anastomosing shear bands/ deformation band.

Curvilinear array of dark seams, bounding lenses of adjacent bedding. Striation on surface.

Fracture measured within a set of parallel fractures.

~3 mm pyrite concretion.

dark <1 mm elliptical patch (reduction spot?)
Dominant lithology:
dark grey green homogenous mudstone, with dominant (>90%) siliclastic grains, minor silaceous fossil fragments (>10%) and trace ash (1%). Mudstone is commonly biotubed and mottled. Mudstone is frequently interbedded with mm-cm scale silty laminae, with dominant (98%) siliclastic grains with abundant quartz and feldspar fragments, and trace ash and silicaceous grains.

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<tbody>
<tr>
<td>817.0</td>
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<td>100</td>
<td>CC</td>
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</table>

- dark seam, < 1 mm, shear band, cross-cuts core in brecciated green mudstone
- series of anastamosing and cross-cutting shear bands
- white granular ash
- highly fractured, brecciated rocks
- curviplanar dark seam, change in thickness along length
- white granular ash
- series of anastamosing shear bands with brecciated, elongate, green mudstone lenses. clast size ranges from <mm to ~2 cm. segregation into bands of common grain size.
- curviplanar dark seam, cross cuts relatively high angle seams. dominated by anastamosing dark seams (coherent piece 102.5-112.5)
- breccia consisting of ~cm scale lenses of dark green mudstone. network of dark seams, some of which cut breccia clasts, other mark the boundaries along clasts
Hole C0019E Core 16R, interval 818.5-820.01 m (core depth below seafloor)

Dominant lithology:
dark grey green homogenous mudstone, with dominant (>90%) siliclastic grains, minor silaceous fossil fragments (>10%) and trace ash (1%). Mudstone is commonly biotubed and mottled. Mudstone is frequently interbedded with mm-cm scale silty laminae, with dominant (98%) siliclastic grains with abundant quartz and feldspar fragments, and trace ash and silaceous grains.

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<tr>
<td>819.0</td>
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<td>C0</td>
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<tr>
<td>820.0</td>
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<td>C1</td>
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Entire core heavily shattered by drilling process. Bedding and coherent mudstone intervals are faintly observable in core, and in XCT.

Dark grey, elliptical reduction spots, some with pyrite centers. Abundant pyrite nodules. Shear planes marked by aligned (platy?) grains. Heavily fractured during coring.
Three different materials: a brown (clayey) lithology, a dark gray to black lithology and a greenish gray, homogeneous mudstone. Mudstone is only present in one 13.5 cm long biscuit. The brown material includes patches of the black material, and vice-versa. Within each of these materials, patches have sharp edges. One rim of brown material was observed surrounding a black phacoid. The boundaries between predominantly brown and predominantly black intervals are sharp. A sharp contact also separates more and less strongly deformed rock within the black material-dominated interval.

### Table: Sedimentary structures

<table>
<thead>
<tr>
<th>Depth (m CSF-A)</th>
<th>Core length (cm)</th>
<th>Section</th>
<th>Core image</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>822.0</td>
<td>100</td>
<td>1</td>
<td>![Core Image]</td>
<td>Sun-gray-brown, disturbed, brown and black components. Subtle compositional banding. mm-scale phacoids. Predominantly brown with gradational change in proportion of black material to brown only between 10-16 cm. Strongly developed scaly fabric defined by strongly undulating surfaces of flat, platey, 2-3 mm long phacoids (&lt;1 mm thick). Foliation is defined by aligned phacoid long axes. Foliation orientation changes down section. Overall, anastomosing, lensoidal foliation planes form a composite planar fabric. Foliation is more asymmetric in sagittal plane than coronal plane (see structural sketches for interpretation). Foliation is not parallel to contact at 16 cm. Mainly black, metallic lustre with small clasts of brown material near contact at 20 cm. Sharp contact between brown and black. Strong scaly fabric with abundant shiny surfaces. Phacoids are sub-mm near contact at 16 cm, grading coarser to max 1 cm down section. The foliation is not parallel to boundary at 20 cm. Mixture of brown and gray material, possibly disturbed by drilling. Phacoids 4 mm long, 2 mm thick near gray biscuit. Lustrous surfaces. Gray material forms phacoids as well as brown. Foliation broadly parallel to contact at 20 cm. Possibly disturbed by drilling. Sharp contact, curved surface. Dark seams cutting mudstone. At least 2 sets of anastomosing, hairline, dark bands. Steep set is cross-cut by sub-horizontal set. Possible 3rd set also near horizontal. Similar material to 20-22 cm. Mixed gray-brown material. Compositional layering of the order of few mm thick. Strongly foliated with phacoids around 5 mm long. Foliation is undulose and at different angle to unit below. Possible biscuit from drilling. Black material is strongly scaly, phacoid surfaces are frequently shiny and have slickenslips. Phacoids are up to 8 mm long. Foliation defined by phacoid long axes has wavy, anastomosing appearance in all 3 perpendicular directions. Average orientation is defined by long axes. Very similar to the interval 16-20 cm, but coarser phacoids and maybe more shiny surfaces. Predominantly dark gray to black with sparse clasts of brown material (typical size 2x5 mm). Clasts have sharp edges with black material. Contact defined by abrupt change in phacoid size: larger phacoids occur down section with fewer small phacoids. Dark gray to black material with some sparse clasts of brown material (~1.5 cm). Clasts have sharp edges. In one case a dark phacoid is surrounded by finer (sheared) brown material. In general, dark material phacoids are biggest in this portion compared to other layers. At least two scales of phacoid. Larger, less deformed lenses, ~0.5-3 cm long contain less intense foliation. Surrounding them bands 0.5 to 3 cm wide which are more intensely deformed contain phacoids &lt;1 mm. Surfaces of all sized phacoids are shiny and often have slickenlines. Two predominant orientations of phacoid surfaces are visible in all three perpendicular surfaces. Orientations of phacoid long axes are consistent at all scales, defining the foliation. Shorter phacoids may be thinner.</td>
</tr>
</tbody>
</table>

### Diagram: Sedimentary structures

- **Sedimentary structures**: Lithologic, accessories, Bioturbation, Deformations (tectonic), Drilling disturbance, Shipboard samples
- **Graphic**: SME, CT scan, Graphic lithology
- **Lithologic**: CARB, SS, XRD, XRF

### Comments:

- **Sedimentary structures**: Lithologic, accessories, Bioturbation, Deformations (tectonic), Drilling disturbance, Shipboard samples
- **Graphic**: SME, CT scan, Graphic lithology
- **Lithologic**: CARB, SS, XRD, XRF

In general, dark material phacoids are biggest in this portion compared to other layers. At least two scales of phacoid. Larger, less deformed lenses, ~0.5-3 cm long contain less intense foliation. Surrounding them bands 0.5 to 3 cm wide which are more intensely deformed contain phacoids <1 mm. Surfaces of all sized phacoids are shiny and often have slickenlines. Two predominant orientations of phacoid surfaces are visible in all three perpendicular surfaces. Orientations of phacoid long axes are consistent at all scales, defining the foliation. Shorter phacoids may be thinner.
Probable tectonic scaly fabric further damaged by drilling brecciation. Anastomosing both brown silty clayey mudstone and black silty mudstone lithologies and phacoid boundaries do not necessarily coincide with lithologic contacts. Phacoid faces are polished and striated, and some are corrugated on a mm wavelength. Bioturbated burrows (?) filled with ash.

Dominant lithology:

Brown silty clayey mudstone. Silty mudstone occurs as elongate lenses in a discontinuous matrix of darker brown, silty mudstone with abundant black silt grains (manganese - see smear slide at 59 cm in section 2). Dark silty horizons are commonly concentrated in bioturbated discontinuous blebs. Decimeter scale gradational sequences from more clay-rich mudstone at top of beds to siltier Mn rich beds at base. Bases of dark silty beds often have abrupt transitions to clay-rich mudstone below.

Commonly contains discontinuous pods and lenses of white granular ash that may be concentrated in bioturbated horizons. (see smear slide in section 1 at 33 cm)

Bedding is not well defined but is loosely identifiable by aligned lenses of various mudstone lithologies, likely the result of both bioturbation and moderate shear.

Unit is not intensely deformed but contains local zones of shear.
Dominant lithology:
Brown silty clayey mudstone - same as in core 18.

Silty mudstone occurs as elongate lenses in a discontinuous matrix of darker brown, silty mudstone with abundant black silt grains (manganese - see smear slide at 59 cm in section 2). Dark silty horizons are commonly concentrated in bioturbated discontinuous blebs. Decimeter scale gradational sequences from more clay-rich mudstone at top of beds to siltier Mn rich beds at base. Bases of dark silty beds often have abrupt transitions to clay-rich mudstone below. Commonly contains discontinuous pods and lenses of white granular ash that may be concentrated in bioturbated horizons. (see smear slide in section 1 at 33 cm)

Bedding is not well defined but is loosely identifiable by aligned lenses of various mudstone lithologies, likely the result of both bioturbation and moderate shear. Unit is not intensely deformed but contains local zones of shear.

Possible shear fracture. Mottled texture of small lenses of brown clay-rich mudstone fragments in a discontinuous matrix of dark, silty mudstone. Possibly bound by high angle shear zones. Bedding defined by black patches broadly aligned defining bedding. Discontinuous bioturbated horizons of ash. 0.5 cm pods of ash that are likely bioturbated. Shear surfaces cutting bedding. Reverse displacement. 0.1 cm of displacement measured in the split core face. Minor bioturbated ash lenses. 2 mm-thick white cement along fractures not carbonate. Worm burrows and mottling. Organic material. White sugary bleb of ash. Deformation band network 1-5 mm thick bands of pale material in an anastamosing network. Pumice ball.
Dominant lithologies:

Brown silty clayey mudstone, as observed in cores 18 and 19, is present the upper 190 cm of core 20. Bedding is loosely defined by elongate, discontinuous lenses of brown silty mudstone and dark (Mn rich) silty mudstone. Occasional pods of white, grainy ash, preferentially included in burrows and bioturbated intervals.

Bottom 65 cm consists of laminar, yellow brown and dark brown clay, with occasional pink, red-brown and white laminae. Unit consists of >80% siliclastic grains, with <10% volcanic grains and trace to <10% siliceous microfossils. More than 75% of the material falls in the clay grain size fraction. Claystone contains minor amounts of pyrite or manganese, and possible crysotblesite.

The base of the claystone recovered contains fragments of yellow-brown chert, as observed in core 21.
Entire core consists of rock fragments - no intact core recovered.

Upper 15 cm consists of fragments of mudstone from cores 18-20 and possibly from cores above core 17. These are interpreted to be fragments that fell into the base of the hole and are not interpreted to be in place.

Remainder of core consists of fragments of yellow-brown and chocolate brown laminar chert.

Yellow-brown chert: <mm to mm scale laminae of light yellow-brown (Hue 5Y 7/2) and dark yellow-brown (Hue 5Y 6/3) chert and occasional cm bands of translucent (Hue 10Yr 5/6) chert. These fragments are often coated in clay of the same color, as is found at the base of core 20 section 2.

<table>
<thead>
<tr>
<th>Depth (m CSF-A)</th>
<th>Core length (cm)</th>
<th>Section</th>
<th>Core image</th>
<th>CT scan</th>
<th>Graphic lithology</th>
<th>Sedimentary structures</th>
<th>Lithologic accessories</th>
<th>Bioturbation</th>
<th>Deformations (tectonic)</th>
<th>Drilling disturbance</th>
<th>Shipboard samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>CC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Entire core consists of fragments that are not in place.
<table>
<thead>
<tr>
<th>Hole</th>
<th>Core</th>
<th>Type</th>
<th>Section</th>
<th>A/W</th>
<th>Interval (cm)</th>
<th>% Siliciclastic Grains</th>
<th>% Volcaniclastic Grains</th>
<th>% Siliceous Microfossils</th>
<th>% Others</th>
<th>% Sand (&gt;63 µm)</th>
<th>% Silt (4–63 µm)</th>
<th>% Clay (&lt;4 µm)</th>
<th>Sediment classification</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>C0019E</td>
<td>19</td>
<td>R</td>
<td>3</td>
<td>A</td>
<td>48</td>
<td>85</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>3</td>
<td>45</td>
<td>52</td>
<td>Mudstone</td>
<td>Yellowish-gray clay later at bottom of core, no burrows, less reddish than top of core</td>
</tr>
<tr>
<td>C0019E</td>
<td>20</td>
<td>R</td>
<td>1</td>
<td>A</td>
<td>25</td>
<td>97</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>Tr</td>
<td>35</td>
<td>65</td>
<td>Mudstone</td>
<td>Greenish gray sediment at top of core, clay-rich muds</td>
</tr>
<tr>
<td>C0019E</td>
<td>20</td>
<td>R</td>
<td>1</td>
<td>A</td>
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<td>75</td>
<td>10</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>30</td>
<td>70</td>
<td>Claystone</td>
<td>Noted as mudstone on VCD description sheet</td>
</tr>
<tr>
<td>C0019E</td>
<td>20</td>
<td>R</td>
<td>2</td>
<td>A</td>
<td>57.5</td>
<td>75</td>
<td>Tr</td>
<td>0</td>
<td>15</td>
<td>Tr</td>
<td>30</td>
<td>70</td>
<td>Claystone</td>
<td>Sampled from the pinkish brown layer, ~1.5 cm wide, some of the silt may be authigenic</td>
</tr>
<tr>
<td>C0019E</td>
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<td>R</td>
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<td>A</td>
<td>58.5</td>
<td>80</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>Tr</td>
<td>15</td>
<td>85</td>
<td>Claystone</td>
<td>Rich brown layer bounding the pinkish brown layer sampled above. Not gritty at all when tasted</td>
</tr>
<tr>
<td>C0019E</td>
<td>20</td>
<td>R</td>
<td>2</td>
<td>A</td>
<td>68</td>
<td>90</td>
<td>Tr</td>
<td>10</td>
<td>0</td>
<td>8</td>
<td>20</td>
<td>72</td>
<td>Claystone</td>
<td>Sampled from dark layer (61-74 cm)</td>
</tr>
<tr>
<td>C0019E</td>
<td>20</td>
<td>R</td>
<td>2</td>
<td>A</td>
<td>108</td>
<td>90</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>90</td>
<td>Claystone</td>
<td>Green clay layer, low relief/birefringence minerals, poss. Zeolites</td>
</tr>
</tbody>
</table>

* Light colors denote major stratigraphic units
* Darker colors within lighter domain indicate sub-lithologies