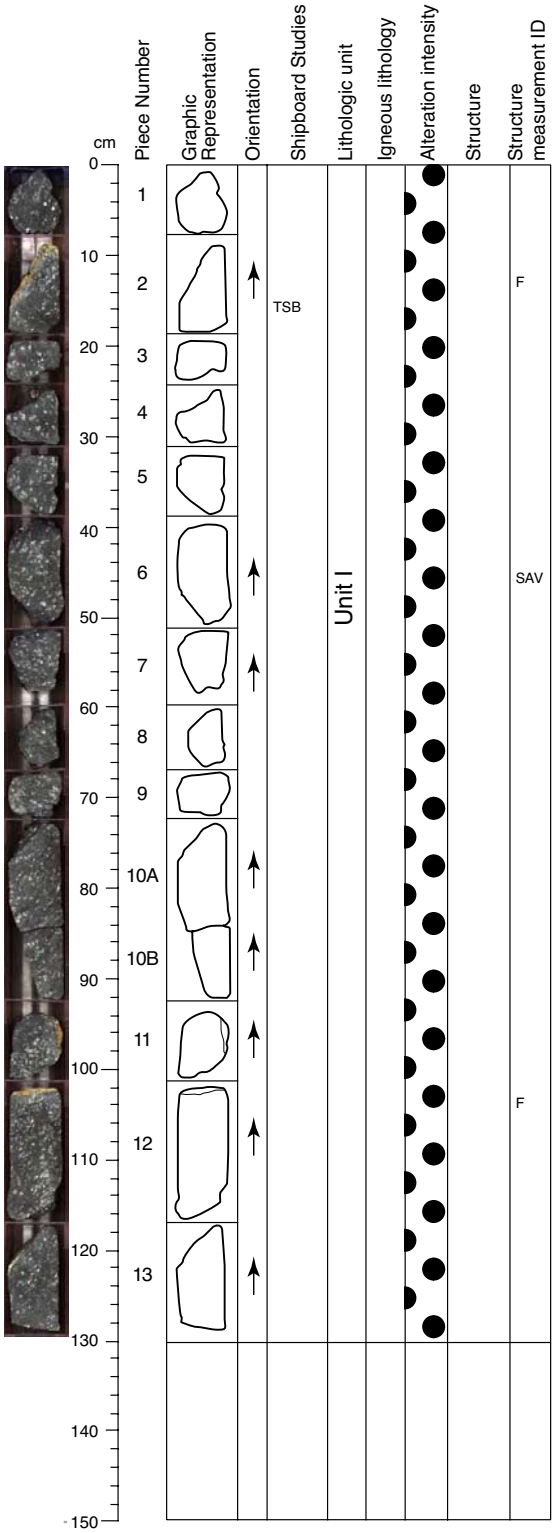
Core Photo



209-1274A-1R-1 (Section top: 0.0 mbsf)

UNIT I: HARZBURGITE

Pieces 1–13

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 71%–89%
Orthopyroxene	Mode 5%–30%
	Size 1–15 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <3%
	Size 1–4 mm
	Shape/Habit Anhedral
Spinel	Mode <2%
	Size 1–4 mm
	Shape/Habit equant/vermicular

COMMENTS: This core consists of moderately altered harzburgite and dunite. Harzburgites in Pieces 1-7 and 10-13 contain a small amount of clinopyroxene. Pieces 10-12 are rich in clinopyroxene (as much as 4%). The amount of orthopyroxene slightly decreases at 123-130 cm in Piece 13 relative to others. Spinel occurs as isolated equant grains or vermicular grains associated with orthopyroxene. The texture gradually changes from protogranular at the top of section to porphyroclastic at the bottom.

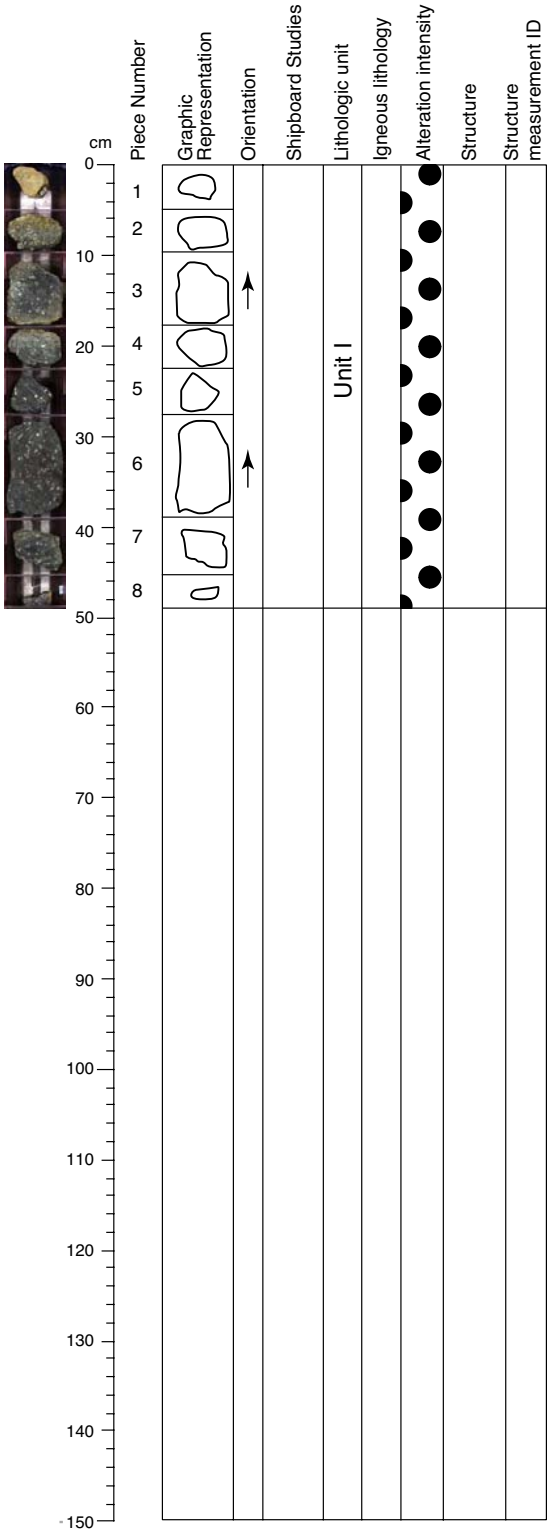
SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of very highly serpentine altered harzburgite. Only a very small percentage (<<1%) of magnetite is present. All pieces retain ca. 10% fresh olivine in cores of serpentine mesh texture. In close proximity to orthopyroxene-rich areas this may increase to as much as 25%-30% fresh olivine. However, in general, the distribution of fresh material is heterogeneous. Orthopyroxene is commonly altered to pseudomorphic bastite with a non-pseudomorphic dark green serpentine rim. However, as much as 25% of orthopyroxene cores are fresh. Fresh spinel is present in all pieces.

VEIN ALTERATION:
Volumetrically the veining in this section is dominated by two large aragonite veins (Pieces 2, 6, 11, and 12) with red halos composed mainly of clay, iron oxyhydroxides, acicular carbonate, and possibly hematite. Other veins in this section amount to <1% of the core and are composed of two generations of serpentine veins: 1) dark green to black transgranular serpentine veins, and 1) sigmoidal, paragranular, white chrysotile veins.

THIN SECTIONS: Sample 1274A-1R-1, 15-17 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are holly leaf to symplectic around orthopyroxene. There is weak crystal plastic foliation in Piece 1 (unoriented), but there are no obvious crystal plastic foliations defined by pyroxene grains in the remainder of the section. Piece 11 contains a modal layer contact between enstatite-poor harzburgite above and enstatite-rich below. The contact is inclined 30 degrees in the cut plane of the core. Pieces 2, 11, 12, and 13 contain narrow (1 cm wide) brittle shear zones along boundaries of oxidized serpentine veins. The serpentine matrix is cut by dense brittle shear fractures and wider shear zones of fine-grained breccia along vein boundaries. Most pieces are cut by thin (0.2 mm) black serpentine veins, commonly more dense near serpentine shear zones (Pieces 2 and 11). Piece 1 shows numerous very small chrysotile veins.

Core Photo



209-1274A-2R-1 (Section top: 11.9 mbsf)

UNIT I: HARZBURGITE

Pieces 1–8

COLOR: Dark green/gray with localized orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 73%–90%
Orthopyroxene	Mode 25%–10%
	Size 1–7 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1.5%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1–2 mm
	Shape/Habit Vermicular

COMMENTS: This core consists of moderately altered harzburgite with a minor amount of orthopyroxenite. Harzburgites in Pieces 4-5 contain a small amount of clinopyroxene (<1%). Vermicular spinel commonly forms intergrowths with orthopyroxene. Altered orthopyroxenite (2 cm thick) is present at the top of Piece 2. Texture varies from protogranular to porphyroclastic.

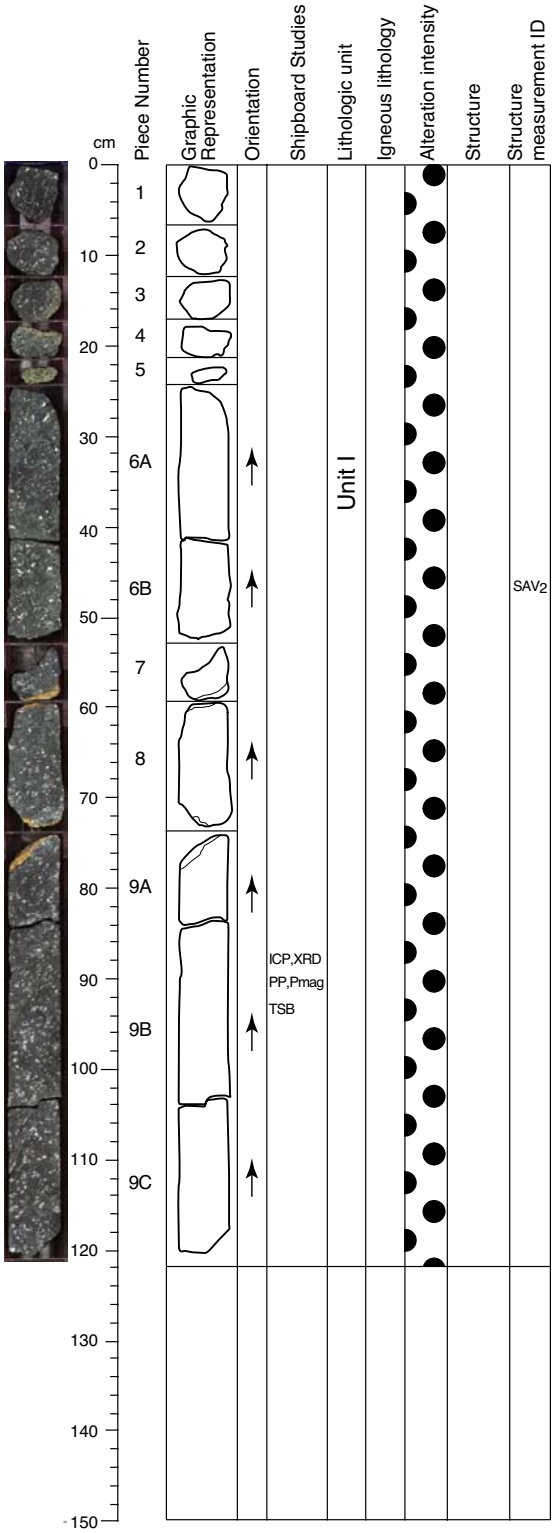
SECONDARY MINERALOGY:
COMMENTS: Pieces 1 and 2 are highly altered to serpentine, clay and oxyhydroxides. The rest of the pieces are completely altered harzburgite to serpentine and minor oxyhydroxides and clays. Piece 6 is the freshest piece in the section and may contain up to 20% fresh olivine in some areas. Orthopyroxene is altered to pseudomorphic bastite and nonpseudomorphic serpentine with some fresh orthopyroxene core relics in all pieces. Spinel is fresh in all pieces.

VEIN ALTERATION:
Serpentine veins are the dominant vein type in this section. Volumetrically they generally represent <1% of the section. An early generation of dark green picrolite veins that appear subparallel to the fabric of the host rock is crosscut by a later generation of sigmoidal white chrysotile veins. These also crosscut a single composite chrysotile/green picrolite vein.

THIN SECTIONS: Sample 1274A-2R-1, 0-3 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures, except for Pieces 1, 7, and 8. Piece 1 has a porphyroclastic mylonite texture with a strong crystal plastic foliation. Aspect ratios of elongate pyroxene are 4 to 5:1. The piece is unoriented. Piece 7 is porphyroclastic and strongly foliated. The crystal plastic foliation is inclined 15 degrees in the cut plane of the core. Piece 8 appears to be pyroxenite vein material. Spinel textures are generally holly leaf to symplectic around orthopyroxene in protogranular harzburgite. There are no obvious crystal plastic foliations defined by pyroxene grains in the remainder of the section. Pieces 2-4, 7, and 8 contain zones of minor brecciation associated with serpentine veins. Fracturing of serpentine matrix along fractures with minor offset that are filled with serpentine veins. Most pieces cut by thin (0.2 mm) black serpentine veins, commonly more dense near serpentine shear zones (Pieces 3, 4, 5, and 7). Piece 1 shows numerous very small chrysotile veins. Piece 4 is cut by a late composite green serpentine/chrysotile vein.

Core Photo



209-1274A-3R-1 (Section top: 16.9 mbsf)

UNIT I: HARZBURGITE

Pieces 1–9
COLOR: Dark green/gray with localized orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 74%–83%
Orthopyroxene	Mode 25%–15%
	Size 2–15 mm
	Shape/Habit Anhedral
Spinel	Mode <1.5%
	Size 1–4 mm
	Shape/Habit Vermicular

COMMENTS: This core consists of moderately altered harzburgite and dunite. Vermicular spinel commonly forms intergrowths with orthopyroxene. A band of altered dunite (3 cm thick) occurs in Piece 8. Texture is porphyroclastic in Pieces 1-3 and protogranular in Pieces 4-9.

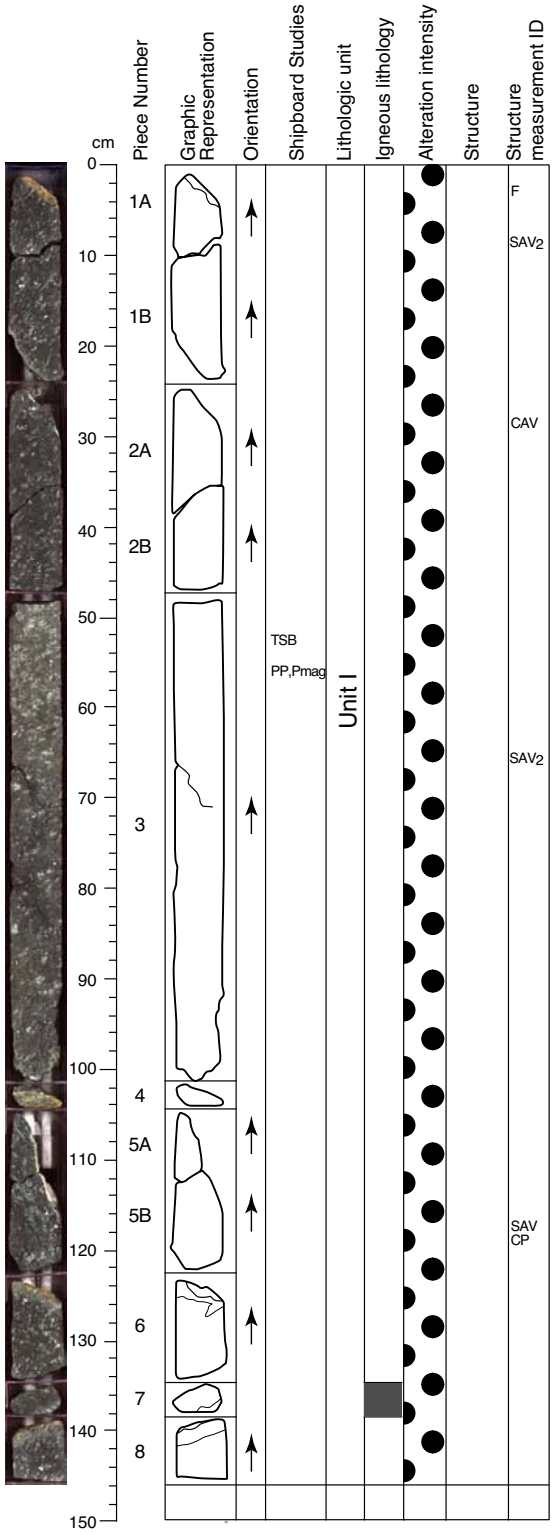
SECONDARY MINERALOGY:
COMMENTS: This section is composed of harzburgite that has been highly altered to serpentine minerals. Locally however there are patches with more than 15% fresh olivine and orthopyroxene. Orthopyroxene is altered to bastite.

VEIN ALTERATION:
Veining is not prominent in this section. Orange iron oxyhydroxide and carbonate veins are present on the margins of Pieces 7, 8, and 9A. Chrysotile veins are only a minor component in this section. The intensity of chrysotile veining diminishes down section but the connectivity increases slightly.

THIN SECTIONS: Sample 1274A-3R-1, 92-94 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally holly leaf to symplectic around orthopyroxene. A zoned dunite and pyroxenite vein is present on the base of Piece 8 and the top of Piece 9. There are no obvious crystal plastic foliations defined by pyroxene grains in section, although fine white veins of serpentine define a anastomosing serpentine foliation well displayed in Piece 6 and inclined 30 degrees in the cut face of the core. Pieces 3 through 9 have weak cross fiber serpentine foliation. There is very little brittle deformation in this section. Piece 4 has low densities of serpentine-filled shear fractures. Pieces 1 and 3 show early generation of higher angle, thin, planar serpentine veins cut by later wispy serpentine veins. Carbonate veins associated with ‘orange’ oxidation zones on the end of Pieces 7, 8, and 9.

Core Photo



209-1274A-4R-1 (Section top: 21.3 mbsf)

UNIT I: HARZBURGITE

Pieces 1–8

COLOR: Dark green/gray with localized orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 73%–92%
Orthopyroxene	Mode 8%–25%
	Size 1–15 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode < 1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1–4 mm
	Shape/Habit Vermicular

COMMENTS: This core consists of moderately altered harzburgite and dunite. A low abundance of clinopyroxene is present. In Piece 2, orthopyroxene abundance is low (~15%) between 17-33 cm. Piece 4 is a highly altered pebble. Piece 5 is more intensely altered than other parts of the section. Piece 7 is a small pebble of dunite. In places, orthopyroxene grains interstitially surround olivine. Spinel occurs as isolated granular grains or vermicular grains associated with orthopyroxene. Texture of this section is protogranular to partly weakly porphyroclastic.

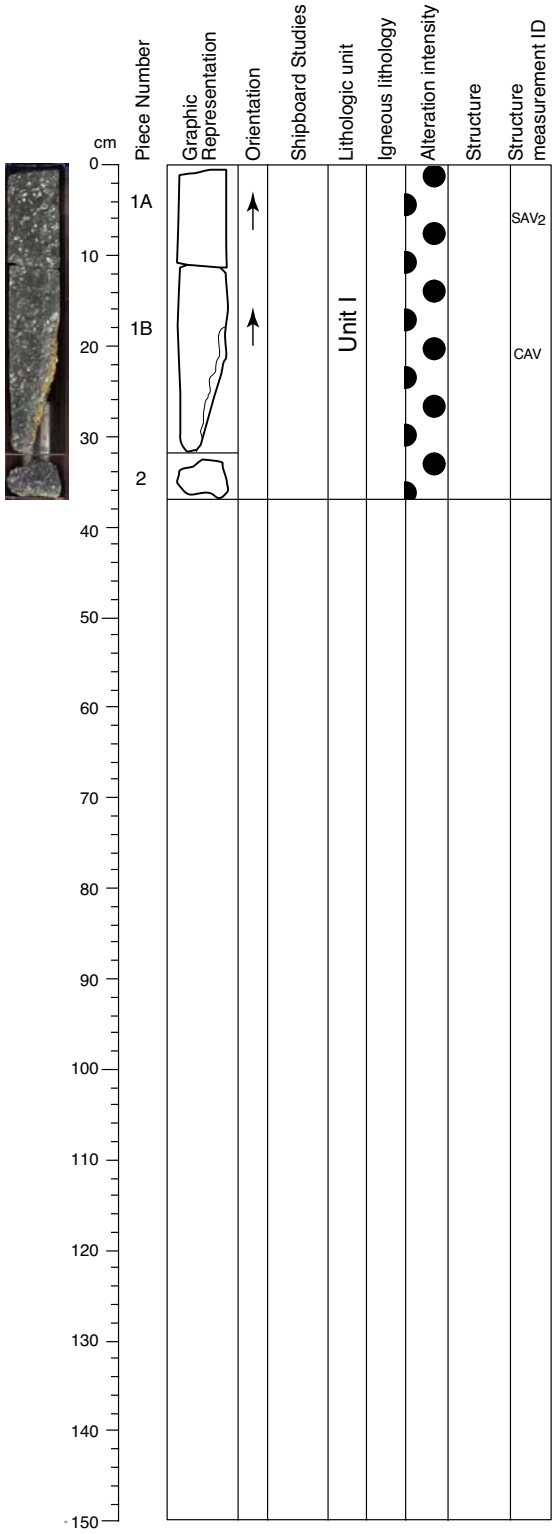
SECONDARY MINERALOGY:
COMMENTS: The core is composed of highly altered harzburgite. Average olivine alteration is approximately 93% with fresh olivine heterogeneously distributed in the cores of serpentine mesh textures. Fresh orthopyroxene occurs in all pieces. Orthopyroxene is commonly altered to bastite and thin coronas of dark green serpentine. Spinel is present in all pieces.

VEIN ALTERATION:
The most prominent veins of this section are carbonate veins with iron oxyhydroxide and clay-rich halos. The carbonate forms dense clusters of radiating acicular crystals (aragonite?) that are commonly exposed on the edges of pieces. Serpentine veining may amount to as much as 3% of the section and comprises two generations of sigmoidal chrysotile veins and a composite chrysotile/picrolite veins.

THIN SECTIONS: Sample 1274A-4R-1, 52-54 cm

STRUCTURE:
The section consists of serpentinized harzburgite with dominantly protogranular textures. Spinel textures are generally holly leaf to symplectic around orthopyroxene. Pieces 1 and 2 have a well defined crystal-plastic foliation defined by the preferred dimensional orientation of pyroxene grains that is inclined 45 degrees in the cut face of the core. Piece 5 has a weak porphyroclastic texture and a well-defined crystal plastic foliation inclined at 62 degrees. It also contains a parallel serpentine foliation. The remainder of the section has ill-defined crystal-plastic structure. There is modal variation in pyroxene content in the section and the enstatite-poor harzburgite appear to have a stronger crystal-plastic foliation. There is very little brittle deformation within this section. Piece 1 has low densities of fine serpentine-filled shear fractures. Piece 8 has moderate concentrations of shear fractures within a 2 cm wide zone of altered serpentinite. Pieces 1 through 8 exhibit weak cross fiber serpentine foliation. Wispy small chrysotile veins occur in Pieces 1-8. Carbonate veins cut Pieces 2 and 5. Early generation of small green serpentine veins occur in Piece 5. Rare long thin white serpentine veins with wall rock alteration cut Piece 5.

Core Photo



209-1274A-4R-2 (Section top: 22.76 mbsf)

UNIT I: HARZBURGITE

Pieces 1–2

COLOR: Dark green/gray with localized orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 79%–84 %
Orthopyroxene	Mode 20%–15%
	Size 2–12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–2 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular

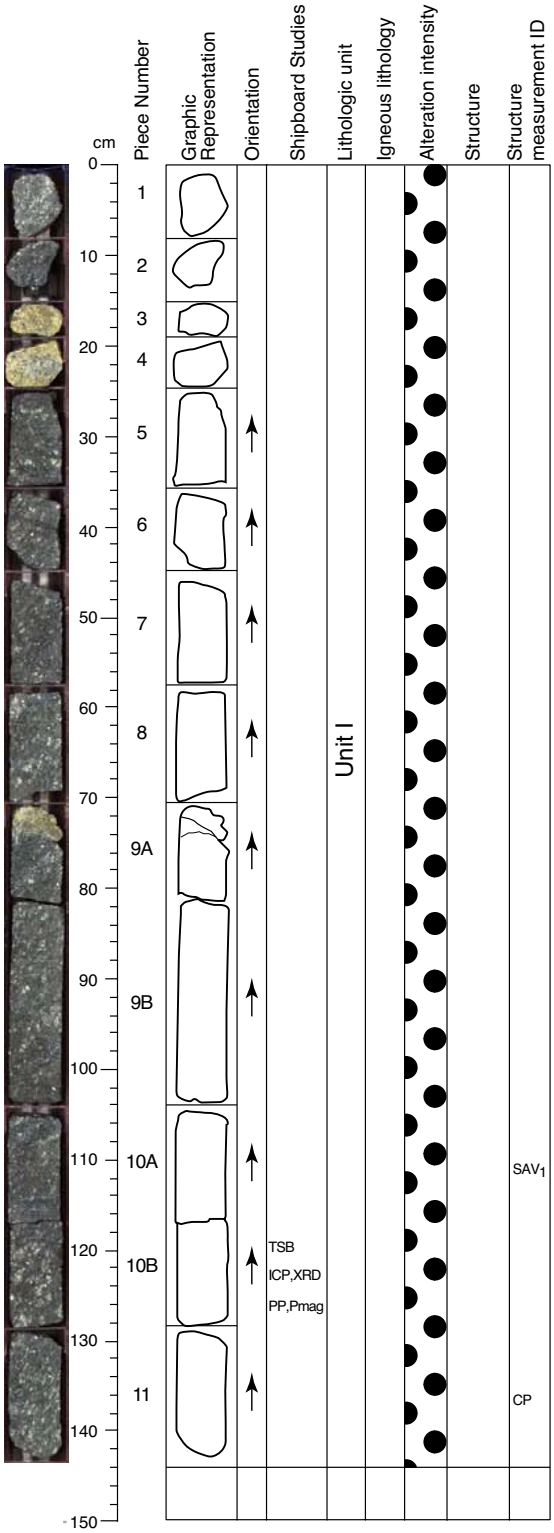
COMMENTS: This core consists of moderately altered harzburgite. A small amount of clinopyroxene is present in harzburgite. Sulfide minerals occur as inclusions in altered orthopyroxene grains. Spinels exhibit vermicular shape forming intergrowth with orthopyroxenes.

SECONDARY MINERALOGY:
COMMENTS: The core is composed of highly altered harzburgites. Average olivine alteration is approximately 93% with fresh olivine heterogeneously distributed in the cores of serpentine mesh textures. Fresh orthopyroxene is present. Orthopyroxene is commonly altered to bastite and thin coronas of dark green serpentine. Spinel is present.

VEIN ALTERATION:
The veins in this section are very similar to the veins present in Sections 1274A-1R-1 to 4R-1. Orange veins composed of carbonate and iron oxyhydroxide and minor clay are present on the edges of Piece 1. Serpentine veins account for less than 1% of this section. An early, very fine, black serpentine vein is crosscut by white cross-fiber sigmoidal chrysotile veins.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally holly leaf to symplectic around orthopyroxene. There is no obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene in the section. There is very little brittle deformation within this section. Pieces 1 and 2 exhibit weak cross fiber serpentine foliation and wispy chrysotile veins. Carbonate remains occur on surface of oxidation zone around crack in Piece 1. An early generation of green serpentine veins cut by white chrysotile vein in Piece 2.

Core Photo



209-1274A-5R-1 (Section top: 26.3 mbsf)

UNIT I: HARZBURGITE

Pieces 1–11

COLOR: Dark green/gray with localized orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 74%–89%
Orthopyroxene	Mode 20%–10%
	Size 2–15 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–2 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1–3 mm
	Shape/Habit Vermicular

COMMENTS: This core consists of moderately altered harzburgite. Amounts of orthopyroxene and clinopyroxene are less than up section. Pieces 5-6 show modal layering in clinopyroxene and orthopyroxene. Elongated orthopyroxene is present in Piece 11.

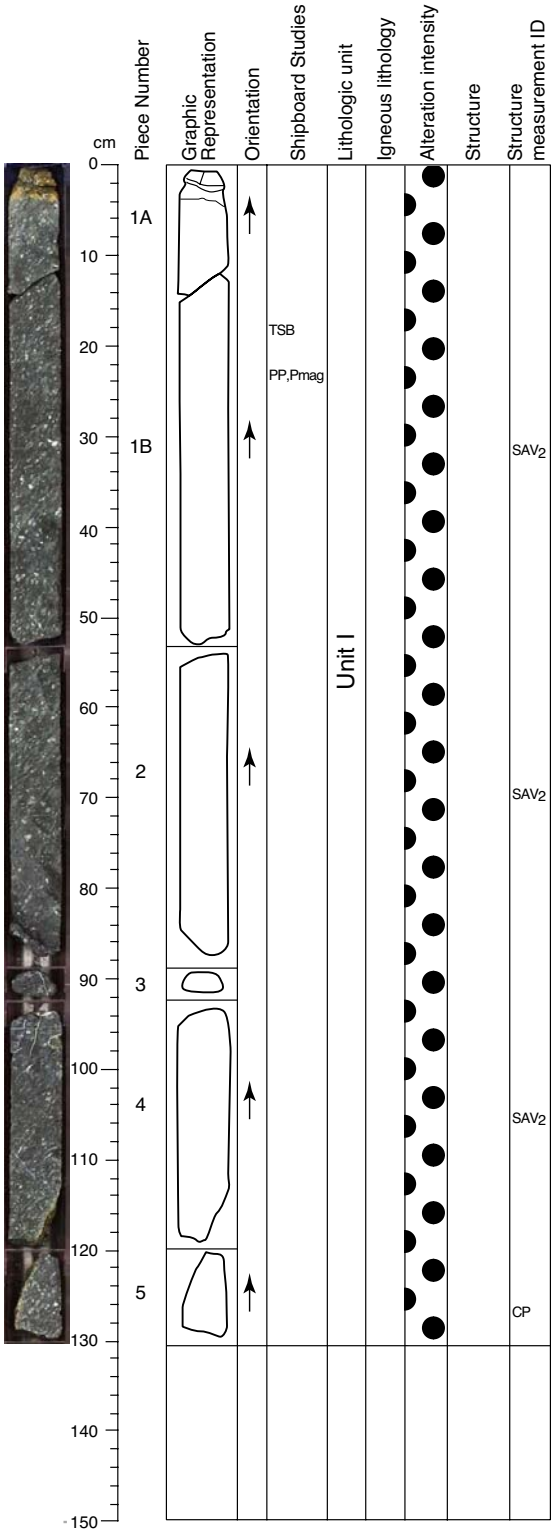
SECONDARY MINERALOGY:
COMMENTS: This section consists of highly altered harzburgite. Some pieces are affected by oxyhydroxide clay alteration on the top or bottom of the piece, presumably due to vein alteration (e.g., Pieces 3-4 and the top of Piece 9). Olivine is altered to mesh texture serpentine and fresh olivine is present in the cores of these textures (~3% on average but locally as much as 10% fresh olivine). Fresh orthopyroxene within relict grains is present in all pieces. Orthopyroxene is altered to bastite pseudomorphs and nonpseudomorphic serpentine. Spinel is fresh in all pieces.

VEIN ALTERATION:
The veining in this section is dominated by serpentine veins. Most abundant are white sigmoidal chrysotile cross-fibers. These sigmoidal veins crosscut an earlier generation of mixed picrolite-chrysotile veins that are extremely fine in places.

THIN SECTIONS: Sample 1274A-5R-1, 119-121 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally holly leaf to symplectic around orthopyroxene. There is no obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene in most of the section, but Pieces 1, 7, and 8 have a weak crystal plastic foliation inclined at 45 degrees in the cut face of the core. There is very little brittle deformation within this section. Pieces 1-2, 5-8, and 10-11 have a weakly defined cross fiber serpentine foliation. Change in style of chrysotile cross fiber veins to hatchwork foliation or layer parallel is usually associated with a lack of well-defined crystal plastic foliation. Some early, planar green and black serpentine veins occur in Pieces 5, 6, 7, and 10A.

Core Photo



209-1274A-5R-2 (Section top: 27.74 mbsf)

UNIT I: HARZBURGITE

Pieces 1–5

COLOR: Dark green/gray with localized orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 76%
Orthopyroxene	Mode 22%–25%
	Size 2–1.5 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode 1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular

COMMENTS: This core consists of moderately altered harzburgite. Spinel grains in this section are slightly larger (as large as 3 mm) than that in other cores. Alteration is higher than in cores further up section.

SECONDARY MINERALOGY:

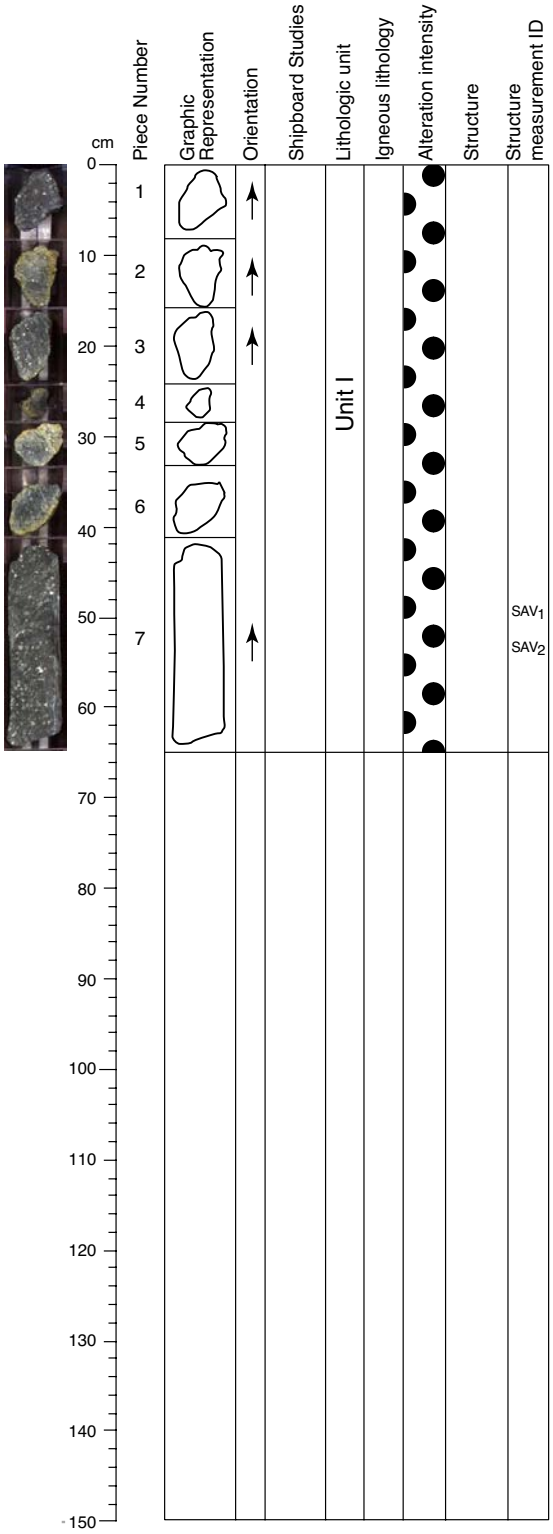
COMMENTS: This section of core is composed of highly serpentine altered harzburgite. Compared to olivine, the percentage of fresh orthopyroxene is relatively high (ca. 25% fresh orthopyroxene compared to ca. 3% fresh olivine). Fresh olivine is preserved in the cores of serpentine mesh texture. Orthopyroxene has been altered to pseudomorphic bastite and nonpseudomorphic dark green serpentine. Fresh spinel is present in all of pieces. The top of Piece 1 has been altered to iron oxyhydroxides and clay.

VEIN ALTERATION:
Sigmoidal chrysotile veins are strongly aligned throughout the section. They account for as much as 3% of the core volume in this section. Locally they crosscut earlier generations of dark serpentine veins.

THIN SECTIONS: Sample 1274A-5R-2, 17-20 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Piece 1 contains a fragment of harzburgite and pyroxenite. Spinel textures are generally holly leaf to symplectic around orthopyroxene and there is a spatial association with pyroxene. All pieces have an obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains or aggregates in most of the section. The foliation is inclined at 40 degrees in the cut face of the core. Pieces 1 through 5 have minor concentrations of fine, en-echelon shear fractures (filled with serpentine?) that are parallel to the cross-fiber serpentine foliation, which generally lies subparallel to the crystal plastic foliation. The section is characterized by a return to serpentine foliations that define a sigmoidal style of white chrysotile veins wrapping around pyroxene, unlike the hatchwork pattern in Section 1274A-5R-1. A talc serpentine vein cuts Pieces 3 and 4. Thin black serpentine veins cut Piece 1.

Core Photo



209-1274A-6R-1 (Section top: 30.8 mbsf)

UNIT I: HARZBURGITE

Pieces 1–7

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 83%–88%
Orthopyroxene	Mode 15%–10%
	Size 2–10 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode 1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–4 mm
	Shape/Habit Interstitial/Equant/Vermicular

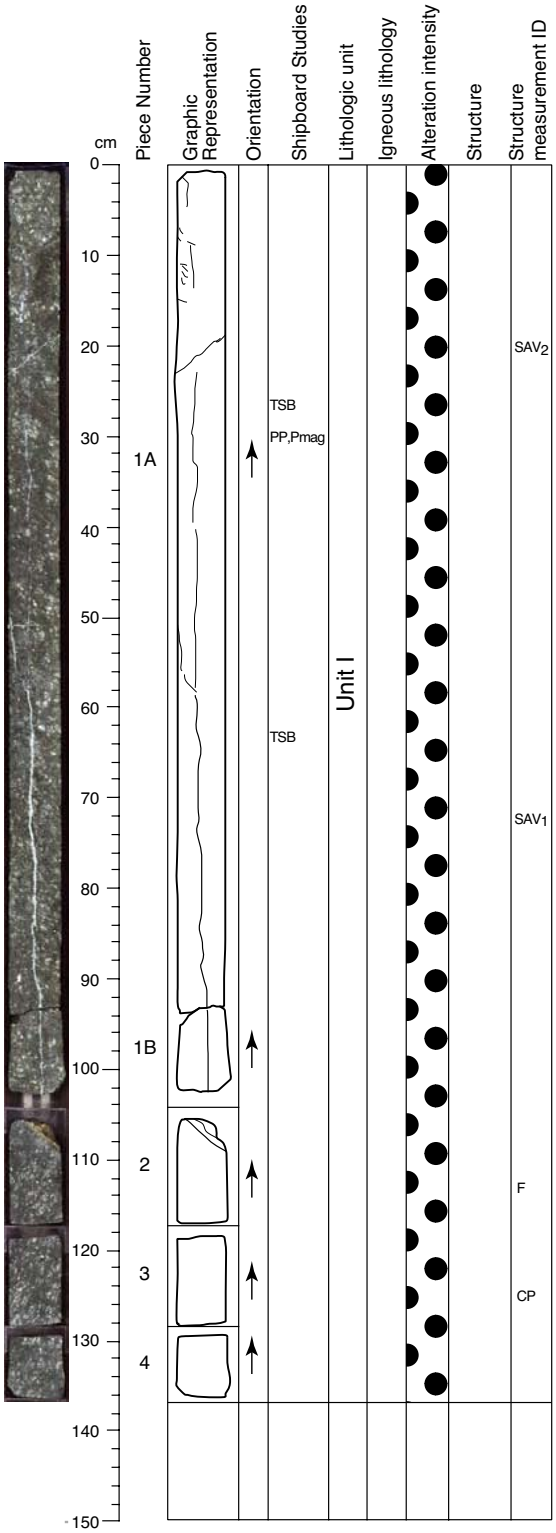
COMMENTS: This core consists of moderately altered orthopyroxene-poor harzburgite with small amount of clinopyroxene. Some spinel grains show vermicular shapes and are associated with orthopyroxene.

SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of highly serpentinized harzburgite. 10%-20% of olivine and 40% of orthopyroxene are preserved. Spinel is predominantly fresh. Piece 2 has an oxidation halo along an aragonite vein.

VEIN ALTERATION:
Sigmoidal chrysotile veins account for up to 2% of the core volume in this section.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally holly leaf to symplectic around orthopyroxene and there is a spatial association with pyroxene. Pieces 5 and 7 have an obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains or aggregates. The remainder of the section has no obvious crystal-plastic foliation. The foliation is inclined at 38 degrees in the cut face of the core. This section contains only very minor brittle deformation textures. Piece 2 contains fine fractures parallel to the cross-fiber serpentine foliation. An interval of altered serpentinite in Piece 5 contains a moderate concentration of shear fractures. Pieces 1, 2, and 5 are cut by weak intensity cross-fiber serpentine foliation. A large subvertical (> 20 cm) serpentine vein cuts Pieces 5. Carbonate veining is associated with alteration in Pieces 2, 5, and 6. Thin black serpentine vein cuts Piece 2.

Core Photo



209-1274A-6R2 (Section top: 31.45 mbsf)

UNIT I: HARZBURGITE

Pieces 1–4

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 74%–84%
Orthopyroxene	Mode 25%–15%
	Size 2–12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 0.5–2 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–4 mm
	Shape/Habit Vermicular/Equant

COMMENTS: This core consists of moderately altered harzburgite with small amount of clinopyroxene. Altered clinopyroxene occurs in Piece 1. Orthopyroxene mode increases downhole.

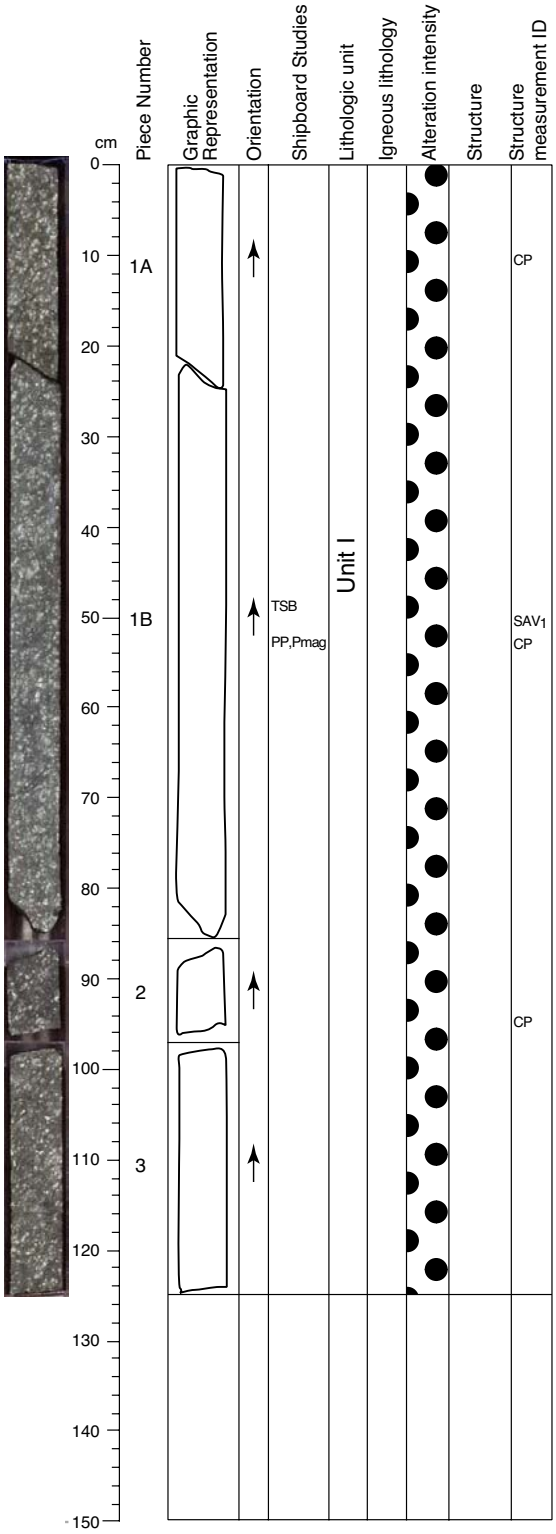
SECONDARY MINERALOGY:
COMMENTS: The section is composed of highly serpentine altered harzburgite. Variable amounts of olivine occur in the cores of serpentine mesh texture. Fresh olivine cores usually range from 3%-4% but locally can be higher in areas adjacent to orthopyroxene. Fresh orthopyroxene cores are present in all pieces. Orthopyroxene is variably altered to pseudomorphic bastite cores and nonpseudomorphic dark green serpentine. Fresh spinel is present in all pieces. A thin former magmatic vein crosses Piece 1. This vein was likely pyroxenite and has been altered to serpentine, chlorite and amphibole with grains of sulfide and possibly native copper.

VEIN ALTERATION:
Two generations of serpentine veins are present in this section. White, sigmoidal chrysotile veins are present throughout the first three pieces. In Piece 1 a serpentine vein crosscuts a near vertical former igneous vein that runs down the section. Pyrite and possibly native copper are present at the intersection of these veins. The margins of a carbonate-hematite-clay vein, which has a prominent 1-cm wide dark green halo, are preserved at the top of Piece 2.

THIN SECTIONS: Sample 1274A-6R-2, 25-28 cm and 1274A-6R-2, 62-64 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular texture. Spinel textures are generally holly leaf to symplectic (e.g., Piece 1) around orthopyroxene and/or there is a spatial association with pyroxene. Clinopyroxene appears as an interstitial phase with irregular and embayed outlines. Pieces 2, 3, and 4 have an obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 58 degrees in the cut face of the core. The remainder of the section has no obvious crystal-plastic foliation. Piece 1 exhibits weak cross-fiber serpentine foliation. Pieces 2 though 4 exhibit moderate intensity cross-fiber serpentine foliation subparallel to the crystal-plastic foliation. There are less wispy white serpentine veins; mostly they occur in Piece 1 with low amounts in Pieces 2 and 3. A large subvertical (> 100 cm) former igneous vein is cut by serpentine-filled tension gashes orthogonal to the vein and longitudinal serpentine-sulfide veins along the original magmatic vein. The vein is cut by single diagonal serpentine vein in Piece 1. A trace of carbonate is associated with the oxidized margin of a crack in Piece 2.

Core Photo



209-1274A-6R3 (Section top: 32.82 mbsf)

UNIT I: HARZBURGITE

Pieces 1–3

COLOR: Dark green/gray.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 71%–76%
Orthopyroxene	Mode 28%–22%
	Size 2–15 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode 1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–4 mm
	Shape/Habit Interstitial/Equant/Vermicular

COMMENTS: This core consists of moderately altered orthopyroxene-rich harzburgite with a low abundance of clinopyroxene. Clinopyroxene abundance increases downhole. Spinel is mainly interstitial.

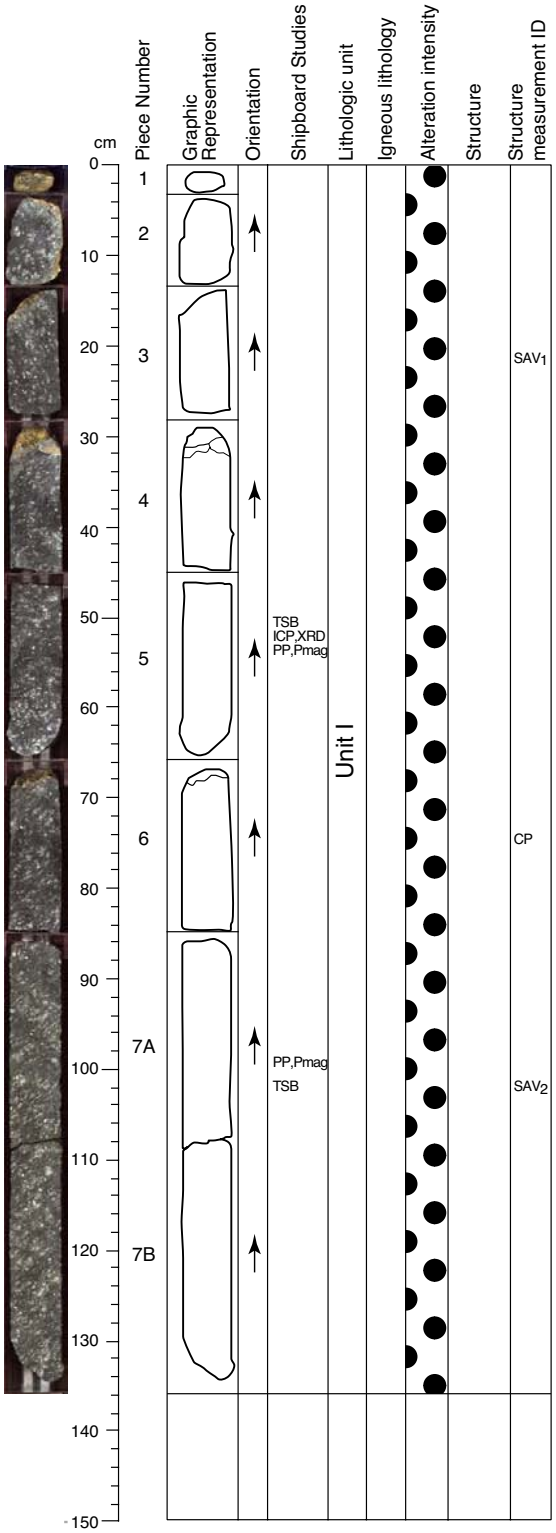
SECONDARY MINERALOGY:
COMMENTS: This section of core consists of highly serpentine altered harzburgite. Fresh olivine occurs within all pieces and is present as cores within serpentine mesh texture alteration. The proportion of fresh olivine is locally variable but averages ~5%. Orthopyroxene is mainly altered to bastite although some fresh orthopyroxene is present in all pieces.

VEIN ALTERATION:
In this section two generations of serpentine veins, one composed of white chrysotile and one of dark green serpentine, are present but both are volumetrically insignificant.

THIN SECTIONS: Sample 1274A-6R-3, 47-50 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular texture. Spinel textures are generally holly leaf to symplectic (e.g., Piece 1) around orthopyroxene and/or there is a spatial association with pyroxene. The upper 43 cm of Piece 1 and Pieces 2 and 3 have an obvious weak crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 50 degrees in the cut face of the core. The remainder of Piece 1 has no obvious crystal-plastic foliation. Pieces 1 through 3 exhibit a weak cross-fiber serpentine foliation. Thin, planar black serpentine veins cut Piece 1B. Very weak sigmoidal wispy white chrysotile veins are in Pieces 1 and 3.

Core Photo



209-1274A-7R1 (Section top: 35.8 mbsf)

UNIT I: HARZBURGITE

Pieces 1–7

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 70%–80%
Orthopyroxene	Mode 28%–18%
	Size 2–15 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Equant/Interstitial/Vermicular

COMMENTS: This core consists of moderately altered orthopyroxene-rich harzburgite with a low abundance of clinopyroxene. Orthopyroxene modal layering is present in Pieces 3-6. Spinel shows vermicular shape associated with orthopyroxene in the orthopyroxene-rich part of the section. Spinel commonly exhibits interstitial shape.

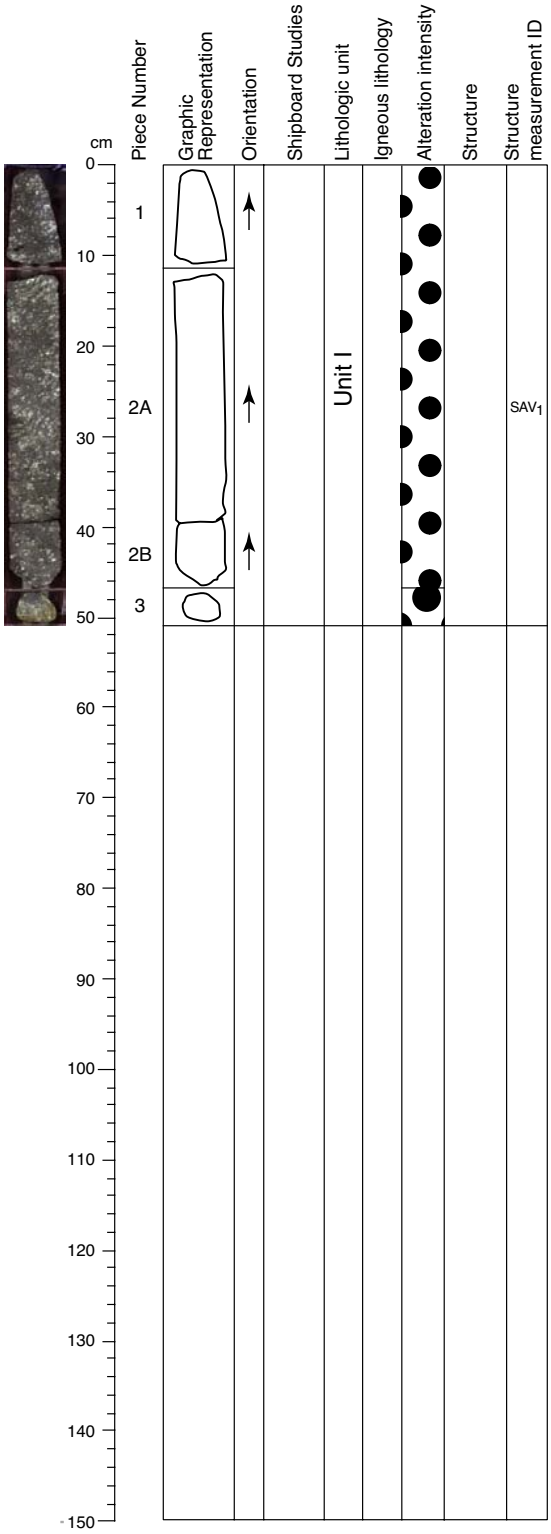
SECONDARY MINERALOGY:
COMMENTS: This section of core consists of highly serpentine altered harzburgite. Oxyhydroxide weathering is present in Pieces 1-4, and 6. Fresh olivine occurs within the cores of serpentine mesh texture alteration and fresh orthopyroxene cores are preserved in many orthopyroxenes. Where altered, orthopyroxene is mostly replaced by pseudomorphic bastite. Fresh spinel is present in all pieces.

VEIN ALTERATION:
Carbonate veining is indicated by orange carbonate-iron oxyhydroxide-clay vein halos that are present on the edges of Pieces 1 to 4 and account for about 1% of the volume of core in this section. Two generations of serpentine veins are also present. Dark green picrolite veins account for less than 0.1% of the section. These were crosscut by sigmoidal, white chrysotile veins, which occur infrequently throughout the section.

THIN SECTIONS: Samples 1274A-7R-1, 48-51 cm and 1274A-7R-1, 101-105 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular texture. Spinel textures are generally holly leaf to symplectic around orthopyroxene. Pieces 3, 6 and 7 have an obvious weak crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 45 degrees in the cut face of the core. The remainder of the section has no obvious crystal-plastic foliation. There is very little brittle deformation in this section. Pieces 3 and 4 have open fractures spaced more than 10 cm from one another. Pieces 1 through 7 exhibit weak strength cross-fiber serpentine foliation subparallel to the crystal plastic foliation. Oxidized halos to large cracks occur within Pieces 1-4 and 6. A carbonate is vein present in Piece 4. Early thin, planar black serpentine veins are visible in Pieces 3, 4, and 7 and sigmoidal wispy white chrysotile veins cut Pieces 6 and 7.

Core Photo



209-1274A-7R2 (Section top: 37.16 mbsf)

UNIT I: HARZBURGITE

Pieces 1–3

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 73%
Orthopyroxene	Mode 25%
	Size 2–12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode 1.5%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–4 mm
	Shape/Habit Vermicular

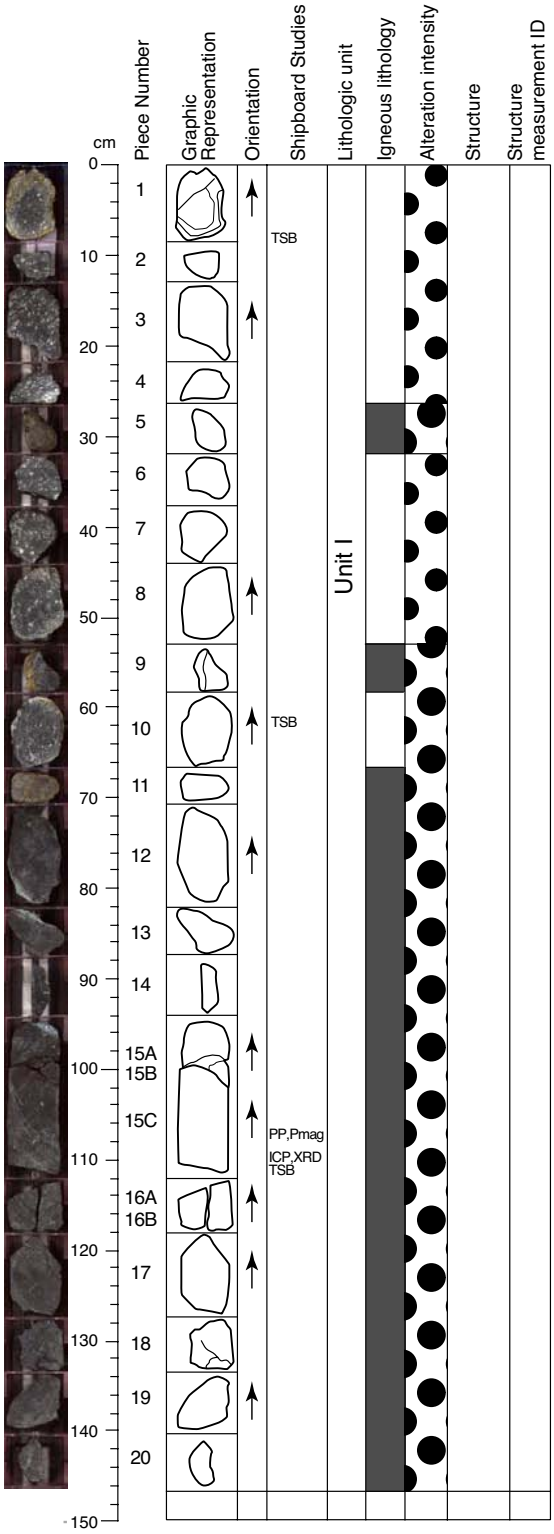
COMMENTS: This core consists of moderately altered harzburgite with a low abundance of clinopyroxene. Spinel shows vermicular shape.

SECONDARY MINERALOGY:
COMMENTS: The section is composed of harzburgite completely altered to serpentine. Unlike the previous sections of core, few fresh olivine grains remain within the cores of serpentine mesh textures. Larger orthopyroxene grains are altered to pseudomorphic bastite. Smaller orthopyroxene grains are altered to nonpseudomorphic dark green serpentine, but rare fresh orthopyroxene cores are preserved in all pieces. Oxyhydroxide is present on the bottom of Piece 3 which probably represents a vein alteration halo. Fresh spinel is present in all pieces.

VEIN ALTERATION:
Very similar to Section 1274A-7R-1, the presence of iron oxyhydroxide-carbonate-clay vein halos indicates carbonate veining, in particular in Piece 3. Dark green picrolite veins are crosscut by tiny, sigmoidal, white chrysotile veins.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular texture. Spinel textures are generally holly leaf associated spatially with pyroxene to symplectic with orthopyroxene. Piece 2 has an obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains or aggregates. The remainder of the section has no obvious crystal-plastic foliation. The foliation is inclined at 50 degrees in the cut face of the core. Pieces 1 through 3 exhibit weak serpentine foliation. Early thin, planar black serpentine veins cut Pieces 1 and 2. Weak sigmoidal wispy white chrysotile veins occur in all three pieces.

Core Photo



209-1274A-8R1 (Section top: 40.0 mbsf)

UNIT I: HARZBURGITE

Pieces 1–20

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 83%–98%
Orthopyroxene	Mode 15-0%
	Size 1-12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1–3 mm
	Shape/Habit Vermicular/Interstitial/Equant

COMMENTS: This core consists of moderately altered harzburgite with a low abundance of clinopyroxene and intervals of dunite. Alternation of harzburgite and dunite in the upper part of the section and only dunite is present in the lower part of the section. Large subhedral to euhedral spinel grains (<3 mm) are present in dunite. Spinel shows vermicular to interstitial shape in harzburgite.

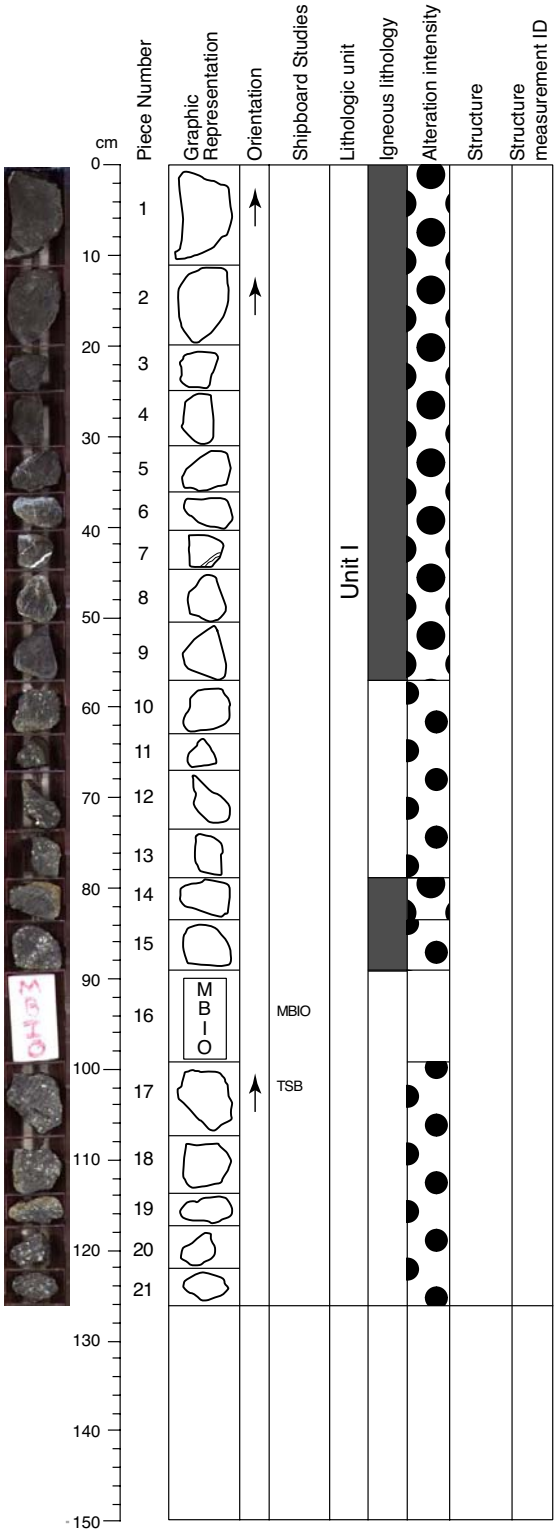
SECONDARY MINERALOGY:
COMMENTS: This section of core consists of harzburgite and dunite that is highly to completely altered to serpentine minerals. Harzburgite retains, on average, 3% of fresh olivine that is present within the cores of serpentine mesh texture alteration. Large orthopyroxenes commonly have fresh cores mantled by pseudomorphic bastite. Small orthopyroxene grains are replaced by dark green serpentine. Iron oxyhydroxide-clay alteration is present on the margins of Pieces 1, 3, and 9 that is interpreted as being a halo from the adjacent crack. Pieces 12-20 are serpentinized dunite that contains fresh spinel with narrow halos of chlorite. Olivine alteration is patchy and ranges from 70%-100% although average olivine alteration is around 95%.

VEIN ALTERATION:
Dark green to black picrolite+magnetite veins are crosscut by tiny, sigmoidal, white chrysotile veins. Chrysotile veins account for 0.5 to 3% of the core.

THIN SECTIONS: Samples 1274A-8R-1, 15-18 cm, 1274A-8R-1, 61-64 cm, and 1274A-8R-1, 109-111 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular texture (Pieces 1-8 and 10) and dunite (Pieces 9, 11-20). Spinel textures are generally symplectic with orthopyroxene within the harzburgite, whereas large oval spinel occurs in the dunite. Harzburgites have weak crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains or aggregates. The foliation is inclined at 52 degrees in the cut face of the core. The harzburgites are generally enstatite poor in the section. The dunites in the section have no obvious crystal-plastic foliation in spinels. Piece 1 contains concentrations of shear fractures with little or no offset in a zone of altered/oxidized serpentinite. Piece 9 contains composite black serpentine veins that appear to fill a fracture that has shear offset. Piece 5 contains numerous anastomosing shear fractures that bound phacoidal-shaped polyhedra. Fractures have limited shear offset (<0.1 cm). Pieces 1 through 4 exhibit weak cross-fiber serpentine foliation. Pieces 15 through 20 have occasional open fractures (spaced 5 to 20 cm). Pieces 1-7 show faint wispy sigmoidal serpentine veins and Pieces 12-20 have occasional thin branching black serpentine veins cut by sparse while wispy chrysotile veins.

Core Photo



209-1274A-8R2 (Section top: 41.47 mbsf)

UNIT I: HARZBURGITE

Pieces 1–21

COLOR: Dark green/gray.

PRIMARY MINERALOGY: DUNITE AND HARZBURGITE

Olivine	Mode 83%–98%
Orthopyroxene	Mode 0%–15%
	Size 2–10 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <0.5%
	Size 1–2 mm
	Shape/Habit Anhedral
Spinel	Mode 1–1.5%
	Size 1–6 mm
	Shape/Habit Equant/Interstitial/Vermicular

COMMENTS: This core consists of moderately altered spinel-rich dunite with no orthopyroxene in the upper part and alternation of dunite and harzburgite in the lower part. Orthopyroxene-rich layer occurs in Piece 15 (1 cm thick). Large subhedral to euhedral spinel grains as large as 6 mm are often present in dunites. Spinel shows interstitial or vermicular shape in harzburgite.

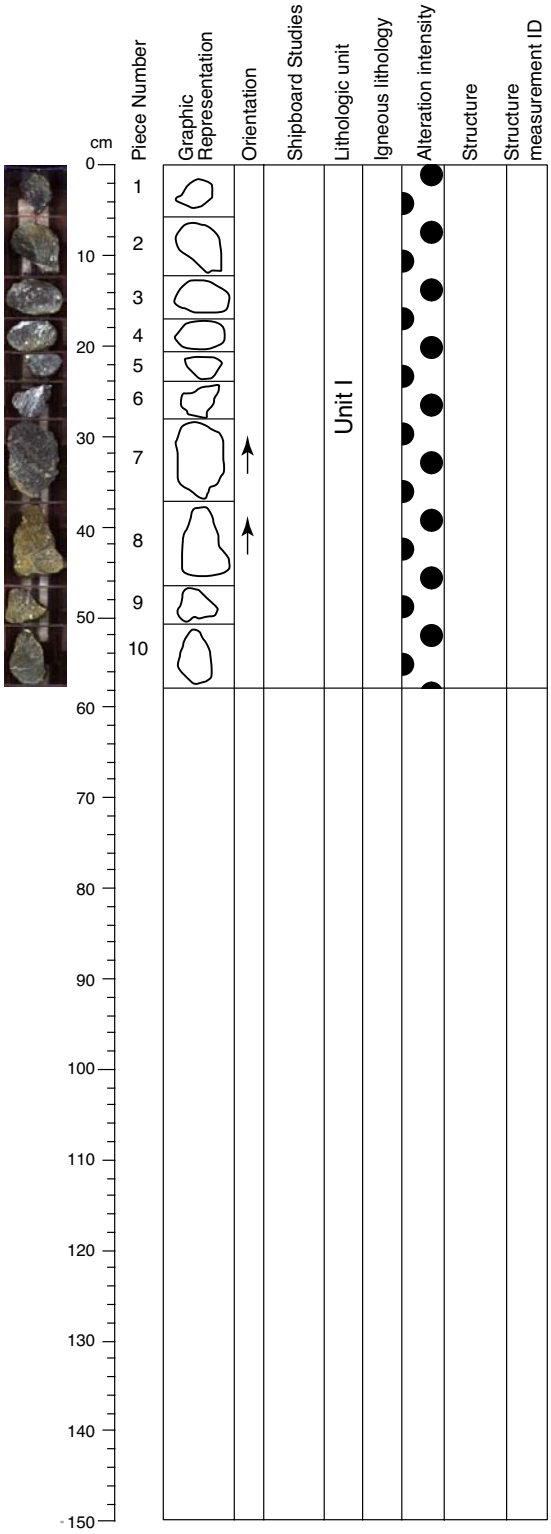
SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of highly serpentine altered harzburgite and dunite. Olivine is altered to serpentine mesh textures with some fresh olivine remaining in the mesh texture cores. The distribution of fresh olivine throughout the core is heterogeneous. In harzburgite fresh cores of olivine occur in orthopyroxene rich areas and as much as 10% is fresh. Large orthopyroxenes have fresh cores and a corona of pseudomorphic bastite and non-pseudomorphic dark green serpentine. Fresh spinel is present in all pieces.

VEIN ALTERATION:
This section reveals four generations of veins in the serpentinized dunite (Pieces 1-9). Early, irregular, black, wispy serpentine+magnetite veins are cut by mm-wide serpentine+magnetite+pyrite veins that have narrow green halos. A later generation of cross-fibrous, sigmoidal, wispy chrysotile veins cuts both generations of dark serpentine veins. Late aragonite veins as thick as 4 mm are present in Pieces 7 and 8. Pieces 10-21 have only two generations of veins: early black serpentine-magnetite veins cut by cross-fibrous sigmoidal chrysotile veins.

THIN SECTIONS: Sample 1274A-8R-2, 101-103 cm

STRUCTURE:
The section consists of serpentinized dunite (Pieces 1-9) and serpentinized harzburgite with protogranular textures (Pieces 10-13 and 16-20). Piece 14 is a mixed dunite and harzburgite and Piece 15 is a dunite cut by a pyroxenite magmatic vein. Spinel textures are generally holly leaf to vermicular associated spatially with pyroxene to symplectic within orthopyroxene in the harzburgites. Large subhedral to anhedral spinels are associated with dunites. Piece 18 has an obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The remainder of the section has no obvious crystal-plastic foliation. Pieces 7 and 8 have minor shear fracturing adjacent to oxidized serpentine veins and Pieces 18 and 19 exhibit weak cross-fiber serpentine foliation. Pieces 1-4 are similar to previous section with thin branching black serpentine veins cut by sparse white wispy chrysotile veins. Pieces 5-8 are more altered and have an additional planar black serpentine vein set with reaction halos. A relatively thick carbonate vein cuts Piece 7. Pieces 10-21 are cut by sparse thin black serpentine veins cut by wispy white chrysotile veins and Pieces 12, 15, and 17-19 have a recognizable white chrysotile foliation.

Core Photo



209-1274A-9R1 (Section top: 45.3 mbsf)

UNIT I: HARZBURGITE

Pieces 1–10

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 89%
Orthopyroxene	Mode 10%
	Size 2–8 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular/Interstitial

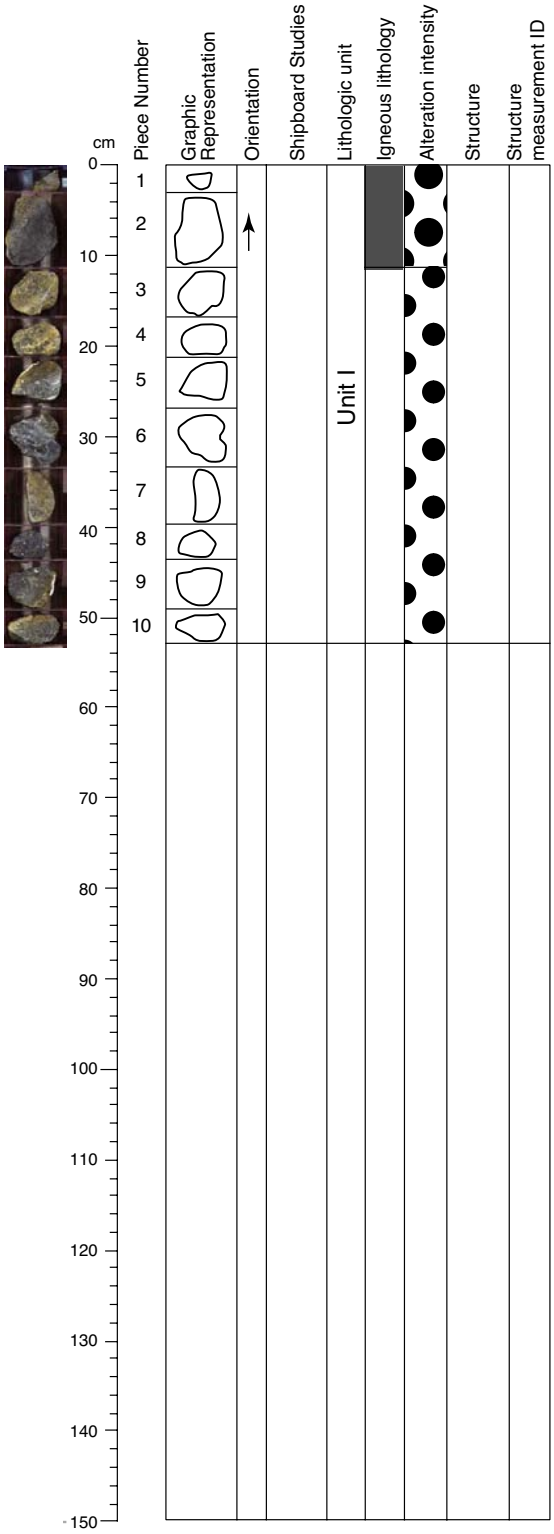
COMMENTS: This core consists of small pebbles of highly altered harzburgite with orthopyroxene (~10%) and spinel (1%). Spinels exhibit vermicular to interstitial shape forming intergrowth with orthopyroxene. Texture is protogranular.

SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of harzburgite completely altered to serpentine (Pieces 1-7) with an overprint of clays and iron oxyhydroxides in Pieces 8-10. Fresh olivine within the cores of serpentine mesh texture is rare. Fresh spinel is present in all pieces.

VEIN ALTERATION:
This section contains 1-2 vol% of veins with black, straight, subparallel serpentine-magnetite veins cut by small, sigmoidal cross-fiber chrysotile veins in Pieces 1-7. Piece 8 and 9 also show the oldest generation of black serpentine-magnetite veins, but crosscutting white veins are usually aragonite. Piece 10 has an irregular white picrolite vein and rare aragonite veinlets.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally holly leaf to vermicular associated spatially with pyroxene to symplectic within orthopyroxene. All pieces are unoriented and several show weathering. The section shows only weak crystal-plastic foliation. Pieces 1 through 10 exhibit weak to moderate cross-fiber serpentine foliation. The strength of serpentine foliation varies across pieces from absent in the least serpentinized zones to moderate in highly serpentinized zones. Pieces 4, 5, and 6 contain fine shear fractures parallel to weak serpentine foliation. Fractures appear to be filled with serpentine or talc. All pieces show thin black serpentine veins cut by wispy white chrysotile veins. The black serpentine veining becomes net-like in Piece 2. Wispy white serpentine veins define a foliation in Pieces 4-8. Piece 10 has green serpentine veins and Pieces 2 and 10 have small carbonate veins.

Core Photo



209-1274A-10R1 (Section top: 49.9 mbsf)

UNIT I: HARZBURGITE

Pieces 1–10

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 89%–98%
Orthopyroxene	Mode 0%–10%
	Size 2-7 mm
	Shape/Habit Anhedral
Spinel	Mode <1.5%
	Size 1-5 mm
	Shape/Habit Equant/Vermicular

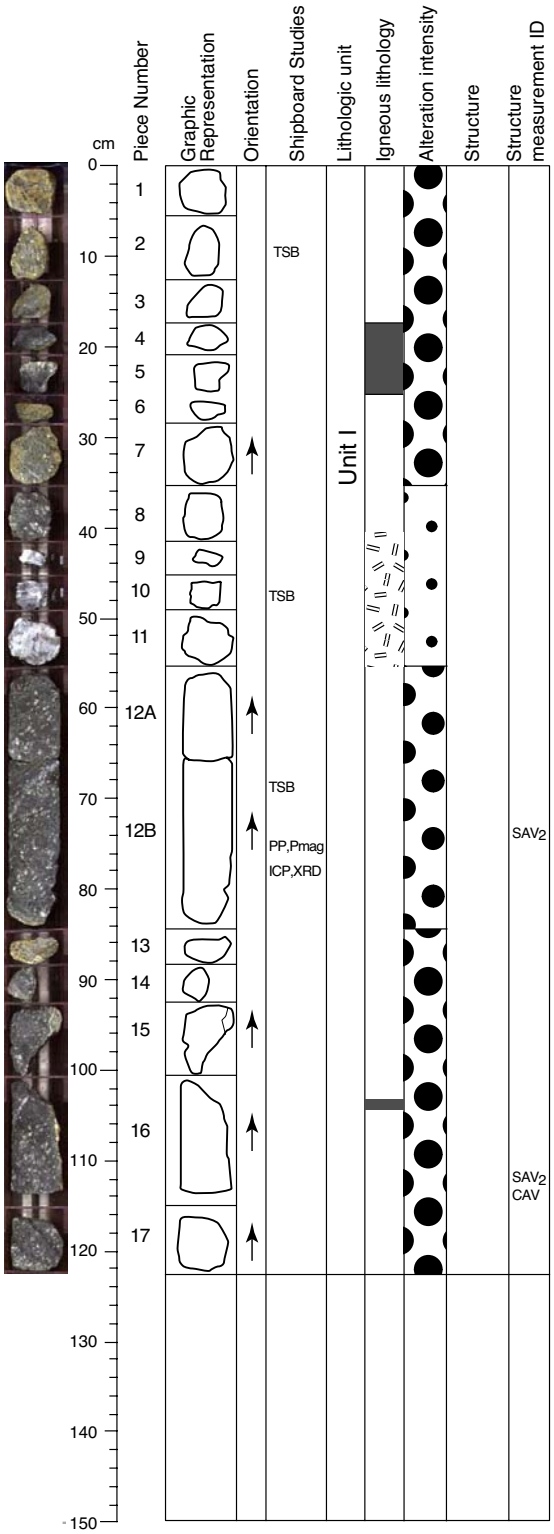
COMMENTS: This core consists of small pebbles of highly altered dunite in Pieces 1-2 and harzburgite in Pieces 3-10. Dunite contains spinels with equant shape. Harzburgites in Pieces 3-6 and 9-10 contain less than 1% spinel. Vermicular spinels are in Piece 7. Texture is protogranular.

SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of completely altered dunite and harzburgite. Serpentinization dominates the alteration although clay-iron oxyhydroxide alteration is also present which may be halos to carbonate veins (Pieces 5 and 9) in brittle fractures along the section. Fresh olivine is present within cores of serpentine mesh texture in dunite but not harzburgite. Rare orthopyroxene cores may be fresh.

VEIN ALTERATION:
Small, discontinuous, black serpentine+magnetite veins are present throughout the section, except in Pieces 6 to 8. Crosscutting wispy chrysotile veins are developed in all pieces. Late aragonite veins are present in Pieces 3-5, 7, and 9-10. A 3-mm wide aragonite vein has a mm-wide selvage of Fe-oxyhydroxide in Piece 9.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures (Pieces 3-10) and dunite (Pieces 1-3). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic around orthopyroxene with harzburgites. Piece 2 contains large clumps of spinel without fabric. There is no obvious crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains or aggregates within the samples. Pieces 1, 2, 4, 5-7, and 9-10 exhibit a weak cross-fiber serpentine foliation. Pieces 1-5, 7, and 9-10 show thin black serpentine veins. Wispy white chrysotile veins cut all pieces and carbonate veins are present in Pieces 3-5, and 9-10.

Core Photo



209-1274A-11R1 (Section top: 54.9 mbsf)

UNIT I: HARZBURGITE

Pieces 1–8, 12–17

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 73%–98%
Orthopyroxene	Mode 5%–25%
	Size 2–12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode <2%
	Size 1–2 mm
	Shape/Habit Vericular/Equant

COMMENTS: This core consists of highly altered harzburgite in Pieces 1-3, 6-8, 12-15, and 17, dunite in Pieces 4-5 and 16, and gabbro in Piece 9-11. Harzburgites contain vermicular shaped spinels associated with orthopyroxene. Dunites contain spinels with equant shape. Piece 5 has an orthopyroxenite band of 0.5 cm thick at one end. Texture is protogranular.

Pieces 9-11

COLOR: Light gray

PRIMARY MINERALOGY: OXIDE GABBRO

Plagioclase	Mode 55%
	Size 1–10 mm
	Shape/Habit Anhedral
Amphibole	Mode 30%
	Size 2–12 mm
	Shape/Habit Subhedral
Oxide	Mode 15%

COMMENTS: Medium- to coarse-grained gabbro consists of plagioclase, brown amphibole and oxide.

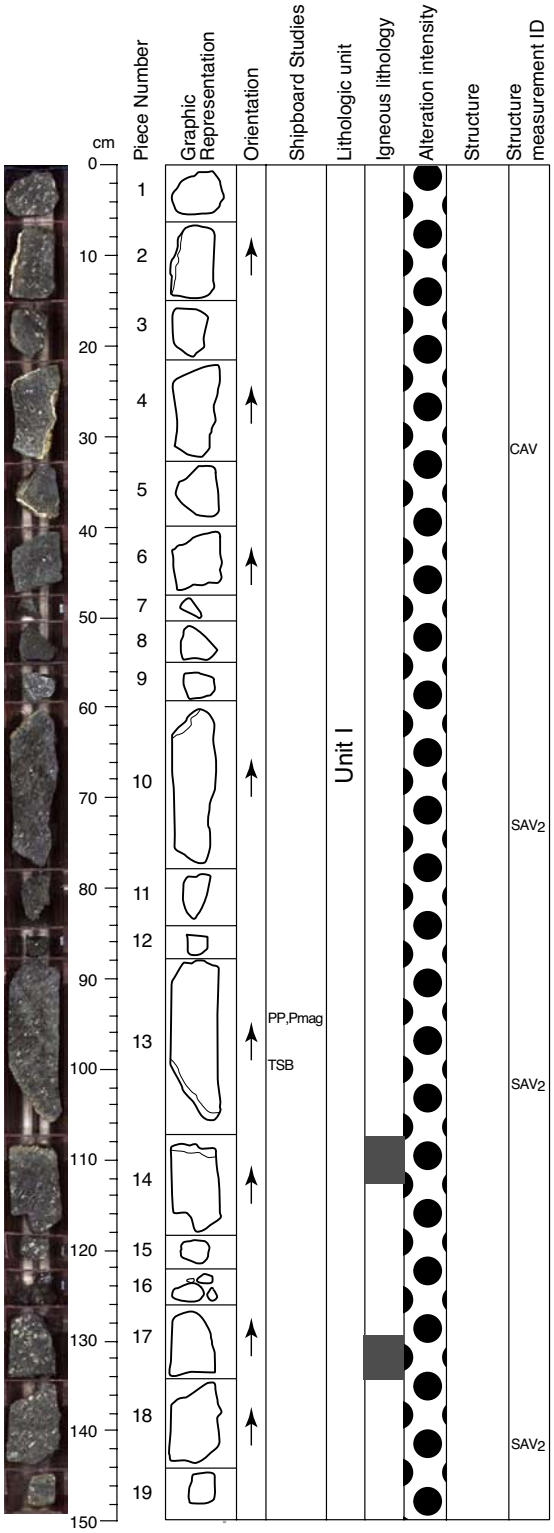
SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of highly altered harzburgite and dunite with rare pieces of highly altered gabbroic rocks (Pieces 9-11). Pieces 1-7 are completely altered to serpentine with a strong overprint of red iron oxyhydroxide and clay alteration. Fresh olivine remains in the cores of grains within the serpentine mesh texture in Pieces 4 and 5. Fresh olivine within the rest of the harzburgite is rare and accounts for <3%. Fresh orthopyroxene remains in a large number of orthopyroxene cores in the lower half of the section. Otherwise, orthopyroxene is altered to pseudomorphic bastite in large relict grains and in nonpseudomorphic grains it is altered to dark green serpentine. Gabbroic rocks are altered to prehnite and chlorite (after plagioclase) and brown amphibole (after clinopyroxene?). Fresh spinel is present in all peridotite pieces.

VEIN ALTERATION:
Approximately 1% of the core in this section is made of metamorphic veins. These are 1) straight, black serpentine+magnetite veins, 2) transgranular, wispy, white chrysotile veins, and 3) aragonite veins with reddish alteration halos in Pieces 1-8. Gabbro (Piece 9-11) has no visible veins. Pieces 12 to 17 have paragranular chrysotile veins that are crosscut by late aragonite veins with green halos.

THIN SECTIONS: Samples 1274A-11R-1, 7-12 cm, 1274A-11R-1, 46-49 cm, and 1274A-11R-1, 67-70 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures (Pieces 1-3, 6-8, and 12-17), dunite (Pieces 3-4) and oxide gabbro (Pieces 9-11). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic with orthopyroxene within harzburgites. Piece 12 is oriented and contains a crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 40 degrees in the cut face of the core. The oxide gabbros are mesoscopically undeformed and are rich in sulfides. The dunites in Pieces 4 and 5 are cut by postkinematic pyroxenitic magmatic veins. Pieces 1-7 and 12-17 exhibit weak wispy chrysotile serpentine foliation. Pieces 1-8, 13, and 17 show thin black serpentine veins and wispy white chrysotile veins cut all pieces except the gabbros (Pieces 9-11). Carbonate veins are present in Pieces 1-2, 13, 15, and 16.

Core Photo



209-1274A-12R1 (Section top: 59.4 mbsf)

UNIT I: HARZBURGITE

Pieces 1–19

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 83%–94%
Orthopyroxene	Mode 5%–15%
	Size 1-12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–4 mm
	Shape/Habit Vermicular

COMMENTS: This core consists of highly altered harzburgite in with 4-6 cm thick dunite bands in Pieces 14 and 17 where modal amount of orthopyroxene decreases to 5%-10%. Spinels are vermicular in shape and are commonly associated with orthopyroxenes. Texture is protogranular in the upper part of the section (Pieces 1-14) and changes to porphyroclastic in the lower part (Pieces 14-19) where modal banding is present.

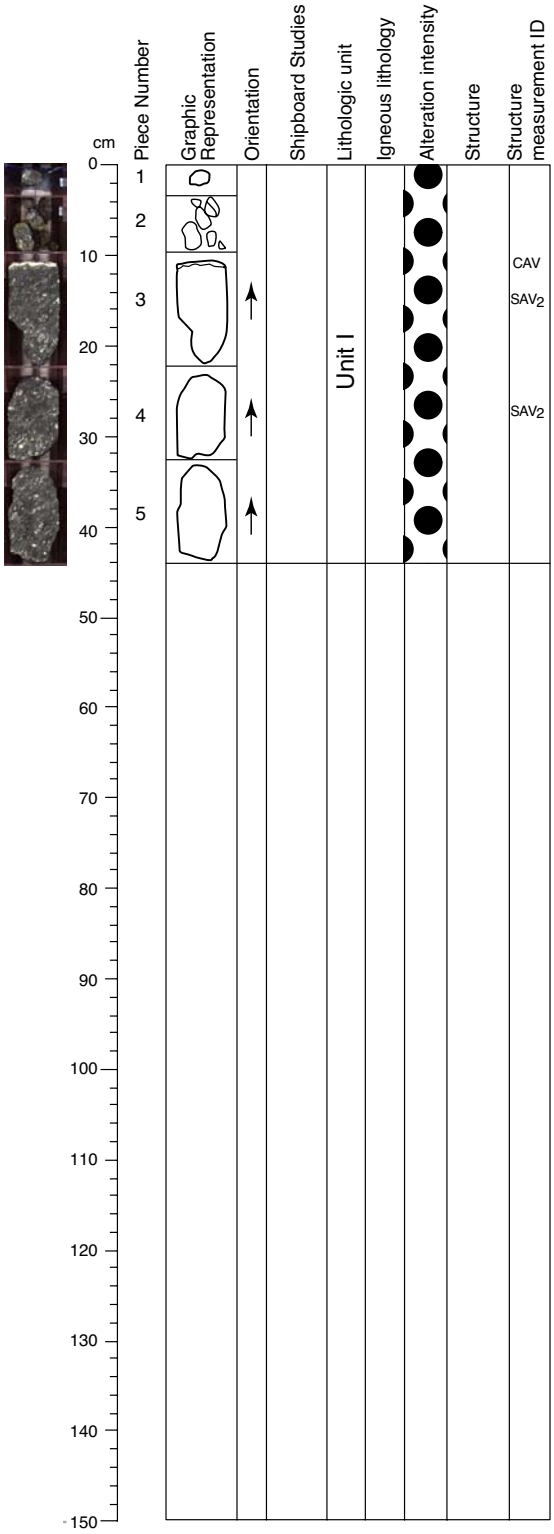
SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of highly to completely serpentine altered harzburgite. An overprint of iron oxyhydroxides and green clay is present on the margins of the pieces and is interpreted as halos of carbonate veins. Fresh olivine is rare (<2%) and is found in the cores of serpentine mesh texture alteration in close proximity to orthopyroxene-rich zones. Fresh orthopyroxene is present in all pieces but is commonly altered to pseudomorphic bastite and rims of nonpseudomorphic dark green serpentine. Fresh spinel is present in all pieces.

VEIN ALTERATION:
Veining in this section is characterized by abundant paragranular, white, sigmoidal cross-fiber chrysotile veins that account for about 2% of the core volume. Pieces 2 to 5 have crosscutting aragonite veins with reddish halos and traces of an earlier generation of black serpentine-magnetite veins that are cut by the paragranular chrysotile veins.

THIN SECTIONS: Sample 1274A-12R-1, 98-101 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. Pieces 10, 13, 14, and 18 are oriented and contain a crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 51 degrees in the cut face of the core. The section in general has a lower modal pyroxene content. Piece 2 has weak cross-fiber serpentine foliation that is parallel to a crystal plastic foliation along one edge. A second set of cross-fiber serpentine veins are oriented approximately 90 degrees to the serpentine foliation and are commonly penetrative (Pieces 10-14). Pieces 3 through 19 contain sets of fine en-echelon shear fractures with no offset that are parallel to the weak cross-fiber serpentine foliations. Fractures appear to have a relatively consistent dip throughout this section and are filled with wispy sigmoidal chrysotile. Pieces 2, 6, 13, and 19 show early thin black serpentine veins. Pieces 2-5 have large carbonate veins and associated oxidation of the harzburgite.

Core Photo



209-1274A-12R2 (Section top: 60.9 mbsf)

UNIT I: HARZBURGITE

Pieces 1–5

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 73%–93%
Orthopyroxene	Mode 5%–25%
	Size 2–12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode 1%
	Size 1–4 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular

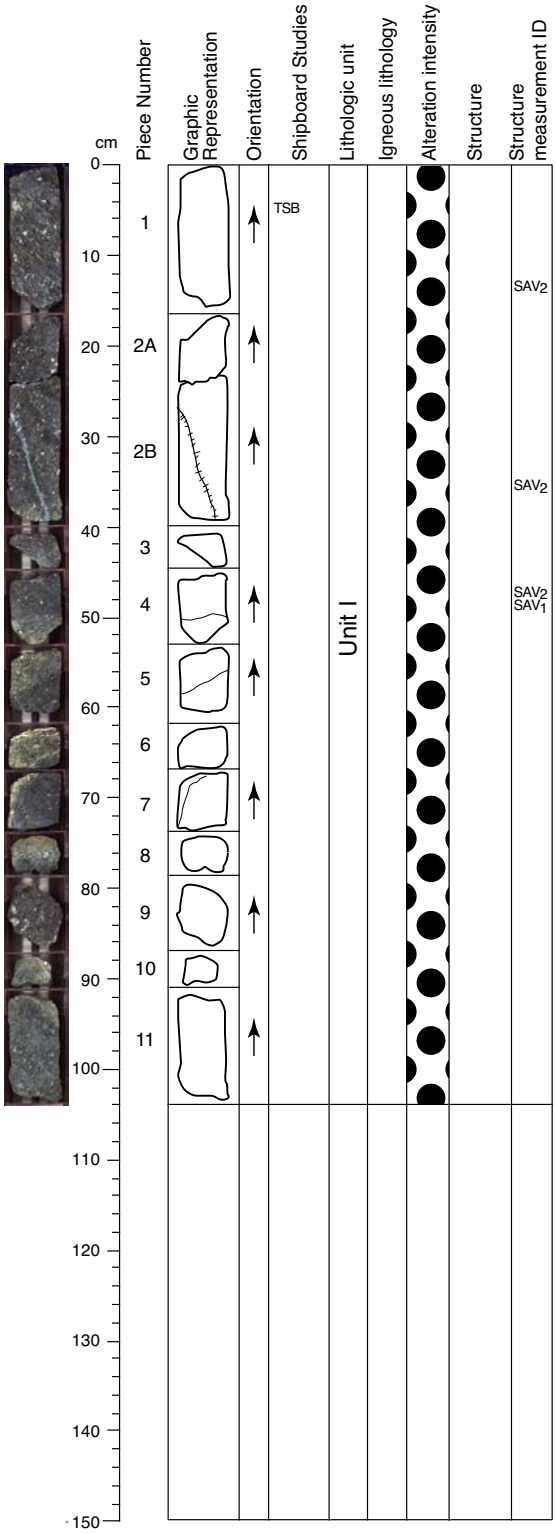
COMMENTS: This short core consists of highly altered harzburgite and dunite, similar to Section 1272A-12R-1. Modal banding of orthopyroxene-rich and -poor zones occurs in Pieces 3-5. Spinels exhibit vermicular shape and are commonly associated with orthopyroxenes. Texture is porphyroclastic.

SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of variably altered rubble (Pieces 1 and 2) and highly serpentine altered harzburgite. Fresh olivine cores occur mainly within areas of serpentine mesh texture adjacent to orthopyroxene-rich zones. Large orthopyroxenes commonly have fresh cores but are otherwise altered to pseudomorphic bastite or nonpseudomorphic dark green serpentine. Fresh spinel is present in all pieces.

VEIN ALTERATION:
The most prominent veins in this section are paragranular, sigmoidal, white chrysotile veins that are crosscut by a 3-mm wide aragonite vein in Piece 3. Pieces 1-2 and 4-5 have an earlier generation of straight, black, serpentine-magnetite veins.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. Piece 2 consists of small fragments of harzburgite and pyroxenite. Pieces 3, 4, and 5 are oriented and contain a crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 50 degrees in the cut face of the core. Pieces 1 through 5 contain sets of fine en-echelon shear fractures with no offset that are parallel to weak cross fiber serpentine foliation. The serpentine foliation is subparallel to the crystal plastic foliation. Fractures appear to have a relatively consistent dip throughout this section and are filled with wispy sigmoidal chrysotile. Pieces 1, 4 and 5 show early thin black serpentine veins and Piece 3 has a large carbonate vein.

Core Photo



209-1274A-13R1 (Section top: 64.4 mbsf)

UNIT I: HARZBURGITE

Pieces 1–11

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 88%
Orthopyroxene	Mode 10%
	Size 2–15 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode 1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular

COMMENTS: This core consists of highly altered harzburgite. Spinels are vermicular in shape and commonly associated with orthopyroxenes. Texture is protogranular.

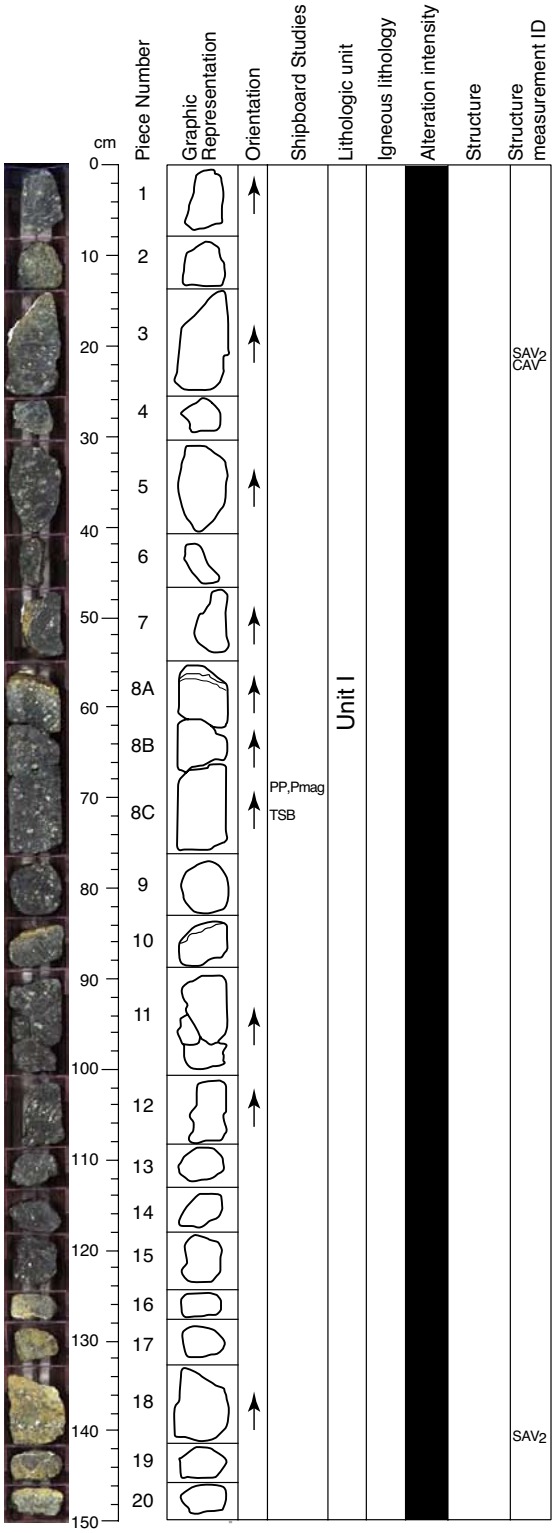
SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of completely serpentine altered harzburgite overprinted by varying amounts of green clay and iron oxyhydroxides that form the halos to carbonate veins (e.g., Pieces 6 and 9). Fresh orthopyroxene cores are present in Pieces 2 and 9. Fresh olivine is present within the cores of serpentine mesh texture alteration in Piece 9.

VEIN ALTERATION:
Apart from paragranular, sigmoidal, white chrysotile veins that make up 1-2 vol% of the core, this section shows abundant crosscutting aragonite veins (1% of the core volume) in Pieces 3-11. The earliest generation of veins are black serpentine-magnetite veins that account for about 0.3% of the core volume.

THIN SECTIONS: Sample 1274A-13R-1, 3-6 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. Pieces 1, 2, and 5 are oriented and contain a very weak crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 54 degrees in the cut face of the core. The section has low modal pyroxene. Pieces 1, 2, and 3 contain sets of fine shear fractures with no offset that are filled with sigmoidal chrysotile. Pieces 1 and 11 have strong to moderate strength cross-fiber serpentine foliation that is subparallel to crystal-plastic foliation where present. There are four generations of veins in these pieces. Piece 2 is cut by a prominent serpentine vein.

Core Photo



209-1274A-14R1 (Section top: 69.0 mbsf)

UNIT I: HARZBURGITE

Pieces 1–20

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 83%–86%
Orthopyroxene	Mode 13%–15%
	Size 2-12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular/Interstitial

COMMENTS: This core consists of highly altered harzburgite. Modal variation of orthopyroxene forms banding in Pieces 1-7 and 10-20. Spinels are mostly vermicular in shape and commonly associated with orthopyroxenes. Some spinels with interstitial shape occur in Pieces 1-2. Texture is protogranular.

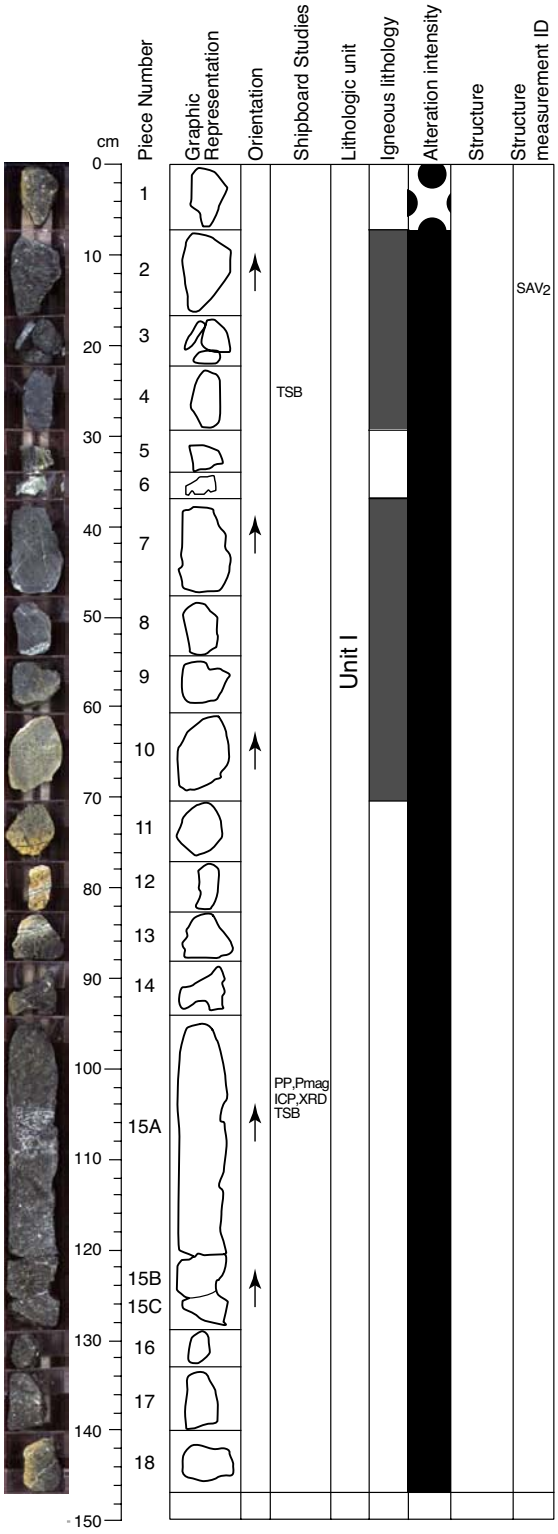
SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of highly to completely serpentine altered harzburgite. Strong iron oxyhydroxide and carbonate overprint is also present within the halos to carbonate veins. Fresh olivine relics are rare (<1%) and tend to be concentrated around orthopyroxene-rich zones. Fresh orthopyroxene cores are present mainly in Pieces 5 and 7-9. Orthopyroxene is mostly replaced by bastite. Away from areas of iron oxyhydroxide overprinting, fresh spinel is present.

VEIN ALTERATION:
The section hosts three generations of veins: (1) early, black, transgranular serpentine-magnetite veins, (2) paragranular to transgranular chrysotile veins that contain 10% aragonite in Pieces 16 to 20, and (3) coarse, vuggy aragonite veins (as wide as 2 mm) in Pieces 3, 4, 7, 8, and 16-20. Aragonite veins have cm-wide green to red alteration halos.

THIN SECTIONS: Sample 1274A-14R-1, 70-73 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. Pieces 5, 11, and 12 contain a very weak crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains. The foliation is inclined at 30 degrees in the cut face of the core. A pryoxene rich band cuts Piece 18 and is approximately horizontal in the cut face of the core. Pieces 10, 11, and 18 contain sets of en-echelon shear fractures with no offset that are filled with chrysotile. Piece 1 has moderate strength serpentine foliation. Pieces 8, 19, and 20 have weak strength serpentine foliation. There are three generations of veins. Pieces 1-5, and 8-14 show early thin black magnetite. Later thin light green picrolite-talc veins cut Piece 1 and wispy sigmoidal serpentine shows hatchwork in all pieces. Carbonate veins cut Pieces 3, 4, 7, 8, and 16-19.

Core Photo



209-1274A-15R1 (Section top: 74.0 mbsf)

UNIT I: HARZBURGITE

Pieces 1–18

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 83%–98%
Orthopyroxene	Mode 7%–15%
	Size 1–7 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode 1%–2%
	Size 1–2 mm
	Shape/Habit Vermicular/Equant

COMMENTS: Highly altered dunite and harzburgite occur in the upper part of the section (Pieces 1-10) while massive harzburgite occupies the lower part of the section (Pieces 11-18). Dunites in Pieces 4 and 7-10 lack orthopyroxene. Harzburgites in Pieces 11-14 have thin gabbroic dikes (<0.5 cm thick). Most spinels in harzburgite are either vermicular or equant in shape and are commonly associated with orthopyroxenes. Spinels in dunite are mostly equant in shape and rarely vermicular. Texture is protogranular.

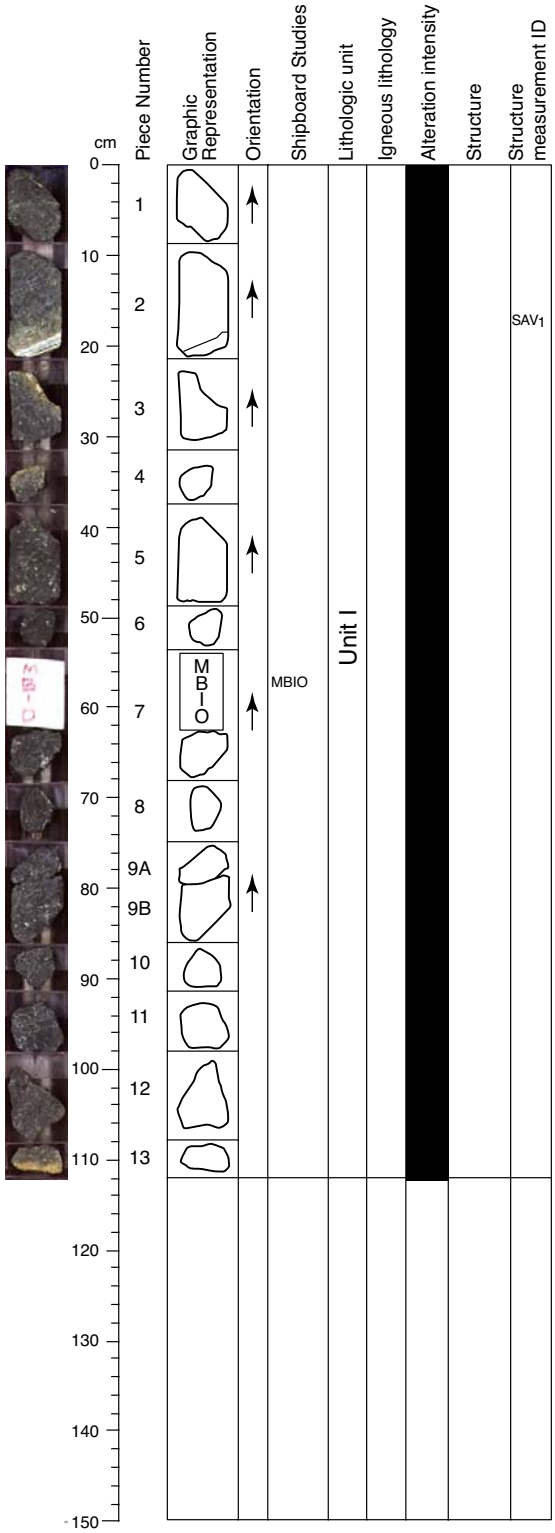
SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of completely serpentine altered harzburgite and dunite. This has subsequently been overprinted by reddish-brown iron oxyhydroxides and carbonates. Orthopyroxene is altered to pseudomorphic bastite with some pieces still retaining fresh orthopyroxene cores (e.g., Pieces 1 and 15). Fresh olivine is very rare. Fresh spinel is present in pieces that have no oxyhydroxide overprint.

VEIN ALTERATION:
Chrysotile veins in this section range from paragranular (Pieces 2-9) to transgranular (Pieces 10-18). Pieces 3 and 4 have both types of chrysotile veins. Paragranular chrysotile veins are abundant in proximity to a shear zone in the interval from 25-34 cm. In Piece 5, black serpentine-magnetite veins and chrysotile veins are both oriented parallel to the foliation. A composite serpentine-hematite-aragonite vein in Piece 12 appears sheared and could represent a completely altered magmatic veinlet. Piece 8 has a picrolite vein with magnetite selvages and abundant hematite and magnetite in green alteration halos.

THIN SECTIONS: Samples 1274A-15R-1, 23-26 cm and 1274A-15R-1, 102-105 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures (Pieces 1-5, and 11-18) and dunite (Pieces 7-10). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene (e.g., Piece 11). A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in the section. A pyroxene-rich band cuts Piece 1 and Piece 15 shows strong modal variation in pyroxene content. Piece 6 is a small pebble of partially cohesive fault gouge. A soft matrix of talc and/or clay minerals supports fine clasts (0.05 to 0.3 cm) of serpentinite and phyllosilicate crystals. Pieces 12 and 13 are each cut a by small fault in the center of a system of serpentine veins. Displacement along fractures is suggested by imbricated clasts of wall rock within the veins, but orientation and displacement are unknown. Pieces 2, 3, and 4 are cut arrays of fine, chrysotile-filled shear fractures with no offset and consistent orientations. Piece 2 has wispy chrysotile veins showing a foliation. Pieces 14 through 18 are cut by fine, chrysotile-filled shear fractures with random hatchwork orientation. Some fractures form conjugate sets with each other. Pieces 7, 8,. and 9 exhibit a weak cross-fiber serpentine foliation. Piece 5 exhibits moderate strength cross -fiber serpentine foliation with parallel oriented chrysotile veins. Piece 3, 4, 7-9,. and 11 have weakly developed, randomly oriented and wispy chrysotile veins. Pieces 10 and 12 have carbonate veins and Piece 11 has a black serpentine vein with dilatational offsets filled by green serpentine. Piece 8 appears to have two thin magnetite sulfide veins with white alteration halos.

Core Photo



209-1274A-15R2 (Section top: 75.47 mbsf)

UNIT I: HARZBURGITE

Pieces 1–13

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 84%–89%
Orthopyroxene	Mode 10%–15%
	Size 1–3 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode <1 %
	Size 1–2 mm
	Shape/Habit Equant/Vermicular

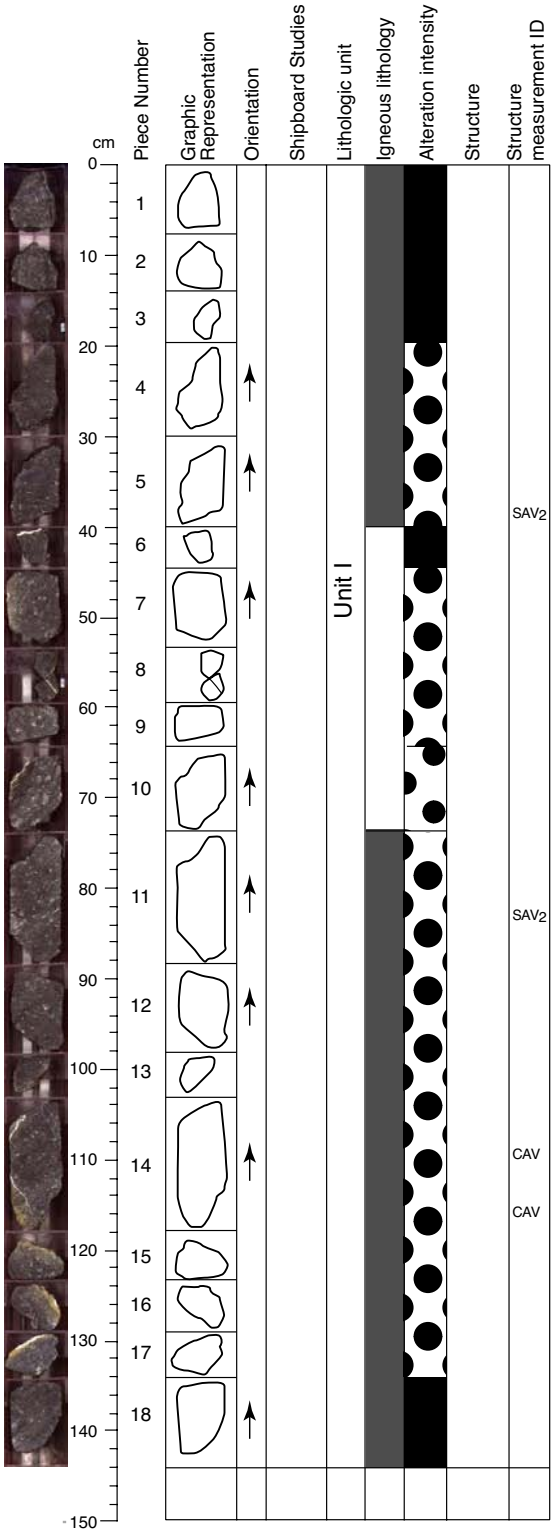
COMMENTS: This section is composed of highly altered harzburgite that is continuous from Section 1274A-15R-1. Amount of orthopyroxene varies from 10% in the upper part of the section (Pieces 1-4) to 12%-15% in the lower part (Pieces 5-13). Orthopyroxenes are interstitial. Spinels are equant or vermicular in shape and are commonly associated with orthopyroxenes. Texture is protogranular.

SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of completely serpentine altered harzburgite and dunite. This has subsequently been overprinted by reddish-brown iron oxyhydroxides and carbonates. Orthopyroxene is altered to pseudomorphic bastite with some pieces still retaining fresh orthopyroxene cores. Fresh olivine is very rare. Fresh spinel is present in pieces that have no oxyhydroxide overprint.

VEIN ALTERATION:
Veining in this section is primarily characterized by transgranular chrysotile veins (0.5% to 1% of core volume). Chrysotile veins cut rare black serpentine-magnetite veins. Massive aragonite veins in Pieces 2-4 and 13 are coarse grained and have reddish alteration halos. A composite massive, gray to green picrolite vein in Piece 2 is used by later aragonite veins.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures (Pieces 3-12) and enstatite-rich dunite (Pieces 1-2). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene, except in dunite. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in the section. Pyroxenite magmatic veins cut Pieces 3 and 4. The harzburgites are in general depleted in pyroxene and show strong modal variation in pyroxene content. All pieces in this section are cut by fine, chrysotile filled shear fractures with random (hatchwork) orientation (a weak foliation is visible in Pieces 1 and 2). Some fractures form conjugate sets with each other. The upper portion of Piece 2 contains a thin band of cohesive cataclastic breccia contained within a system of serpentine veins and re-used by a later aragonite vein. Pieces 2, 3, and 5 show early thin black serpentine veining cut by the chrysotile veins. Piece 11 shows thin green picrolite veins cut by the chysotile veins. Pieces 1-4, 8, and 13 are cut by carbonate veins.

Core Photo



209-1274A-16R1 (Section top: 83.7 mbsf)

UNIT I: HARZBURGITE

Pieces 1–18

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 87%–94%
Orthopyroxene	Mode 5%–12%
	Size 1–12 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1–10 mm
	Shape/Habit Vermicular/Equant

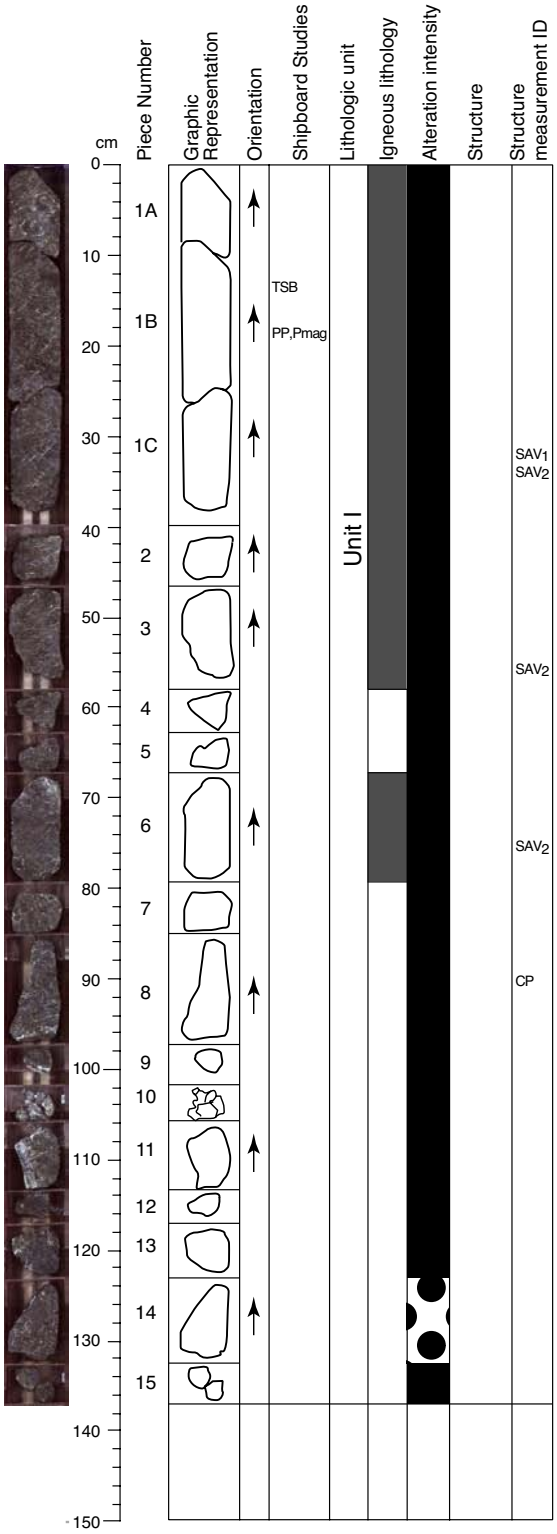
COMMENTS: Highly altered dunites with 5%-6% orthopyroxene in Pieces 1-5 and 11-18 and harzburgites with 9%-12% orthopyroxene in Pieces 6-10. Orthopyroxene mode varies through the section. Spinels are either vermicular or equant in shape and commonly associated with orthopyroxenes. Texture is protogranular.

SECONDARY MINERALOGY:
COMMENTS: Pieces 1 to 5 are very highly to completely serpentinized dunite (alteration is estimated to range between 93% and 97%). Pieces 6 to 18 are highly to completely serpentinized with considerable variation in the degree of alteration of olivine (70%–97%) and orthopyroxene (50%-97%). Fresh olivine and orthopyroxene are particularly abundant in Piece 10. Pieces 7, 10, and 13 to 17 have brown halos adjacent to carbonate veins that contain iron oxyhydroxides, clay and carbonate.

VEIN ALTERATION:
This section hosts three vein generations. Early black serpentine-magnetite veins are crosscut by branched chrysotile veins. Late, white, vuggy carbonate veins, probably mainly composed of aragonite, are present in Pieces 6 to 10 and 13 to 17 with prominent large brown to gray alteration halos are in Pieces 7, 10, and 14 to 17.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures (Pieces 6-18) and enstatite-bearing dunite (Pieces 1-5). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene, except in dunite. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in the section. The harzburgites are in general depleted in pyroxene and show strong modal variation in pyroxene content. All pieces in this section are cut by minor arrays of very weakly foliated to randomly oriented sets of fine, chrysotile-filled shear fractures. Pieces 5, 11, and 14 show a poor foliation. Fractures may form conjugate sets with one another, but have no consistent or measurable orientation throughout the core. Pieces 1, 9, 11, 14, and 16 contain early black magnetite-serpentine veins. Pieces 6-10, and 13 to 17 contain carbonate veins.

Core Photo



209-1274A-16R2 (Section top: 85.14 mbsf)

UNIT I: HARZBURGITE

Pieces 1–15

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 78%–95%
Orthopyroxene	Mode 18%–5%
	Size 1–8 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1–5 mm
	Shape/Habit Vermicular/Equant

COMMENTS: Highly altered dunite and harzburgite that is continuous from Section 1274A-16R-1. Dunites have 5-7% orthopyroxene in Pieces 1-3, 6 and harzburgites have 18% orthopyroxene in Pieces 4-5, and 7-15. Orthopyroxene mode varies through the section. Spinels are either vermicular or equant in shape and commonly associated with orthopyroxenes. Texture is protogranular.

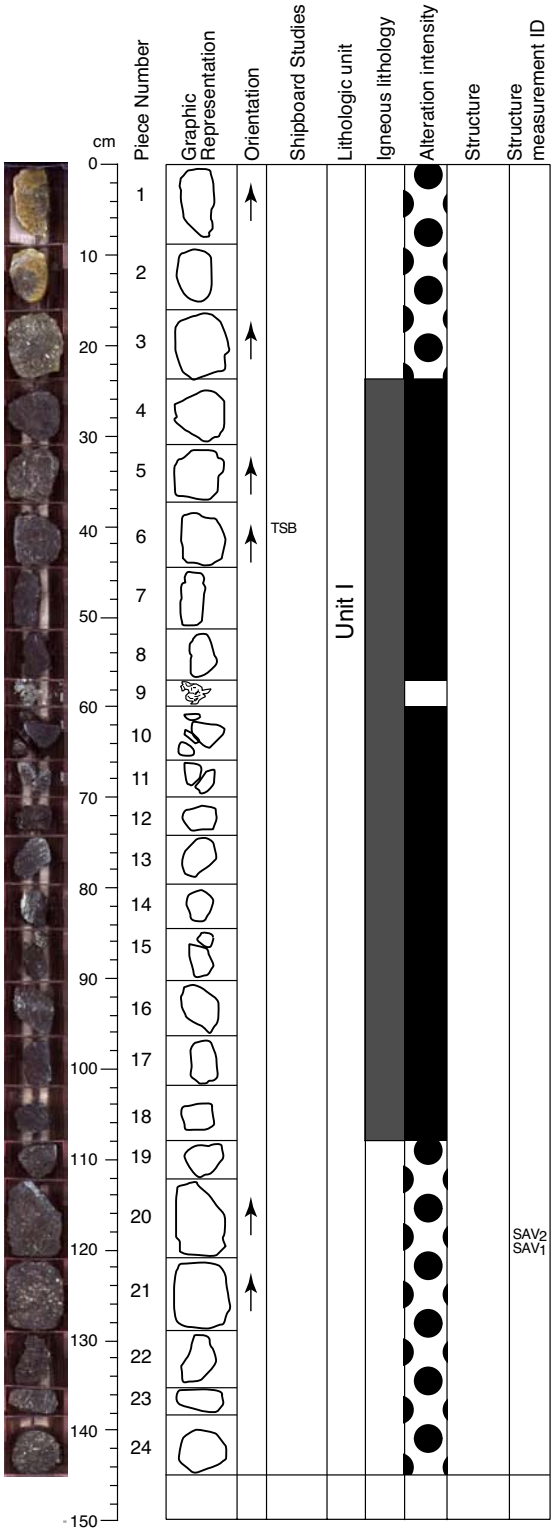
SECONDARY MINERALOGY:
COMMENTS: Alteration of harzburgite in this section is complete with the exception of Piece 14 which shows very high alteration. Most pieces contain some altered orthopyroxene (the degree of alteration varies from 80-100%). Minor fresh olivine is also locally present, commonly adjacent to unaltered orthopyroxene crystals. The margin of Piece 11 contains a completely altered gabbroic dikelet. This has been replaced by chlorite/smectite, serpentine and talc.-

VEIN ALTERATION:
White chrysotile veins dominate the veining in this section. Chrysotile veins probably represent two different generations. Early black serpentine-magnetite veins are crosscut by the chrysotile veins.

THIN SECTIONS: Sample 1274A-16R-2, 13-16 cm

STRUCTURE:
The section consists of serpentinized orthopyroxene-poor harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. A crystal-plastic foliation defined by the preferred dimensional orientation of enstatite grains is not obvious in the section. A highly altered magmatic vein cuts Pieces 11. The protolith could not be determined. The harzburgites are in general depleted in pyroxene and show strong modal variation in pyroxene content. Pieces 1 through 7 are cut by fine chrysotile-filled, en-echelon shear fractures with consistent orientations throughout the section. Pieces 8, 9, 10, 11, and 14 are cut by steeply dipping minor faults. Piece 1, 6, 7, and 8 show two generations of crosscutting chrysotile veins. Piece 6 in particular shows sigmoidal chrysotile vein cut by late planar chrysotile veins. Pieces 12-15 show hatchwork of chrysotile veins. Talc slicken-fibers on the fault surfaces have approximately 20 degree rakes, and indicate oblique slip (dominantly strike slip with minor normal sense motion). Piece 11 exhibits moderate to strong cross-fiber serpentine foliation, and Pieces 12-14 exhibit weak cross fiber serpentine foliation. Early black serpentine veins are visible in Pieces 1, 2, and 7.

Core Photo



209-1274A-17R1 (Section top: 88.3 mbsf)

UNIT I: HARZBURGITE

Pieces 1–24

COLOR: Dark green/gray. Locally orange/brown weathering.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 80%–98%
Orthopyroxene	Mode 0%–18%
	Size 1-9 mm
	Shape/Habit Anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit Anhedral
Spinel	Mode <3%
	Size 1–9 mm
	Shape/Habit Vermicular/Equant

COMMENTS: This section consists of highly altered harzburgite in Pieces 1-3, 19-24 and dunite in Pieces 4-18. Piece 9 is a fault gouge. Orthopyroxene content varies from 10 to 18% in harzburgite and from 0% to 5% in dunite. Dunite in Pieces 13-14 and 17-18 lack orthopyroxene. Spinel in harzburgite is mostly vermicular in shape and commonly associated with orthopyroxenes. Spinel in dunite is equant in shape and occurs in the olivine matrix. Texture is protogranular.

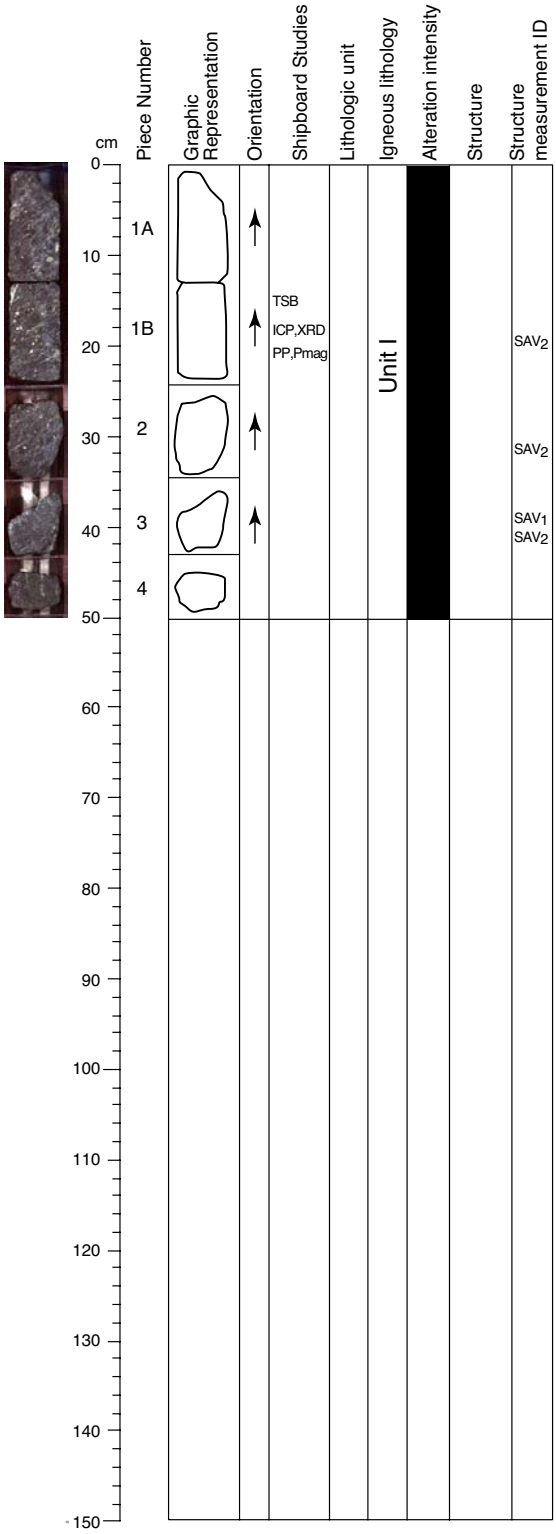
SECONDARY MINERALOGY:
COMMENTS: The dunite of this section is completely serpentinized. The harzburgite (Pieces 1-3, and 19-24) is somewhat less altered (estimates range from 87% to 92%). Extensive orange/brown halos of iron oxyhydroxide, clay, and carbonate alteration are present adjacent to carbonate veins. A completely altered gabbroic dikelet is present in Piece 19. Piece 9 is composed of light gray, asbestiform serpentine and gray serpentinite mud.

VEIN ALTERATION:
This section hosts dominantly black serpentine-magnetite and later white chrysotile veins. Volumetrically not important are green and/or black and white composite serpentine±magnetite veins that post-date black serpentine and pre-date chrysotile veins. In the lowermost three pieces of the section, chrysotile veins are paragranular, elsewhere they are transgranular.

THIN SECTIONS: Sample 1274A-17R-1, 39-42 cm

STRUCTURE:
The section consists of serpentinized harzburgite (Pieces 3, 10-11, 14-16, and 19-24), orthopyroxene-poor harzburgite (Pieces 1-2, 6, and 15) and dunite (Pieces 4, 6-8). The harzburgite has protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in most of the section with the exception of Piece 21. The foliation is inclined in this piece by 18 degrees in the cut face of the core. A highly altered gabbroic magmatic vein cuts Piece 19. The harzburgite is in general depleted in pyroxene and show strong modal variation in pyroxene content. Piece 9 is a small fragment of breccia with a partially cohesive clay matrix. Breccia is matrix supported and contains clasts of serpentine (0.1 to 0.5 cm diameter) and serpentine fibers. It is probably of tectonic origin and represents a fault gouge breccia. Piece 16 is cut by fine, chrysotile-filled en-echelon shear fractures and a small fault with less than 0.2 cm offset. Pieces 17- 20 are cut by fine chrysotile-filled shear fractures with no preferred orientation. Pieces 22-24 are cut by fine, en-echelon shear fractures with consistent orientation through the section. Pieces 1, 2, and 11-4 have moderate strength cross-fiber serpentine foliation. Pieces 3-8, 10 and 16-24 have weak cross-fiber serpentine foliation. Early black serpentine veins occur in Pieces 3-6, 19-21, and 23. Pieces 1 and 2 are cut by composite planar magnetite serpentine veins. Pieces 7, 8, 11, and 12 cut by green serpentine veins. Piece 16 shows two generations of crosscutting black serpentine veins. Pieces 13 and 14 show parallel black magnetite veins.

Core Photo



209-1274A-17R2 (Section top: 89.75 mbsf)

UNIT I: HARZBURGITE

Pieces 1–4

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 83%
Orthopyroxene	Mode 15%
	Size 2–6 mm
	Shape/Habit anhedral
Clinopyroxene	Mode 1%
	Size 1–5 mm
	Shape/Habit anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular/Equant

COMMENTS: This short section consists of harzburgite with 15%orthopyroxene that is continuous from Section 1274A-17R-1. Spinels are vermicular or equant in shape.

SECONDARY MINERALOGY:
COMMENTS: This section of core is composed of completely serpentinized harzburgite with locally preserved orthopyroxene grains and minor fresh olivine crystals (sub 1mm and <1%).

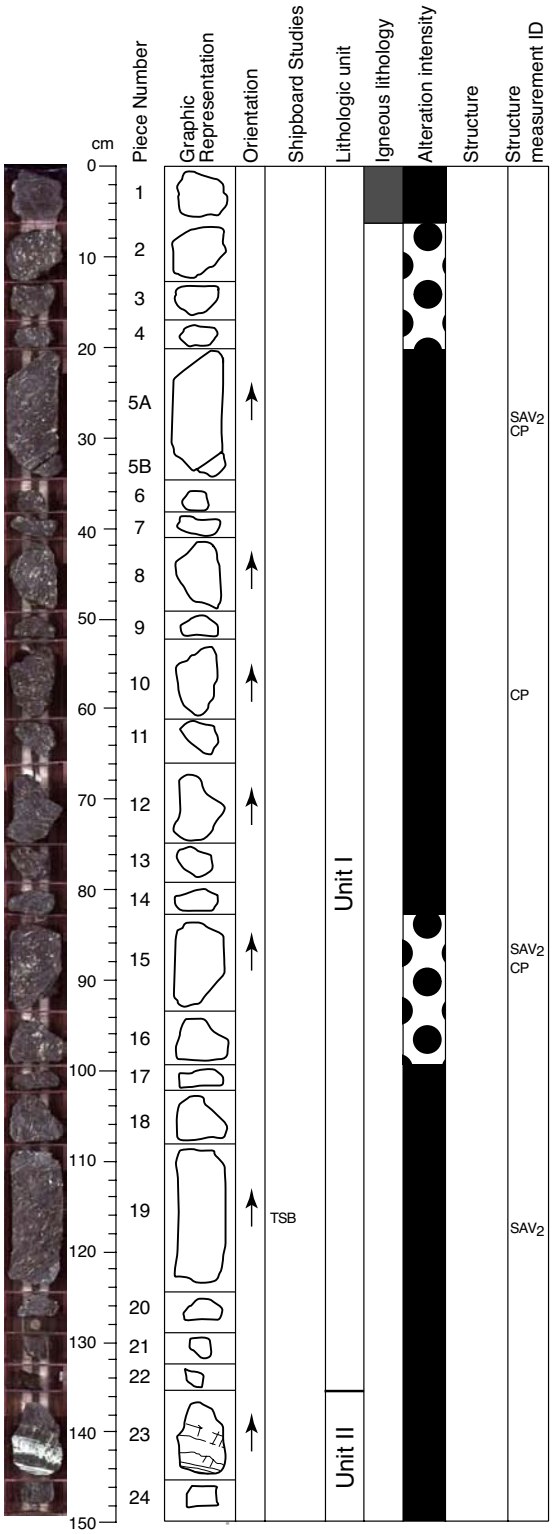
VEIN ALTERATION:

This section hosts dominantly black serpentine-magnetite and later white chrysotile veins. Volumetrically not important are green and/or black and white composite serpentine±magnetite veins that post-date black serpentine and pre-date chrysotile veins. In the lowermost three pieces of the section chrysotile veins are paragranular, elsewhere they are transgranular.

THIN SECTIONS: Sample 1274A-17R-2, 14-17 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. A weak crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is present in Piece 1 and subparallel to the serpentine foliation. The foliation is inclined in this piece by 45 degrees in the cut face of the core. Pieces 1 through 3 are cut by fine chrysotile-filled, en-echelon shear fractures with consistent orientations throughout the section. Piece 4 shows hatchwork chrysotile veining. All pieces have faint black-magnetite serpentine network, with larger veins visible in Piece 3, that are parallel to a possible fault filled with green serpentine.

Core Photo



209-1274A-18R1 (Section top: 93.3 mbsf)

UNIT I: HARZBURGITE

Pieces 1–22

COLOR: Dark green/gray, light gray where gabbroic.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 80%–91%
Orthopyroxene	Mode 2%–18%
	Size 1–10 mm
	Shape/Habit anhedral
Clinopyroxene	Mode <1%
	Size 1–4 mm
	Shape/Habit anhedral
Spinel	Mode <1%
	Size 1–5 mm
	Shape/Habit Equant/Vermicular/Interstitial

COMMENTS: Highly altered dunite with 2% orthopyroxene in Piece 1 and harzburgite with 8%-18% orthopyroxene in Pieces 2-22. Orthopyroxene mode varies in harzburgite with a typical scale of ten centimeters. Spinels in dunite are equant in shape while spinels in harzburgites are either vermicular or interstitial in shape forming intergrowth with orthopyroxene. Texture is protogranular.

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 23-24

COLOR: Light gray

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 79%
Orthopyroxene	Mode 20%
	Size 1–7 mm
	Shape/Habit anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Vermicular/Interstitial

COMMENTS: Transition to completely serpentinized peridotite. Alteration contact before fault gouge. Spinels are equant or vermicular in shape forming intergrowth with orthopyroxene. Texture is protogranular.

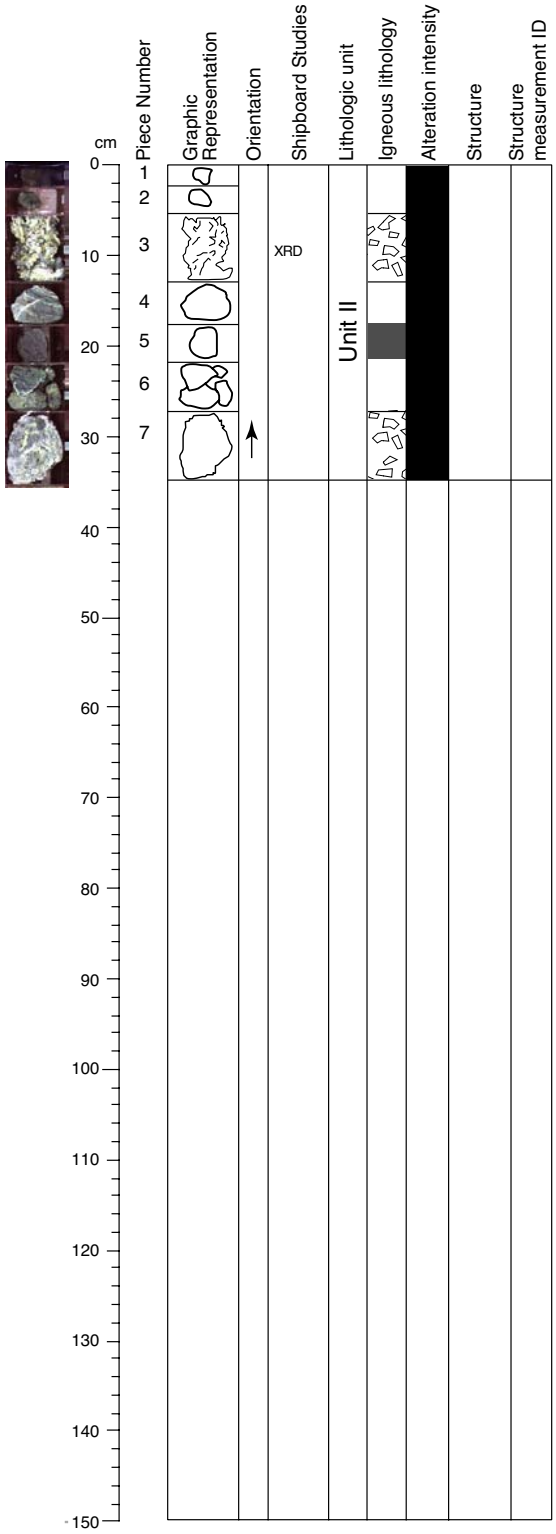
SECONDARY MINERALOGY:
COMMENTS:
Piece 1 is completely serpentinized dunite. Alteration of Pieces 2 to 21 varies between very highly altered and completely altered with as much as 10% fresh olivine and 20% fresh orthopyroxene. Pieces 22 to 24 are composed of completely altered gabbroic rock in completely serpentinized harzburgite.

VEIN ALTERATION:
An early generation of serpentine-magnetite is cut by one or two later chrysotile vein generations. The latter are dominantly transgranular. In addition to the chrysotile veins Pieces 12 and 15 also host straight, massive, green picrolite veins that were crosscut by late chrysotile veins. In proximity to the shear zone in Pieces 23 and 24 (gabbro) the paragranular chrysotile veins show a pronounced subparallel alignment that mimics the rock fabric. Within the sheared gabbro (Pieces 23 and 24) a single large light green picrolite vein is developed that is orientated perpendicular to the foliation.

THIN SECTIONS: Sample 1274A-18R-1, 115-118 cm

STRUCTURE:
The section consists of serpentinized harzburgite (Pieces 2-24) with protogranular textures and dunite (Piece 1). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. A weak crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is present in Pieces 8, 18, and 19 and is subparallel to the serpentine foliation, although some pieces with strong serpentine foliation lack crystal-plastic foliation. The crystal-plastic foliation is inclined in these pieces at 37 degrees in the cut face of the core. Pieces 1, and 5 through 22 have fine, en-echelon, chrysotile-filled shear fractures; some with consistent orientations (foliations shown by Pieces 5, 8, 10, 12, 14, 15, 17, and 18). Later generation of planar chrysotile veins in Pieces 5 and 23. Piece 23 shows intense wall rock alteration of a peridotite (spinel still visible) and is cut by a 0.5 cm wide serpentine vein with fibers oblique to the walls, indicated shear offset of up to 0.5 cm. Pieces 1 through 23 exhibit weak cross-fiber serpentine foliation. Piece 24 exhibits moderate cross-fiber serpentine foliation and intense parallel serpentine veins. Pieces 12 and 15 contain green serpentine veins which are cut by the chrysotile veins and show orthogonal tension cracks.

Core Photo



209-1274A-18R2 (Section top: 94.8 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1–7

COLOR: Dark green/gray to light green/gray.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 89%–94%
Orthopyroxene	Mode 5%–10%
	Size 1–10 mm
	Shape/Habit anhedral
Spinel	Mode <1 mm
	Size 1 mm
	Shape/Habit Vermicular

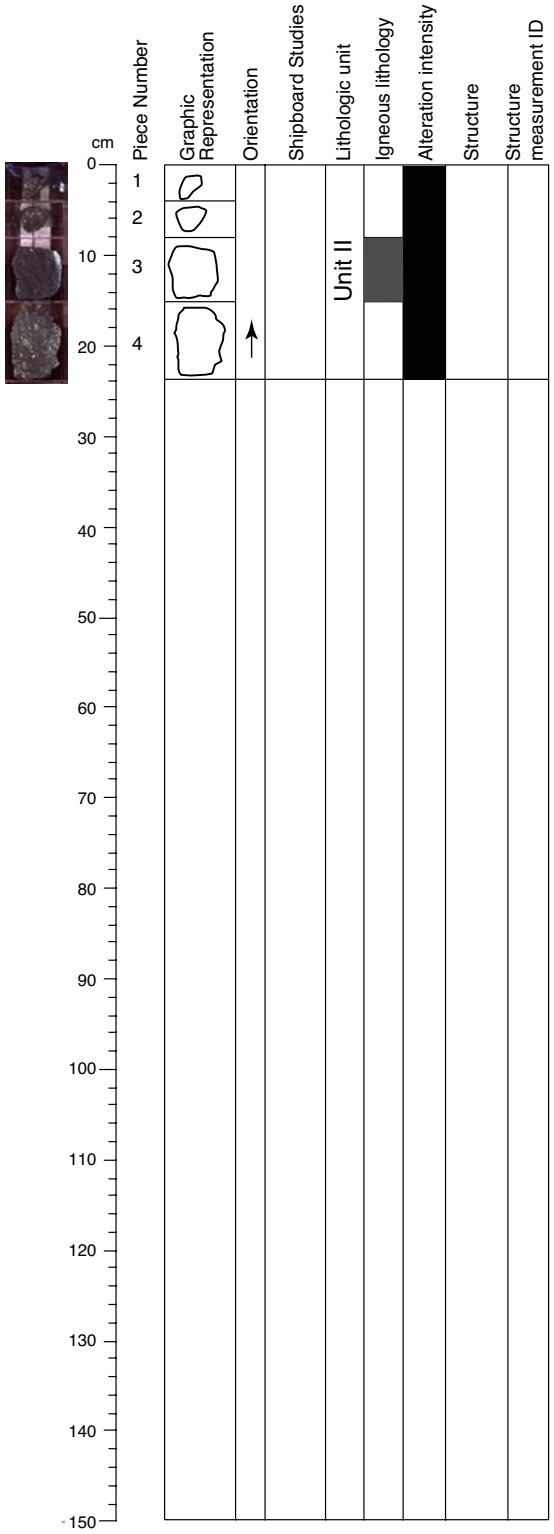
COMMENTS: Highly altered harzburgite in Pieces 1-2, 4, 6 and dunite in Piece 5. Piece 3 is a fault gouge and Piece 7 is a brecciated harzburgite.

SECONDARY MINERALOGY:
COMMENTS:
Piece 1 is completely serpentinized black harzburgite. Piece 5 is completely serpentinized dunite with minor fresh olivine. Pieces 2, 4, and 6 are light green/gray, completely serpentinized harzburgite with exceptionally large asbestiform serpentine aggregates. Piece 3 is composed of asbestiform serpentine rubble. Harzburgitic breccia within a serpentine matrix is present in Piece 7.

VEIN ALTERATION:
This section is strongly affected by the shear zone developed at the bottom of the previous section (1274A-18R-1). Pieces 1, 2, and 4 host green picrolite that were cut by white chrysotile veins. Piece 5 is a serpentinized dunite that contains a network of black serpentine veins. Pieces 6 and 7 show strong cataclastic deformation but no discrete veins.

STRUCTURE:
The section consists of serpentinized harzburgite (Pieces 1-2, and 4-6) with protogranular textures and fault gouge (Pieces 3 and 7). Pieces 3 and 7 are partially cohesive fault gouges. These comprise breccias supported by a clay and/or serpentine matrix with serpentinite clasts (0.1 cm to 3 cm diameter), and serpentine fibers up to 0.5 cm long. Clasts with slickensides indicate a tectonic origin for the breccia. Pieces 4 and 6 are subrounded clasts or fractured serpentinite containing thin veneers (<0.2 cm wide) or zones of cataclastic breccia. Piece 4 contains green serpentine veins cut by later white serpentine veins. These pieces may have been clasts within fault gouge that were isolated by drilling. Piece 1 shows parallel green serpentine veining and later wispy chrysotile veins similar to Piece 24 in Section 1274A-18R-1. Piece 5 shows black serpentine net-veining.

Core Photo



209-1274A-19R1 (Section top: 97.9 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1–4

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 82%–98%
Orthopyroxene	Mode 18%–1%
	Size 2–12 mm
	Shape/Habit anhedral
Clinopyroxene	Mode <1%
	Size 1–3 mm
	Shape/Habit anhedral
Spinel	Mode 1%
	Size 1–3 mm
	Shape/Habit Equant/Interstitial

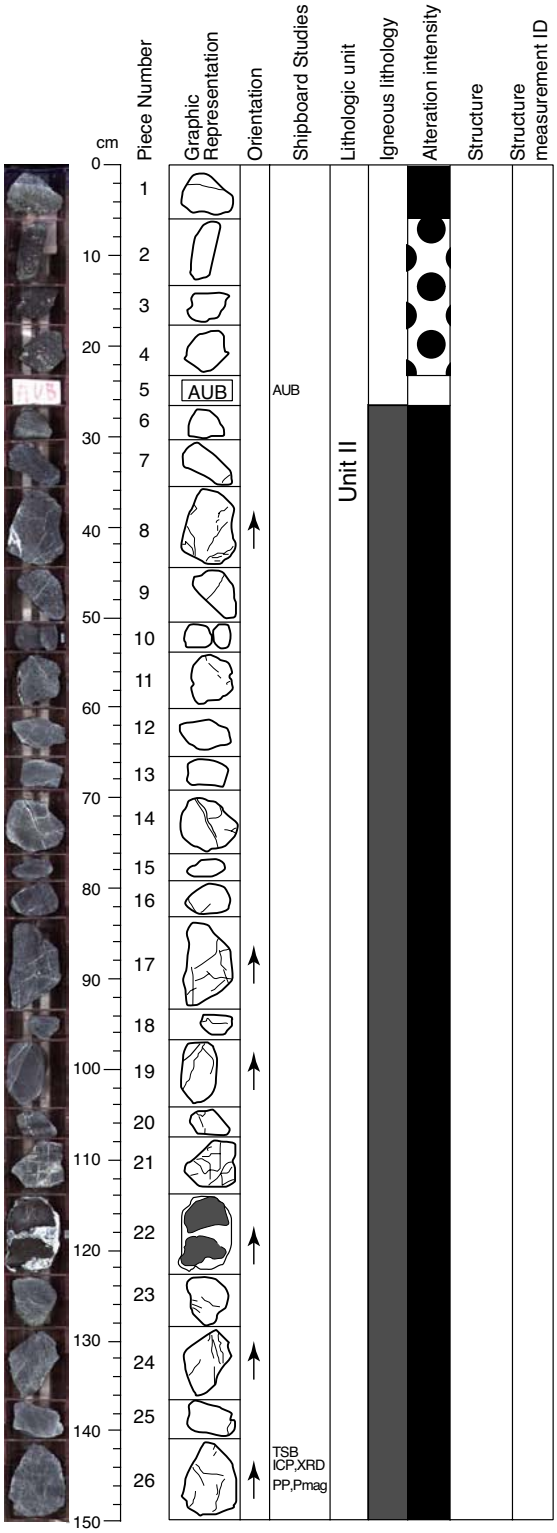
COMMENTS: This short section consists of harzburgite in Piece 1-2, and 4, and dunite in Piece 3. Spinels are either equant or interstitial in shape. Texture is protogranular.

SECONDARY MINERALOGY:
COMMENTS:
Pieces 1, 2, and 4 are completely serpentinized harzburgite. Minor fresh orthopyroxene cores are preserved locally. Minor fresh olivine is also locally preserved in Pieces 1, 2, and 4. These olivine relics are retained in the cores of serpentine mesh texture alteration. Completely serpentinized dunite is present in Piece 3.

VEIN ALTERATION:
This section hosts early black serpentine-magnetite veins that were crosscut by green picrolite veins. Late, branched, white chrysotile veins crosscut the serpentine-magnetite and the green picrolite veins.

STRUCTURE:
The section consists of serpentinized harzburgites (Pieces 1, 2, and 4) with protogranular textures and dunite (Piece 3). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene within harzburgite. Dunite has large anhedral ovoid spinel. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in harzburgite pieces and spinels in dunite do not have a preferred orientation. Piece 4 is cut by fine, chrysotile-filled shear fractures with consistent orientations and no offset. Pieces 1, 2, and 3 exhibit weak cross-fiber serpentine foliation. Piece 4 is cut by one early green serpentine vein cut by the later wispy chrysotile veins.

Core Photo



209-1274A-20R1 (Section top: 102.9 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1–26

COLOR: Dark green/gray to light green/gray

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 84%–97%
Orthopyroxene	Mode 0%–15%
	Size 1–5 mm
	Shape/Habit anhedral
Spinel	Mode 1%–3%
	Size 0.5–3 mm
	Shape/Habit Vermicular/Interstitial/Equant

COMMENTS: Altered harzburgite in Pieces 1-4 and dunite in Pieces 6-26. Modal layering of orthopyroxene in harzburgite. Spinels in harzburgite is vermicular or interstitial forming intergrowth with orthopyroxene while those in dunite is equant or interstitial in shape. Piece 22 is a breccia made of harzburgite.

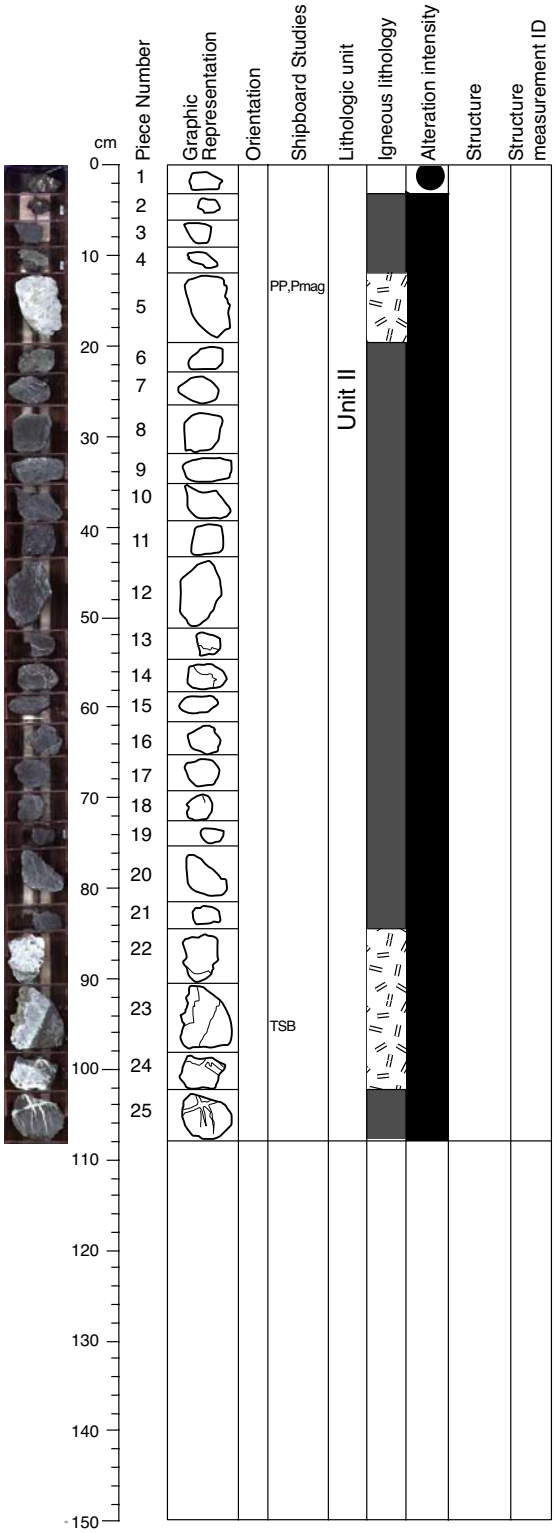
SECONDARY MINERALOGY:
COMMENTS:
Most of this section (Pieces 6 to 26) is completely serpentinized dunite. Piece 22 is a breccia consisting of completely serpentinized dunite clasts in a soft, light green/gray serpentine matrix. Pieces 2-4, are very highly serpentinized harzburgite. Piece 1 is completely altered and is composed of harzburgite with a c. 2-cm wide gabbro dikelet on one margin.

VEIN ALTERATION:
The harzburgite of this section (Pieces 1-4) shows early serpentine-magnetite and later white chrysotile veins. The dunites of this section host dominantly white occasionally branched chrysotile veins. These veins cut early black serpentine-magnetite and later green massive picrolite veins that are present only in Pieces 15 to 17, and 23. In addition to these serpentine-magnetite and chrysotile veins, composite white/black serpentine-magnetite/chrysotile veins are developed in Piece 14.

THIN SECTIONS: Sample 1274A-20R-1, 141-143 cm

STRUCTURE:
The section consists of dominantly dunite (Pieces 2, 6-21, and 23-26), serpentinized harzburgite (Pieces 1-4) with protogranular textures, and fault gouge (Piece 21). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene within harzburgite. Dunite has large anhedral equant to ovoid spinel. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in harzburgite pieces and spinels in dunite do not have a preferred orientation. Piece 8 is cut by a serpentine-filled fracture with up to 0.5 cm shear offset, and has minor slickensides along one face that show reverse sense of motion. Pieces 9 through 21 are cut by sporadic and randomly oriented shear fractures and microfaults with 0.1 cm to 0.3 cm offset. Fractures are filled with serpentine. Piece 22 comprises two subangular serpentinite clasts (3–4 cm diameter) joined by partially cohesive serpentine gouge. The gouge between the clasts is identical to that described in Pieces 3 and 8 of Section 1274A-18R-2, and is likely of tectonic origin. Pieces 3, 4, and 7 through 21 exhibit weak cross-fiber serpentine foliation. Pieces 1, 2, 6, and 23-26 exhibit moderate strength cross-fiber serpentine foliation. Pieces 1-4 (harzburgites) have early black serpentine veins cut by later white chrysotile veins. Pieces 5-26 (dunites) exhibit the following sequence of veins: early black net serpentine > planar black serpentine veins > green serpentine veins > late white chrysotile veins. Green serpentine veins cut Pieces 7, 8, 15-17, 20 and 23-26. White/black composite serpentine cut Pieces 13 and 14.

Core Photo



209-1274A-21R1 (Section top: 112.5 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1–4, 6–21, 25

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 80%–98%
Orthopyroxene	Mode 20%–0%
	Size 2–10 mm
	Shape/Habit anhedral
Clinopyroxene	Mode <0.5%
	Size 1–2 mm
	Shape/Habit anhedral
Spinel	Mode <3%
	Size 1–3 mm
	Shape/Habit Equant/Interstitial

COMMENTS: Small pebbles of altered harzburgite in Pieces 1-2 and altered dunite in Pieces 3-4, 6-21 and 25. Spinels are either equant or interstitial in shape.

Pieces 5, 22–24

COLOR: Light gray where rodingitized.

PRIMARY MINERALOGY: GABBRO

COMMENTS: Too highly altered to determine primary mineralogy. Pieces 22-24 have a contact with peridotite.

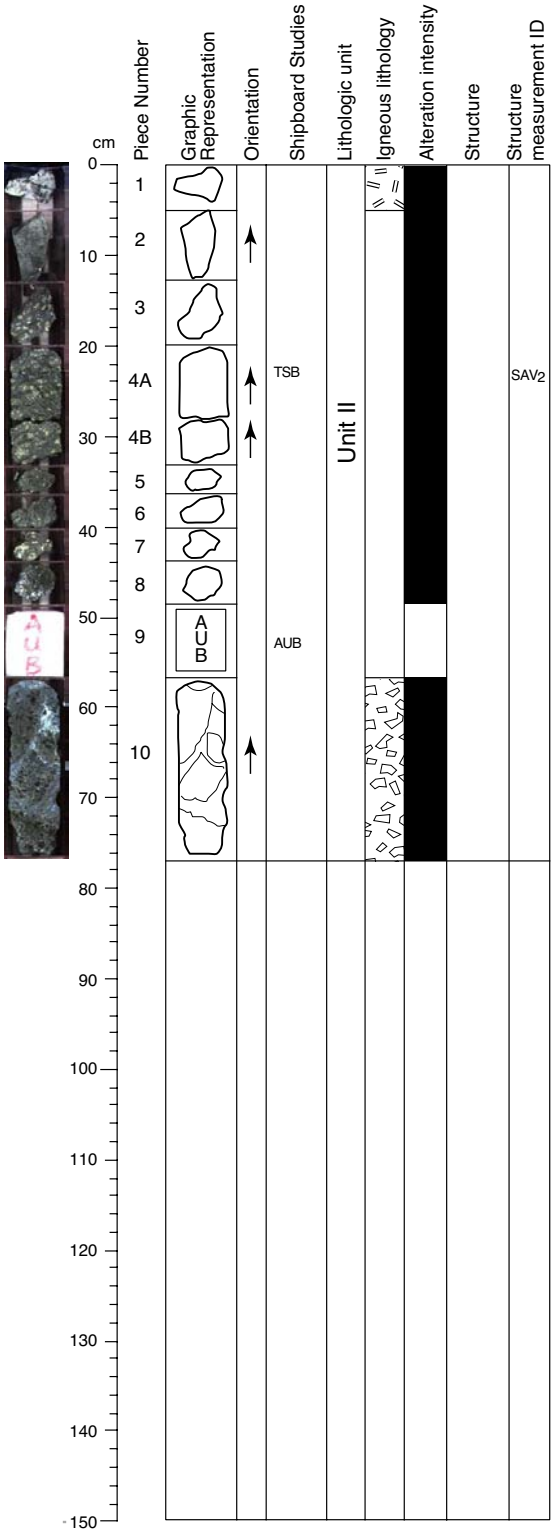
SECONDARY MINERALOGY:
COMMENTS:
Pieces 1 and 2 of this section are very highly serpentinized harzburgite with approximately 10% fresh olivine preserved as cores within serpentine mesh texture alteration. Around 10% of fresh orthopyroxene is also preserved within the cores of larger grains. The majority of this section of core (Pieces 3, 4, 6-21, and 23-25) is composed of completely serpentinized dunite. Pieces 5, 22, and 23 host completely altered gabbroic rock within the serpentinized host rock. These gabbros are heavily rodingitized indicated by the formation of zoisite, hydrogrossular, and prehnite after plagioclase. Clinopyroxene is altered to chlorite and amphibole. Small amounts of andradite, titanite, and vesuvianite are also present.

VEIN ALTERATION:
Similar to the previous sections, transgranular chrysotile veins dominate the veining in this section. Chrysotile veins in Piece 12 are paragranular. Serpentine-magnetite veins are the earliest vein generation. Pieces 7 and 16 host white and green composite picrolite-chrysotile veins. Pieces 11 and 17 host single green picrolite veins. In proximity to the gabbroic unit in Pieces 24 and 25, massive white and light green picrolite-chrysotile veins are present.

THIN SECTIONS: Samples 1274A-21R-1, 12-17 cm and 1274A-21R-1, 93-98 cm

STRUCTURE:
The section consists dominantly of dunite (Pieces 6-21), serpentinized harzburgite (Pieces 1-2) with protogranular textures, and highly altered oxide gabbro with intrusive contacts or relationships with dunite (Pieces 5, 22, 23, 24, and 25). Dunite has large anhedral equant to ovoid spinel. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in harzburgite pieces and spinels in dunite do not have a preferred orientation. The oxide gabbros appear to retain their igneous textures and have clear intrusive relationships with respect to the dunites. Most of the oxide gabbro pieces have contacts with dunite preserved and Piece 5 may contain small xenoliths of dunite within gabbro. Pieces 12 and 15 are cut by fine shear fractures with no offset and consistent orientations that are filled with chrysotile. Pieces 3-4, 6-12, and 15- 21 exhibit weak serpentine foliation. Pieces 1 and 2 have a weak chrysotile foliation in harzburgite. Pieces 5, 22 and 23 are very sparsely veined gabbros. Pieces 24 and 25 contain large white and green serpentine tension cracks cutting gabbro veins emanating from gabbro. Pieces 6 to 21 are dunites with some early black serpentine veins and green serpentine veins in Pieces 11 and 17, and are all cut by late chrysotile veins, some composite with green serpentine interiors (Pieces 7 and 16).

Core Photo



209-1274A-22R1 (Section top: 122.1 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Piece 1

COLOR: Light gray

PRIMARY MINERALOGY: GABBRO

COMMENTS: Too highly altered to determine primary mineralogy.

Pieces 2–10

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 69%
Orthopyroxene	Mode 30% Size 2–12 mm Shape/Habit anhedral
Clinopyroxene	Mode 1% Size 1–3 mm Shape/Habit anhedral
Spinel	Mode <1% Size 1–2 mm Shape/Habit Vermicular

COMMENTS: Altered gabbro in Piece 1 and altered harzburgite with 30% orthopyroxene in Pieces 2-10. Spinels in harzburgite are vermicular in shape forming intergrowth with orthopyroxene.

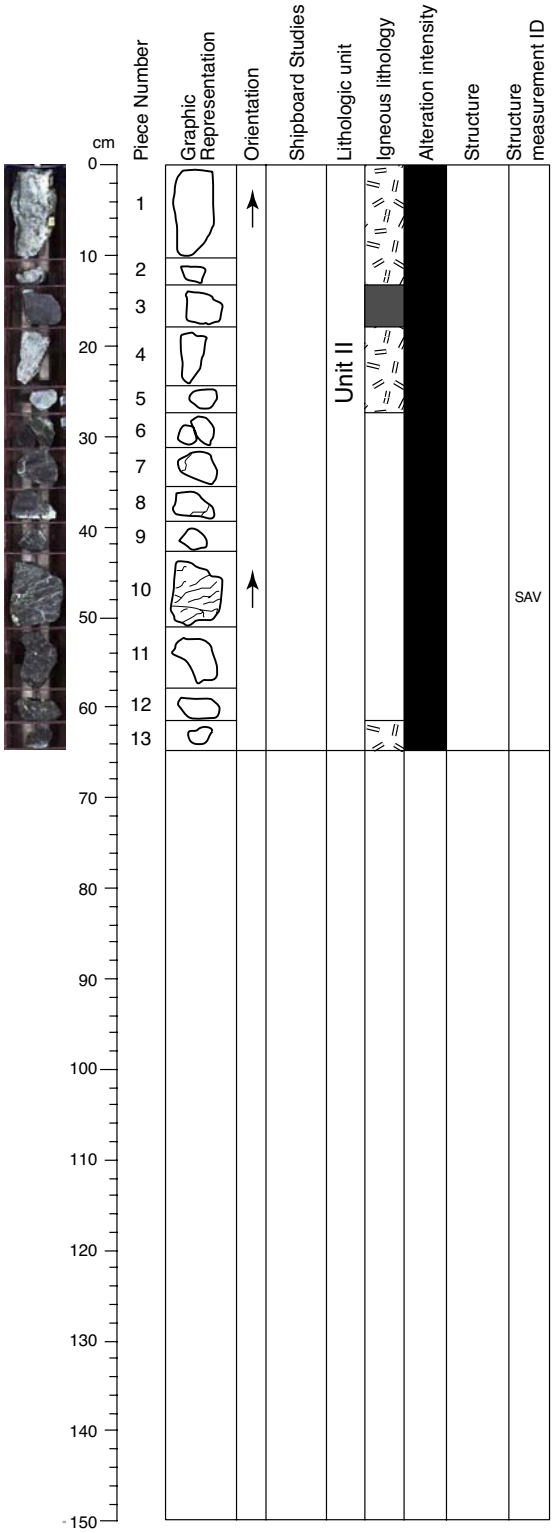
SECONDARY MINERALOGY:
COMMENTS:
This section of core is mostly composed of green, completely serpentinized harzburgite (Pieces 2 to 8). The unusual softness of the core and its color may be due to the presence of clay in the serpentinized olivine matrix. Piece 1 consists of completely altered (rodingitized) gabbro. Piece 10 is composed of a serpentinized breccia in which completely altered clasts of dunite are suspended in a matrix of green serpentine.

VEIN ALTERATION:
The serpentinized harzburgite of this section hosts mainly picrolite and chrysotile veins. Piece 2, the least altered rock in this section, also shows early serpentine-magnetite veins that are obscured in the more altered lower part of the section. Piece 1, a gabbro, hosts green to black picrolite veins.

THIN SECTIONS: Sample 1274A-22R-1, 20-23 cm

STRUCTURE:
The section consists dominantly of serpentinized harzburgite (Pieces 3-19) with protogranular textures, highly altered oxide gabbro (Piece 1), orthopyroxene-rich dunite (Piece 2) and a fault gouge (Piece 10). Harzburgite is generally enriched in pyroxene content. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic with orthopyroxene. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is not obvious in the harzburgite. Piece 10 is a partially cohesive fault gouge. Breccia is supported by a clay and/or talc rich matrix containing subrounded to subangular clasts of serpentine ranging in size from 0.05 cm to 1 cm. Foliated shear bands with random orientation cut the matrix of the gouge in several locations. Pieces 3 through 8 are cut by numerous unfilled (weathered chrysotile) shear fractures with random orientations. Pieces 2 through 8 exhibit weak cross-fiber serpentine foliation. Pieces 2-8 contain sparse green serpentine and later chrysotile veins with Piece 2 showing a distinct serpentine foliation.

Core Photo



209-1274A-23R1 (Section top: 126.8 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Piece 1-2, 4–5, 13

COLOR: Light gray

PRIMARY MINERALOGY: GABBRO

COMMENTS: Too highly altered to determine primary mineralogy. Pieces are rich in oxides.

Pieces 3, 6–12

COLOR: Dark green/gray

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 89%–99%
Orthopyroxene	Mode 0%–10%
	Size 1–7 mm
	Shape/Habit Anhedral
Spinel	Mode 1%
	Size 1 mm
	Shape/Habit Equant/Interstitial/Vermicular

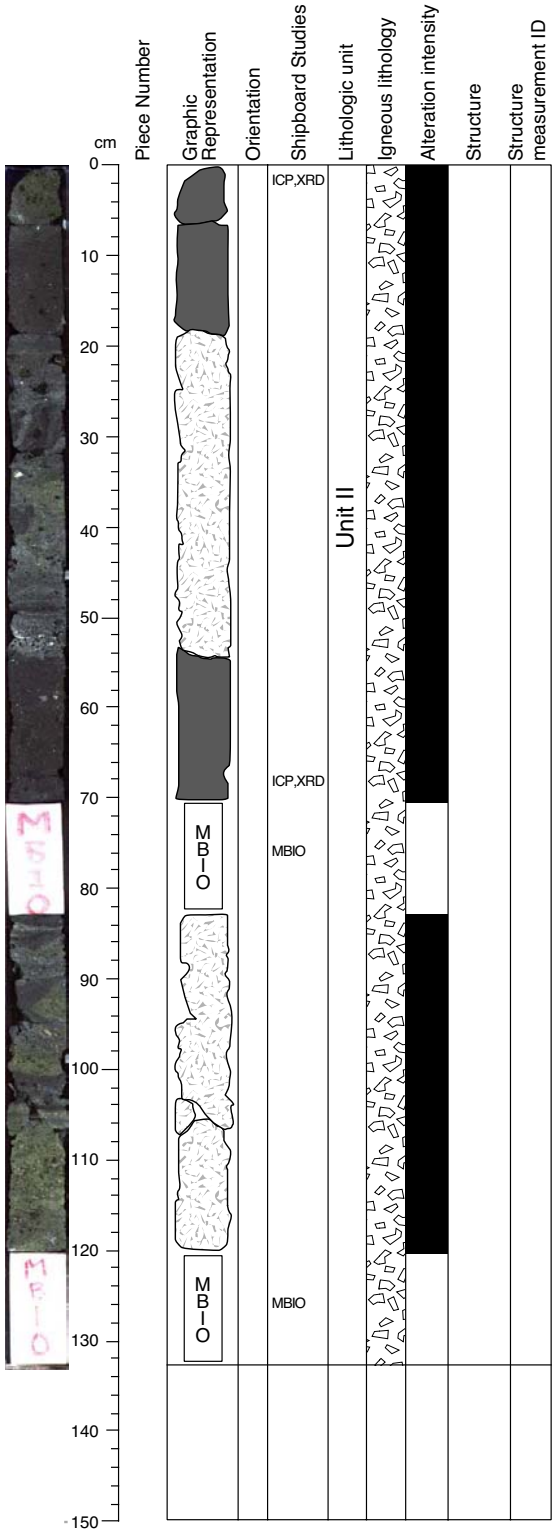
COMMENTS: This section consists of altered gabbro in Pieces 1-2, 4-5, and 13, altered dunite in Piece 3, and altered harzburgite in Piece 6-12. Spinels in dunite are equant in shape while spinels in harzburgite are vermicular to interstitial in shape.

SECONDARY MINERALOGY:
COMMENTS:
Pieces 1, 4, 5, and 13 of this section are completely altered (rodingitized) gabbro. Plagioclase is altered to Ca-silicates. Clinopyroxene in the gabbro has been replaced by amphibole+chlorite+talc. The remainder of the core is composed of completely serpentinized dunite (Pieces 3 and 6-9) and completely serpentinized harzburgite (Pieces 10-13).

VEIN ALTERATION:
The serpentinized harzburgite of this section hosts mainly white transgranular chrysotile veins. Composite paragranular white to green picrolite-chrysotile veins are present in Pieces 9 and 10. The gabbro of Pieces 1, 2, 4 and 5 hosts green transgranular picrolite veins.

STRUCTURE:
The section consists dominantly of serpentinized dunite (Pieces 3, 6-13), highly altered oxide gabbro (Piece 1, 2, and 4), orthopyroxene-rich dunite (Piece 3) and a cohesive matrix supported fault breccia containing gabbro and serpentinized dunite clasts (Piece 5). Piece 1 has slickenfibers along a subvertical face that indicate oblique strike slip motion. Pieces 4 has a high density of shear fractures filled with greenschist facies mineral assemblages. Pieces 6, 7 and 9 through 13 are cut by fine, chrysotile-filled shear fractures with little or no lateral offset. Pieces 9 and 10 show a foliation and Pieces 11, 12, and 13 show a hatchwork. Pieces 6 and 7 exhibit weak cross-fiber serpentine foliation. The gabbros (Pieces 1, 2, and 5) have green serpentine veins.

Core Photo



209-1274A-23R2 (Section top: 127.45 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1

COLOR: Light green.

PRIMARY MINERALOGY:

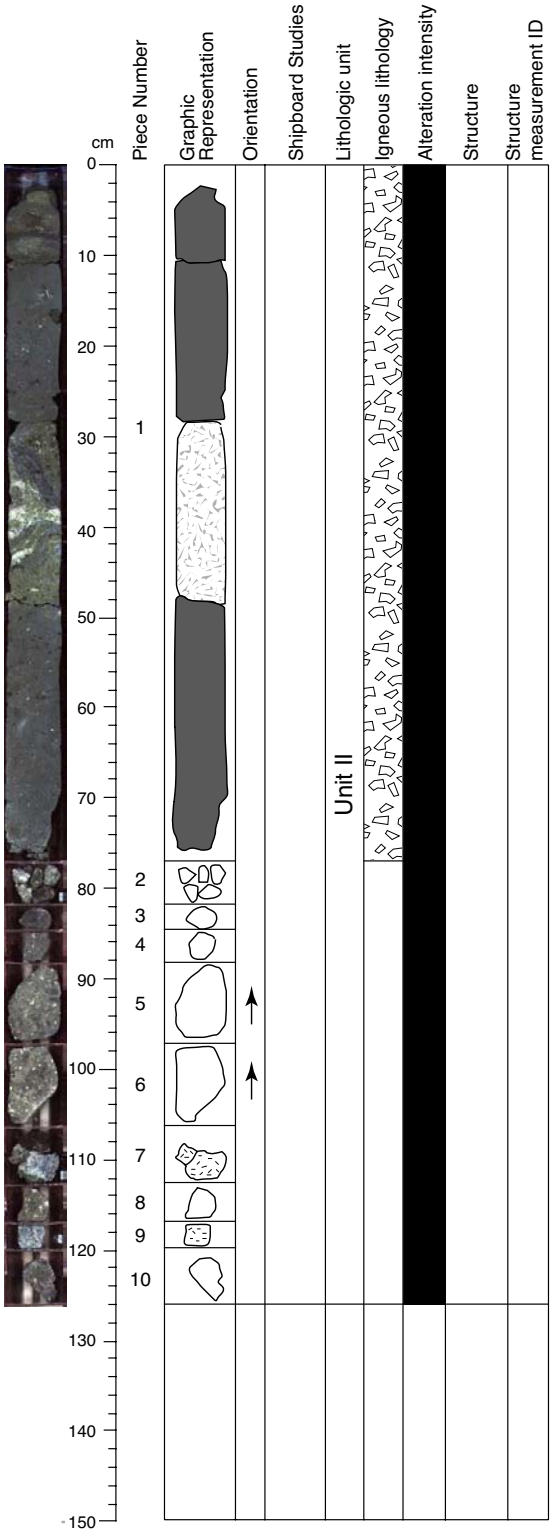
COMMENTS: This section is composed of clay and mud with gravel-sized fragments that appear to have been derived by serpentinized peridotite.

SECONDARY MINERALOGY:
COMMENTS:
This section is composed of soft, green, serpentine-clay with intermittently dispersed fragments of black and gray serpentinite. It is interpreted to be part of a serpentine rich fault zone.

VEIN ALTERATION:
No veins.

STRUCTURE:
The entire section is composed of partially cohesive fault gouge. The gouge is variable in nature down through the section. From 0–106 cm, it is matrix supported with 10% – 20% serpentine clasts ranging in diameter from 0.01 cm to 1 cm with several outsized clasts up to 3 cm. The matrix is partially cohesive serpentine and possibly clay minerals, and is gray or green. Gray and green matrix breccias are segregated into distinct bands. Foliation, where visible, is subhorizontal or dipping up to 30 degrees. Outsized clasts have pressure shadow tails through the matrix in some locations that indicate subhorizontal shear. The breccia from 106 to 120 cm is clast supported with a carbonate matrix. Clasts diameter ranges from 0.01 to 0.2 cm and are subangular to subrounded serpentine. The breccia is foliated with subhorizontal to irregular foliation with random angles. There are no veins. The extent of drilling disturbance must be evaluated especially for horizontal shear indicators at ~30 cm.

Core Photo



209-1274A-24R1 (Section top: 131.8 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1, 7, 9

COLOR: Light green.

PRIMARY MINERALOGY:

COMMENTS: Similar to Section 1274A-23R-2 Pieces 1 and 7 are composed of clay and mud with gravel-sized fragments that appear to have been derived by serpentinized peridotite.

Pieces 2–6, 8, 10

COLOR: Light green.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 85%
Orthopyroxene	Mode 14%
	Size 2–7 mm
	Shape/Habit anhedral
Clinopyroxene	Mode 1%
	Size 1–4 mm
	Shape/Habit anhedral
Spinel	Mode <1%
	Size 1–2 mm
	Shape/Habit Vermicular/Interstitial

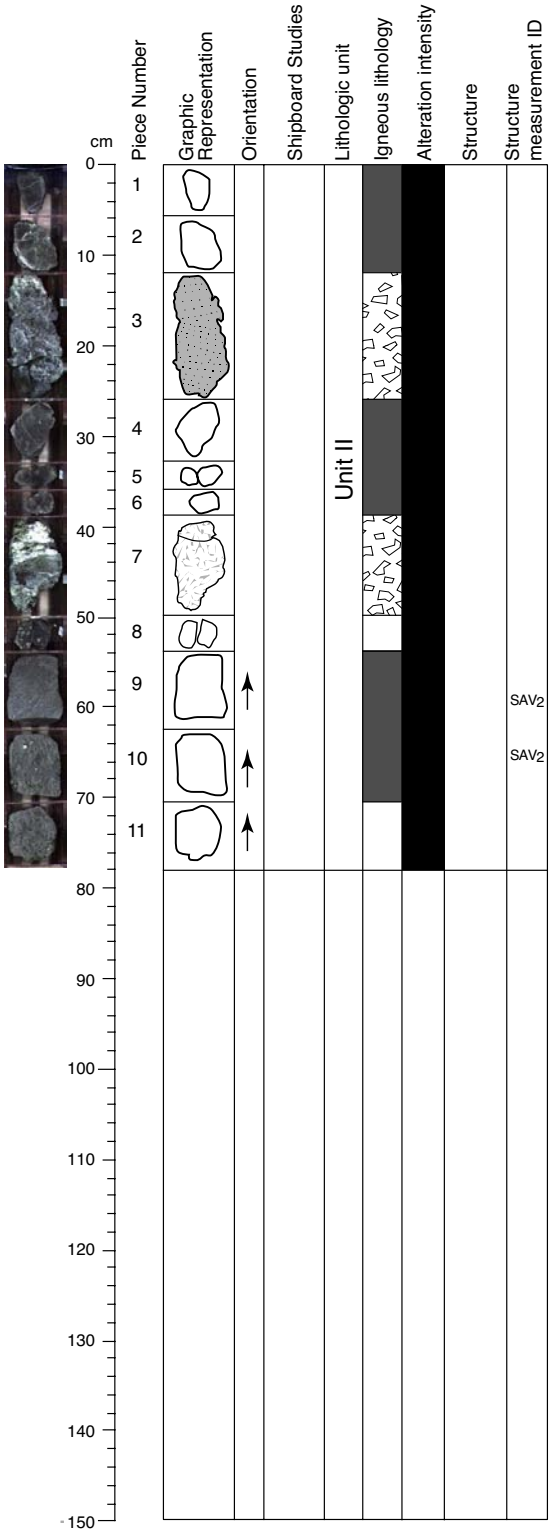
COMMENTS: Highly altered harzburgite. Spinels are vermicular or interstitial in shape forming intergrowth with orthopyroxenes.

SECONDARY MINERALOGY:
COMMENTS:
The soft serpentine-clay mudstone of Core 1274A-23R-2 continues in the top part of this section (Pieces 1 and 7). Pieces 2-6, 8, and 10 are composed of completely serpentinized harzburgite.

VEIN ALTERATION:
The upper 77 cm of this section host no veins. The lower part of the section hosts early black serpentine-magnetite and later white chrysotile veins.

STRUCTURE:
The section consists dominantly of fault gouge (Piece 1) and serpentinized harzburgite with protogranular textures (Pieces 2-12) many of which appear to have been enclosed in gouge as clasts (e.g., Pieces 2, 8, and 11). Piece 1 is a long section of partially cohesive fault gouge with a carbonate matirx. From 0 cm to 26 cm, the breccia is matrix-supported and contains less than 15% subrounded to subangular serpentine clasts within a matrix of very fine grained carbonate and likely clay minerals. This breccia is subhorizontally foliated between 0 cm and 8 cm, and unfoliated from 8 cm to 26 cm. From 26 cm to 46 cm the breccia is clast supported, with approximately 60% subrounded to subangular serpentine clasts (0.01 to 0.03 cm diameter) in a matrix of fine-grained carbonate. The breccia has an irregular foliation defined by variations in the dominant colors of the clasts. From 46 cm to 74 cm, the breccia is supported by a fine-grained carbonate matrix that contains 0.01 to 0.05 cm diameter serpentine clasts with no visible foliation. Pieces 2 through 6 and 8 are cut by fine, randomly oriented open shear fractures with no visible offset. Pieces 7 and 9 are small fragments of partially cohesive, carbonate-matrix supported fault gouge. Serpentine clasts ranging in diameter from 0.01 to 0.1 cm and are subrounded to subangular. Sparse early black serpentine veins and late chrysotile veins in Pieces 2-6, 8, and 10.

Core Photo



209-1274A-25R1 (Section top: 136.5 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1–2, 4–6, 8–11

COLOR: Dark green/gray with black fragments.

PRIMARY MINERALOGY: DUNITE AND HARZBURGITE

Olivine	Mode 80%–98%
Orthopyroxene	Mode 0%–20%
	Size 1–7 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1 mm
	Shape/Habit Equant/Vermicular

COMMENTS: This section consists of mostly dunite (Pieces 1-2, 4-6, and 9-10) with a piece of harzburgite (Piece 8) and fault gouge (Pieces 3 and 7). Spinels are equant shape in dunite or vermicular shape forming intergrowth with orthopyroxene in harzbugite. Dunite in Piece 2 is brecciated.

Pieces 3, 7

COLOR: Light green.

PRIMARY MINERALOGY:

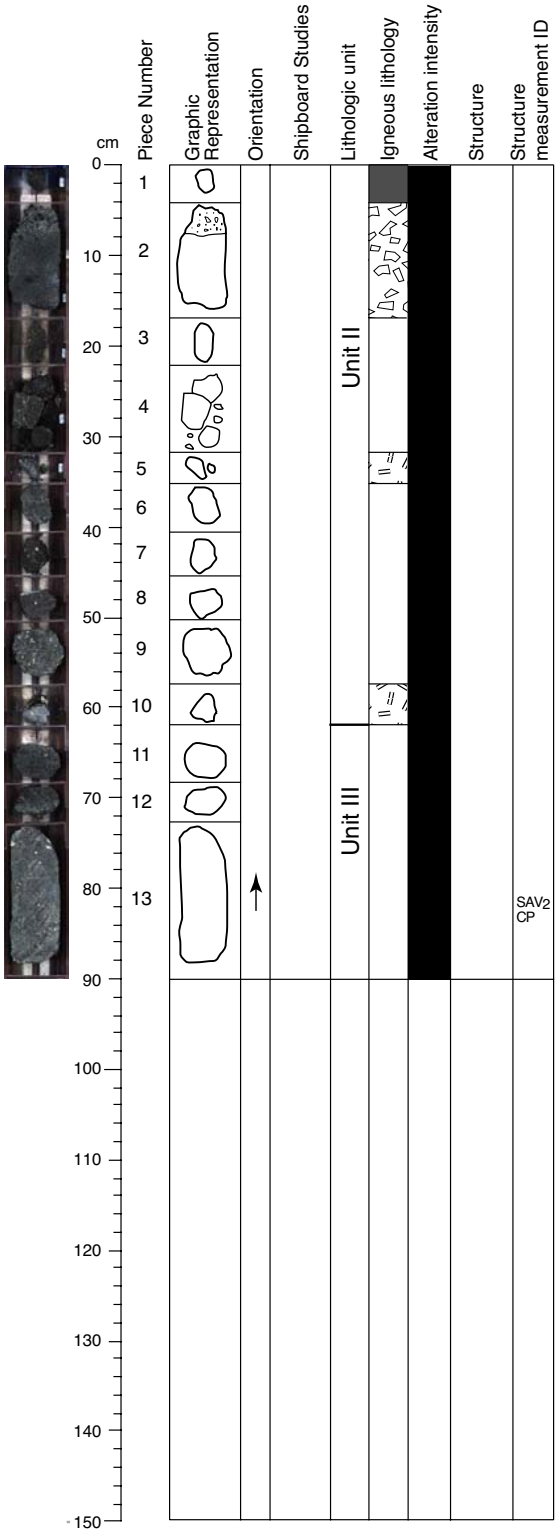
COMMENTS: Similar to Section 1274A-23R-2 Pieces 3 and 7 are composed of clay and mud with gravel-sized fragments that appear to have been derived by serpentinized peridotite.

SECONDARY MINERALOGY:
COMMENTS:
Pieces 3 and 7 of this section of core are composed of serpentine-clay cemented breccia that contains dispersed fragments of black and green serpentinized harzburgite and dunite, which are interpreted to be part of a serpentine rich fault zone. The remainder of the section consists of completely serpentinized harzburgite and dunite.

VEIN ALTERATION:
Early serpentine-magnetite and later chrysotile vein characterize veining in this section. Chrysotile veins are present only in Pieces 9 to 11 where they are paragranular. Pieces 3 and 7 host no veins.

STRUCTURE:
The section consists of serpentinized dunite (Pieces 1-2, 4-6, and 9), serpentinized harzburgite depleted in pyroxene (Pieces 8, 10 and 11) and fault gouge (Pieces 3 and 7). The harzburgite has protogranular texture and lacks strong crystal plastic foliation defined by the preferred dimensional orientation of pyroxene, however, they commonly has an intense serpentine foliation at various inclinations in the cut face of the core that ranges from vertical in Piece 10 to 60 degrees in Piece 9. Piece 3 is a partially cohesive, carbonate-matrix fault gouge. The breccia is composed of subrounded to subangular serpentine clasts between 0.05 cm to 5 cm in diameter supported by a carbonate matrix. The breccia has variable, randomly oriented foliation defined by concentrations of coarse clasts. Piece 4 is cut by open, fine shear fractures, and is bounded by slickensides on two faces. It is possible that these clasts were within the overlying breccia and then was disturbed by drilling. Piece 2 is cut by many shear fractures with incipient brecciation in some locations. Piece 5 is partially cohesive, clast-supported fault gouge. Subrounded to subangular serpentine clasts within a fine carbonate matrix have weak and variably oriented foliation. Pieces 5, 6, 9, 10, and 11 are cut by fine shear fractures with little offset. Pieces 1, 2, 4, 6, and 8 have black-magnetite serpentine veins cut by rare white serpentine veins. Piece 5 is cut by a composite green serpentine vein. Piece 1 has a tiny magmatic vein. Pieces 9, 10, and 11 are cut by white chrysotile veins defining a foliation. Note Pieces 10 and 11 have a vertical foliation!

Core Photo



209-1274A-26R1 (Section top: 141.5 mbsf)

UNIT II: MUD/PERIDOTITE/GABBRO

Pieces 1, 3–4, 6-9

COLOR: Dark green/gray.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine Mode 80%–98%
Orthopyroxene Mode 2%–20%
Size 1-5 mm
Shape/Habit anhedral
Spinel Mode <1%
Size 1–3 mm
Shape/Habit Vermicular

COMMENTS: Highly altered harzburgite with 15%-20% orthopyroxene in Pieces 3-4, 6-9, and a pebble of dunite with 2% orthopyroxene in Piece 1.

Pieces 2

COLOR: Dark green/gray.

PRIMARY MINERALOGY:

COMMENTS: Similar to Section 1274A-23R-2 Piece 2 is composed of clay and mud that appear to have been derived by serpentinized peridotite.

Pieces 5, 10

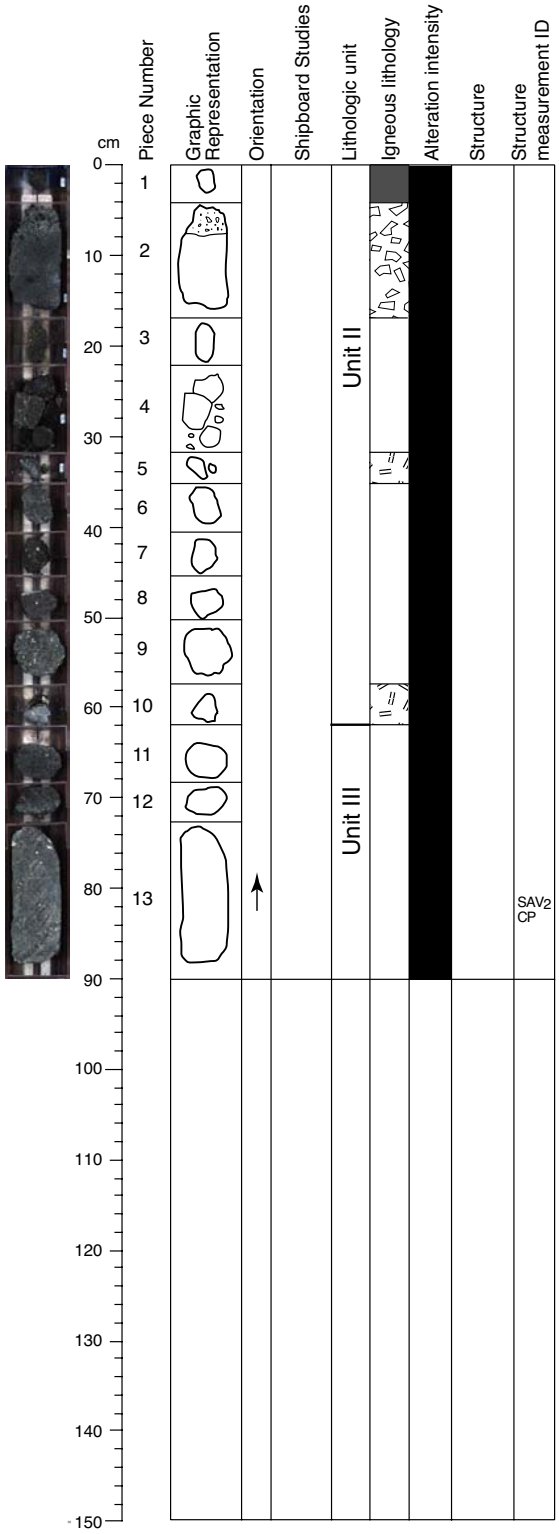
COLOR: Dark green/gray.

PRIMARY MINERALOGY: GABBRO

COMMENTS: Small pieces of altered gabbro. Too highly altered to determine primary mineralogy.

Continued on next page.

Core Photo



209-1274A-26R1 (Section top: 141.5 mbsf)

UNIT-III: HARZBURGITE

Pieces 11–13

COLOR: Dark green/gray.

PRIMARY MINERALOGY: HARZBURGITE

Olivine Mode 84%
Orthopyroxene Mode 15%
Size 1–5 mm
Shape/Habit anhedral
Spinel Mode <1%
Size 1–3 mm
Shape/Habit Vermicular

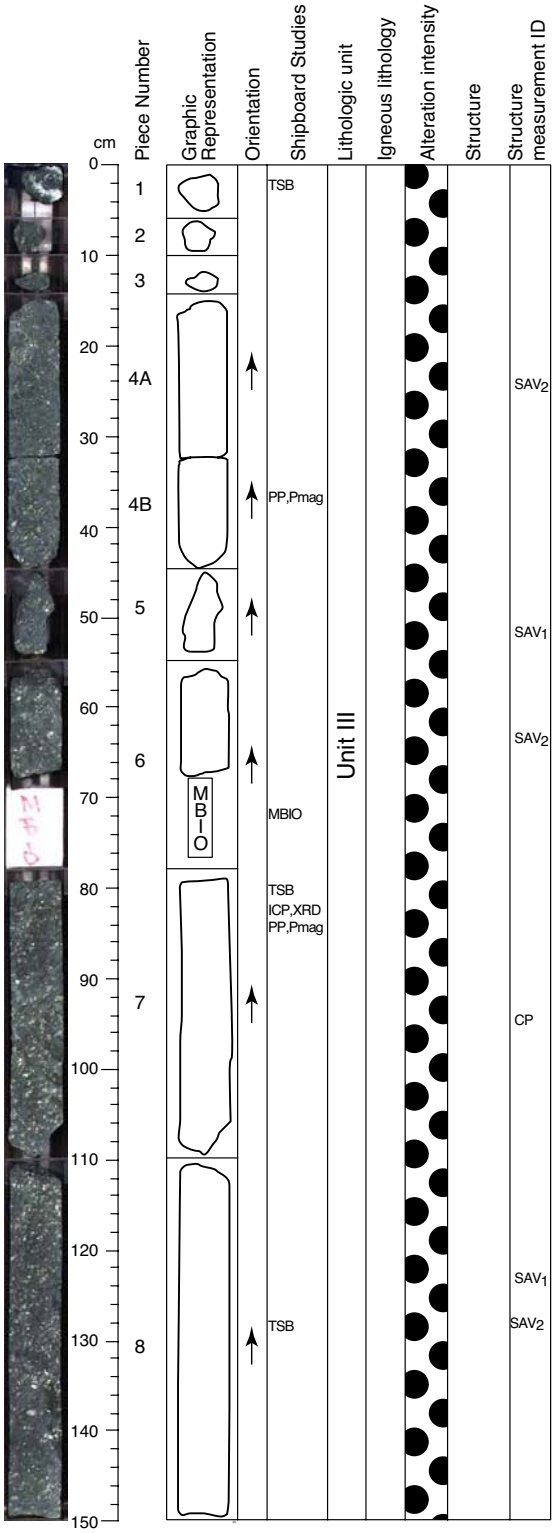
COMMENTS: Highly altered harzburgite with 15% orthopyroxene. Spinels exhibit vermicular shape forming intergrowth with orthopyroxenes.

SECONDARY MINERALOGY:
COMMENTS:
Pieces 1 and 2 are composed of clayey, serpentinized harzburgite. The remainder of the core is composed of completely serpentinized harzburgite with rare fresh olivine cores and occasional fresh orthopyroxene cores (e.g., Pieces 1 and 3).

VEIN ALTERATION:
An early serpentine-magnetite generation was crosscut by a later chrysotile vein generation. In Pieces 11 to 13 the chrysotile veins are paragranular. The fault gouge of Piece 1 and the gabbro of Piece 10 hosts no veins.

STRUCTURE:
The section consists of serpentinized enstatite-poor harzburgite with protogranular textures (Pieces 1, 3-4, and 6-13) and fault gouge (Pieces 2 and 5). Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic within orthopyroxene. A crystal-plastic foliation defined by the preferred dimensional orientation of enstatite grains is not obvious in the harzburgite samples within the section. The harzburgites are generally depleted in pyroxene and show strong modal variation in pyroxene content. Pieces 2 and 5 are sections of cohesive, matrix-supported fault gouge. Sub-rounded to sub-angular serpentinite clasts ranging in size from 0.03 to 0.2 cm with outsized clasts up to 1 cm are supported by a clay and/or serpentine matrix. Pieces 1, 3-4, and 6-13 are cut by fine, serpentine-filled shear fractures with consistent orientations. Piece 8 is cut by green serpentine veins and Piece 4 is cut by a white talc-serpentine vein. Piece 13 is cut by early black serpentine veins. Pieces 3, 4, 6-9, and 11-13 have sparse wispy chrysotile veins and Piece 13 has a very weak serpentine foliation.

Core Photo



209-1274A-27R1 (Section top: 146.1 mbsf)

UNIT III: HARZBURGITE

Pieces 1

COLOR: Dark green/gray.

PRIMARY MINERALOGY: GABBRO

COMMENTS: Small piece of altered gabbro with a contact with peridotite. Too highly altered to determine primary mineralogy.

Pieces 2–8

COLOR: Dark green/gray. Light gray where rodingitized.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 75%–90%
Orthopyroxene	Mode 25%–10%
	Size 1–10 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1–10 mm
	Shape/Habit Vermicular/Equant

COMMENTS: Altered harzburgite rich in orthopyroxene (25% in mode). Spinel exhibits mostly vermicular shape forming intergrowths with orthopyroxene and have an equant shape only where the abundance of orthopyroxene is as low as 10%.

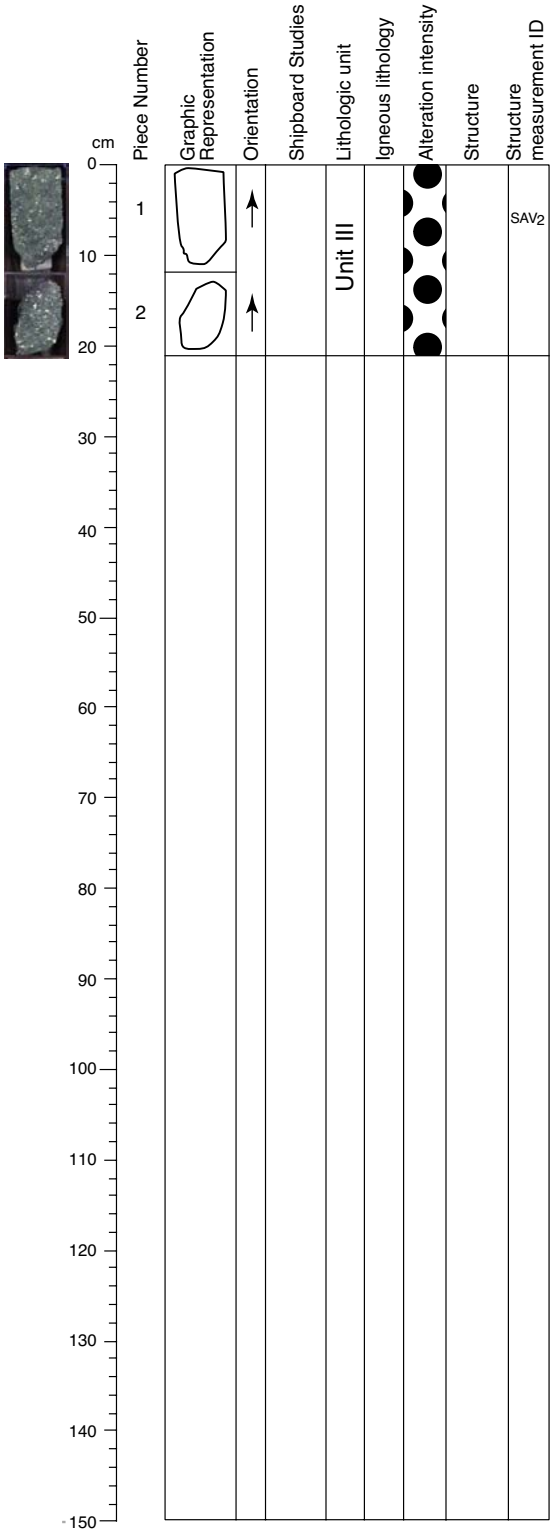
SECONDARY MINERALOGY:
COMMENTS:
This section of core is composed mainly of highly serpentinized harzburgite. Small cores of fresh olivine are present in all pieces, especially in orthopyroxene-rich areas. All pieces contain fresh orthopyroxene cores rimmed mainly by bastite pseudomorphs. Fresh spinel is present in all pieces. Piece 1 contains completely rodingitized gabbro.

VEIN ALTERATION:
This section hosts volumetrically insignificant early serpentine-magnetite and later chrysotile veins.

THIN SECTIONS: Samples 1274A-27R-1, 1-4 cm, 1274A-27R-1, 78-81 cm, and 1274A-27R-1, 126-129 cm

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic with orthopyroxene. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is weak in the section, but obvious in Pieces 4, 5, 6, and 7 and is inclined 30 degrees in the cut face of the core. A gabbroic magmatic vein cuts Piece 1 and appears highly altered, but undeformed. Pieces 2 through 8 are cut by fine, chrysotile-filled shear fractures with consistent orientations. A strong chrysotile foliation is present in Pieces 4 and 5. Weak serpentine foliation occurs in Pieces 6, 7, and 8. Early black serpentine veins cut Pieces 6, 7, and 8. Piece 1 has green serpentine veins cutting the gabbroic gabbro vein.

Core Photo



209-1274A-27R2 (Section top: 147.6 mbsf)

UNIT III: HARZBURGITE

Pieces 1–2

COLOR: Dark green/gray.

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 80%
Orthopyroxene	Mode 20%
	Size 1–4 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1 mm
	Shape/Habit Vermicular

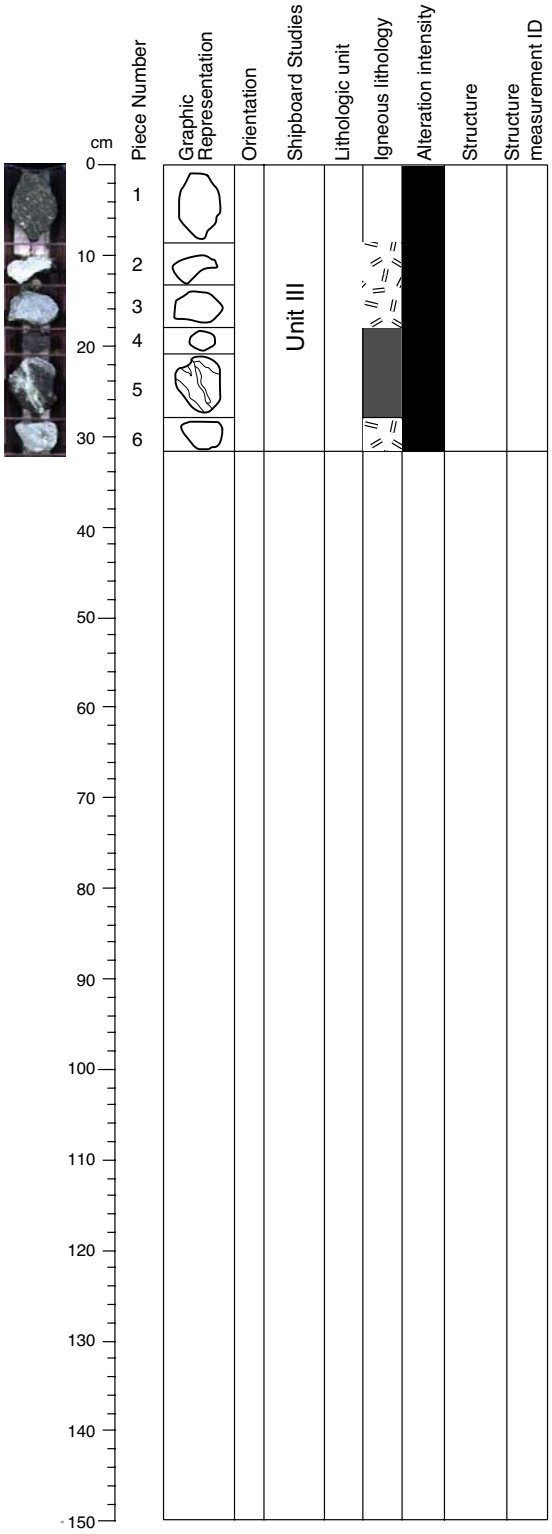
COMMENTS: This short section contains altered harzburgite with 20% orthopyroxene and vermicular shaped spinel forming intergrowths with orthopyroxene.

SECONDARY MINERALOGY:
COMMENTS:
This section of core is composed mainly of highly serpentinized harzburgite. Small cores of fresh olivine are present in all pieces, especially in orthopyroxene rich areas. Both pieces contain fresh orthopyroxene cores rimmed mainly by bastite pseudomorphs. Fresh spinel is present in both pieces.

VEIN ALTERATION:
This section hosts volumetrically insignificant early serpentine-magnetite and later chrysotile veins.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures. Spinel textures are generally vermicular to holly leaf associated spatially with pyroxene to symplectic with orthopyroxene. A crystal-plastic foliation defined by the preferred dimensional orientation of orthopyroxene grains is weak in the section and is inclined 22 degrees in the cut face of the core. Pieces 1 and 2 are cut by fine, chrysotile-filled shear fractures, which define a weak serpentine foliation.

Core Photo



209-1274A-28R1 (Section top: 151.1 mbsf)

UNIT III: HARZBURGITE

Pieces 1, 4–5

COLOR: Dark green/gray where serpentinized.

PRIMARY MINERALOGY: HARZBURGITE AND DUNITE

Olivine	Mode 80%–92%
Orthopyroxene	Mode 20%–8%
	Size 1–5 mm
	Shape/Habit Anhedral
Spinel	Mode <1%
	Size 1 mm
	Shape/Habit Vermicular

COMMENTS: This short section consists of altered harzburgite with 20% orthopyroxene in Piece 1, altered gabbro in Pieces 2-3, and 5-6, and dunite with 8% orthopyroxene in Pieces 4-5. In Piece 5 a gabbro dike intrudes dunite.

Pieces 2–3, 6

COLOR: Light gray.

PRIMARY MINERALOGY: GABBRO

COMMENTS: Small piece of altered gabbro. Too highly altered to determine primary mineralogy.

SECONDARY MINERALOGY:
COMMENTS:
This section of the core is composed of gabbro that has been completely altered to Ca-silicates+amphibole+talc+chlorite with no remaining relics of primary minerals. Piece 5, a dunite with a high percentage of fresh olivine, is cut by a completely altered gabbroic vein. Harzburgite (Pieces 1 and 4) is completely altered to serpentine and only Piece 1 contains any fresh orthopyroxene.

VEIN ALTERATION:
The serpentinized harzburgite of this section show early serpentine-magnetite and later white chrysotile veins. Piece 5 contains a large light green cross-fiber serpentine vein. The gabbro of Pieces 2, 3, and 6 has no veins.

STRUCTURE:
The section consists of serpentinized harzburgite with protogranular textures (Pieces 1, 4, and 5) and highly altered gabbroic rocks with igneous textures (Pieces 2, 3, 6, and a portion of 5). Piece 5 is a harzburgite cut by a gabbroic magmatic vein. No crystal-plastic foliation could be defined in the harzburgite. Pieces 2, 3, and 5 contain dense arrays of shear fractures along serpentine veins with incipient brecciation in some locations. Piece 3 is also cut by a 2 mm wide, serpentine-filled fault with approximately 1 cm offset. Pieces 1 and 4 are cut by fine, serpentine-filled shear fractures with consistent orientations. Pieces 1 and 4 have hatchwork of chrysotile veins. Piece 5 has a 0.5 cm thick green serpentine vein with shear fibers associated with the gabbroic magmatic vein.

THIN SECTION:	**209-1274A-1R-1, Piece 2, 15-17 cm**	**TS#187**	**Observer: WB, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	40	85			
Orthopyroxene	8	12	1-8	Anhedral-subequant	
Clinopyroxene	0.5	1	<0.5	Anhedral, interstitial	At orthopyroxene boarders.
Spinel	0.5	1	0.5-1	Vermicular, interstitial	Interstitial, vermicular at orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	50	Olivine, orthopyroxene		Mesh texture after olivine, bastite after orthopyroxene.
Magnetite	Trace	Olivine, Spinel		Very rare.
Hematite	Trace	Olivine		Very rare.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine+magnetite	1	Straight	Only small trace of magnetite.
Chrysotile	0.2	Sigmoidal	Cross fiber.
Clay	0.2	Irregular	

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction of relict olivine.

Brittle:
Sample is cut by planar, en-echelon, serpentine shear fractures, some form conjugate pairs, no offset visible on any fractures.

Foliation:
None visible in thin section.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins
4) Late shear fractures

THIN SECTION:	**209-1274A-3R-1, Piece 9B, 92-94 cm**	**TS#188**	**Observer: CG, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	40	73			
Orthopyroxene	15	25	1-10	Anhedral-subequant	
Clinopyroxene	0.5	1	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	0.5	1	0.5-1	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	50	Olivine, orthopyroxene, clinopyroxene	Mesh texture	Cross-fiber length-fast serpentine (Lizardite) in mesh textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxenes. Massive to interlocking serpentine (non-pseudomorphic) mantles bastite after orthopyroxene.
Talc	Trace	Orthopyroxene		
Tremolite	1	Orthopyroxene	Fibrous	Along orthopyroxene cleavage replacing clinopyroxene exsolutions.
Chlorite		Olivine		
Brown clay	Trace	Olivine		Intergrown with serpentine?
Magnetite	Trace	Olivine	Subhedral	Rare in rims of fresh olivine with cross-fiber lizardite.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins			

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1274A-4R-1, Piece 3, 52-54 cm**	**TS#189**	**Observer: WB, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	40	75			
Orthopyroxene	12	20	1-7	Anhedral-subequant	
Clinopyroxene	0.5	1	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1.5	2	0.5-2	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	50	Olivine, orthopyroxene		Mesh texture after olivine, bastite after orthopyroxene.
Magnetite	Trace	Olivine		Very rare.
Hematite	Trace	Olivine		Very rare.
Tremolite	Trace	Orthopyroxene		Very rare along grain boundaries.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine+magnetite	0.8	Irregular	Only small trace of magnetite.
Chrysotile	0.4	Sigmoidal	Cross-fiber.
Clay	0.2	Irregular	With trace hematite.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1274A-5R-1, Piece 10B, 119-121 cm**	**TS#190**	**Observer: CG, AC, HP**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	35	70			
Orthopyroxene	12	27	1-8	Anhedral-subequant	
Clinopyroxene	0.5	1.5	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1	1.5	0.5-1	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	75	Olivine, orthopyroxene, clinopyroxene	Mesh and ribbon textures. Rare hourglass textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of mesh and ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxenes.
Tremolite	0.5	Orthopyroxene	Fibrous	Along orthopyroxene cleavage replacing clinopyroxene exsolutions.
Brucite	0.5	Olivine		Intergrown with serpentine?
Magnetite	0.5	Olivine	Subhedral to anhedral.	In rims of fresh olivine with cross-fiber lizardite and in aggregates in veins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins		Paragranular. Sigmoidal. Cross-fiber	Length-slow serpentine (chrysotile).

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Brittle:
Sample is cut by sets of late, unfilled en-echelon shear fractures with less than 0.01 mm offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Cross Cutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins
4) Late shear fractures

THIN SECTION:	**209-1274A-5R-2, Piece 1B, 17-20 cm**	**TS#191**	**Observer: WB, AC, HP**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	72			
Orthopyroxene	6	25	1-8	Anhedral-subequant	
Clinopyroxene	0.5	<1	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1	1.5	0.5-3	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	67	Olivine, orthopyroxene		Dominantly ribbon texture (a-serpentine) after olivine, bastite after orthopyroxene
Brucite	3	Olivine		Intergrown with serpentine. Brown, anomalous interference color.
Magnetite	Trace	Olivine		Very rare.
Hematite	Trace	Olivine		Very rare.
Tremolite	Trace	Orthopyroxene		Very rare along grain boundaries.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine+magnetite	0.1	Irregular	Only small trace of magnetite.
Chrysotile	1	Sigmoidal	Cross fiber, g-serpentine.
Clay	0.1	Irregular	With trace hematite.

GENERAL COMMENTS There is bleb of sulfide (probably primary) with pentlandite and pyrrhotite flames (relicts?) partly replaced by maghemite or hematite or possibly violarite.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine, weak pyroxene foliation.

Brittle:
Sample is cut by sets of late, unfilled en-echelon shear fractures with less than 0.05 mm offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins
4) Late shear fractures

THIN SECTION:	**209-1274A-6R-2, Piece 1A, 25-28 cm**	**TS#192**	**Observer: CG, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	80			
Orthopyroxene	5	18	1-10	Anhedral-subequant	
Clinopyroxene	0.5	<1	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1	1.5	0.5-2	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	75	Olivine, orthopyroxene, clinopyroxene	Ribbon textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of mesh and ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxene core.
Tremolite	Trace	Orthopyroxene	Fibrous	Along orthopyroxene cleavage replacing clinopyroxene exsolutions.
Brown clay	0.5	Olivine		Intergrown with serpentine minerals.
Magnetite	0.5	Olivine	Subhedral to anhedral.	In rims of ribbon textures occurring as magnetite aggregates with cross-fiber lizardite.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins		Paragranular and transgranular. Sigmoidal. Cross-fiber	Length-slow serpentine (chrysotile).

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Brittle:
Sample is cut by late, serpentine-filled en-echelon shear fractures and tension gashes with no apparent offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):	1) Minor ductile deformation 2) Serpentinization 3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-6R-2, Piece 1, 62-64 cm**	**TS#193**	**Observer: CG, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	70			
Orthopyroxene	8	27	1-10	Anhedral-subequant	
Clinopyroxene	0.5	1.5	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1	1.5	0.5-2	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

GENERAL COMMENTS A gabbroic vein completely altered cut the peridotite

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
HARZBURGITE:				
Serpentine	83	Olivine, orthopyroxene, clinopyroxene	Ribbon and rare hourglass textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of mesh and ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxene core.
Tremolite	3	Orthopyroxene, clinopyroxene	Fibrous	
Brown clay	2	Olivine		Orange. Replacing fresh olivines.
Magnetite	1	Olivine	Anhedral	In rims of ribbon textures occurring as magnetite aggregates with cross-fiber lizardite and as veins.
Talc	3	Orthopyroxene		
GABBROIC VEIN:				
Serpentine	37	Olivine	Interlocking	Most of the vein rim.
Ore mineral	Trace		Subhedral	Native copper and other opaque minerals.
Chlorite	30	Plagioclase?		
Amphibole	30	Plagioclase, Pyroxene?		
Talc	3	Plagioclase, Pyroxene?		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins		Transgranular. Sigmoidal. Cross-fiber	Length-slow serpentine (chrysotile). Crosscut gabbroic veins.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization

THIN SECTION:	**209-1274A-6R-3, Piece 1B, 47-50 cm**	**TS#194**	**Observer: WB, AC, HP**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	69			
Orthopyroxene	8	28	1-10	Anhedral-subequant	
Clinopyroxene	0.5	1.5	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1	1.5	0.5-2	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	45	Olivine, orthopyroxene		Mesh, hourglass, and ribbon texture (a-serpentine) after olivine, bastite after orthopyroxene.
Brown clay	Trace	Olivine		Interspersed within serpentine
Magnetite	Trace	Olivine		Rare, mostly in veins.
Tremolite	Trace	Orthopyroxene		Very rare along grain boundaries.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine+magnetite	0.5	Irregular	Noticeable amounts of magnetite
Chrysotile	0.1	Sigmoidal	Cross fiber, g-serpentine.
Clay	0.1	Irregular	With trace hematite.
Tremolite	<.1	Sigmoidal	One vein parallel to a chrysotile vein.

GENERAL COMMENTS There is bleb of sulfide (probably primary) with pentlandite and pyrrhotite flames (relicts?) partly replaced by maghemite or hematite or possibly violarite.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Brittle:
Sample is cut by late, en-echelon shear fractures and tension gashes with no apparent offset.
Some are filled with serpentine, others are open; Fractures have no lateral offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section): 1) Minor ductile deformation
2) serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-7R-1, Piece 5, 48-51 cm**	**TS#195**	**Observer: WB, AC, HP**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	35	72			
Orthopyroxene	12	25	1-10	Anhedral-subequant	
Clinopyroxene	1	1.5	0.5-1	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1	1.5	0.5-1	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	45	Olivine, orthopyroxene		Mesh, hourglass, and ribbon texture (a-serpentine) after olivine, bastite after orthopyroxene.
Brucite?	1	Olivine, orthopyroxene		Brown abnormal interference colors. Interspersed with serpentine.
Magnetite	Trace	Olivine		Rare, mostly in veins.
Tremolite	Trace	Orthopyroxene		Very rare along grain boundaries.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine+magnetite	0.5	Irregular	Noticeable amounts of magnetite.
Chrysotile	0.1	Sigmoidal	Cross fiber, g-serpentine.
Clay	0.1	Irregular	With trace hematite.
Tremolite	<.1	Sigmoidal	One vein parallel to a chrysotile vein.

GENERAL COMMENTS: There is bleb of sulfide (probably primary) with pentlandite and pyrrhotite flames (relicts?) partly replaced by maghemite or hematite or possibly violarite.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine

Brittle:
Sample is cut by late, en-echelon shear fractures and tension gashes with no apparent offset.
Some are filled with serpentine, others are open; fractures have no lateral offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-7R-1, Piece 7, 101-105cm**	**TS#196**	**Observer: CG, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	35	70			
Orthopyroxene	12	26.5	1-10	Anhedral-subequant	
Clinopyroxene	1	1.5	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1.5	2	0.5-3	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	70	Olivine, orthopyroxene, clinopyroxene	Ribbon and minor mesh textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of mesh and ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxene core. Cross-fiber lizardite vein network crosscutting orthopyroxene.
Talc	1	Orthopyroxene, clinopyroxene		Along bastite pseudomorph cleavage.
Brown clay minerals	Trace	Olivine		Intergrown with serpentine minerals.
Magnetite	0.5	Olivine	Anhedral	In rims of ribbon textures occurring as streams of magnetite aggregates. Also, in serpentine veins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Transgranular. Cross-fiber	Length-slow serpentine.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Brittle:
Sample is cut by late, en-echelon shear fractures and tension gashes with no apparent offset.
Fractures are filled with serpentine and have no lateral offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-8R-1, Piece 3, 15-18cm**	**TS#197**	**Observer: AC, CG, HP**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	35	72			
Orthopyroxene	12	25	1-7	Anhedral-subequant	
Clinopyroxene	1	1.5	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	1	1.5	0.5-2	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	37.5	Olivine, orthopyroxene, clinopyroxene	Ribbon, mesh and rare hourglass textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxene core or completely replacing it.
Talc and Tremolite	1	Clinopyroxene		Intergrown.
Brucite	1	Olivine		Intergrown with serpentine minerals.
Magnetite	0.5	Olivine	Anhedral	In rims of ribbon and mesh textures occurring as streams of magnetite aggregates. Also, in serpentine veins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Paragranular. Sigmoidal. Cross-fiber.	Length-slow serpentine (chrysotile).

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine, kink banding in pyroxene.

Brittle:
Sample is cut by late, en-echelon, serpentine-filled shear fractures and tension gashes with no apparent offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Cross Cutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-8R-1, Piece 10, 61-64cm**	**TS#198**	**Observer: AC, CG, HP**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	15	83			
Orthopyroxene	5	15	1-7	Anhedral-subequant	
Clinopyroxene	0.5	1	<0.5	Anhedral, interstitial	At orthopyroxene borders
Spinel	0.5	1	0.5-2	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene and clinopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	76.5	Olivine, orthopyroxene, clinopyroxene	Coarse ribbon textures and mesh textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxene core or completely replacing it.
Tremolite	1	Orthopyroxene. Clinopyroxene		In bastite pseudomorphs after orthopyroxene likely replacing former clinopyroxene exsolutions. Also replacing orthopyroxene porphyroclasts along cracks.
Talc		Pyroxenes		Replacing orthopyroxene and clinopyroxene along cleavages.
Brucite	1	Olivine		Intergrown with serpentine minerals.
Magnetite	0.5	Olivine	Anhedral. Strings.	In rims of ribbon and mesh textures occurring as streams of magnetite aggregates. Also, in serpentine veins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins	rare	Paragranular. Sigmoidal. Cross-fiber.	Length-slow serpentinte (chrysotile).

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine, kink banding in pyroxene.

Brittle:
Sample is cut by late, en-echelon, serpentine-filled shear fractures and tension gashes with no apparent offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-8R-1, Piece 15C, 109-111 cm**	**TS#199**	**Observer: AC, HP**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	98			
Clinopyroxene	<0.5	<0.5	<1	Interstitial	Also symplectitic intergrowth with spinel.
Spinel	0.5	2	0.5-3	Equant, anhedral	Symplectitic intergrowth with clinopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	70	Olivine, clinopyroxene	Mesh texture and rare ribbon textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of ribbon textures replacing olivine.
Brucite?	10	Olivine	Extremely fine grained kernels.	Kernels of mesh texture consist of very fine grained material with anomalous brown and bluish interference colors. Surrounded by coarser serpentine.
Talc	< 0.5	Clinopyroxene		
Magnetite		Olivine	Anhedral. Strings.	Mainly in veins but also In rims mesh textures.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins	Very rare	Transgranular. Sigmoidal. Cross-fiber.	Length-slow serpentinte (chrysotile).

Common brucite is indicated by XRD analysis, however it is not readily recognizable in thin section. It may be present as extremely fine-grained aggregates within mesh texture.
In thin section 209-1274A-15R-1, Piece 15, 102-105 cm (number 208), this textural relationship is considerably better preserved.

STRUCTURE

Crystal Plastic:
None apparent in thin section; very coarse grained remnant olivine suggests no crystal plastic deformation.

Brittle:
Sample is cut by late, magnetite-filled shear fractures with no apparent offset.

Foliation:
Faint foliation defined by ribbon textures serpentine in some locations.

Crosscutting Relationships (as are apparent in thin section):	1) Serpentinization 2) Late shear fractures

THIN SECTION:	**209-1274A-8R-2, Piece 17, 101-103cm**	**TS#200**	**Observer: AC, CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	82			
Orthopyroxene	8	16	1-7	Anhedral-subequant	
Clinopyroxene	0.5	<1	<0.5	Anhedral, interstitial	At orthopyroxene borders.
Spinel	0.5	1	0.5-2	Vermicular, interstitial	At orthopyroxene borders; symplectitic intergrowth with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	24.5	Olivine, orthopyroxene, clinopyroxene	Coarse ribbon textures and mesh textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene rimming fresh orthopyroxene core or completely replacing it.
Brucite	Trace	Olivine		Interspersed with serpentine. Brown interference colors.
Tremolite	4	Orthopyroxene. Clinopyroxene		
Magnetite	0.5	Olivine	Anhedral. Strings.	Mainly in veins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins	Rare	Paragranular. Sigmoidal. Cross-fiber.	Length-slow serpentinte (chrysotile).

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine, kink banding in pyroxene.

Brittle:
Sample is cut by late, en-echelon, open and serpentine-filled shear fractures and tension gashes with no apparent offset.
Open shear fractures appear to post date serpentine-filled fractures.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine filled shear fractures
4) Open shear fractures

THIN SECTION:	**209-1274A-11R-1, Piece 2, 7-12 cm**	**TS#201**	**Observer: WB, HP, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	85	0.1-3	Anhedral	Interstitial between orthopyroxene.
Orthopyroxene	8	15	< 6	Interstitial, euhedral to anhedral	
Clinopyroxene	0.5	<1	< 0.7	Interstitial	Intergrown with spinel at corner or edge of orthopyroxene, exsolution lamellae in orthopyroxene.
Spinel	1	1	0.05-6	Vermicular to subhedral	Intergrown with clinopyroxene, orthopyroxene and olivine at the corner of orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	50	Olivine, orthopyroxene	Mesh to ribbon texture	
Talc	2	Orthopyroxene	Fibrous	
Tremolite	Trace	Orthopyroxene	Fibrous	
Carbonate	5	Olivine, orthopyroxene	Blocky	
Brucite and/or brown clay	30	Olivine, orthopyroxene		Brown, anomalous interference colors. Locally with orange overtones.
Magnetite	Trace	Olivine	Subhedral	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine	<1		1st
Chrysotile	1		2nd
Carbonate	3		3rd

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine.

Brittle:
Sample is cut by late, serpentine-filled en-echelon shear fractures.

Foliation:
Weak foliation defined by ribbon texture serpentinite.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins
4) Serpentine-filled shear fractures
5) Carbonate veins

THIN SECTION:	**209-1274A-11R-1, Piece 10, 46-49 cm**	**TS#202**	**Observer: CG, WM**
ROCK NAME:	**OXIDE GABBRO**		
GRAIN SIZE:	**Medium- to fine-grained**		
TEXTURE:	**Granular; recrystallized**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxene	8	16	16	Equant	
Orthopyroxene	1	2	2	Equant	
Plagioclase	45	64	11	Equant	
Olivine	2	4	3	Equant	
Sulfides	Trace	Trace	Small	Equant	
Ilmenite	12	12	10	Equant	

GENERAL COMMENTS

Primary sulfide inclusions (possibly pentlandite) in plagioclase.
This sample has been recrystallized destroying original mineral habits and then annealed producing abundant 120 degree triple junctions.
Plagioclase twins are bent indicating additional deformation.
Olivine is associated with the clinopyroxene except for a small patch associated with oxides (reaction?).

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Green Amphibole	2	Clinopyroxene, Orthopyroxene	Subhedral	Replacing pseudomorphically clinopyroxene and orthopyroxene. Also associated to Fe-Ti-Oxides.
Amphibole	20	Plagioclase		Fine aggregates replacing plagioclase.
Brown Amphibole	Trace	Clinopyroxene	Anhedral	Inclusions in clinopyroxene associated to Fe-Ti-oxides inclusions.
Chlorite	5	Clinopyroxene	Arborescent, acicular.	Occurring as reaction rims between pyroxenes and plagioclase.
Prehnite	3	Plagioclase	Bow-tie aggregates	Intergrowth with chlorite
Talc	1	Pyroxene		Intergrowth with chlorite or green amphibole.
Serpentine	1	Olivine	Interlocking textures.	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile vein		Transgranular. Cross-fiber.	

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and minor deformation twins in plagioclase.

Brittle:
Sample is cut by late fractures and microfaults with less than 0.1 mm offset; incipient brecciation where fractures are highly concentrated.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Shear fractures
3) Alteration

THIN SECTION:	**209-1274A-11R-1, Piece 12B, 67-70 cm**	**TS#203**	**Observer: WB, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	30	68	0.1-3	Anhedral	Kinked.
Orthopyroxene	15	28	0.2-0.6	Interstitial, anhedral	Kinked.
Clinopyroxene	1	1.5	0.5	Interstitial	Intergrown with spinel at corner or edge of orthopyroxene, exsolution lamellae in orthopyroxene.
Spinel	1.5	2	0.05-6	Vermicular to subhedral	Intergrown with clinopyroxene, orthopyroxene and olivine at the corner of orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	50	Olivine, orthopyroxene	Mesh to ribbon texture	Mesh to ribbon texture. Mostly after olivine.
Brucite	3	Olivine		Intergrown with serpentine.
Talc	Trace	Orthopyroxene	Fibrous	Rare.
Tremolite	Trace	Orthopyroxene	Acicular	Rare.
Magnetite	0.5	Olivine, Spinel	Anhedral	Tracing former olivine grain boundaries. Only in areas of heavy serpentinization of olivine.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Cross-fiber chrysotile veinlets	0.2		

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; undulose extinction and kink banding of relict olivine, kink banding in pyroxene.

Brittle:
Sample is cut by late, en-echelon, open and serpentine-filled shear fractures and tension gashes with no apparent offset.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine filled shear fractures
4) Open shear fractures

THIN SECTION:	**209-1274A-12R-1, Piece 13, 98-101 cm**	**TS#204**	**Observer: CG, Hp, NA, AC**
ROCK NAME:	HARZBURGITE		
GRAIN SIZE:	Coarse-grained		
TEXTURE:	Granular		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	15	83	0.01-3	Anhedral	Kink band in large grain, small neoblast with euhedral small-grained spinel at subgrain boundary and around large orthopyroxene.
Orthopyroxene	4	15	0.8-15	Anhedral, interstitial	Kinked, some elongated interstitial grains.
Clinopyroxene	1	1	< 0.4	Interstitial	Intergrown with spinel, common at the corner or edge of orthopyroxene, large exsolution lamellas in large orthopyroxene grains.
Spinel	0.5	1	0.01-2	Vermicular, euhedral	Intergrown with clinopyroxene, orthopyroxene and olivine at the corner of orthopyroxene. Small euhedral grains with olivine neoblast.

GENERAL COMMENTS A large euhedral spinel is within orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	85	Olivine, orthopyroxene, clinopyroxene	Ribbon textures and mesh textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of ribbon textures replacing olivine. Bastite pseudomorphs and completely replacing orthopyroxene. Also lizardite veins replacing orthopyroxene.
Magnetite	1	Olivine	Anhedral to subhedral	Mainly in veins.
Brucite	1	Olivine		
Talc	Trace	Orthopyroxene		Pseudomorphically replacing o0rthopyroxene.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Sigmoidal to Irregular. Transgranular. Cross-fiber.	Length-slow serpentine (chrysotile). Two crosscutting generations.

STRUCTURE

Crystal Plastic:
Neoblast formation at large orthopyroxene boundaries, some neoblast patches of former large olivine.
Relict pyroxene porphyroclasts have kink bands, bend cleavage.

Brittle:
Sample is cut by en-echelon, serpentine filled shear fractures and tension gashes that are oblique to serpentine foliation.

Foliation:
Weak foliation is defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile deformation
2) Serpentinization
3) serpentine-filled shear fractures

THIN SECTION:	**209-1274A-13R-1, Piece 1, 3-6 cm**	**TS#205**	**Observer: WB, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	15	73	0.01-3	Anhedral	Kink band in large grain, small neoblast with euhedral small-grained spinel at subgrain boundary and around large orthopyroxene.
Orthopyroxene	5	25	0.8-15	Anhedral, interstitial	Kinked, some elongated interstitial grains
Clinopyroxene	0.8	<1	< 1.6	Interstitial	Intergrown with spinel, common at the corner or edge of orthopyroxene
Spinel	1	1	0.01-6	Vermicular, holly-leaf, and euhedral	Intergrown with clinopyroxene, orthopyroxene and olivine at the corner of orthopyroxene. Small euhedral grains with olivine neoblast

GENERAL COMMENTS
Coarse grained orthopyroxene aggregate in the middle of the thin section.
A large holly-leaf spinel is within altered orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	75	Olivine, orthopyroxene	Interlocking to ribbon textures	
Brucite	10	Olivine		Intergrown with serpentine. Some brucite-rich domains.
Talc	Trace	Orthopyroxene	Fibrous	Rare along cracks.
Tremolite	1	Olivine, orthopyroxene	Acicular	Rare along cracks, in selvages of chrysotile veins.
Chlorite	Trace	Olivine	Fibrous	In rare patches.
Magnetite	1	Olivine	Subhedral	Along former grain boundaries of olivine

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins	3	Cross-fibrous	Paragranular, with amphibole in selvages and rare intergrowth.

STRUCTURE
Crystal Plastic:
Minor crystal plastic deformation; Relict pyroxene and olivine have kink banding and undulose extinction.

Brittle:
Sample is cut by en-echelon, serpentine filled shear fractures and tension gashes.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-14R-1, Piece 8C, 70-73 cm**	**TS#206**	**Observer: WB, HP, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Coarse granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	15	68	< 3	Anhedral	Kinked.
Orthopyroxene	10	30	0.2-15	Interstitial/elongated	Kinked.
Clinopyroxene	1	1	0.3	Interstitial	Intergrown with spinel, common at the corner or edge of orthopyroxene.
Spinel	1	1		Vermicular	Intergrowth with clinopyroxene, orthopyroxene and olivine at the corner of orthopyroxene.

GENERAL COMMENTS Coarse grained orthopyroxene aggregate in the middle of the thin section.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	65	Olivine, orthopyroxene	Interlocking to ribbon textures	
Brucite	3	Olivine		Intergrown with serpentine.
Talc	1	Orthopyroxene	Fibrous	Rare along cracks and margins.
Tremolite	1	Olivine, orthopyroxene	Acicular	Rare along cracks, in selvages of chrysotile veins.
Magnetite	1	Olivine	Subhedral	Along former grain boundaries of olivine.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile	0.5	Cross-fibrous	Paragranular to transgranular.
Clay	0.1		Rare.

STRUCTURE

Crystal Plastic:
Minor crystal plastic deformation; Relict pyroxene and olivine have kink banding and undulose extinction.

Brittle:
Sample is cut by en-echelon, serpentine filled shear fractures and tension gashes.

Foliation:
Weak to moderate foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-15R-1, Piece 4, 23-26 cm**	**TS#207**	**Observer: AC, CG, HP**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	99			
Spinel	0.5	1	0.5-1	Equant	

GENERAL COMMENTS Symplectitic intergrowth of spinel with pyroxene, now completely altered.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	94	Olivine	Well developed ribbon textures.	Cross-fiber length-fast serpentine (Lizardite) in rims of ribbon textures replacing olivine.
Brucite and/or brown clay	3	Olivine		
Magnetite	2	Olivine	Anhedral	Mainly magnetite streams and aggregates in serpentine veins.
Chromite	Trace	Spinel		
Brucite	1	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Cross-fiber. Irregular. Branched.	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Sample is cut by en-echelon, serpentine filled shear fractures and tension gashes.
Fractures are in parallel sets oblique to the serpentine foliation.

Foliation:
Moderate to strong foliation defined by ribbon textures serpentine.

Crosscutting Relationships (as are apparent in thin section): 1) Serpentinization
2) Serpentine filled shear fractures

THIN SECTION:	**209-1274A-15R-1, Piece 15, 102-105 cm**	**TS#208**	**Observer: AC, CG**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	2	95			
Orthopyroxene	0	2			
Clinopyroxene	<0.5	<0.5	<1	Interstitial	Also symplectitic intergrowth with spinel.
Spinel	0.5	2	<1	Equant, anhedral	Symplectitic intergrowth with clinopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	96	Olivine, orthopyroxene, clinopyroxene	Ribbon and minor mesh textures	Cross-fiber length-fast serpentine (Lizardite) in rims of ribbon textures replacing olivine. Bastite pseudomorphs after orthopyroxene.
Magnetite	1	Olivine	Anhedral	Mainly magnetite streams and aggregates in serpentine veins.
Brucite	1	Olivine		Replacing fresh olivine in the core of mesh textures.
Talc	0.5	Clinopyroxene		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins	Rare	Cross fiber. Sigmoidal.	

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; Relict pyroxene has kink banding.

Brittle:
Sample is cut by en-echelon, serpentine filled shear fractures and tension gashes.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-2R-1, Piece 1, 0 - 3 cm**	**TS#209**	**Observer: HP, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Fine-grained**		
TEXTURE:	**Mylonitic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	40	86	0.02-2	Anhedral	Neoblast around orthopyroxene.
Orthopyroxene	5	13	0.5-15	Anhedral	Highly elongated.
Clinopyroxene	0.1	<1	-	Anhedral	Associated with orthopyroxene.
Spinel	0.5	< 1	0.01-1.6	Euhedral, vermicular to holly-leaf	Associated with orthopyroxene, small grains around porphyroclasts.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	55	Olivine, orthopyroxene.		Forming the rims of a mesh texture with fresh olivine preserved in the kernels.
Brown clay?	5			Fine grained aggregates interspersed (replacing?) serpentine.
Fe-oxyhydroxide	1	Olivine.	Dispersed, or forming brown aggregates.	Associated with brown clay within serpentine.
Magnetite	Trace			
Brucite	1	Olivine.		Intergrown with serpentine.
Talc	5	Orthopyroxene.	Fine-grained.	Forming around orthopyroxene crystals and along fractures.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins	rare	Cross fiber. Sigmoidal.	Locally replaced by talc.

STRUCTURE

Crystal Plastic:
Extreme ductile deformation; Peridotite mylonite.
Olivine has been completely recrystallized to fine (0.03 mm to 0.07 mm) polygonal neoblasts; very few olivine porphyroclasts remain.
Pyroxene is present as elongate porphyroclasts with kink bands aligned parallel to the shear foliation.

Foliation:
Strong mylonitic foliation.

Crosscutting Relationships (as are apparent in thin section):
1) Extreme crystal plastic deformation
2) Minor serpentinization
3) Late alteration

THIN SECTION:	**209-1274A-16R-2, Piece 1B, 13-16 cm**	**TS#210**	**Observer: CG, HP, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	3	83	-	Anhedral	
Orthopyroxene	0	15	0.5-5	Interstitial	
Clinopyroxene	0	?	< 0.2	Anhedral	At the corner or edge of orthopyroxene grain commonly associated with spinel.
Spinel	1	1	0.2-5	Vermicular to anhedral	Intergrown with orthopyroxene, clinopyroxene and olivine, including small olivine grains.

GENERAL COMMENTS A large aggregate of vermicular spinel associated with former orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	94	Olivine, orthopyroxene.		
Magnetite	0.5			
Brucite	1	Olivine.	Very fine-grained.	Locally in kernels of mesh texture.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins.	7	Irregular to sigmoidal.	In some places serpentine is intergrown with very fine grained mineral aggregates (brown clays?)

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; Relict pyroxene has kink bands and olivine has undulose extinction.

Brittle:
Sample is cut by en-echelon, serpentine filled shear fractures and tension gashes; fractures are oblique to serpentine foliation.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine-filled shear fractures

THIN SECTION:	**209-1274A-17R-1, Piece 6, 39-42 cm**	**TS#211**	**Observer: HP, NA, AC**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	2.5	90			
Orthopyroxene	1	7	0.2-3	Interstitial, anhedral	
Clinopyroxene	0.5	<1	<0.6	Interstitial, anhedral	At the edge or corner of orthopyroxene and spinel.
Spinel	2	2.5	0.05-1	Anhedral to euhedral	Commonly associated with orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine, orthopyroxene		Prominent mesh and hour-glass texture.
Magnetite	1	Olivine	Very fine-grained.	Along rims in mesh texture.
Brucite	2	Olivine	Very fine-grained.	Locally in kernels of mesh texture.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-magnetite.	2	Very fine, straight.	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Sample is cut by en-echelon, serpentine and magnetite filled shear fractures and tension gashes; fractures are oblique to serpentine foliation.
Serpentine-filled fractures cut magnetite-filled fractures.

Crosscutting Relationships (as are apparent in thin section):	1) Minor ductile deformation 2) Serpentinization

THIN SECTION:	**209-1274A-17R-2, Piece 1B, 14-17 cm**	**TS#212**	**Observer: HP, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	10	80		Anhedral to euhedral	Euhedral grains included in orthopyroxene.
Orthopyroxene	5	18	<5	Interstitial, anhedral	
Clinopyroxene	Trace	Trace	<0.2	Interstitial, anhedral	At the corner or edge of orthopyroxene grain commonly associated with spinel.
Spinel	1	1.5	0.1-4	Vermicular, anhedral	Intergrown with orthopyroxene, clinopyroxene and olivine, including small olivine grains.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	85	Olivine, orthopyroxene		Mesh texture and ribbons.
Magnetite	1	Olivine		Along rims of mesh texture.
Brucite	2	Olivine		Interspersed within serpentine bands.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile	4	Fibers.	Crosscutting serpentine-magnetite veins.
Serpentine-magnetite	2	Very fine.	

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; kink banding in relict pyroxene, undulose extinction in olivine.

Foliation:
Moderate foliation defined by mesh texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization

THIN SECTION:	**209-1274A-18R-1, Piece 19, 115-118 cm**	**TS#213**	**Observer: HP, NA, AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	8	80			
Orthopyroxene	2	18	0.8-6	Interstitial, anhedral	
Clinopyroxene	0.5	<1	< 0.3	Interstitial, anhedral	At the corner or edge of orthopyroxene grain commonly associated with spinel.
Spinel	1	1	0.02-1	Vermicular, anhedral to euhedral	Intergrown with orthopyroxene, clinopyroxene and olivine, including small olivine grains.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine, orthopyroxene		Pseudomorphing orthopyroxene.
Green amphibole	Trace	Orthopyroxene		
Magnetite	1	Olivine		
Brucite	1	Olivine		Very fine. Brown crystallites interspersed with serpentine.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-magnetite	3	Very fine	

STRUCTURE

Crystal Plastic:
Minor ductile deformation; undulose extinction and kink banding of relict olivine, neoblast formation with polygonal grain boundaries on margin of some grains.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1274A-20R-1, Piece 26, 141-143 cm**	**TS#214**	**Observer: HP, NA, HD**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	98			
Orthopyroxene	0	Trace			
Spinel	1	1.5		Vermicular, euhedral	Vermicular grains intergrown with orthopyroxene.

GENERAL COMMENTS Symplectitic intergrowth of pyroxene and spinel, now completely altered

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	88			
Magnetite	1		Fine-grained	Along rims of mesh texture.
Brucite	10			Interspersed with serpentine. Along veins. In kernels surrounded by mesh serpentine.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-magnetite.		Banded, fine	Complex timing relationship. Some crosscut chrysotile veins. Others are crosscut by chrysotile veins.
Chrysotile-brown clay			Locally banded with fine grained, brown clay aggregates and domains consisting of fibrous chrysotile.

STRUCTURE

Crystal Plastic:
Weak crystal-plastic deformation with numerous orthopyroxene kink bands, bent grains, and locally coarse polygonal neoblast formation. Relict olivine has rare subgrain boundaries preserved.

Brittle:
Sample is cut by at least two generations of late, en-echelon serpentine-filled shear fractures and tension gashes with no apparent offset.

Crosscutting Relationships (as are apparent in thin section):
1) weak crystal plastic deformation
2) serpentinization
3) serpentine vein formation

THIN SECTION:	**209-1274A-21R-1, Piece 5, 12-17 cm**	**TS#215**	**Observer: CG, WM, HD**
ROCK NAME:	**GABBRONORITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	0	60			
Orthopyroxene	0	8			
Clinopyroxene	5	29	5		
Spinel	1	3			

GENERAL COMMENTS Orthopyroxene presence is inferred to correspond to grains that are now altered and have a lattice of oxides as a pseudomorph. Plagioclase grains are completely obliterated.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Zoisite	15	Plagioclase	Prismatic crystal with occasional polysynthetic twinning	
Prehnite	8	Plagioclase	Anhedral to subhedral	
Chlorite minerals	40	Plagioclase, Pyroxenes	Fan-like aggregates	
Talc	2	Plagioclase, Pyroxenes		
Titainite	1	Fe-Ti-oxides		
Magnetite	1	Fe-Ti-oxides		
Hydrogrossular / Sericite	26	Plagioclase	Fine intergrowths	
Amphibole	2	Pyroxenes		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
Obscured by alteration, but relict idiomorphic outlines indicate that it was minor if originally present.

Brittle:
Minor breaking of mineral grains, local cataclasis of finer grained material, and some slight brecciation of larger relict mineral grains.

Crosscutting Relationships (as are apparent in thin section):

THIN SECTION:	**209-1274A-21R-1, Piece 23, 93-98 cm**	**TS#216**	**Observer: CG, WM, NA, HD**
ROCK NAME:	**HARZBURGITE and GABBRO**		
GRAIN SIZE:	**Medium- and coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
HARZBURGITE					
Olivine	-	89			
Orthopyroxene	-	10	<6	Anhedral, interstitial	
Spinel	1	1		Vermicular, anhedral	
GABBRO					
Plagioclase	0	45			
Orthopyroxene	0	7			
Clinopyroxene	0	45			
Oxide	?	3			

GENERAL COMMENTS
The sample contains the contact between a harzburgite and a gabbro.
The alteration of both lithologies is so complete that little can be said of their original textures.
The orientation of the few clear pseudomorphs in the gabbro suggests perpendicular growth off of the contact.
There appears to be a reaction rind separating the gabbro from the harzburgite or there could have been multiple injections.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
HARZBURGITE:				
Serpentine	98	Olivine, orthopyroxene	Ribbon textures.	Massive serpentine and bastite pseudomorph after orthopyroxene. Length-fast serpentine (Lizardite).
Magnetite	1	Olivine	Anhedral, streams	In mesh cores and in veins.
Brown clays	1	Olivine		Intergressed with chrysotile and lizardite.
GABBROIC ROCKS:				
Amphibole	30	Orthopyroxene, Clinopyroxene		
Chlorite	30	Plagioclase		
Talc	31.5	Pyroxenes		
Garnet (Andradite)	0.5	Plagioclase, Pyroxenes	Euhedral	Large aggregates
Hydrogrossular	3	Plagioclase, Pyroxenes		
Prehnite	3	Plagioclase		Fine intergrowths with chlorite
Vesuvianite	1	Plagioclase, Pyroxenes	Tabular	Length-fast columnar crystals. High relief.
Opaque minerals	1	Primary Oxides		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine		Straight to irregular. Cross-fiber.	

STRUCTURE
Crystal Plastic:
Harzburgite: Weakly porphyroclastic harzburgite with moderately well developed pyroxene shape fabric enhanced by stretching of orthopyroxene grains. Kink banding present. Gabbro: no significant crystal plastic deformation.

Brittle:
Harzburgite: Cut by at least two generations of en echelon serpentine veins. Gabbro: No significant brittle deformation.

Crosscutting Relationships (as are apparent in thin section):
1) Weak porphyroclastic crystal plastic deformation
2) Gabbro intrusion along sharp contact at ~70 degrees
3) Serpentinization
4) At least two generations of serpentine veining oblique to contact and porphyroclastic foliation, some cutting contact

THIN SECTION:	**209-1274A-22R-1, Piece 4A, 20-23 cm**	**TS#217**	**Observer: HP, AC, HD**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	12	83			
Orthopyroxene	4	15	2-6	Interstitial, anhedral	
Clinopyroxene	<0.2	< 1	-	Interstitial, anhedral	At the corner or edge of orthopyroxene grain commonly associated with spinel.
Spinel	<1	<1	0.2-0.4	Vermicular, anhedral	Intergrown with orthopyroxene and clinopyroxene.

GENERAL COMMENTS Small olivine included in orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	85	Olivine, orthopyroxene		Mesh and ribbon texture.
Magnetite	Trace	Olivine		
Brown clay	5	Olivine		Commonly in kernels of mesh texture.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-magnetite.			**Locally magnetite dominated.**

STRUCTURE

Crystal Plastic:
Weak porphyroclastic deformation with the formation of orthopyroxene neoblasts with 120 degree grain boundaries, kink bands and bent grains common.
Some subgrain boundaries observed in relict olivine.

Brittle:
Irregular serpentine veins criss cross the sample with no apparent offset.

Crosscutting Relationships (as are apparent in thin section):
1) Weak porphyroclastic deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1274A-27R-1, Piece 1, 1-4 cm**	**TS#218**	**Observer: JH, AC, HD**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	86			
Orthopyroxene	6	12	0.2-0.3	Anhedral	
Clinopyroxene	<1	1	<0.2	Interstitial	At the corner or edge of orthopyroxene grain commonly associated with spinel.
Spinel	<1	1	<0.5	Vermicular	Intergrown with pyroxene.

GENERAL COMMENTS Harzburgite is in contact with a former gabbro (former clinopyroxene replaced by amphibole)

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	55	Olivine, orthopyroxene	Core and rim structures around remaining fresh olivine cores, elsewhere transitional to ribbon texture. Bastite pseudomorphs orthopyroxene.	
Magnetite	1	Olivine, spinel	Anhedral in former olivine grain boundaries.	
Brucite	3	Olivine	Patchy intergrowth with chlorite.	
Talc	5	Pyroxenes, plagioclase	Microgranular in former gabbroic intrusion.	
Amphibole	15	Pyroxenes, plagioclase	Euhedral lozenge and lath shapes.	
Secondary plagioclase	1	Plagioclase	Subhedral band with faint polysynthetic twinning(?)	
Prehnite(?)	3	Plagioclase	Intergrown bow ties with brucite and chlorite.	
Chlorite	3	Pyroxenes, plagioclase	Acicular to fibrous, patchy intergrowth with prehnite(?), amphibole and brucite.	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Isotropic veins radiating outward from former gabbroic intrusion			

STRUCTURE

Crystal Plastic:
Very weak crystal-plastic deformation with formation of kinked and slightly bent orthopyroxene grains and subgrain boundaries in olivine.

Brittle:
Occasional iron oxide stained serpentine veins with no visible offset cutting serpentine and extending into and across (oxide) gabbro vein.

Crosscutting Relationships (as are apparent in thin section):
1) Very weak crystal-plastic ductile deformation
2) Intrusion of (oxide) gabbro vein
3) Serpentinization
4) Late serpentine veins

THIN SECTION:	**209-1274A-27R-1, Piece 7, 78-81 cm**	**TS#219**	**Observer: JH, NA, AC, HD**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	15	89			
Orthopyroxene	2	10		Interstitial, anhedral	
Clinopyroxene	Trace	Trace	<0.2	Anhedral, interstitial	At the corner or edge of orthopyroxene grain.
Spinel	<0.4	<0.5	<0.5	Anhedral	Associated with orthopyroxene.

GENERAL COMMENTS In the stratigraphy of Hole 1274A this sample is at the harzburgite/dunite transition

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	75	Olivine, orthopyroxene	Bastite pseudomorphs after orthopyroxene, mostly proto-ribbon textures in former olivine.	
Magnetite	1	Olivine, spinel	Anhedral, picks out former grain boundaries.	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine		Rare small paragranular sigmoidal chrysotile veins.	
Magnetite		Traces of anhedral iron oxides in margins of sigmoidal veins.	

STRUCTURE

Crystal Plastic:
Weak crystal-plastic deformation with the formation of kink bands and coarse neoblasts with polygonal grain boundaries in orthopyroxene and rare deformation lamellae in olivine.

Brittle:
At least two generations of serpentine veins with no visible offset including veins sub-parallel to and oblique to the serpentine foliation.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile deformation
2) Serpentinization
3) Serpentine vein formation

THIN SECTION:	**209-1274A-27R-1, Piece 8, 126-129 cm**	**TS#220**	**Observer: JH, NA, HD**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	20	80			
Orthopyroxene	7	18	<8	Interstitial, anhedral	
Clinopyroxene	?	Trace		Anhedral	At the corner or edge of orthopyroxene grain commonly associated with spinel.
Spinel	1.5	2	<3	Vermicular, anhedral	Intergrown with orthopyroxene, clinopyroxene and olivine, including small olivine grains.

GENERAL COMMENTS euhedral olivine included in orthopyroxene?

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	65	Olivine, orthopyroxene	Mesh to ribbon texture	Bastite pseudomorphs after orthopyroxene.
Magnetite	1	Olivine	Subhedral to anhedral	Mostly occurs in former olivine grain boundaries. Possible slight staining from iron oxyhydroxides in areas of brown discoloration.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**		**MORPHOLOGY**	**COMMENTS**
Serpentine		Olivine	Cross-fiber	Rare transgranular sigmoidal veins crosscutting relict orthopyroxene grains
Magnetite		Olivine	Anhedral	Rarely lines sigmoidal chysotile veins

STRUCTURE

Crystal Plastic:
Very weak crystal-plastic deformation with formation of enstatite kink band boundaries, bent grains, and rare neoblasts. Rare deformation lamellae in olivine.

Brittle:
At least two generations of crisscrossing serpentine veins.

Crosscutting Relationships (as are apparent in thin section):
1) Weak crystal-plastic ductile deformation
2) Serpentinization
3) Serpentine veins