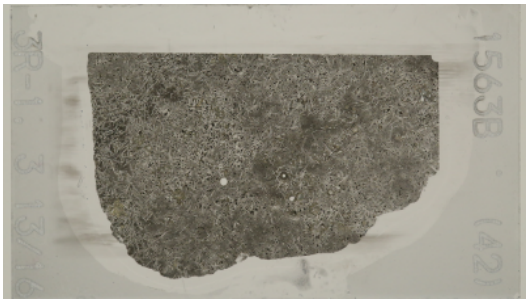
THIN SECTION LABEL ID: **395C-U1563B-3R-1-W 13/16-TSB-TS 42**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Sparse large (~1 mm) olivine phenocrysts with saponite alteration and calcite replacement of material infilling spaces in skeletal olivines. Relatively abundant plagioclase crystals with range of sizes and morphologies, some partially replaced by calcite. Groundmass is intermediate between glass/altered glass and interstitial clinopyroxene and olivine, altered to clays and FeO/OH. Significant amount of highly birefringent interstitial material (possibly cpx).

Plane-polarized:



Cross-polarized:

Igneous Petrology

Groundmass: Mesostatic to interstitial ol/cpx (highly birefringent infilling fans).

Alteration: Moderate to low. Groundmass altered to smectite (saponite) with dendritic disseminated magnetite. Vesicles infilled with saponite, with pyrite around some rims. Some plagioclase replaced by calcite, also calcite infilling in saponitized olivine.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	2	0.5	0.75	0.5	subhedral	subequant	
Plagioclase	25	0.04	1.5	0.75	subhedral	elongate	Large grain size distribution/range of morphologies
Clinopyroxene	3				anhedral	interstitial	Fibrous, interstitial, mesostasis

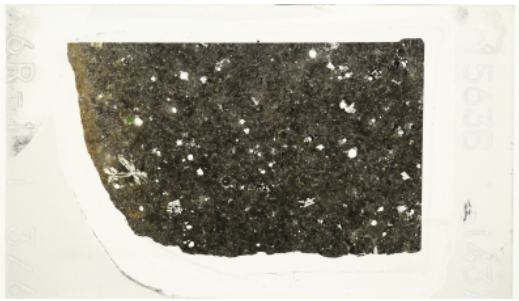
THIN SECTION LABEL ID: **395C-U1563B-6R-1-W 3/6-TSB-TS 43**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

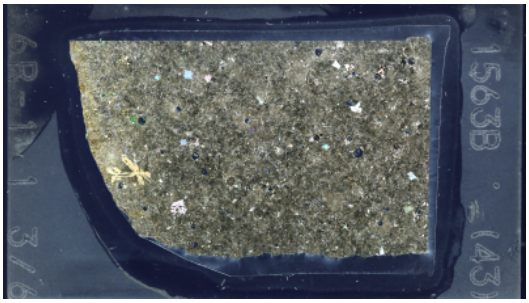
Lithology: moderately olivine phyric basalt

Thin section summary: Large to very large (~3.8 mm) olivine phenocrysts and skeletal megacrysts (rims weakly altered to clay and FeO/OH) within opaque/isotropic glass and mesostasis groundmass that is moderately altered to clay, FeO/OH, and some celadonite. Abundant dendritic olivine (e.g., swallowtail, branching forms), with growth of small, acicular olivines on phenocryst edges/vertices. Sparse small plagioclase laths. Vesicles filled with saponite and celadonite.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Cpx mesostasis, opaque oxides, altered glass, sparse olivine.

Alteration: Moderate. Groundmass altered to saponite with minor yellow celadonite. Olivine shows minor replacement to saponite and FeO/OH. Vesicles rimmed with FeO/OH, saponite and yellow celadonite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	7	0.04	3.75	1.5	subhedral	subequant	Skeletal
Plagioclase	3	0.06	0.8	0.25	subhedral	elongate	
Clinopyroxene							Mesostasis

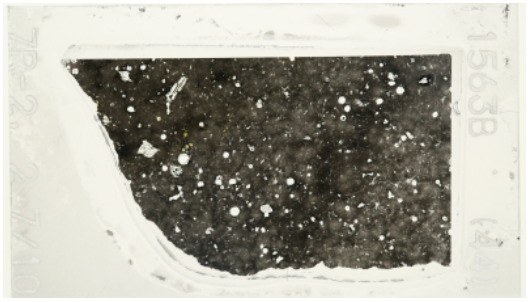
THIN SECTION LABEL ID: **395C-U1563B-7R-2-W 7/10-TSB-TS 44**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

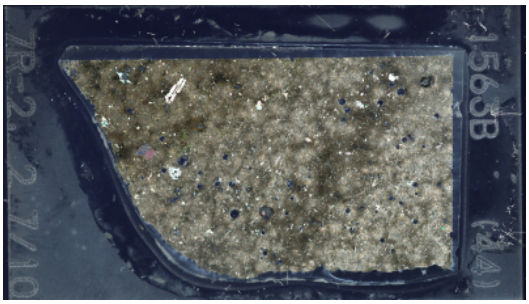
Lithology: sparsely olivine phyric basalt

Thin section summary: Moderately abundant large (~3 mm) olivine phenocrysts, some skeletal, in opaque/isotropic fine-grained groundmass. Small, acicular and/or hopper olivines form at edge of large olivine and in groundmass. Olivine is weakly altered in places. Groundmass is mostly altered glass (clays and FeO/OH with minor celadonite). Vesicle fill, when observable, contain a range of minerals and mineral textures.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Cpx mesostasis, opaque oxides, altered glass, sparse olivine.

Alteration: Low. Groundmass altered in patches to saponite, FeO/OH and green celadonite. Olivine weakly altered to saponite/celadonite around rims and along cracks. When filled, vesicles contain saponite, green celadonite, FeO/OH, and possible zeolite in some. Pyrite and magnetite around some vesicle borders.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	5	0.04	3	0.5	subhedral	subequant	Skeletal
Plagioclase	1	0.08	0.4	0.18	subhedral	elongate	
Clinopyroxene							Mesostasis

THIN SECTION LABEL ID: **395C-U1563B-8R-2-W 13/16-TSB-TS 45**

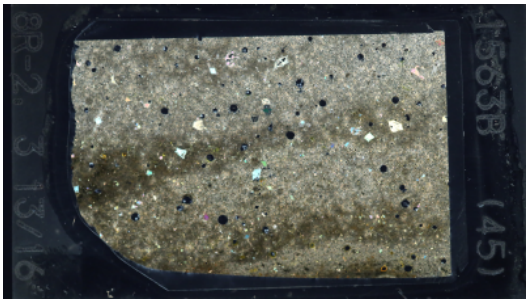
Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Moderately abundant olivine phenocrysts in groundmass of plagioclase, gray cpx mesostasis, opaque oxides and altered glass. Some olivines are skeletal. Acicular olivine forms at edge of larger olivine. Groundmass altered to clay and FeO/OH with minor celadonite. Several elongate plagioclase present, but section is predominantly plagioclase aphyric. Highly vesicular with mineral fills of saponite, FeO/OH, and celadonite.

Plane-polarized:

Cross-polarized:



Igneous Petrology

Groundmass: Cpx mesostasis, plagioclase, sparse olivine, opaque oxides.

Alteration: Moderate. Groundmass moderately altered to saponite, FeO/OH, and yellow to green celadonite. Olivine weakly altered along rims and cracks to saponite and FeO/OH. Vesicles filled with complex mineral layers of FeO/OH, saponite, yellow and green Celadonite, and possible zeolite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	5	0.06	1.6	0.5	subhedral	subequant	Skeletal
Plagioclase	5	0.08	1.2	0.3	subhedral	elongate	
Clinopyroxene							Mesostasis

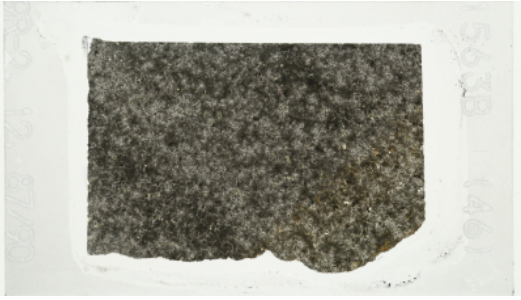
THIN SECTION LABEL ID: **395C-U1563B-9R-2-W 87/90-TSB-TS 46**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Section of mostly fine-grained groundmass with small plagioclase laths, cpx mesostasis, opaque oxides/altered glass and sparse small olivine phenocrysts. There are sparse borderline phenocrysts/microphenocrysts of olivine which are almost completely altered to saponite and iddingsite material. Plagioclase occasionally has tabular skeletal habit or hopper morphology.

Plane-polarized:



Cross-polarized:

Igneous Petrology

Groundmass: Cpx mesostasis, plagioclase, sparse olivine, opaque oxides.

Alteration: Moderate to high. Groundmass largely altered to clays, FeO/OH, and minor green to yellow celadonite. Olivine phenocrysts partially to completely altered to saponite and some iddingsite material. Saponite filled vesicles.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	1	0.03	0.25	0.1	subhedral	subequant	
Plagioclase	15	0.04	0.6	0.2	subhedral	elongate	
Clinopyroxene							Mesostasis

THIN SECTION LABEL ID: **395C-U1563B-12R-1-W 90/93-TSB-TS 47**

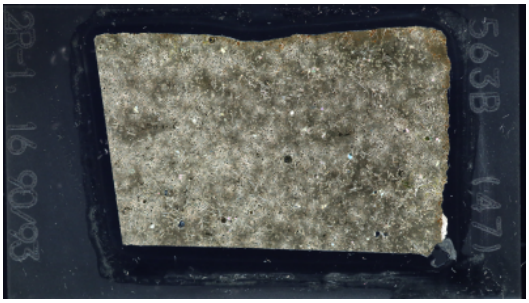
Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Moderately sparse olivine phenocrysts within altered groundmass consisting of clays and FeO/OH, patches of celadonite, and altered glass. Olivine is very sparse within groundmass, and quite altered when present (to saponite and an iddingsite material). Vesicles show saponite/celadonite fills.

Plane-polarized:

Cross-polarized:



Igneous Petrology

Groundmass: Cpx mesostasis, opaque oxides/altered glass, sparse olivine.

Alteration: Moderate to high. Groundmass variably altered to clays, with patches of mostly yellow celadonite and iddingsite material. Vesicles, where filled, contain saponite and yellow to green celadonite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	3	0.03	0.5	0.2	subhedral	subequant	
Plagioclase	15	0.06	1.3	0.6	subhedral	elongate	
Clinopyroxene							Mesostasis

THIN SECTION LABEL ID: **395C-U1563B-13R-1-W 81/84-TSB-TS 48**

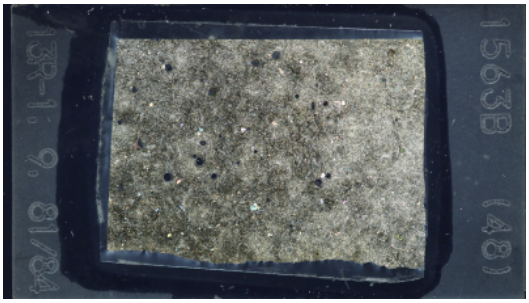
Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Small (0.3â€“0.6 mm) olivine phenocrysts, often skeletal. Small tubular and acicular olivine occur in groundmass. Small plagioclase laths are acicular, often radiating away nucleation points. Groundmass dominated by opaque material with abundant cpx mesostasis and little alteration into celadonite. Celadonite-filled vesicles.

Plane-polarized:

Cross-polarized:



Igneous Petrology

Groundmass: Cpx mesostasis, opaque oxides/altered glass, abundant groundmass olivine, plagioclase.

Alteration: Low to moderate. Groundmass weakly altered to clays and minor green celadonite. When filled, vesicles contain green celadonite and saponite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	5	0.03	0.6	0.2	subhedral	subequant	
Plagioclase	10	0.025	0.5	0.25	subhedral	elongate	Very narrow laths in radial patterns
Clinopyroxene							Mesostasis

THIN SECTION LABEL ID: **395C-U1563B-14R-2-W 89/92-TSB-TS 49**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Sparse (<5%) olivine phenocrysts often completely altered to saponite. Groundmass is crystalline with intergranular texture, consisting of plagioclase and cpx, and is weakly altered. Space between plagioclase grains filled by cpx, saponite and FeO/OH. This section contains minimal olivine within groundmass but difficult to distinguish from intersitial cpx material. Vesicles filled with saponite.

Plane-polarized:

Cross-polarized:

Igneous Petrology

Groundmass: Highly birefringent dendritic ol/cpx(?) present interstitially throughout matrix, opaque oxides, plagioclase.

Alteration: Low to moderate. Groundmass weakly altered to clays and contains disseminated magnetite. Vesicles infilled by saponite. Phenocrysts are mostly completely replaced by saponite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	3	0.05	0.1	0.05	subhedral	subequant	Dendritic
Plagioclase	25	0.03	1	0.35	subhedral	elongate	Abundant equant crystals
Clinopyroxene	3				anhedral	interstitial	Intersitial dendritic cpx

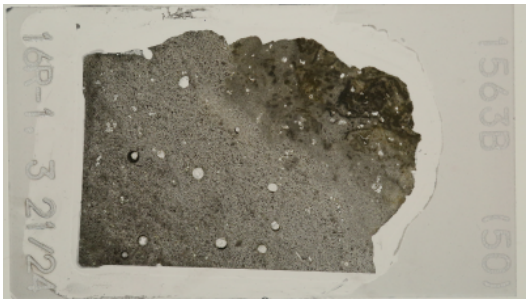
THIN SECTION LABEL ID: **395C-U1563B-16R-1-W 21/24-TSB-TS 50**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

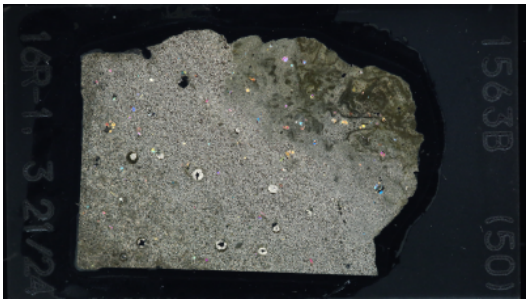
Lithology: sparsely olivine phyric basalt

Thin section summary: Atypical section. Base right-hand corner mostly opaque and plagioclase aphyric, containing olivine phenocrysts which show weak alteration to saponite. Band of opaque material cuts across this part of section. At center of section, plagioclase becomes more phyric and interstitial cpx is resolvable at high magnification. Single large crystal of plagioclase. Boundaries between domains of variable crystallinity can be either sharp or gradational. Groundmass with intergranular/intersertal texture is weakly altered to clays and FeO/OH. Space between plagioclase grains occupied by cpx mesostasis, FeO/OH and altered glass. Calcite and saponite filled vesicles.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Interstitial cpx present in some parts of section, elsewhere mostly mesostasis. Opaque oxides/altered glass, olivine, plagioclase.

Alteration: Moderate to low. Groundmass altered to saponite, FeO/OH and minor celadonite. Olivine phenocrysts weakly altered to saponite in places. Vesicles infilled with calcite, saponite, and some yellow celadonite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	5	0.05	0.75	0.1	subhedral	subequant	
Plagioclase	5	0.5	1	0.15	subhedral	elongate	Clear change in plagioclase abundance and crystal size across the section
Clinopyroxene	3				anhedral	interstitial	Interstitial, mesostasis

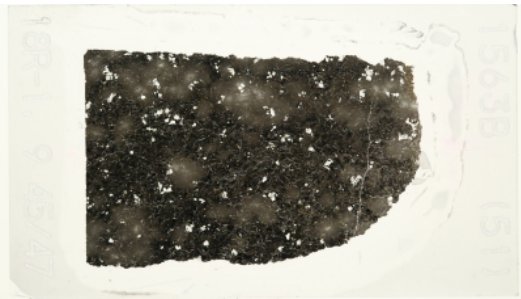
THIN SECTION LABEL ID: **395C-U1563B-18R-1-W 45/47-TSB-TS 51**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

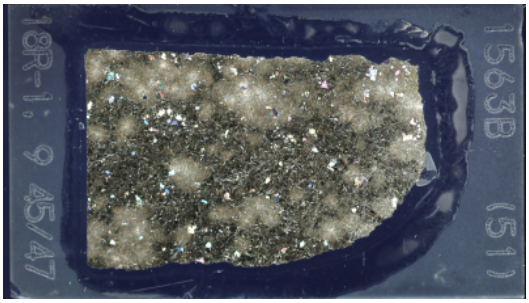
Lithology: sparsely olivine phyric basalt

Thin section summary: Abundant olivine phenocrysts (weakly altered along cracks) with spinel and moderately sized acicular plagioclase laths within mostly isotropic and opaque-dominated matrix/groundmass, the latter of which is variably altered. Some olivines are skeletal. Acicular olivine forms along boundary of large olivine grain. Section is heterogeneous with clumped brown/gray material that is a combination of cpx mesostasis and celadonite to saponite groundmass alteration.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Mostly isotropic. Opaque oxides/altered glass, cpx mesostasis, sparse olivine, plagioclase.

Alteration: Moderate to low. Patches of overprinting brown material may be devitrification. Groundmass variably altered to clays, FeO/OH and green to yellow celadonite. Olivine weakly altered to clay along cracks. Celadonite rimmed vesicles.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	7	0.04	0.7	0.5	subhedral	subequant	Some dendritic olivine
Plagioclase	10	0.06	0.8	0.4	subhedral	elongate	
Clinopyroxene							Mesostasis

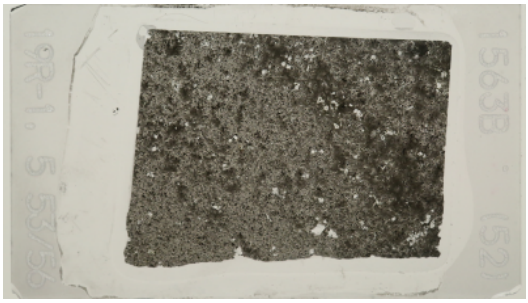
THIN SECTION LABEL ID: **395C-U1563B-19R-1-W 53/56-TSB-TS 52**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

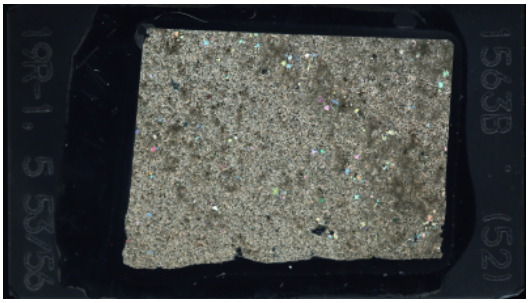
Lithology: sparsely olivine phyric basalt

Thin section summary: Moderately abundant olivine phenocrysts and small acicular plagioclase within heterogeneous matrix/groundmass. Highly birefringent fan-like interstitial material in parts of section is likely dendritic olivine. Abundant patchy opaque oxides/altered glass. Groundmass has intergranular and intersertal textures and is weakly altered to clays, celadonite, and FeO/OHs.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Highly birefringent interstitial ol/cpx(?) present in parts of section, elsewhere gray cpx mesostasis, altered glass/opaque oxides, olivine, plagioclase.

Alteration: Low. Groundmass weakly latered to clays, FeO/OH and in places green celadonite. One calcite-filled vesicle.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	5	0.04	1	0.2	subhedral	subequant	Dendritic/swallowtail common
Plagioclase	7	0.04	0.5	0.2	subhedral	elongate	
Clinopyroxene	1				anhedral	interstitial	Interstitial, mesostasis

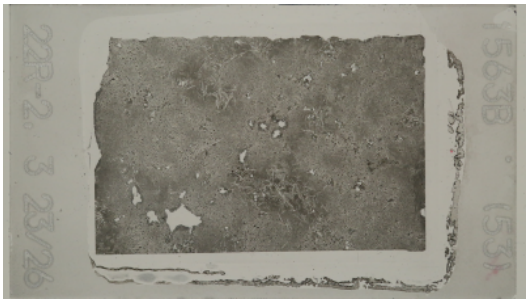
THIN SECTION LABEL ID: **395C-U1563B-22R-1-W 23/26-TSB-TS 53**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

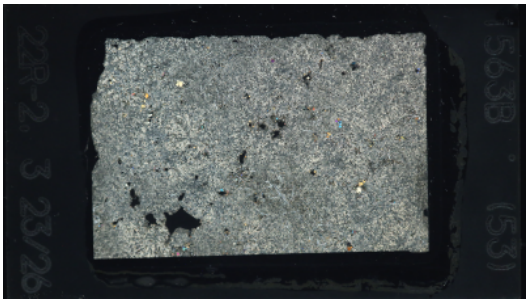
Lithology: sparsely olivine phyric basalt

Thin section summary: Atypical section. Sparse olivine phenocrysts are moderately altered to saponite/chlorite. Portions of section have abundant plagioclase with large crystals exhibiting range of morphologies from acicular to tabular. Groundmass contains olivine and plagioclase. Occasional dendritic interstitial olivine and/or cpx, sometimes with feathery mesostatic texture. Weakly altered groundmass.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Mesostasis, opaque oxides/altered glass, interstitial cpx, olivine, plagioclase.

Alteration: Low. A lot of interstitial magnetite, some dendritic, within the groundmass with clays and FeO/OH. Olivine phenocrysts variably altered to saponite with some chlorite. One smectite (saponite) vesicle.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	2	0.08	0.6	0.2	subhedral	subequant	Dendritic/swallowtail common
Plagioclase	5	0.04	1.4	0.25	subhedral	elongate	
Clinopyroxene	1				anhedral	interstitial	Feathery mesostasis texture

THIN SECTION LABEL ID: **395C-U1563B-23R-1-W 15/18-TSB-TS 54**

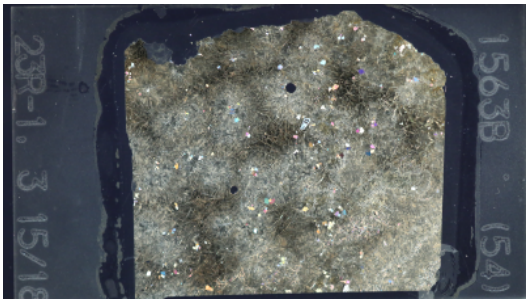
Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Skeletal olivine phenocrysts and abundant dendritic olivine set in opaque/isotropic matrix/groundmass. Swallowtail olivine crystals sometimes form rods and strongly curved chains, and branching dendritic olivine is common in the groundmass. Some large olivines are rimmed with small, acicular olivine growth. Significant volume of brown material associated with feathery olivine dendrites is moderately altered glass or slower cooled mesostatic phase.

Plane-polarized:

Cross-polarized:



Igneous Petrology

Groundmass: Brown radial textured matrix developed across the section, possibly different phase of cpx mesostasis. Opaque oxides/altered glass heterogeneously throughout section.

Alteration: Low. Groundmass potentially shows variable oxidation. Few vesicles with green celadonite remnants at rims. Some olivines altered to saponite/celadonite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	5	0.08	1.2	0.25	subhedral	subequant	Dendritic/swallowtail common
Plagioclase	7	0.04	1.6	0.8	subhedral	elongate	Long acicular laths in opaque/isotropic groundmass; equant crystals in areas of brown matrix
Clinopyroxene							Mesostasis

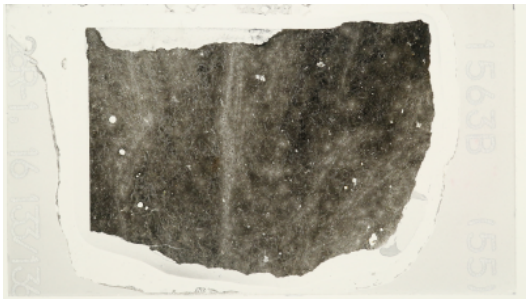
THIN SECTION LABEL ID: **395C-U1563B-26R-1-W 133/136-TSB-TS 55**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

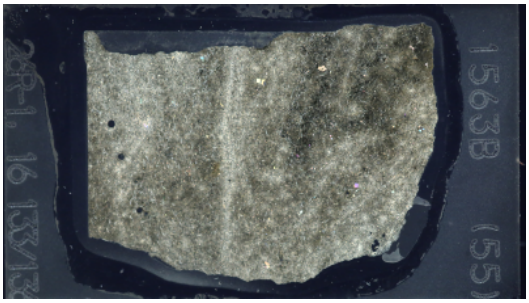
Lithology: sparsely olivine phyric basalt

Thin section summary: Sparse olivine phenocrysts and small acicular plagioclase laths within mostly opaque and isotropic groundmass, containing feathery cpx mesostatic texture with oxides/altered glass and olivine. Vesicles filled with celadonite and saponite. Band of less opaque-rich material and weak alignment of plagioclase laths.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Cpx mesostasis, opaque oxides/altered glass, groundmass olivine and plagioclase.

Alteration: Low. Groundmass potentially shows variable oxidation. Few vesicles with green celadonite remnants at rims. Some olivines altered to saponite/celadonite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	1	0.025	0.5	0.12	subhedral	subequant	
Plagioclase	7	0.04	0.6	0.25	subhedral	elongate	
Clinopyroxene							Mesostasis

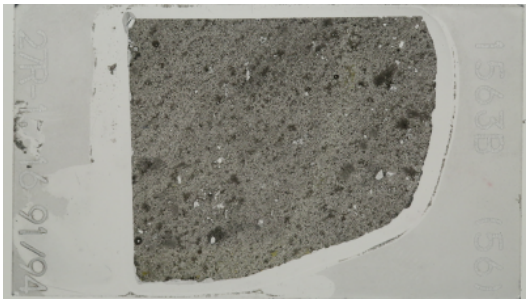
THIN SECTION LABEL ID: **395C-U1563B-27R-1-W 91/94-TSB-TS 56**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

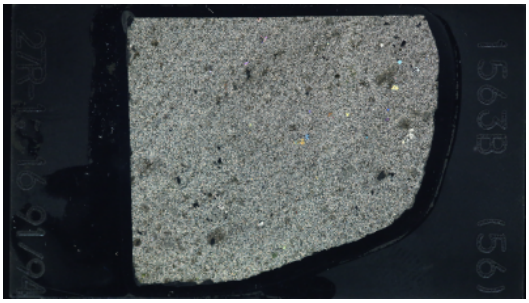
Lithology: sparsely olivine phyric basalt

Thin section summary: Crystalline section with minor mesostasis. Plagioclase is very abundant but grains are small within groundmass of intergranular/intersertal texture. Groundmass cpx and olivine in interstitial spaces. Sparse olivine phenocrysts. Groundmass contains altered cpx mesostasis, FeO/OHs, celadonite, clays and altered glass.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Plagioclase makes up groundmass, interstitial cpx, opaque oxides/altered glass, olivine.

Alteration: Low to moderate. Groundmass variably altered to clays, FeO/OH and green to yellow celadonite. Vesicles filled with celadonite and saponite with minor calcite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	2	0.04	0.8	0.15	subhedral	subequant	
Plagioclase	30	0.025	0.4	0.18	subhedral	elongate	Abundant but equant plagioclase crystals
Clinopyroxene	3				anhedral	interstitial	Interstitial

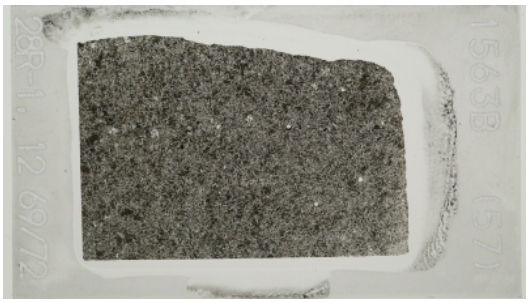
THIN SECTION LABEL ID: **395C-U1563B-28R-1-W 69/72-TSB-TS 57**

Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

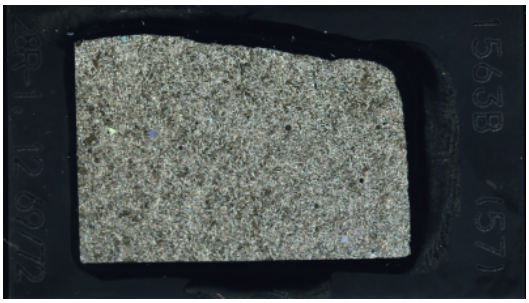
Lithology: sparsely olivine phyric basalt

Thin section summary: Sparse olivine phenocrysts, some of which are weakly altered to clays. Groundmass shows intergranular/intersertal texture and weak alteration. Space between plagioclase grains occupied by altered cpx mesostasis, opaque oxides and altered glass.

Plane-polarized:



Cross-polarized:



Igneous Petrology

Groundmass: Opaque oxides/altered glass, mesostasis, olivine, plagioclase.

Alteration: Low. Groundmass and olivine phenocrysts weakly altered to clays and FeO/OH. Vesicles show some filling by saponite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	1	0.04	0.55	0.12	subhedral	subequant	
Plagioclase	40	0.05	0.6	0.4	subhedral	elongate	
Clinopyroxene							Mesostasis

THIN SECTION LABEL ID: **395C-U1563B-31R-1-W 31/34-TSB-TS 58**

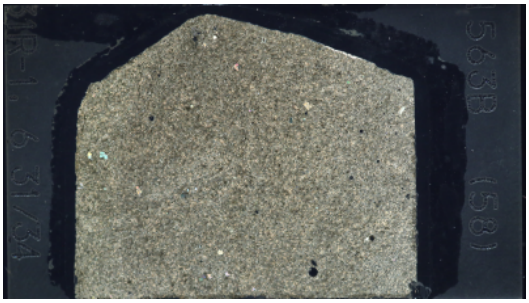
Observer: Callum Pearman, Gabriel Pasquet, Tao Wu, David McNamara Piece no.:

Lithology: sparsely olivine phyric basalt

Thin section summary: Very small plagioclase laths within mostly opaque and isotropic groundmass of mesostasis, olivine, opaque oxides/altered glass and plagioclase. Olivine phenocrysts are sparsely abundant with minor alteration and skeletal habit in places. Weak alignment of plagioclase laths consistent with sheet flow.

Plane-polarized:

Cross-polarized:



Igneous Petrology

Groundmass: Mesostasis, disseminated magnetite, opaque oxides/altered glass, olivine, plagioclase.

Alteration: Moderate-low. Groundmass weakly altered to clays, disseminated magnetite, and green celadonite. Olivine weakly altered to clays, FeO/OH, and in one case pyritized. Vesicles filled with celadonite, and minor calcite.

Mineral	%	Size min. (mm)	Size max. (mm)	Size ave. (mm)	Shape	Habit	Comments
Olivine	1	0.025	1	0.2	subhedral	subequant	
Plagioclase	5	0.04	0.4	0.2	subhedral	elongate	
Clinopyroxene							Mesostasis