Petrographic Report of 35 Polished Thin-Sections

Lynd Project

by

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Distribution List

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General Comments

The polished thin-sections were examined in numerical sequence and with the advent of time and the collection of more information, ideas evolved and changed. These changes will be self-evident in the petrographic descriptions. For example, initially it was not clear what the altered ferromagnesian phenocrysts were. They could have been pyroxenes, amphiboles, olivine or biotite. Subsequently it became clear that probably the only ferromagnesian mineral present in the porphyritic rocks is hornblende. Also, clasts of feldspar and quartz in these porphyritic were initially interpreted to be phenocrysts, but subsequently they were seen to be xenocrystic material derived from the disaggregation of granitoids.

Furthermore, initially it was assumed that all of the porphyritic rocks were extrusives (e.g. andesite), however, much later it became clear they were all intrusives.

Initially the porphyritic rocks were considered to be andesitic, or intermediate, in composition, but because the exact mineralogy of the groundmass is not known, the porphyritic rocks are just referred to as *dacitic-andesitic* in composition. Intuitively, it is felt that the groundmass of these rocks is quite rich in alkali feldspar, possibly even feldspathoid-bearing, so the rocks may be better described as being trachytic-trachyandesitic in composition.

Discussion/Conclusions

Kimberlite or lamproite was not recognised in the rock chips examined. However, the absence of such rocks does not necessarily preclude their existence because it is probably worth noting that such rocks can be highly weathered and friable and therefore may not be represented in the chips that were sampled. One chip in VSAC 26 9-11 contains a large pseudomorph (see Figs 66-67) which could be after olivine. If it was olivine, it may be significant in implying that olivine-bearing rocks were once present.

The main rock type represented by the rock chips is a hornblende lamprophyre of intermediate composition. Subordinate rocks that are present include granitoids, gneisses, cataclastic quartzo-feldspathic rocks, intrusive breccias and amphibolites. Many of the rocks are highly altered and veined by alkali feldspar, ?zeolites and carbonate.

My *simplistic* interpretation of the geology from the examination of the polished thin-sections is an area of granitoids and gneisses that experienced brittle (to ?ductile) deformation/fracturing prior to the intrusion of the lamprophyric magma. Fragments of granitoid and gneiss were incorporated into the magma and variably disaggregated, leading to the production of xenocrysts of feldspar, quartz and biotite. The rounding of some of the xenocrysts may have resulted from gas-streaming, resorption or physical abrasion.

Locally (e.g. VSAC 15 49-55), well-crystallised amphibolite was/is present in the area, probably as country-rock.

The diamond potential of the area based on the rock chips that have been examined is reduced by the lack of evidence for kimberlite, lamproite or ultramafic lamprophyre. However, the mere presence of lamprophyre is significant. Diamonds have been linked to minettes in some parts of the World.

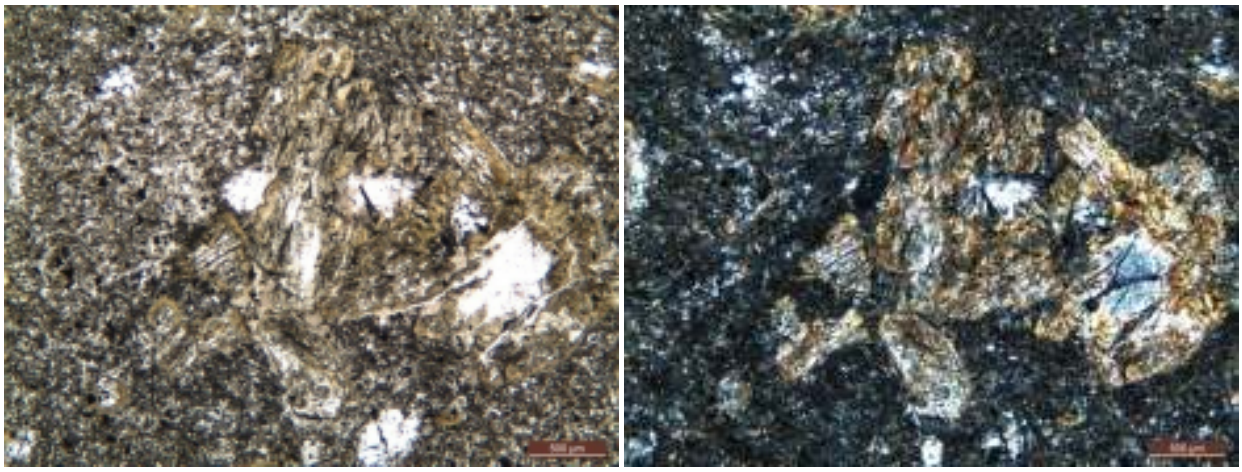
Petrographic List of Rock Types

VSAC 02 16-17	Altered porphyritic (trachy) andesite/intermediate lamprophyre
VSAC 02 17-18	Altered dacitic-andesitic lamprophyre + moderately deformed and recrystallised granodiorite-tonalite
VSAC 02 21-22	Recrystallised mylonitised granitoids
VSAC 02 36-37	Altered dacitic-andesitic hornblende lamprophyre + variably deformed and recrystallised granitic rocks
VSAC 11 10-12	Dacitic-andesitic hornblende lamprophyre + mixed lamprophyre-granitoid rocks + flaser granitoid
VSAC 11 12-14	Variably altered dacitic-andesitic hornblende lamprophyre; with minor xenocrysts and xenoliths of granitoid origin
VSAC 12 25-27	Variably altered dacitic-andesitic hornblende lamprophyre (with trace granitic material)
VSAC 12 28-30	Variably altered dacitic-andesitic hornblende lamprophyre + variably deformed and recrystallised granitoids + rare mafic amphibolites-granulite
VSAC 12 30-32	Dacitic-andesitic hornblende lamprophyre
VSAC 12 33-34	Dacitic-andesitic hornblende lamprophyre
VSAC 12 34-36	Dacitic-andesitic hornblende lamprophyre + variably deformed & recrystallised granitoid + late-stage alkali feldspar
VSAC 15 49-55	Fine- to medium-grained amphibolites + quartzo-feldspathic gneiss
VSAC 16 47-49	Biotite-bearing quartzo-feldspathic schist, deformed and recrystallised granitoid and granitic gneissic schists
VSAC 18 6-10	Coarsely devitrified, dacitic-andesitic hornblende lamprophyre
VSAC 18 21-22	Coarsely devitrified, dacitic-andesitic hornblende lamprophyre + highly altered, deformed and partially recrystallised biotite granitoid
VSAC 18 28-29	Devitrified dacitic-andesitic hornblende lamprophyre
VSAC 18 COMP 1	Coarsely devitrified dacitic-andesitic hornblende lamprophyre; strongly veined
VSAC 18 COMP 2	Coarsely devitrified dacitic-andesitic hornblende lamprophyre
VSAC 20 32-34	Dacitic-andesitic hornblende lamprophyre + hornblende (and biotite) monzonite-diorite
VSAC 20 37-39	Dacitic-andesitic hornblende lamprophyre
VSAC 21 18-19	Altered, devitrified, dacitic-andesitic hornblende lamprophyre
VSAC 26 9-11	Variably altered dacitic-andesitic hornblende lamprophyre + metamorphosed hornblende- and biotite-bearing granitoid
VSAC 26 15-17	Variably altered and devitrified hornblende lamprophyre
VSAC 32 66-67	Cataclasites, fault breccias and ?tuffs/volcaniclastics
VSAC 33 23-24	Highly altered cataclasites/intrusive breccias/?volcaniclastics
VSAC 34 47-48	Highly altered cataclasites/ fault breccia/ intrusive breccias in granitoids
VSAC 35 39-41	Variably altered dacitic-andesitic hornblende lamprophyre
VSAC 36 7-8	Weakly altered dacitic-andesitic hornblende lamprophyre
VSAC 36 27-28	Moderately altered, deformed and recrystallised hornblende- and biotite-bearing granitoids (some quartzitic)
VSAC 40 37-38	Highly altered fault and intrusive breccias derived from hornblende- and biotite-bearing granitoids
VSAC 41 11-12	Dacitic-andesitic hornblende lamprophyre
VSAC 41 18-19	Variably altered dacitic-andesitic hornblende lamprophyre
VSAC 41 19-20	Dacitic-andesitic hornblende lamprophyre
VSAC 43 12-13	Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)
VSAC 43 25-26	Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)

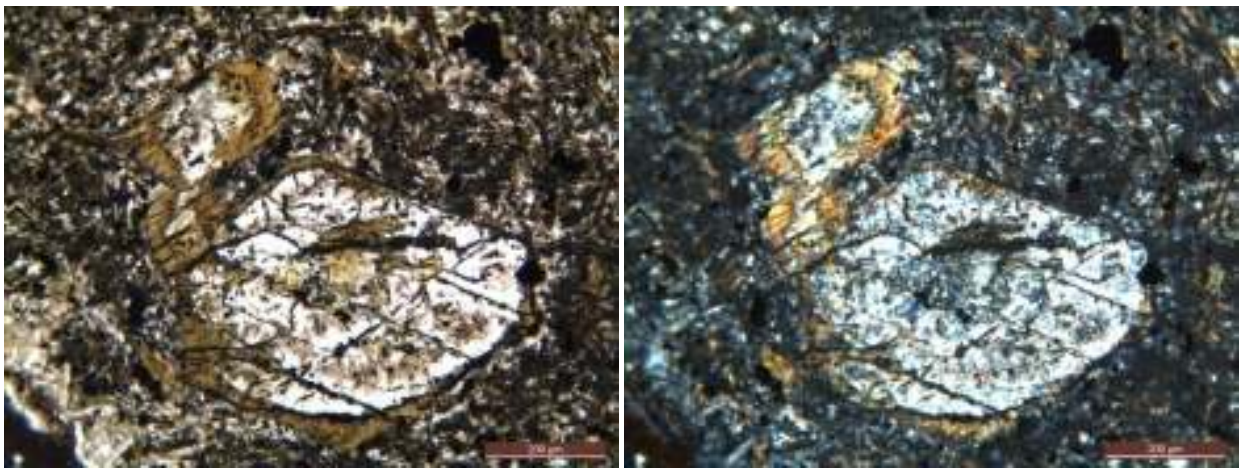
VSAC 02 16-17

Petrographic name: Altered porphyritic andesite/intermediate lamprophyre

The polished thin-section consists of seven rock chips comprising variants of the same, or similar, rock type, namely a highly altered, moderately porphyritic andesite or intermediate lamprophyre. Phenocrysts range up to 2 mm in length or diameter, in places occurring in clusters (Figs. 1 and 2), and making up 3-8 % of the chips. They appear to have been pyroxene*, amphibole (Fig. 3 and 4), biotite and feldspar. Euhedral forms are well-preserved but the original minerals are completely pseudomorphed by greenish brown and colourless phyllosilicates, the colourless type commonly being microcrystalline or cryptocrystalline. Many of the former phenocrysts have a zonal alteration pattern (Figs 1-4), with the greenish brown phyllosilicates forming a euhedral mantle, or rim, around the colourless phyllosilicate.



Figures 1 and 2. *Plane polarised light (PPL) and crossed-polaroid (XP) views of an altered ferromagnesian phenocryst cluster set in a very fine-grained felsitic groundmass. Note euhedral form of the phenocrysts and the two main alteration products. Scale bar = 0.5 mm.*



Figures 3 and 4. PPL and XP views. *Relict amphibole cleavage in phenocryst pseudomorphed by greenish brown and colourless phyllosilicates. Scale bar = 0.2 mm.*

The phenocrysts are set in a very fine-grained felted to trachytic groundmass of feldspars (possibly comprising plagioclase, highly saussuritised, and alkali feldspar, commonly recrystallised into cryptocrystalline material), altered ferromagnesians (many elongate crystals of amphibole and/or

* Evidence acquired subsequently suggests that the altered ferromagnesian phenocrysts were all, or predominantly, hornblende.

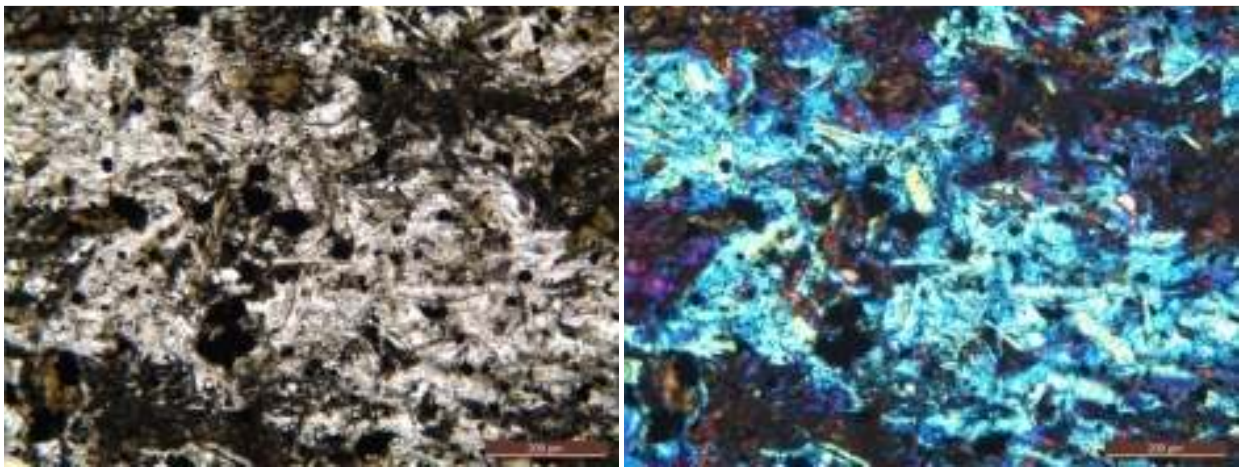
biotite), Fe-Ti oxides (3-5 %), quartz and apatite. In general, the very fine-grained nature of the groundmass in combination with the high degree of alteration, obscure much of the rock's original mineralogy.

The trachytic texture in the groundmass may vary from place to place, creating sub-domains, which give some of the rock chips a mild mottled texture (Figs 5 and 6).

Figures 5 and 6. PPL and XP views. *Sub-domain of trachytic textured groundmass. Polycrystalline aggregate of quartz (lower right) represents part of a granitoid-derived xenolith. Scale bar = 0.5 mm.*

Alteration in the rock also includes veining by alkali feldspar, ?zeolites, quartz and carbonate. In places these minerals may form pods or lenses. Some carbonate replaces former mafic phenocrysts. A 4 mm diameter aggregate of medium-grained quartz, now variably recrystallised, may represent a granitoid inclusion (xenolith) (Fig. 6).

A late-stage crystallisation feature of the rock is the porphyroblastic development of secondary alkali feldspar in the groundmass, extending over areas of 1-2 mm diameter (Figs 7 and 8; see also Fig. 6). In many places former feldspar micro-laths and/or microlites appear to be replaced by the "new" alkali feldspar as there is optical continuity between the two phases. The texture is interpreted, by me, to be a possible devitrification phenomenon that has become all pervasive.



Figures 7 and 8. PPL and XP (with gypsum plate inserted) views. *Optically continuous alkali feldspar forming an extensive base to the microlites of feldspar and altered ?amphibole and equant crystals of Fe-Ti oxides. Scale bar = 0.2 mm.*

The rock may have a significant alkali feldspar content which would make the rock a trachyandesite. As it is difficult to determine, petrographically, the exact amount of alkali feldspar that is present, a geochemical analysis of the rock is probably required to solve this issue. However, because of the widespread introduction (i.e. metasomatism) of late-stage alkali feldspar (and possibly zeolites) a geochemical analysis might not truly reflect the rock's original (primary) composition.

VSAC 02 17-18

Petrographic name: Altered dacitic-andesitic lamprophyre + moderately deformed and recrystallised granodiorite-tonalite

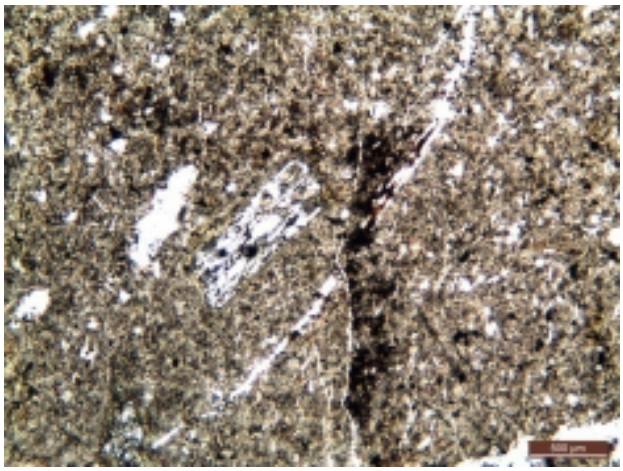
The polished thin-section of 8 rock chips comprising highly altered varieties of:

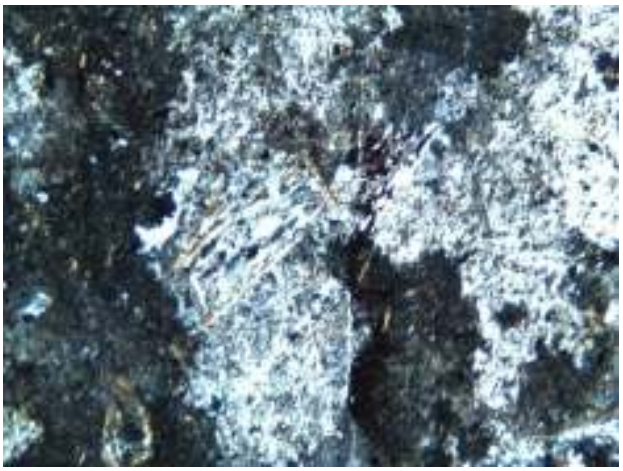
a) Porphyritic dacite-andesite (i.e. lamprophyre) (3)
b) Devitrified/recrystallised porphyritic dacite-andesite (i.e. lamprophyre) (1)
c) Porphyritic andesite (i.e. lamprophyre) (1)
d) Granitoids (3)

Porphyritic dacite-andesite: Characterised by altered, euhedral phenocrysts of feldspar (probably both plagioclase and alkali feldspar) and ferromagnesians (amphibole, pyroxene and possibly biotite) set in a very fine-grained felsic groundmass, which in many places has recrystallised/devitrified into broad optically continuous areas (up to 3 mm in diameter).

The rock is cut by numerous veins of alkali feldspar and is variously haematitised (Fe-stained), saussuritised/kaolinised and silicified/feldspathitised (microcrystalline-cryptocrystalline material).

Devitrified/recrystallised porphyritic dacite-andesite: This rock is very unusual in having a medium-grained, anhedral granular (allotriomorphic) texture superimposed on a porphyritic texture (Figs 9-11). In all other aspects, it is similar to the porphyritic dacite-andesite described above.





Figures 9-11. PPL, XP and XP (with gypsum plate) views of the same area. *Secondary anhedral granular texture superimposed on a primary porphyritic texture. Note the altered amphibole phenocryst and very fine-grained groundmass portrayed in Fig 9. Scale bar = 0.5 mm.*

It is interpreted that the groundmass has devitrified/recrystallised into a pseudo holocrystalline plutonic-looking rock.

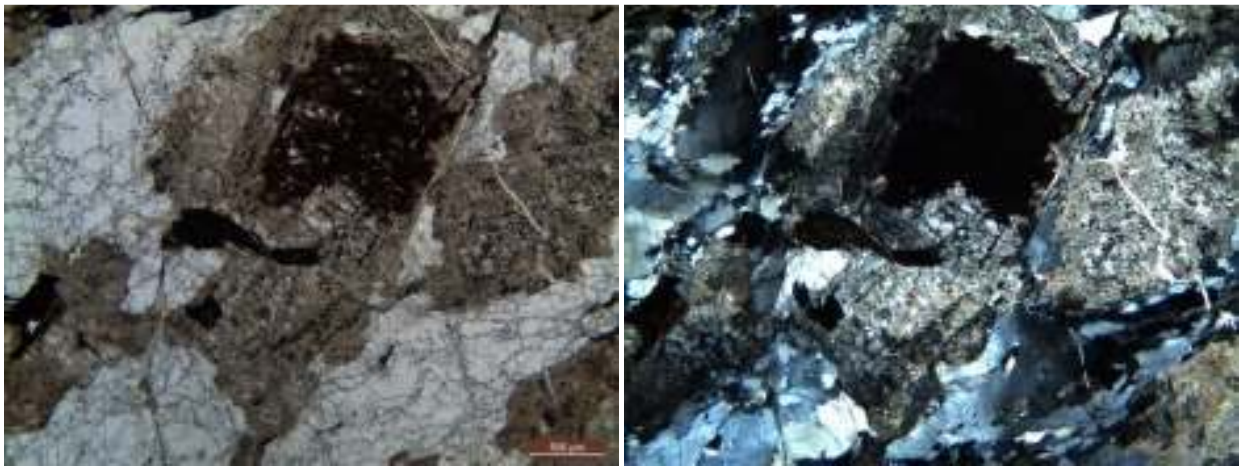
As typical, the rock is highly veined by alkali feldspar.

Porphyritic andesite: Possibility of former olivine phenocrysts having been present (Fig. 11).

Figure 12. XP. *Possible phenocrysts of altered olivine. Scale bar = 0.5 mm.*

Granitoids: Highly deformed, partly recrystallised (blastomylonitic) granodioritic-tonalitic rocks with accessory biotite (chloritised and oxidised), Fe-Ti oxides, sphene (titanate) and epidote (Figs 12-13). Plagioclase is typically mildly haematitised (strong in places) and saussuritised. Originally, the rocks had medium- to coarse-grained subhedral granular textures.

The granitoids are variably veined in a stock-work pattern by alkali feldspar and, in places, by carbonate. One granitoid chip is intruded by porphyritic andesite.

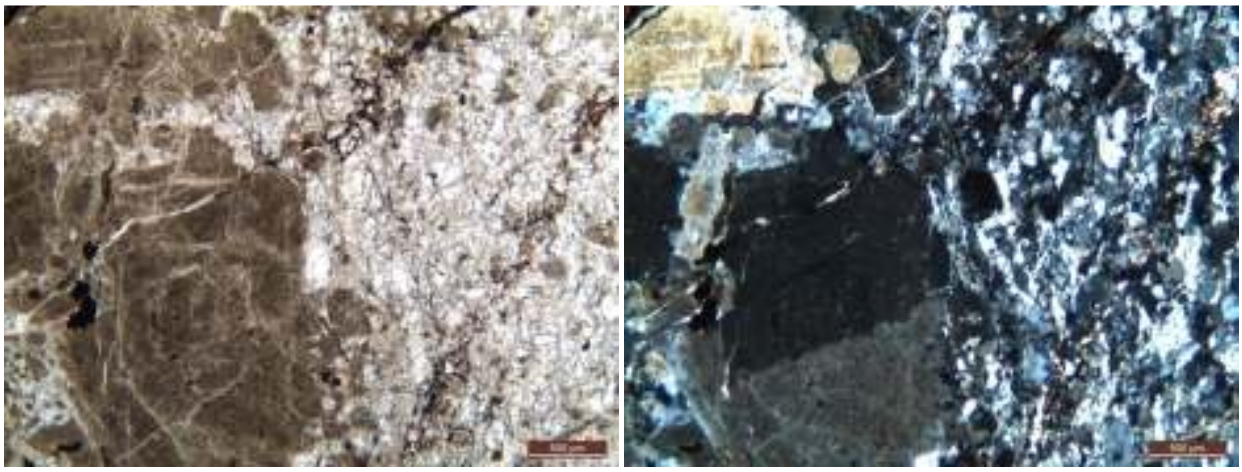


Figures 13 & 14. PPL and XP. *Partially altered, deformed and recrystallised granitoid. Feldspar (plagioclase) is variably kaolinised/saussuritised and haematitised, biotite is highly oxidised and quartz is deformed and recrystallised. Scale bar = 0.5 mm.*

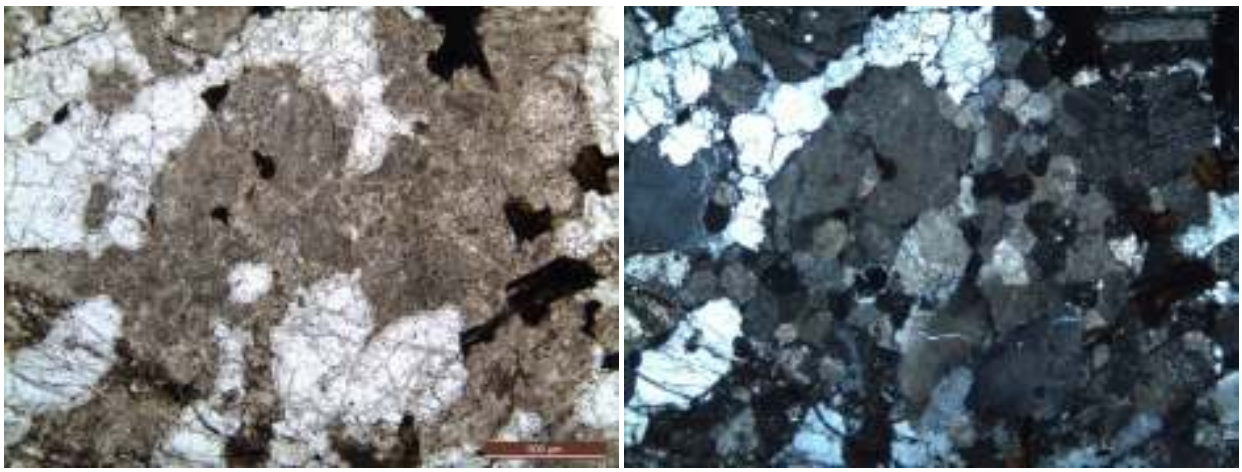
VSAC 02 21-22

Petrographic name: Recrystallised mylonitised granitoids

The polished thin-section consists of six chips that represent various types of granitoids, ranging from fine- to coarse-grained syenogranite to tonalite, which are variably deformed and recrystallised. Three of the chips are dominated by partially recrystallised mylonite (blastomylonite) zones (Figs 15-16), and two other chips have fine- to medium-grained granoblastic (metamorphic) textures (Figs 17-18), indicating major recovery from the mylonite stage.



Figures 15 & 16. PPL and XP views. *Contact between granitoid and partially recrystallised mylonite. Scale bar = 0.5 mm.*



Figures 17 & 18. PPL and XP views. *Granoblastic polygonal texture developed in recrystallised feldspar. Scale bar = 0.5 mm.*

Plagioclase is typically murky/clouded (e.g. Figs 15, 17-19), partly very finely saussuritised, rarely partly sericitised. Alkali feldspar occurs as coarse-grained porphyritic crystals enclosing plagioclase in several of the chips (Fig. 20). Alkali feldspar also commonly occurs as a secondary product in stringer veins in quartz. In places, the secondary alkali feldspar appears to be replacing quartz (Figs 20).

Accessory minerals include biotite (mostly altered/chloritised), Fe-Ti oxides, sphene (titanate) and apatite. Carbonate is present in several of the chips (up to ~5 %), occurring as interstitial and poikiloblastic material.

Figures 19 & 20. PPL and XP views. *Porphyritic alkali feldspar enclosing plagioclase (lower left quadrant) and secondary alkali feldspar occurring in quartz (lower right quadrant). Scale bar = 0.5 mm.*

VSAC 02 36-37

Petrographic name: Altered dacitic-andesitic hornblende lamprophyre + variably deformed and recrystallised granitic rocks

The polished thin-section consists of ~100 small chips (average size ~3 mm; range = 1-12 mm) comprising sub-equal amounts of dacitic-andesitic and granitic material.

The dacitic-andesitic material is slightly more prevalent than the granitic material and includes both porphyritic and non-porphyritic varieties, although the presence of non-porphyritic chips might be just a reflection of the small size of the chips. Where porphyritic, the principal phenocryst mineral is hornblende (brownish green, olive green). However, the identity of many former phenocrysts is not clear as they are commonly replaced by greenish brown phyllosilicates ± chlorite ± carbonate.

The groundmass of the dacitic-andesitic rocks is typically felsitic, ranging from felted to trachytic. The exact identity of the feldspar laths is not known and there is no evidence to indicate that it is plagioclase. Chlorite and greenish phyllosilicates, which replace former ferromagnesian minerals (e.g. microlites of ?pyroxene, amphibole and ?biotite), make up 3-10 % of the groundmass. Fe-Ti oxides typically comprise 3-4 % of the groundmass. Apatite is an accessory phase. As seen in previous thin-sections, the feldspars in the groundmass commonly show optical continuity over wide areas.

Many of the dacitic-andesitic chips are cut by late-stage alkali feldspar and carbonate veins. In places the alkali feldspar occurs in aggregates made up of subhedral to euhedral, fine- to medium-grained crystals.

The granitic chips show the exact range of rock types seen in VSAC 02 17-18 and VSAC 02 21-22, namely, weakly altered and deformed to highly altered and deformed (i.e. mylonitised) biotite monzogranite-tonalite. Some granitoid chips are variably replaced by carbonate.

VSAC 11 10-12

Petrographic name: Dacitic-andesitic hornblende lamprophyre + mixed lamprophyre-granitoid rocks + flaser granitoid

The polished thin-section consists of eight (8) chips:

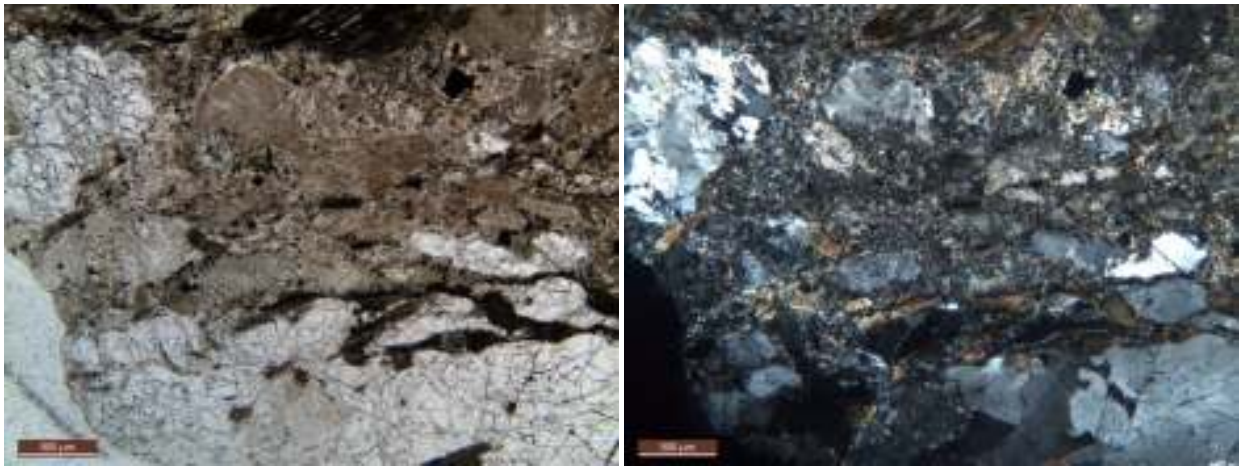
Porphyritic (hornblende) dacite/andesite (or lamprophyre)	(4)
Mixed granitic and dacite/andesite material	(2)
Deformed (flaser) granitoid	(1)
Hybrid ("contaminated") dacite/andesite	(1)

The dacitic-andesitic hornblende lamprophyre contains relict green to brownish green hornblende (up to 5 % volume and up to 3 mm in size) as the main phenocrystic phase. The crystals are commonly euhedral. As is characteristic, the lamprophyre is cut by, and contains pods of, late-stage alkali feldspar.

One chip comprises a highly deformed (flaser structure), altered and partly recrystallised granitoid. Many of the crystals are in advanced stages of disaggregation.

Two chips represent mixtures of (a) deformed granitoid and (b) dacitic-andesitic lamprophyre (Figs 21-22). The lamprophyre is strongly contaminated with crystals and aggregates of feldspar, quartz and biotite, producing a pseudo "clast-support" fabric.

One chip represents dacitic-andesitic lamprophyre that is highly contaminated with granitic material. The rock is dominated by crystals and aggregates of feldspar and quartz.

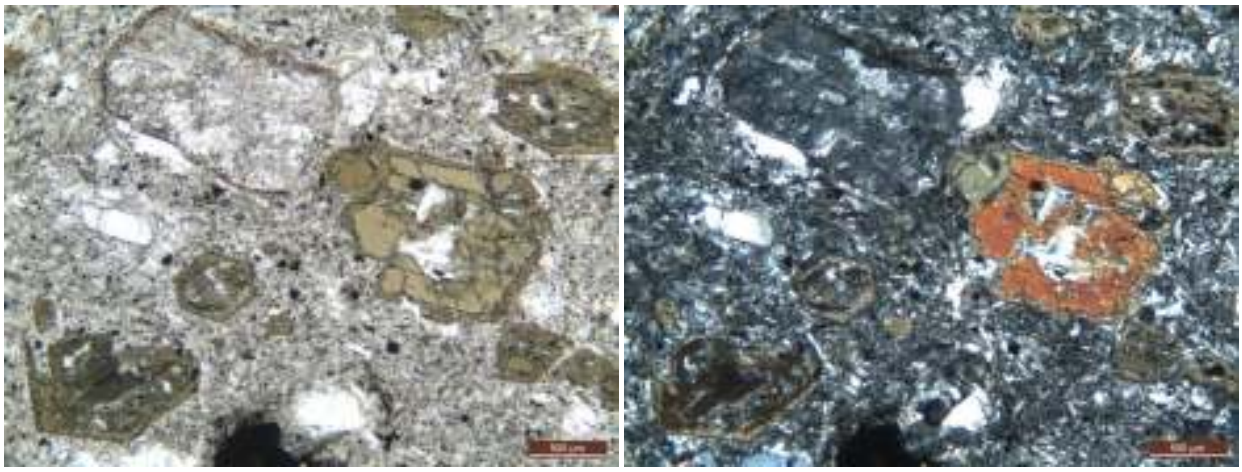


Figures 21 & 22. PPL and XP views. *Contact zone between biotite-bearing granitoid (lower portion) and "contaminated" dacitic-andesitic lamprophyre (upper portion). Note clasts of granitic material (far left) and xenocrysts of feldspar (clouded material), quartz and biotite (top of field of view) in the dacitic-andesitic lamprophyre. Scale bar = 0.5 mm.*

VSAC 11 12-14

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre; with minor xenocrysts and xenoliths of granitoid origin

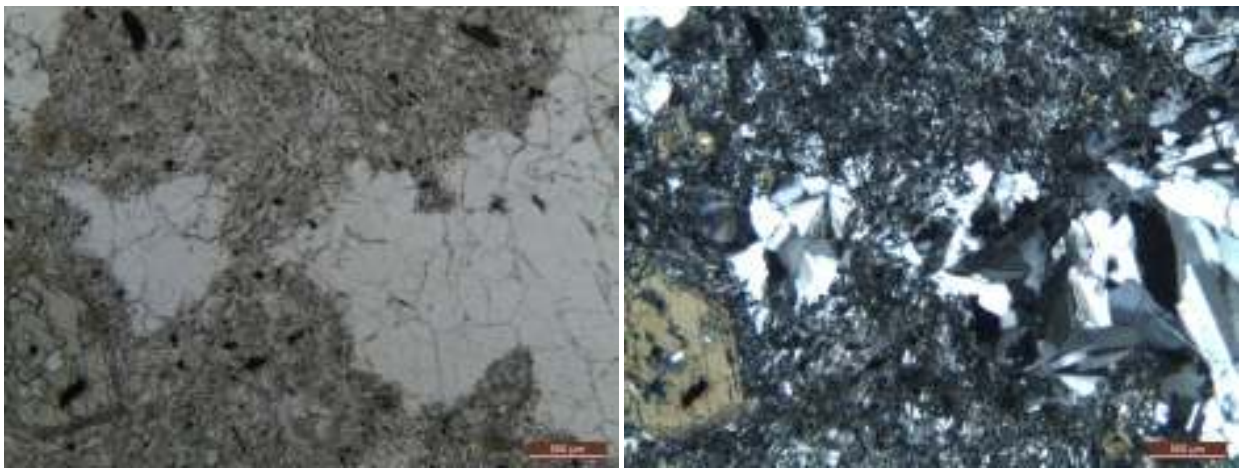
The polished thin-section consists of six chips comprising weakly to strongly altered dacitic-andesitic hornblende lamprophyre. In some chips the hornblende is euhedral and fresh (Figs 23 & 24), in others it is completely altered.



Figures 23 & 24. PPL & XP views. *Dacitic-andesitic hornblende lamprophyre. Note euhedral and subhedral hornblende phenocrysts with altered rims and cores. Clast of feldspar (upper left), with attached quartz and haematitised/altered margins and recrystallised interior, is probably derived from disaggregated granitoid. Small quartz clast left of centre. Scale bar = 0.5 mm.*

Several chips contain clasts of feldspar, quartz and biotite, which generally have reaction rims, indicating they are probably xenocrysts derived from granitoid (e.g. Figs 23-24).

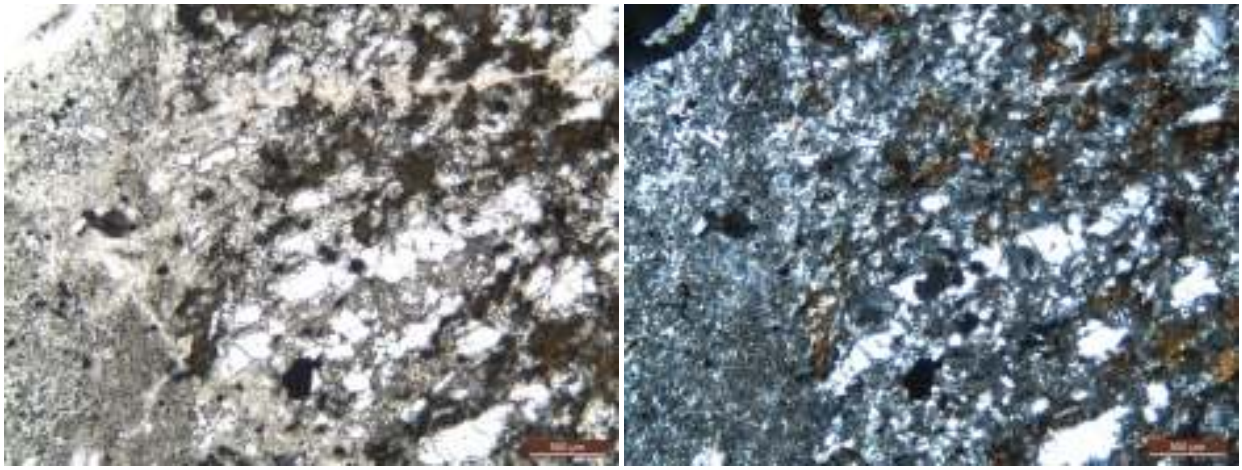
One chip contains large, semi-amoeboid domains (up to 3.5 mm diameter) of euhedral (equant to elongate) alkali feldspar Figs 25-26). The shapes of the domains suggest they may have been former vesicles.



Figures 25 & 26. PPL & XP views. *Amoeboid ?amygdales filled with ?alkali feldspar in hornblende lamprophyre. Scale bar = 0.5 mm.*

One clast contains a 7 mm wide unit of quartzo-feldspathic gneiss with a fine-grained granoblastic-elongate texture, composed of altered feldspar (~52 %), quartz (~35 %), biotite (~10 %), Fe-Ti

oxides (3 %) and accessory apatite (<1 %) (Figs 27-28). The contacts with the host dacite/andesite are sharp, suggesting that the quartzo-feldspathic gneiss is a xenolith.



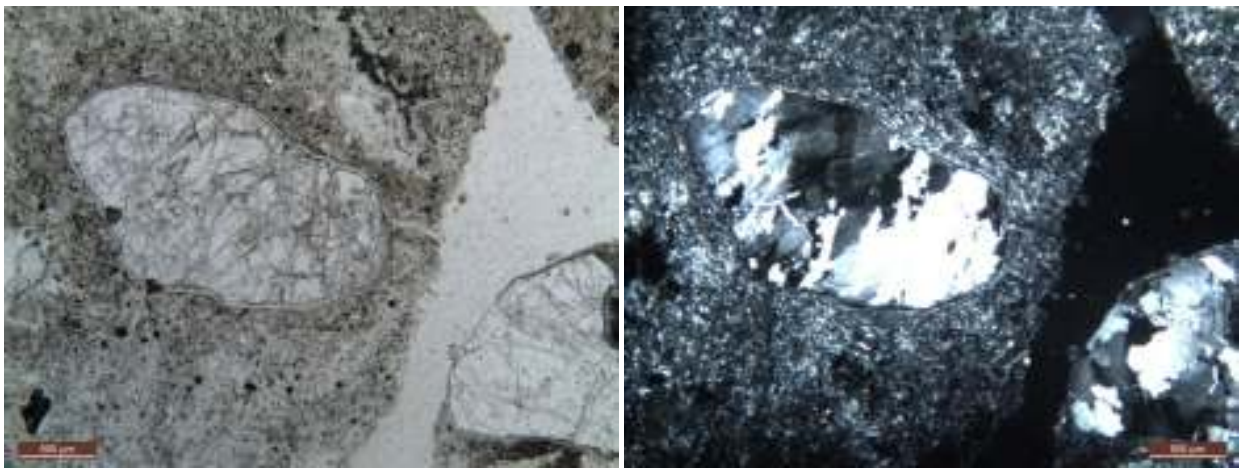
Figures 27 & 28. PPL & XP views. *Sharp (vertical) contact between lamprophyre (left-hand side) and biotite-bearing quartzo-feldspathic gneiss xenolith. Scale bar = 0.5 mm.*

VSAC 12 25-27

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre (with trace granitic material)

The polished thin-section consists of ~100 small chips (average size ~ 3-4 mm; range = 1-9 mm), roughly 98 % of which are very fine-grained (aphanitic) felsitic dacitic-andesitic hornblende lamprophyre. Many of them contain subhedral to euhedral phenocrysts of brownish green hornblende (1-3 %, crystals up to 2 mm in size). Some of the chips contain altered feldspar crystals, which may be phenocrysts, but more likely to be xenocrysts. A few chips contain granitic clasts (xenoliths), chiefly of recrystallised quartz aggregates (Figs 29 & 30). Roughly one-third of the chips contain alkali feldspar veins or aggregates and several of the smaller chips are dominated by the alkali feldspar crystals. In a similar manner, several of the smaller chips are dominated by secondary carbonate.

One of the chips in the polished thin-section is an aggregate of recrystallised and strained quartz. It is presumably derived from granitic material.



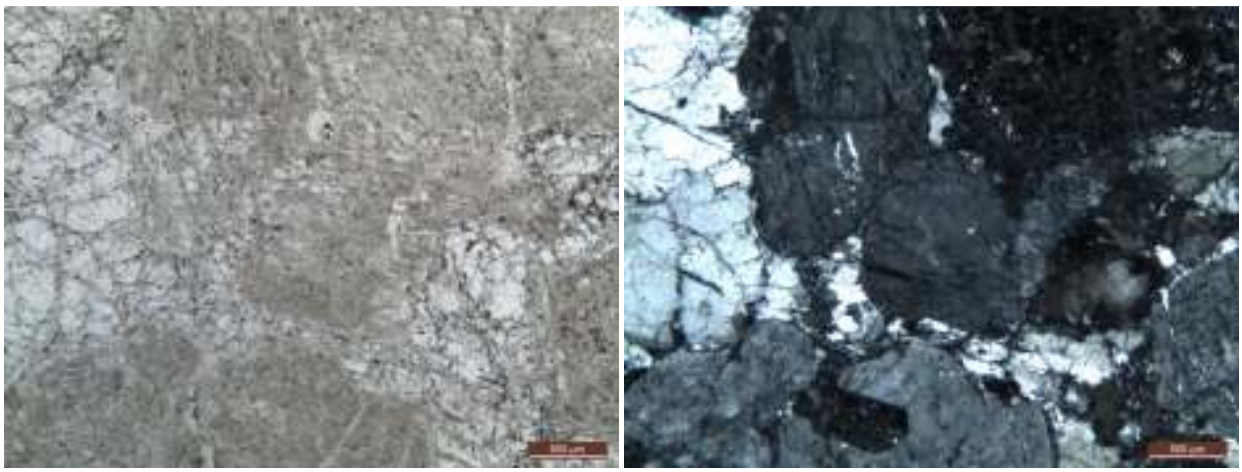
Figures 29 & 30. PPL & XP views. *Rounded clast (xenolith) of recrystallised quartz in hornblende lamprophyre. Note similar clast in adjacent rock chip. Scale bar = 0.5 mm.*

VSAC 12 28-30

Petrographic name: Variably altered dacitic-andesitic lamprophyre + variably deformed and recrystallised granitoids + rare mafic amphibolites-granulite

The polished thin-section consists of ~100 chips (average size ~3 mm; range = <1-12 mm), of which more than 90 % comprise very fine-grained (aphanitic) felsitic dacitic-andesitic hornblende lamprophyre, similar to VSAC 12 25-27. Roughly 40-50 % of the dacitic-andesitic lamprophyre chips contain hornblende phenocrysts, and a small number contain clasts of feldspar, quartz, biotite (altered) and granitic rock. The felsitic matrix ranges from decussate to trachytic, and a few are very fine-grained granular (a result of devitrification).

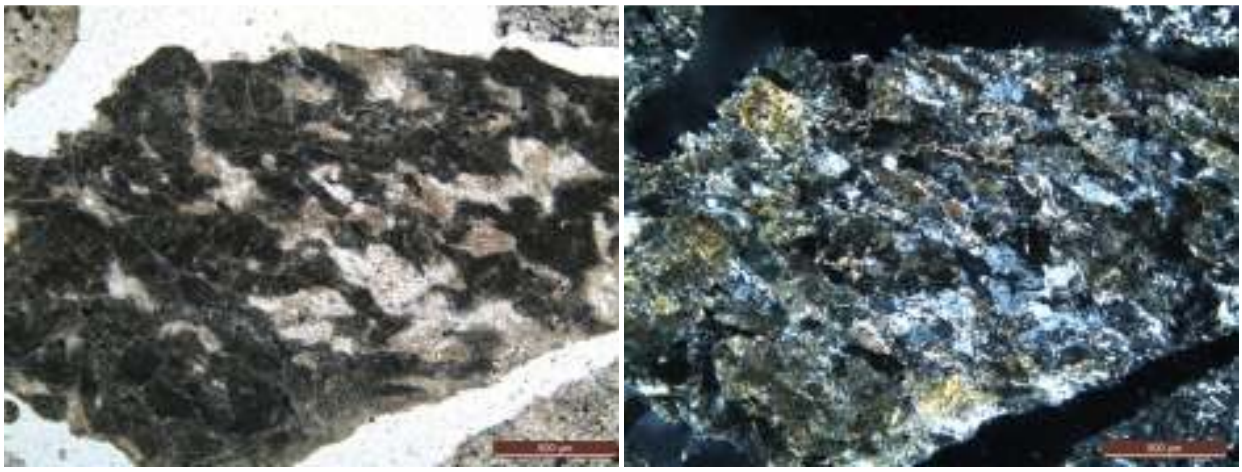
The other main rock type making up the chips is biotite-bearing granitoid (Figs 31-32), ranging from weakly deformed and recrystallised to strongly deformed and recrystallised.



Figures 31 & 32. PPL & XP views. *Tonalitic granitoid with clouded plagioclase and partly recrystallised quartz. Scale bar = 0.5 mm.*

One chip is quite different from the rest (Figs 33-34), having a basic composition, a fine-grained crystalloblastic (±granoblastic-elongate) texture and composed of roughly equal amounts of hornblende (strongly retrograded) and feldspar (highly altered).

The rock could represent a mid-crustal basic amphibolite-granulite.



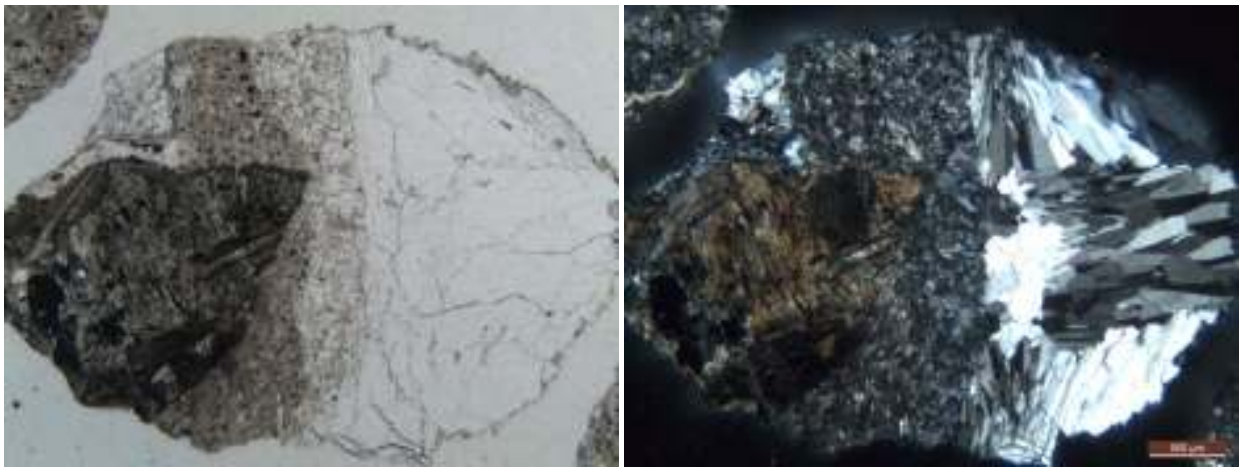
Figures 33 & 34. PPL & XP views. *Highly altered fine-grained amphibolite with a granoblastic-elongate texture. Scale bar = 0.5 mm.*

VSAC 12 30-32

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~100 chips (average size ~4 mm; range = <1-13 mm), of which all them represent dacitic-andesitic hornblende lamprophyre. About 50 % of the chips are weakly hornblende-phyric, with phenocrysts up to 3.5 mm in diameter. Most chips contain patches and/or veins of alkali feldspar. Several chips contain xenocrystic feldspar and xenolithic granitoid clasts.

One chip contains a >2.4 mm, (altered) biotite-rich clast, with accessory Fe-Ti oxide, ?zircon and apatite (Figs 35-36). The biotite flakes are up to 1.2 mm long. The clast must be derived from a granitoid.



Figures 35 & 36. PPL & XP views. *Biotite clast in hornblende lamprophyre. Note columnar ?alkali feldspar domain, small granitoid clast and two varieties of lamprophyre. Scale bar = 0.5 mm.*

The same chip is interesting in that it has two varieties of dacitic-andesitic lamprophyre, one less haematitised and more granular in texture. The chip also contains a granitoid clast and a very impressive vein, or amygdale, composed of bladed-columnar alkali feldspar. (Could it be adularia, orthoclase or something like stilbite?).

Hornblende microlites (unaltered) are well-represented in the groundmass.

Small euhedral crystals of hornblende occur in some alkali feldspar domains, indicating that the so-called “late-stage” crystallisation of the alkali feldspar is possibly spread over an extensive time frame.

As usual, ~5-10 % of the chips are affected by secondary carbonate replacement.

VSAC 12 33-34

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~100 chips (average size ~3 mm; range = <1-10 mm), all of which comprise variants of dacitic-andesitic hornblende lamprophyre, similar to VSAC 12 30-32.

Some chips are extremely haematitised/Fe-stained.

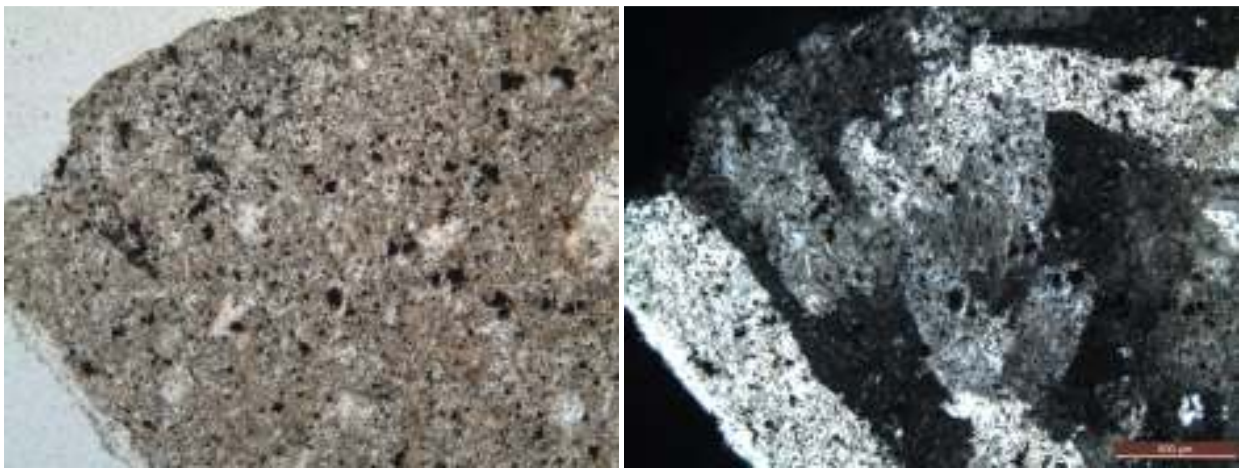
One hornblende phenocryst, intergrown with (or replaced by) alkali feldspar, is ~50 % replaced by carbonate.

VSAC 12 34-36

Petrographic name: Dacitic-andesitic hornblende lamprophyre + variably deformed & recrystallised granitoid + late-stage alkali feldspar

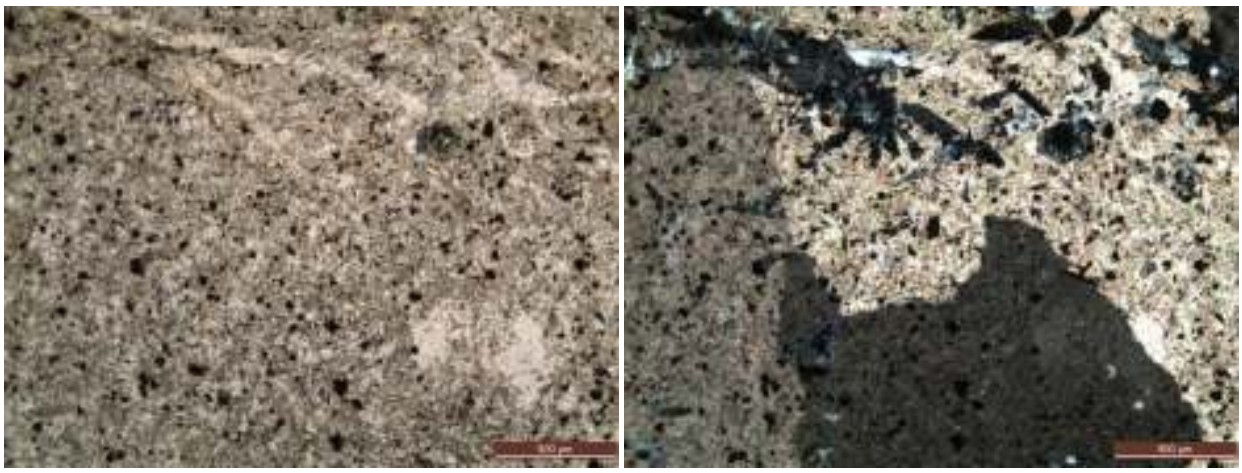
The polished thin-section consists of ~100 chips (average size 3-4 mm; range = 1-12 mm), of which roughly 85 % are dacitic-andesitic hornblende lamprophyre, many with granitoid xenoliths, and the remainder of chips comprising granitoids, fine- to medium-grained crystalloblastic secondary alkali feldspar and carbonate-rich chips.

The dacitic-andesitic lamprophyre chips are generally slightly less porphyritic than seen in the previous thin-sections looked at, but are different because many of them are characterised by well-developed, fine- to medium-grained crystalloblastic, devitrified alkali feldspar. Relict felsitic textures are well-preserved in these new crystals (Fig.37-38).



Figures 37 & 38. PPL & XP views. *Fine- to medium-grained crystalloblastic, "devitrified" alkali feldspar overprinting a primary very fine-grained felsitic texture. Scale bar = 0.5 mm.*

In a similar manner, fine- to coarse-grained poikiloblastic carbonate is a very conspicuous phase within which relict felsitic textures are perfectly preserved (Figs 39-40).



Figures 39 & 40. PPL & XP views. *The area shown is occupied by three porphyroblastic crystals of carbonate (see Fig. 40), overprinting the former felsitic texture. Scale bar = 0.5 mm.*

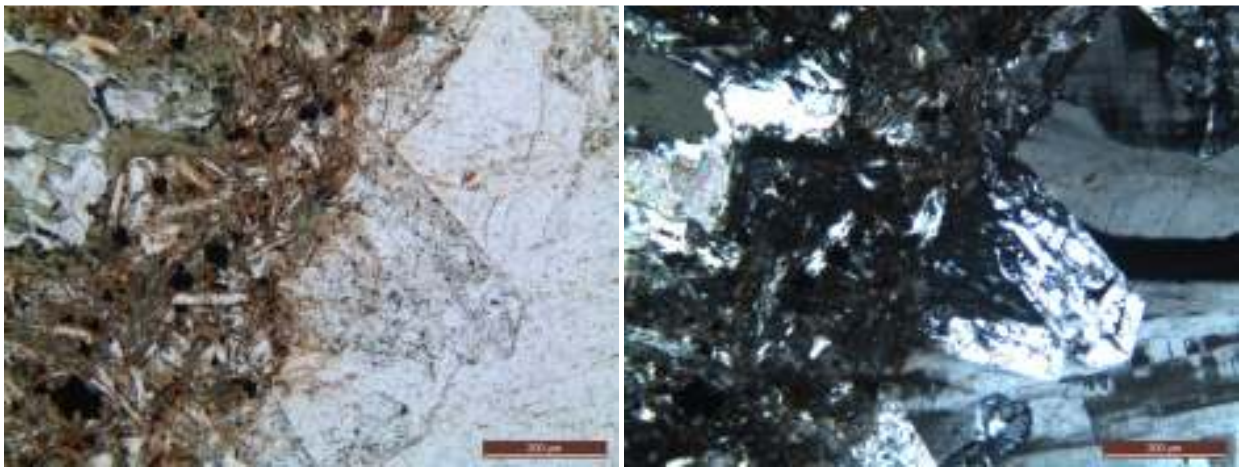
Former hornblende phenocrysts are mainly altered and are represented by rims of brownish green phyllosilicates.

An interesting feature of some of the chips of dacitic-andesitic lamprophyre is the presence of equant to hexagonal alkali feldspar aggregates (Figs 41-42).

Figures 41 & 42. PPL and XP views. *Equant to semi-hexagonal ?alkali feldspar aggregates in lamprophyre. Scale bar = 0.5 mm.*

Granitoid chips (and xenoliths) are generally biotite-bearing and display the full range from weakly deformed and recrystallised to strongly deformed and recrystallised.

One chip (Figs 43-44) contains euhedral alkali feldspar crystals (prismatic, variably replaced, or melted) interfingering with columnar ?microcline.



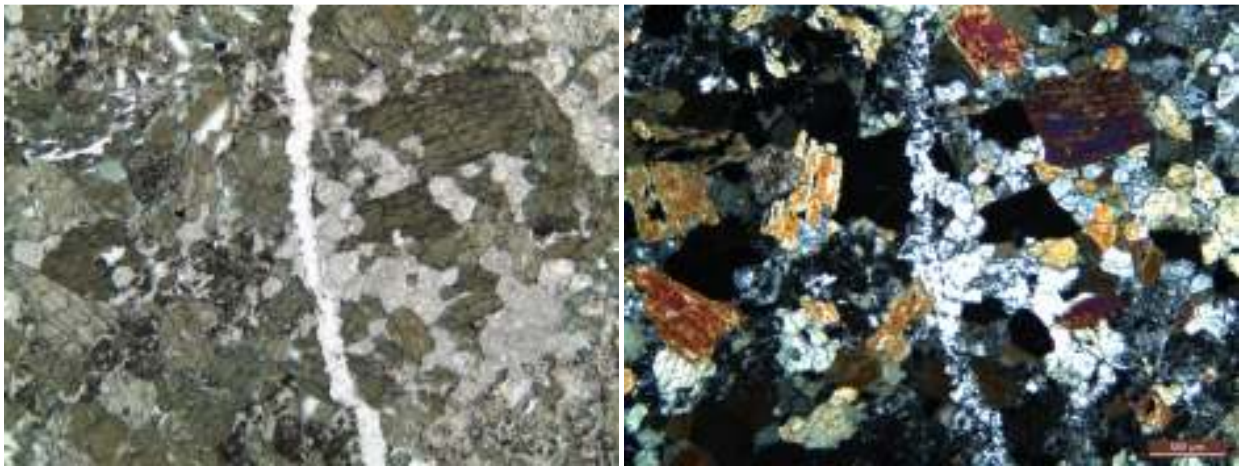
Figures 43 & 44. PPL & XP views. *Several generations of ?alkali feldspar in hornblende lamprophyre host. Note partially replaced nature of the euhedral ?alkali feldspar. Scale bar = 0.2 mm.*

VSAC 15 49-55

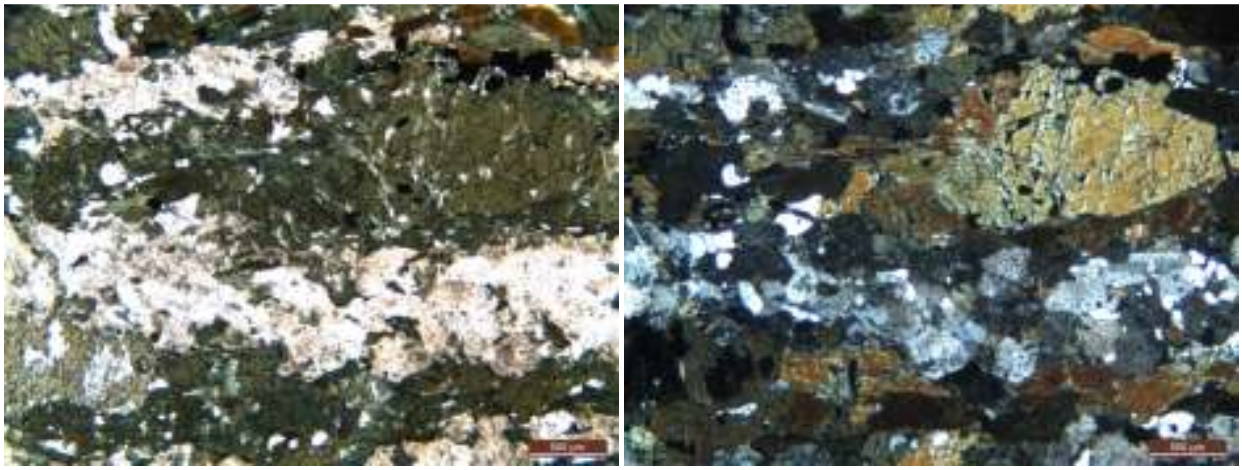
Petrographic name: Fine- to medium-grained amphibolites + quartzo-feldspathic gneiss

The polished thin-section consists of ~100 chips (average size ~4 mm; range = <1-15 mm), of which approximately 95 % are amphibolites, characterised by granoblastic-polygonal to nematoblastic textures (Figs 45-48). The remainder of the chips comprise varieties of quartzo-feldspathic gneiss (very fine- to medium-grained varieties), late-stage/secondary alkali feldspar aggregates and a fine-grained Fe-Ti oxide (~50 %) + quartz + feldspar + biotite + hornblende rock.

The amphibolites are fine- to medium-grained and range from homogeneous to layered, from equigranular to seriate, to foliated/lineated (i.e. nematoblastic). Typically, they comprise sub-equal amounts of hornblende (brownish green, bluish green, green) and feldspar (mostly moderately clouded, i.e. kaolinised and/or sericitised), with accessory Fe-Ti oxides and apatite. Some amphibolites chips contain quartz (up to ~20 %) and biotite (up to ~5 %). Hornblende content varies between ~30-70 %.

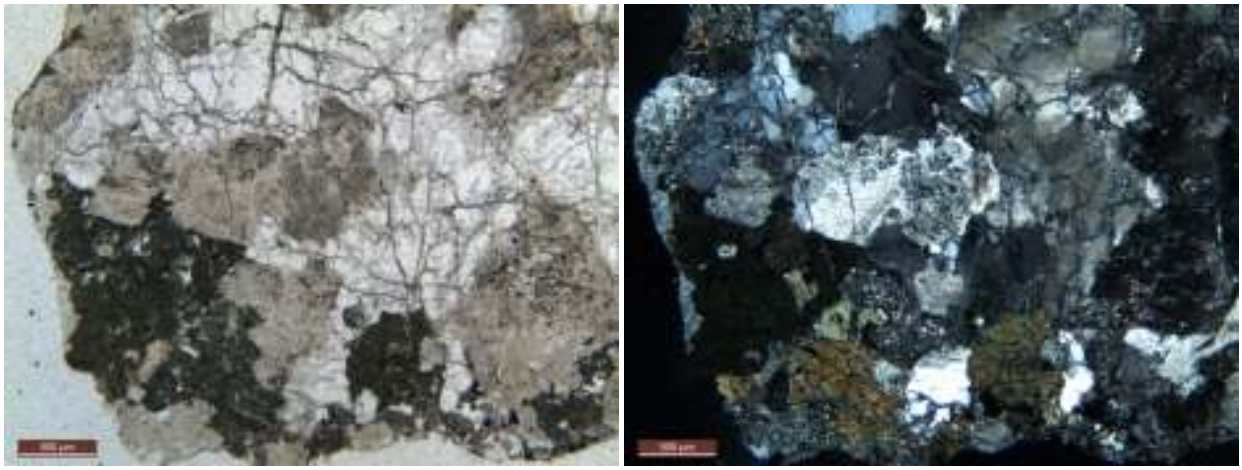


Figures 45 & 46. PPL & XP views. *Amphibolite with equigranular to seriate granoblastic-polygonal texture. Plagioclase clouded and rock cut by late-stage alkali feldspar vein. Scale bar = 0.5 mm.*



Figures 47 & 48. PPL & XP views. *Layered and foliated amphibolite. Scale bar = 0.5 mm.*

The quartzo-feldspathic gneisses are also characterised by granoblastic, moderately polygonal textures (Figs 49-50). Biotite may be more prevalent than hornblende in some chips. One chip looks like a highly recrystallised mylonitised granitoid.



Figures 49 & 50. PPL & XP views. *Hornblende-bearing tonalitic gneiss/granitoid. Scale bar = 0.5 mm.*

The late-stage alkali feldspar ranges from fine- to medium-grained and occurs in veins and aggregates.

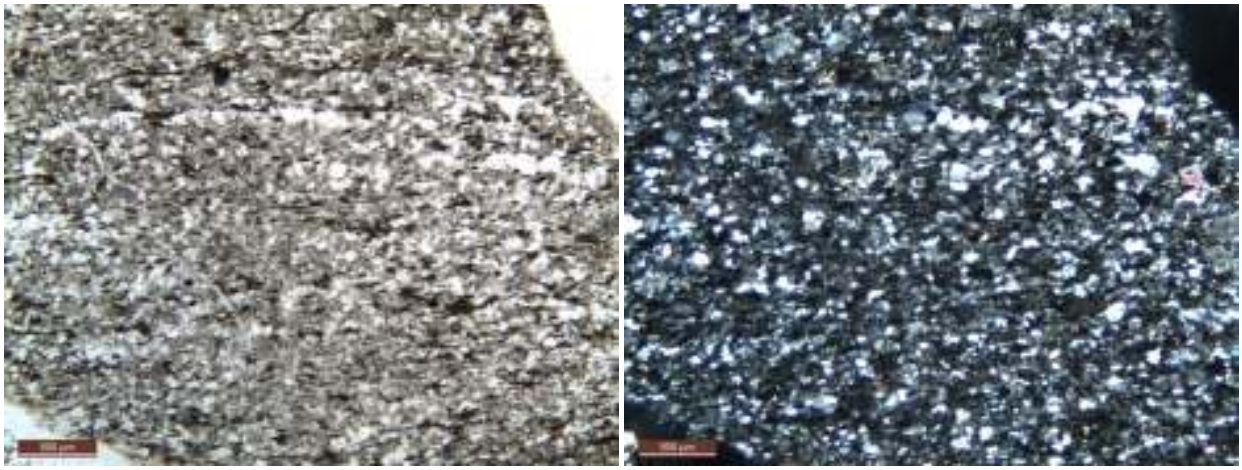
Carbonate is a minor, late-stage replacement mineral, with one crystal over 3 mm in size.

Discussion/Interpretation: The extremely well-crystallised nature of the amphibolites (and gneiss) indicates upper amphibolite (to lower granulite) facies metamorphism, probably at mid-crustal levels.

VSAC 16 47-49

Petrographic name: Biotite-bearing quartzo-feldspathic schist, deformed and recrystallised granitoid and granitic gneissic schists

The polished thin-section consists of ~80-100 chips (average ~4 mm; range = <1-11 mm) of which ~80 % are fine-grained biotite quartzo-feldspathic schists, with up to ~25 % red-brown to reddish biotite (Figs 51-52). Typically, quartz and feldspar form a granoblastic (±polygonal) base for highly aligned biotite flakes (i.e. lepidoblastic texture). Muscovite is present as an accessory mineral in several of the chips.



Figures 51 & 52. PPL & XP views. *Very fine-grained biotite quartzo-feldspathic schist/gneiss. Scale bar = 0.5 mm.*

The remainder of the chips comprise biotite-bearing fine- to medium-grained quartzo-feldspathic gneisses and schists, variably deformed and recrystallised granitoids and fine- to medium-grained alkali feldspar aggregates. Many of the gneiss and gneissic schists have augen structures and display a wide spectrum of deformation and recrystallisation features.

Figures 53 & 54. PPL & XP views. *Biotite gneiss, variably foliated, layered, deformed and recrystallised. Scale bar = 0.5 mm.*

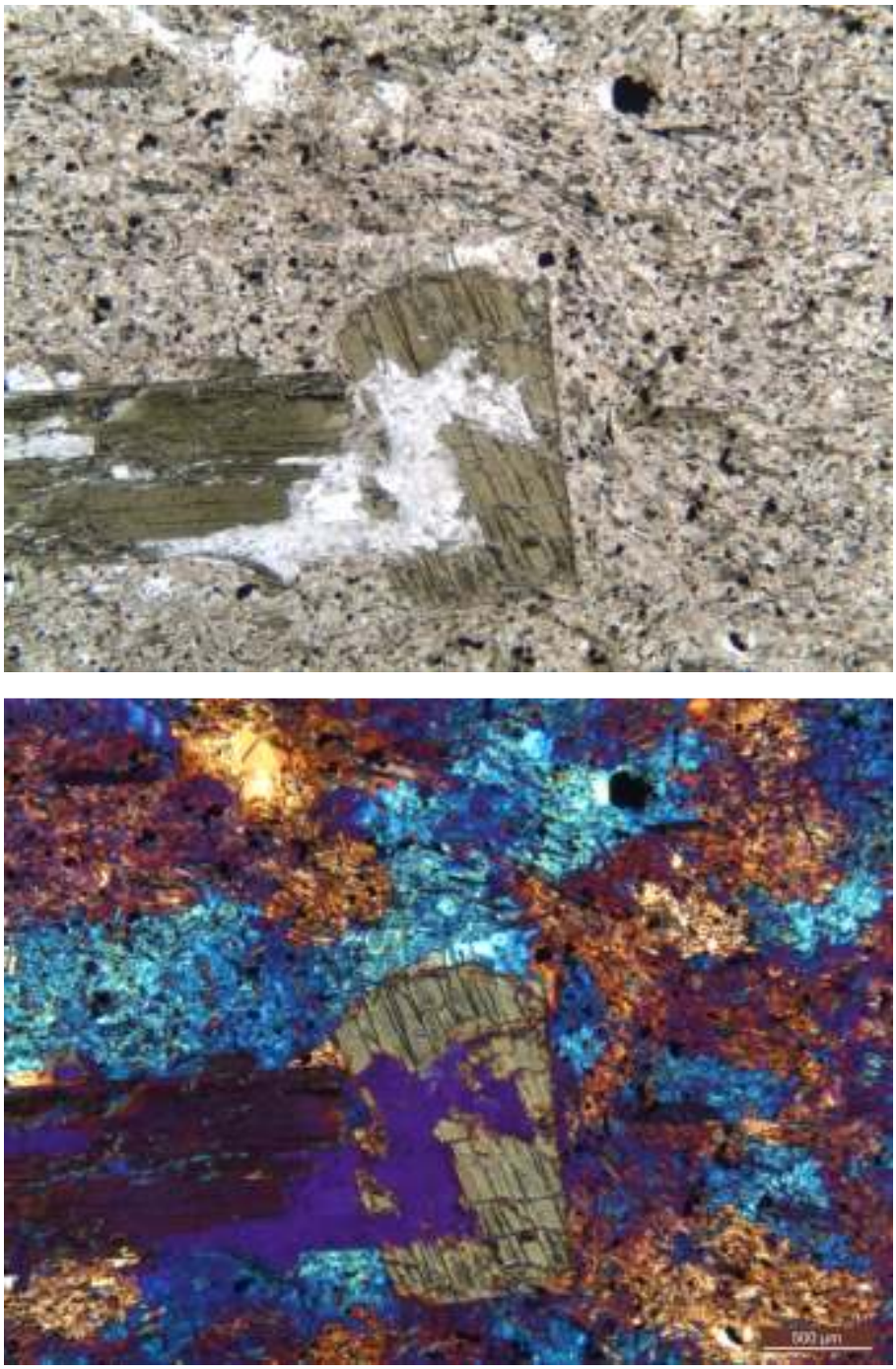
One chip has a cataclastic texture.

Many chips are veined by alkali feldspar and, in places, by carbonate.

VSAC 18 6-10

Petrographic name: Coarsely devitrified, dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of six chips (average size ~1.5 cm; range = 1.3-2 cm) of coarsely devitrified dacitic-andesitic hornblende lamprophyre (Figs 55-56). Hornblende phenocrysts (2-4 %) range from euhedral to subhedral and from equant to elongate (up to 4.5 mm long). In the groundmass the hornblende occurs as microlites and acicular to lath-like crystals.



Figures 55 & 56. PPL and XP (gypsum plate) views. *Hornblende lamprophyre with coarse porphyroblastic "devitrification" (or metasomatic) texture. Scale bar = 0.5 mm.*

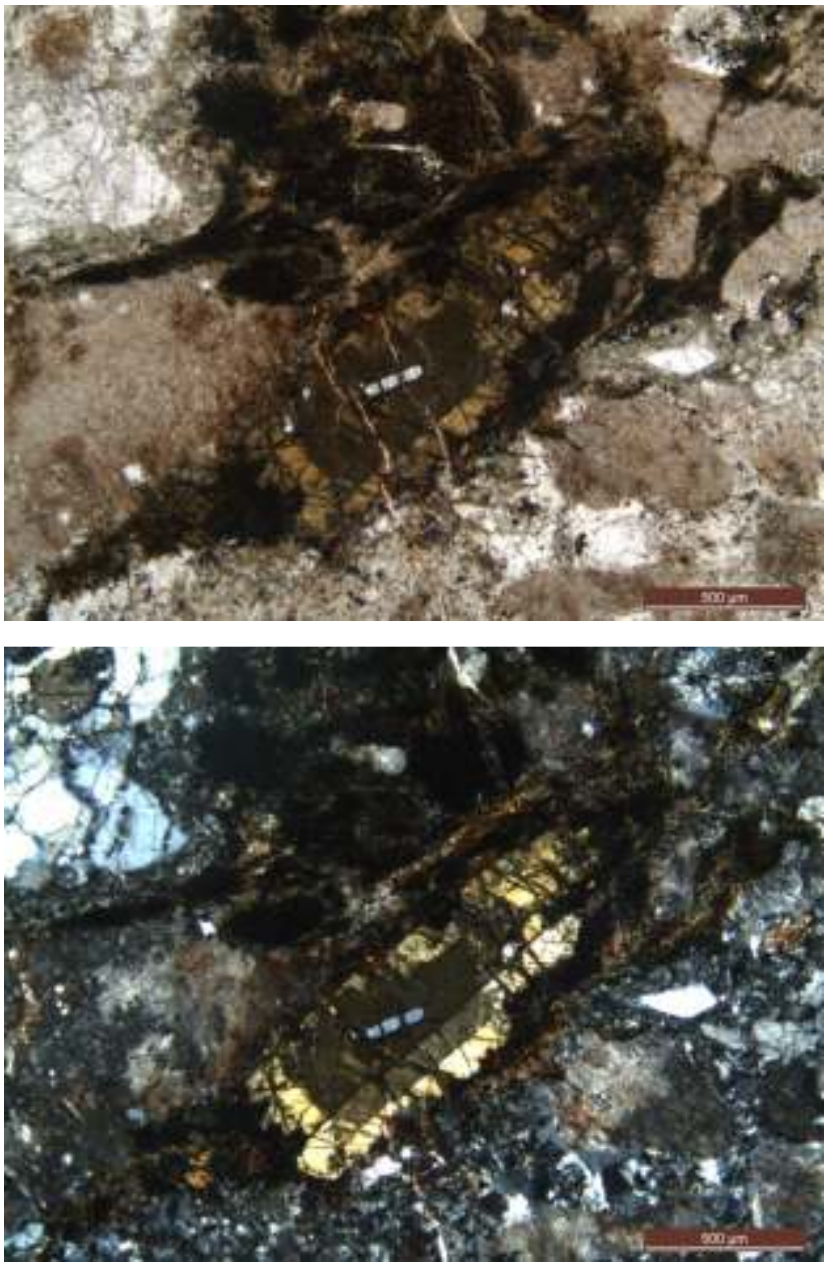
The rock chips generally contain a few percent of alkali feldspar patches and aggregates. Veins of alkali feldspar also cut the rock.

VSAC 18 21-22

Petrographic name: Coarsely devitrified, dacitic-andesitic hornblende lamprophyre + highly altered, deformed and partially recrystallised biotite granitoid

The polished thin-section consists of five chips (average size ~2 cm) of which four are coarsely devitrified dacitic-andesitic hornblende lamprophyre (like VSAC 18 6-10) and one is a highly altered medium- to coarse-grained biotite granitoid.

The granitoid chip contains accessory apatite, ?allanite (Figs 57-58) and zircon. The rock is highly fractured and veined (by alkali feldspar), moderately deformed, and partly recrystallised (typically around grain boundaries). The appearance of the rock suggests it has been partially melted, with remobilisation of alkali feldspar into fractures and veins.



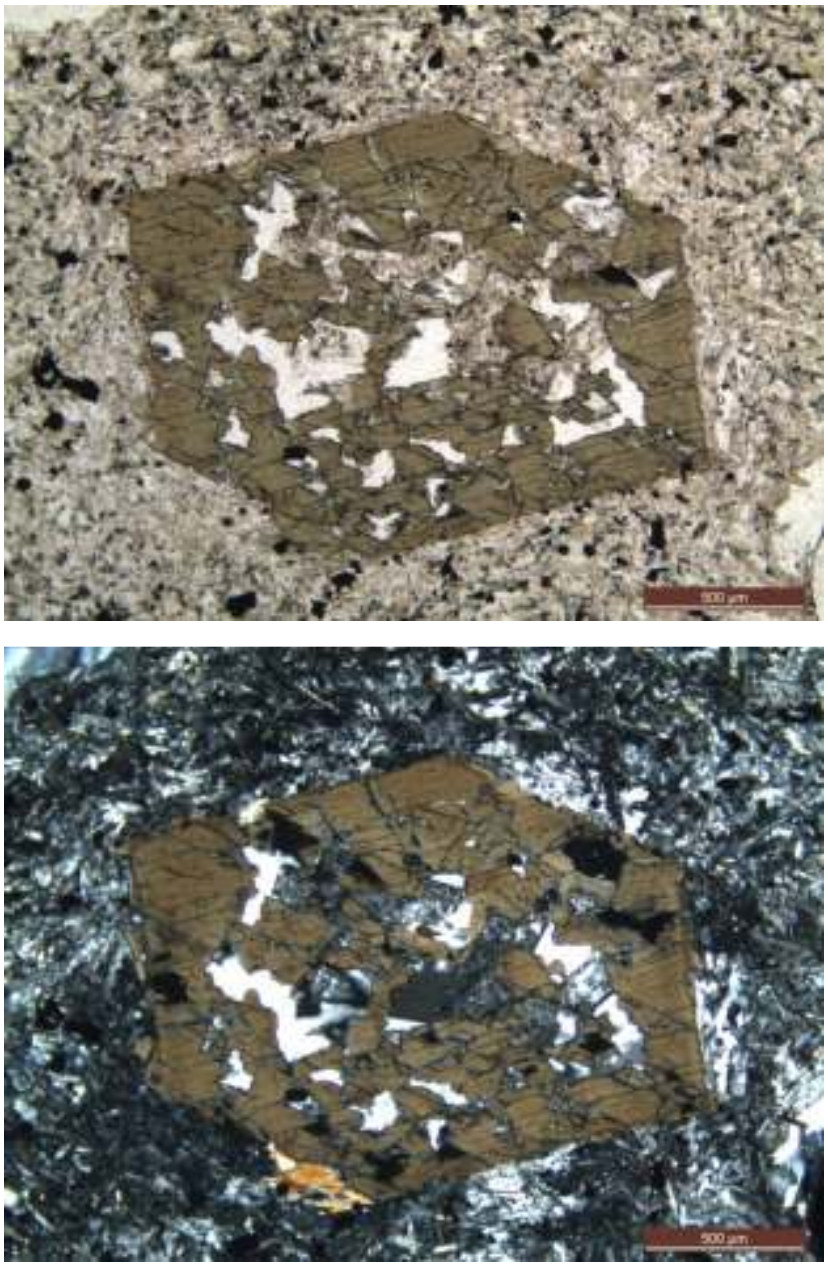
Figures 57 & 58. PPL & XP views. *?Allanite in partly altered, deformed and recrystallised biotite granitoid. Scale bar = 0.5 mm.*

VSAC 18 28-29

Petrographic name: Devitrified dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~35 chips (average size ~10 mm; range = 1-20 mm), comprising devitrified dacitic-andesitic hornblende lamprophyre (Figs 59-60). The devitrification phenomenon is not as common or as coarse-grained as it is in VSAC 18 6-10 and VSAC 18 21-22.

Characteristically, the dacitic-andesitic lamprophyre rock chips contain patches (equant to lenticular, up to 2 mm diameter or length) of well-recrystallised alkali feldspar. Some of the patches are vein-related, some amygdaloidal and some possibly pseudomorphic after equant precursors. Some of the so-called alkali feldspar may be something like stilbite, especially the radiating columnar material.



Figures 59 & 60. PPL & XP views. *Euhedral, "poikilitic" hornblende phenocryst with alkali feldspar inclusions set in a felsitic groundmass. Devitrification/metasomatic textures evident in the groundmass. Scale bar = 0.5 mm.*

VSAC 18 COMP 1

Petrographic name: Coarsely devitrified dacitic-andesitic hornblende lamprophyre; strongly veined

The polished thin-section consists of five chips (average size ~1.8 cm), comprising comparatively coarsely devitrified dacitic-andesitic hornblende lamprophyre. The chips are generally more Fe-stained and kaolinised than the previously described VSAC 18 rocks. Some of the hornblende phenocrysts have dark green cores. Several clasts (xenoliths) of feldspar and quartz are present.

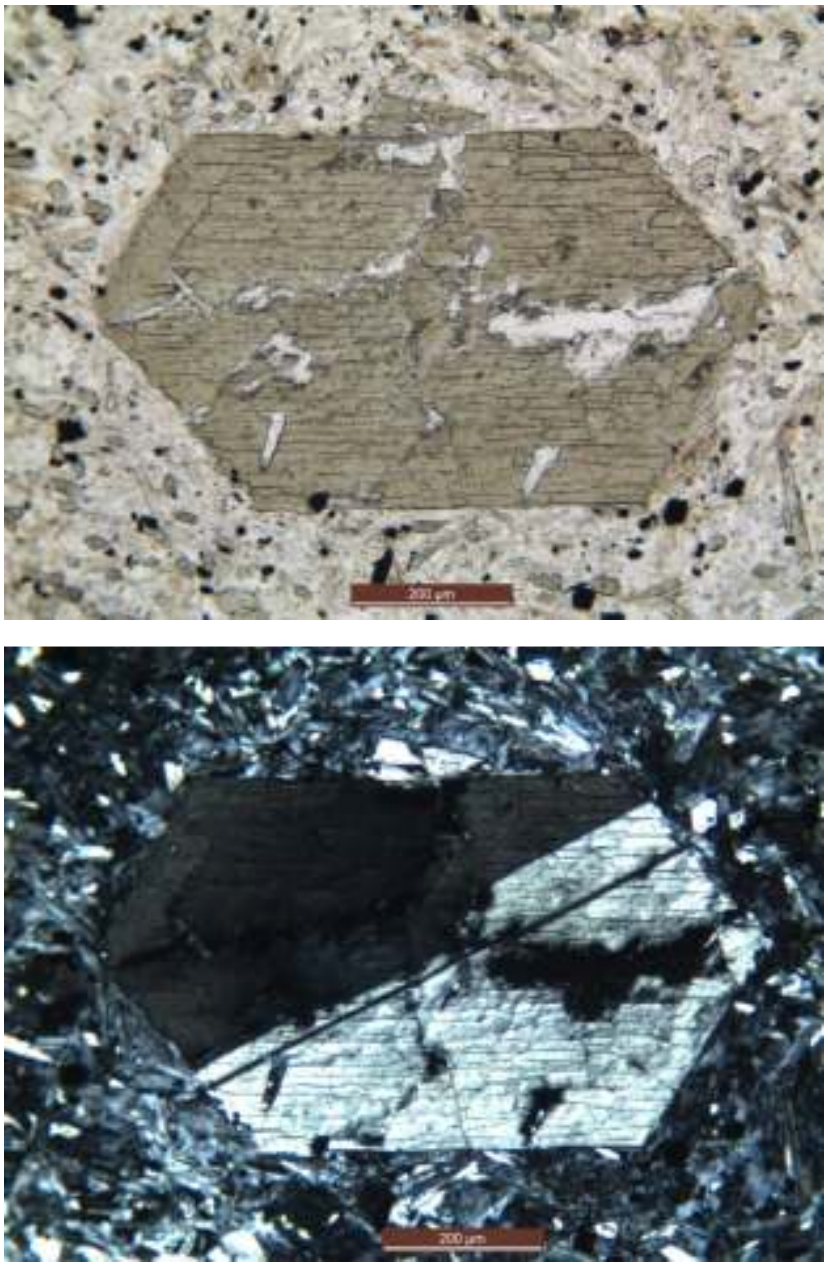
A conspicuous feature of this polished thin-section is the presence of thick veins (up to 1 mm) filled with alkali feldspar and carbonate. Carbonate generally occupies the centre of the veins.

VSAC 18 COMP 2

Petrographic name: Coarsely devitrified dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of seven chips (average size ~1.5 cm), comprising coarsely devitrified dacitic-andesitic hornblende lamprophyre. Several of the hornblende phenocrysts have green cores. One hornblende phenocryst has an euhedral form that is not unlike that of olivine (Figs 61-62).

A few xenocrysts of feldspar and (altered) biotite are present.



Figures 61 & 62. PPL & XP views. *Euhedral, twinned hornblende phenocryst which has a form not unlike that of olivine. Scale bar = 0.2 mm.*

VSAC 20 32-34

Petrographic name: Dacitic-andesitic hornblende lamprophyre + hornblende (and biotite) monzonite-diorite

The polished thin-section consists of six chips (average size ~1.5 cm) comprising three of hornblende lamprophyre and three of foliated and recrystallised hornblende- and biotite-bearing quartz monzonite-diorite.

One of the three lamprophyre chips is similar to the preceding material, but two of them are different in that they are (or were) mostly glassy, i.e. vitrophyric (Fig 63). This implies that the vitrophyric chips represent contact or chilled zones.

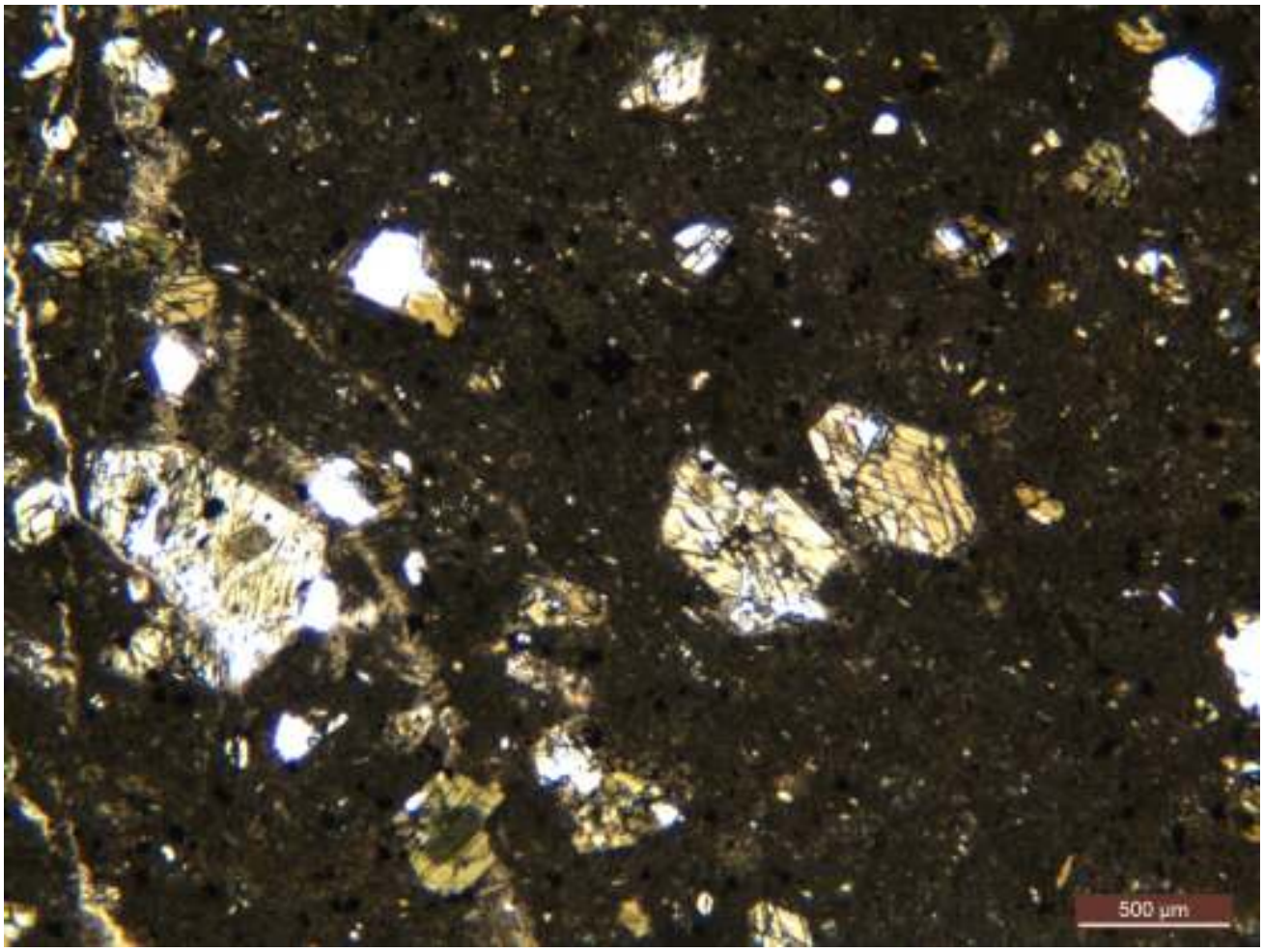


Figure 63. PPL view. *Hornblende phenocrysts set in a very fine-grained, more-or-less glassy groundmass. Several hornblende phenocrysts have green cores. Scale bar = 0.5 mm.*

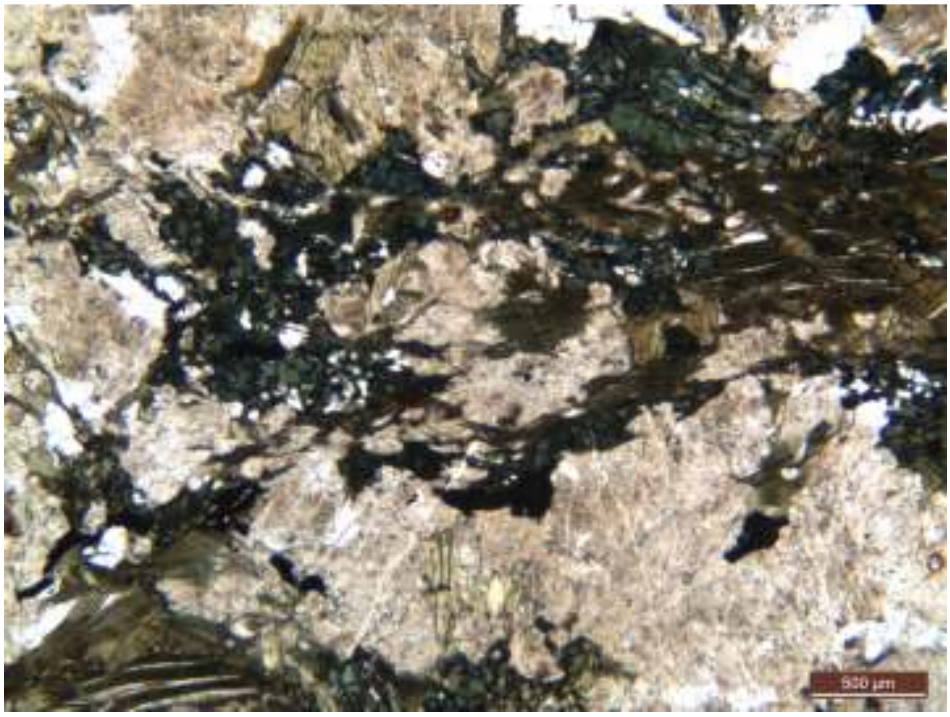
One lamprophyre chip contains rare feldspar and quartz xenocrysts. As common, the lamprophyre chips are variably affected by late-stage alkali feldspar and carbonate veining/replacement.

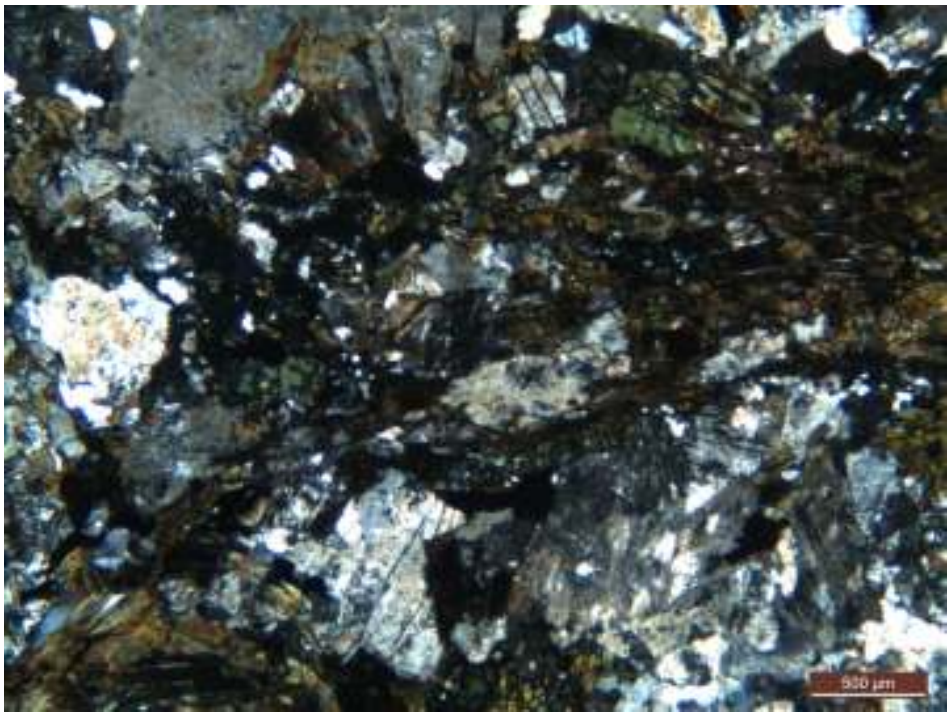
The quartz monzonite-diorite rocks (e.g. Figs 64-65) are fine- to coarse-grained, but prior to recrystallisation they were mainly medium- to coarse-grained. They comprise, very approximately (each chip is different):

Feldspar (predominantly plagioclase, red-stained)	~65 %
Biotite	10-12 %
Hornblende	8-10 %

Quartz	0-20 %
Fe-Ti oxides	2-3 %
Apatite	<=1 %

Textures range from relict subhedral granular (igneous) ones to metamorphic granoblastic-polygonal and lepidoblastic granular ones.





Figures 64 & 65. PPL & XP views. *Partly altered and recrystallised green hornblende- and biotite-bearing quartz monzonite-diorite. Plagioclase is clouded and hornblende is variably poikilitic. Biotite is moderately aligned, producing a mild foliation in the rock. Scale bar = 0.5 mm.*

VSAC 20 37-39

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~50 chips (average size ~5 mm; range = <=1-18 mm), comprising a range of dacitic-andesitic hornblende lamprophyre types, from semi-glassy to weakly recrystallised-devitrified. Some of the chips are >70 % composed of late-stage alkali feldspar. In some of the larger chips, some of the alkali feldspar veins and pods are up to 3 mm wide. Late-stage carbonate is present in some of the chips.

VSAC 21 18-19

Petrographic name: Altered, devitrified, dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of five chips (average size ~15 mm; range = 5-20 mm) of highly altered dacitic-andesitic hornblende lamprophyre. Only trace amounts of original hornblende are left unaltered. Pods and lenses (0.4-6 mm) of fresh alkali feldspar make up ~1-5 % of the chips. Most of the chips show fine- to medium-grained crystalloblastic devitrified textures.

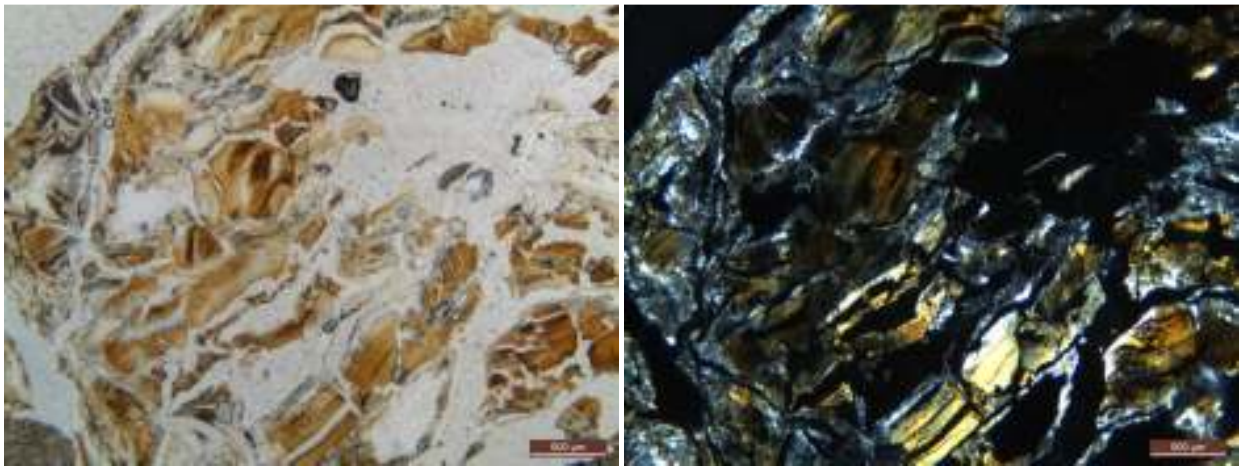
VSAC 26 9-11

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre + metamorphosed hornblende- and biotite-bearing granitoid

The polished thin-section consists of 19 chips (average size ~10 mm; range = 3-17 mm) of which 16 are dacitic-andesitic hornblende lamprophyre and three are fine- to coarse-grained, metamorphosed hornblende- and biotite-bearing granitoids.

Hornblende phenocrysts in the lamprophyre range from fresh to completely altered. Some have alteration rims and a few have green cores and internal zoning. Some of the lamprophyre chips contain angular to irregular clasts (xenocrysts) of quartz and feldspar.

One lamprophyre chip is dominated by a large (~10 x 6 mm) patch of yellow-orange to colourless phyllosilicates pseudomorphing a large phenocryst or phenocryst cluster of what may have been hornblende, or possibly even olivine (Figs. 66-67).



Figures 66 & 67. PPL & XP views. *Former large crystal of altered hornblende or olivine. Scale bar = 0.5 mm.*

The metamorphosed granitoid rocks are highly altered, particularly the former biotite, which is now all semi-opaque to opaque Fe-oxides/hydroxides.

VSAC 26 15-17

Petrographic name: Variably altered and devitrified hornblende lamprophyre

The polished thin-section consists of nine chips (average size ~2 cm long; range up to 2.8 cm long) comprising variably altered and variably devitrified hornblende lamprophyre. Several chips have a heterogeneous texture caused by the presence of finer grained and more porphyritic sub-domains (?cognate xenoliths) (Fig. 68).

Most of the chips contain minor amounts of xenocrysts of quartz and feldspar and xenoliths of granitoid material.

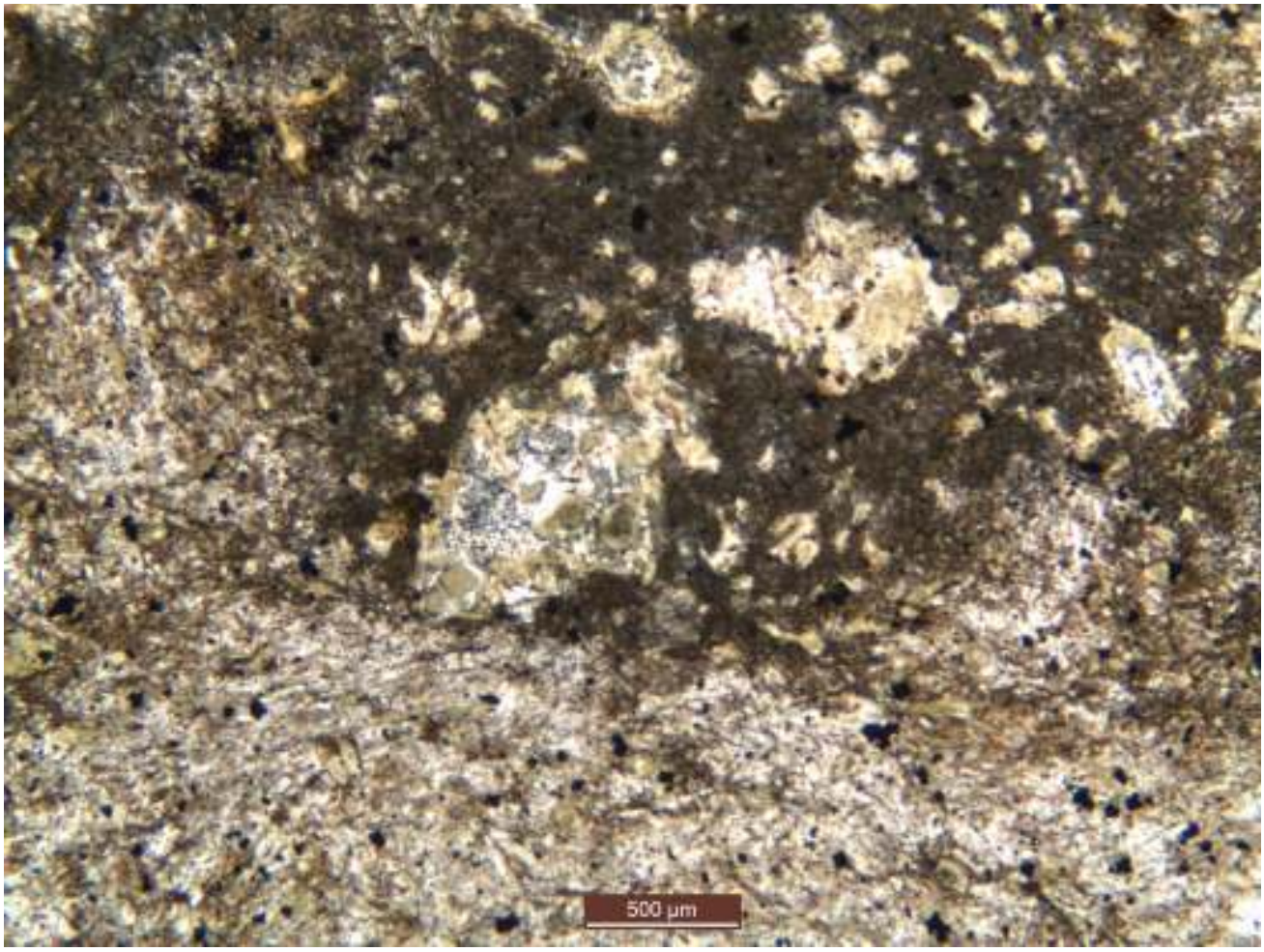


Figure 68. PPL view. *Mottled lamprophyre caused by the presence of darker, finer grained and more porphyritic material set in coarser grained, less porphyritic lamprophyre. Hornblende phenocrysts partially to completely altered. Scale bar = 0.5 mm.*

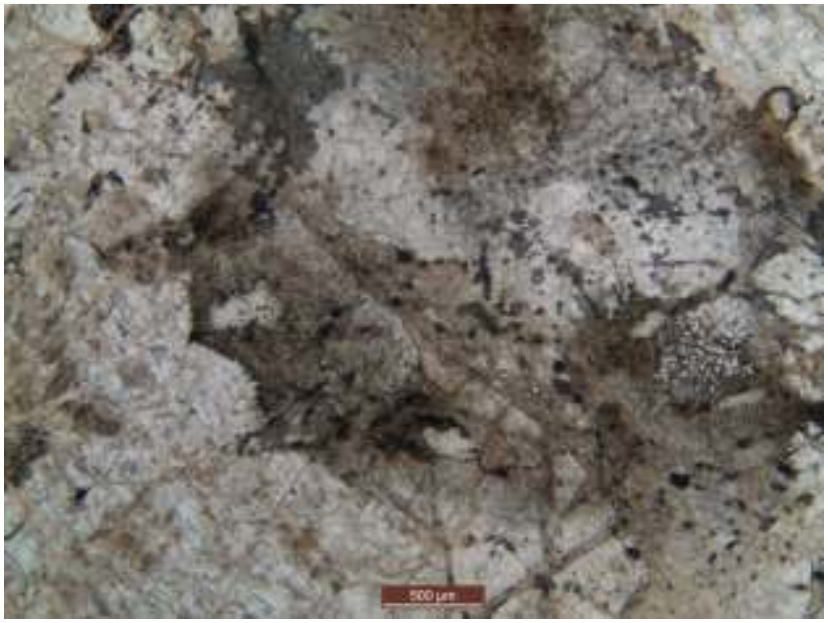
VSAC 32 66-67

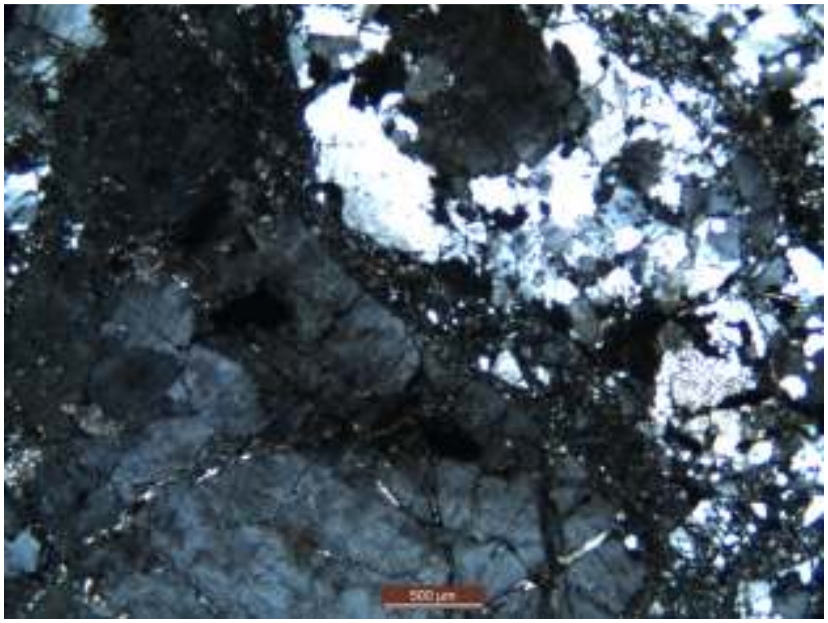
Petrographic name: Cataclasites, fault breccias and ?tuffs/volcaniclastics

The polished thin-section consists of 12 chips (average size ~1.5 cm) comprising:

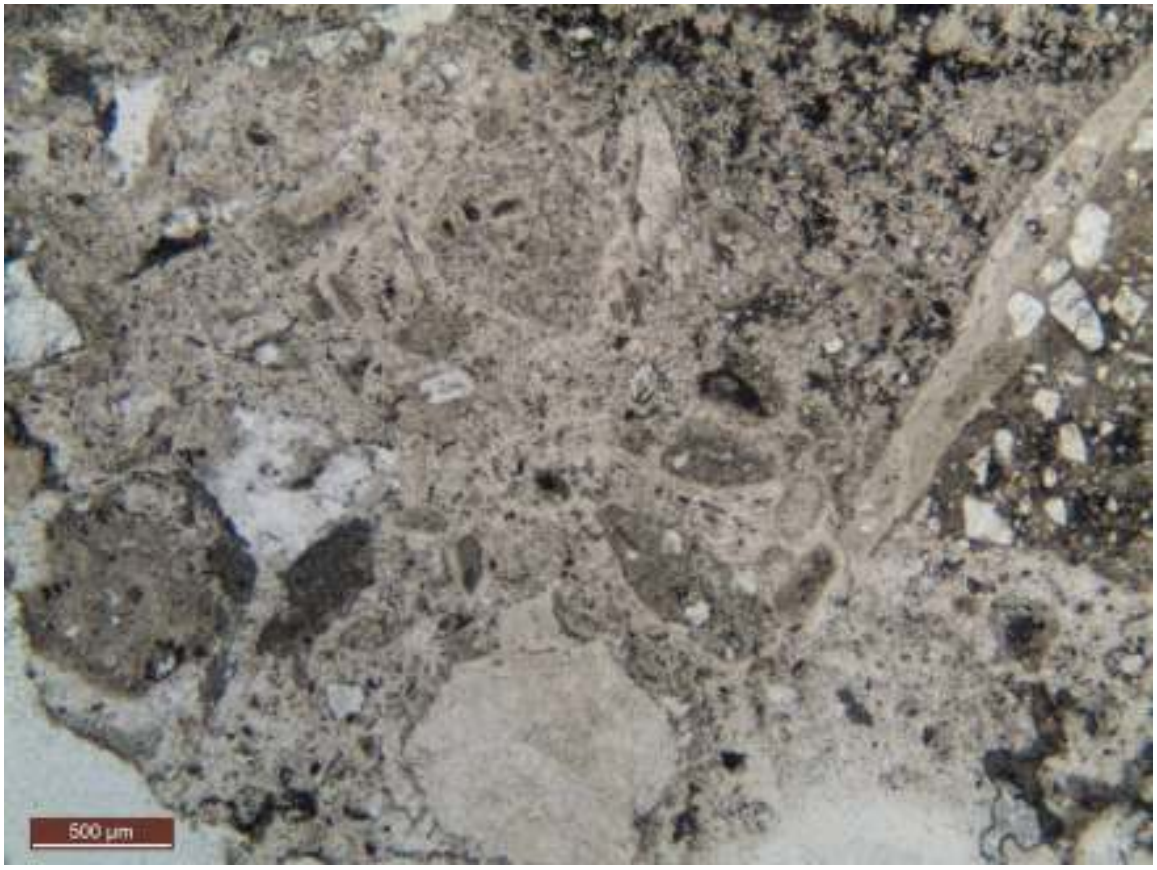
a) Cataclastic medium- to coarse-grained granitoid
b) Feldspathised fault breccia or crystal lithic tuff

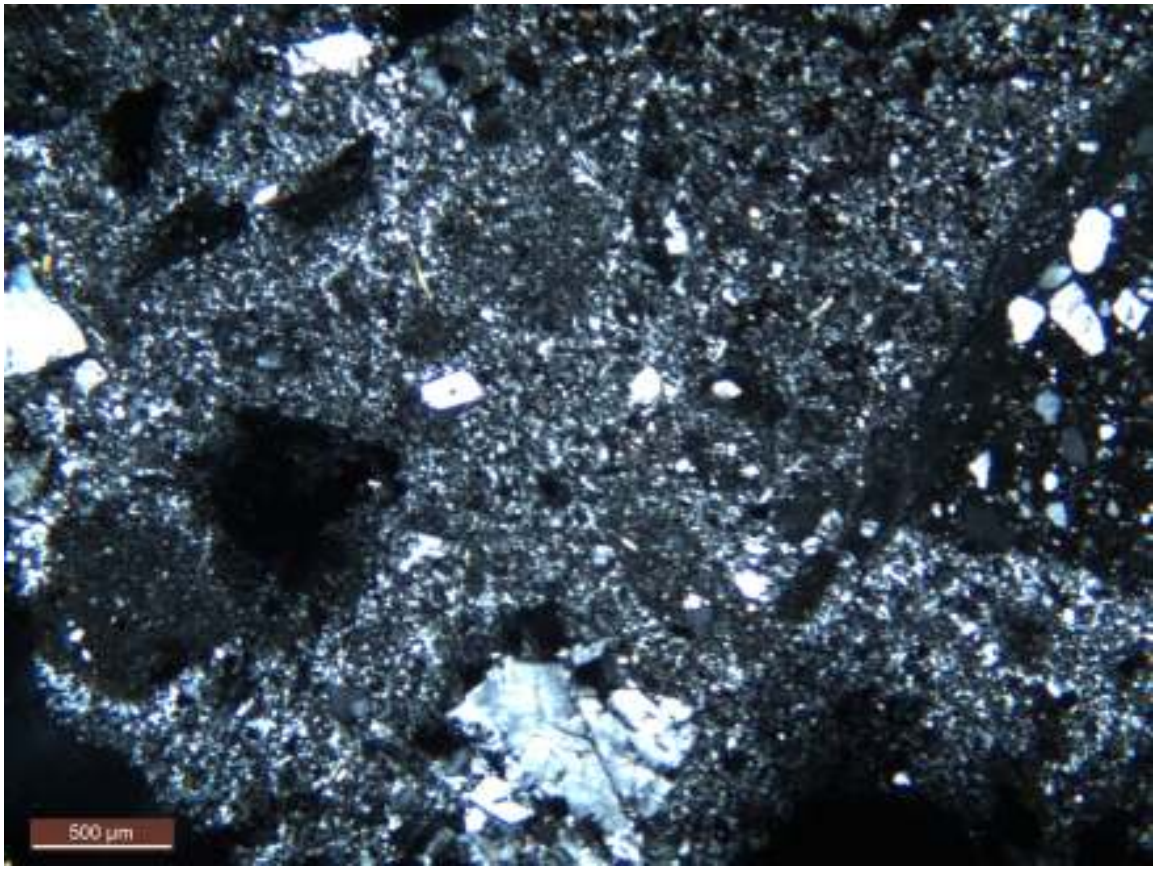
The granitoid rocks are variably deformed and recrystallised and are cut by numerous cataclastic zones, producing, in places, pseudo tuff-like or fault breccia textures (Figs 69-72).





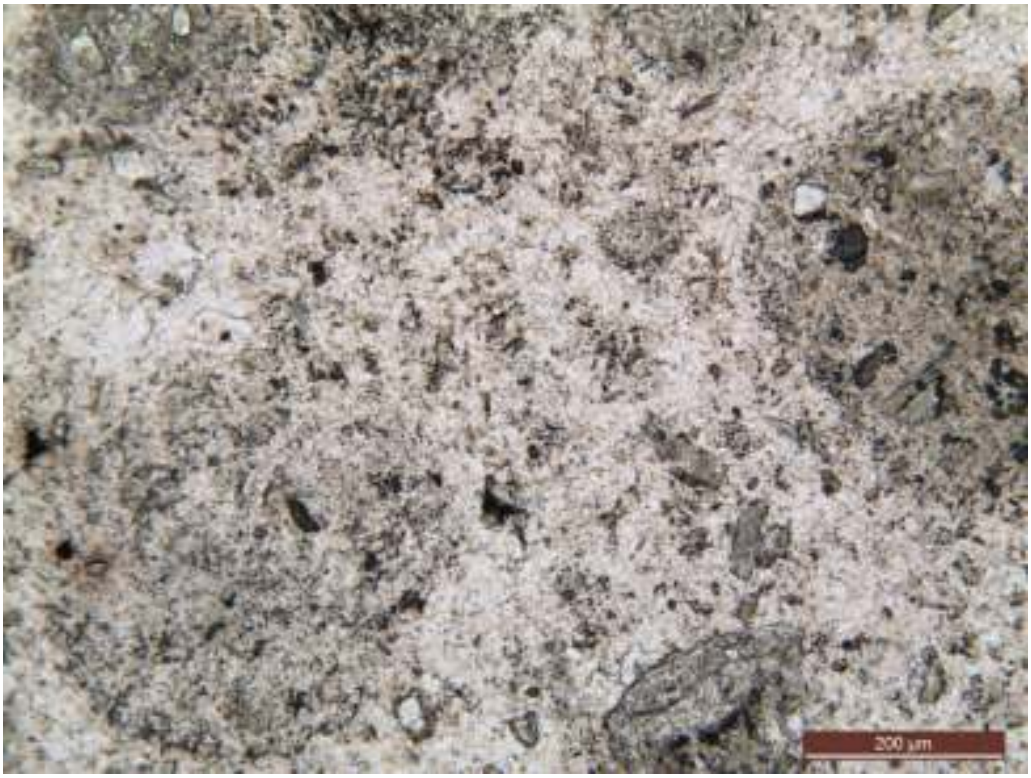
Figures 69 & 70. PPL & XP views. *Thin breccia zone in granitoid, trending NW-SE in the centre of the field-of-view. Scale bar =0.5 mm.*

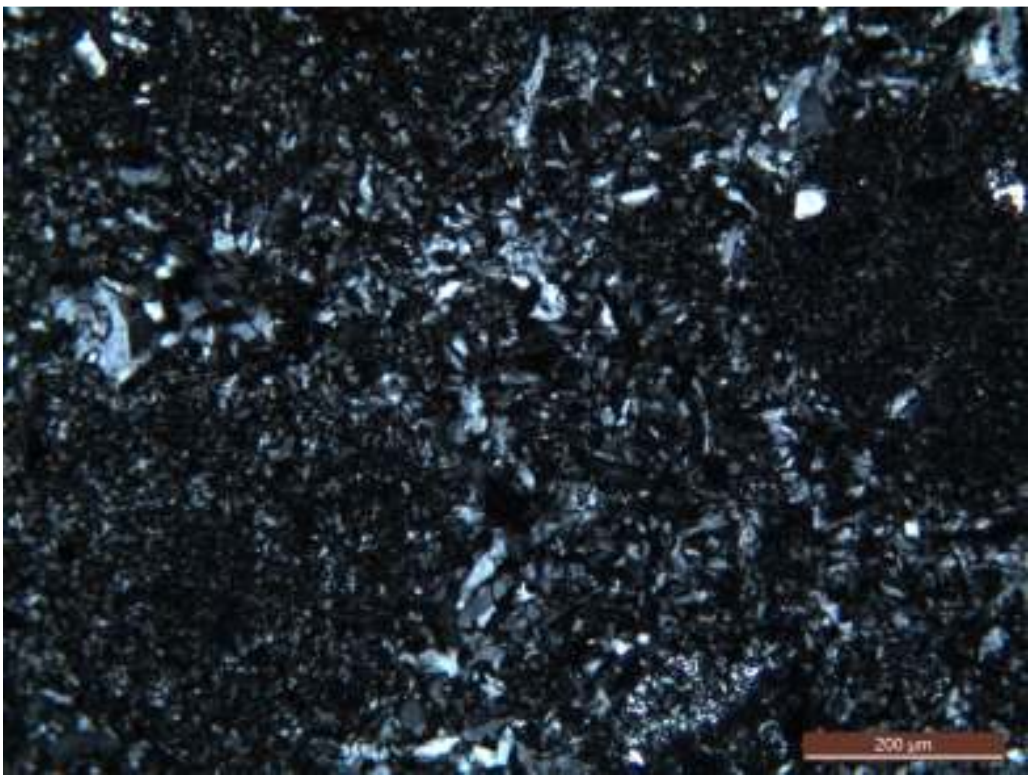




Figures 71 & 72. PPL & XP views. *Breccia produced in granitoid rock. Feldspar clast lower centre. Scale bar = 0.5 mm.*

The feldspathised fault breccia or “tuff” are dominated by microcrystalline-cryptocrystalline feldspar, replacing, and/or forming a matrix to clasts (rounded to angular) of feldspar (fresh to totally altered), quartz, granitoid and cryptocrystalline (?lamprophyre) material (Figs 73-74). Chlorite (ex-biotite) and epidote (<=1 %) is present in some of the chips. Unfortunately, the pervasive feldspathisation has obscured many primary features and textures.





Figures 73 & 74. PPL & XP views. *Two ovoid clasts overprinted by cryptocrystalline ?alkali feldspar crystallisation/metasomatism. Matrix is more micro-crystalline. Scale bar = 0.2 mm.*

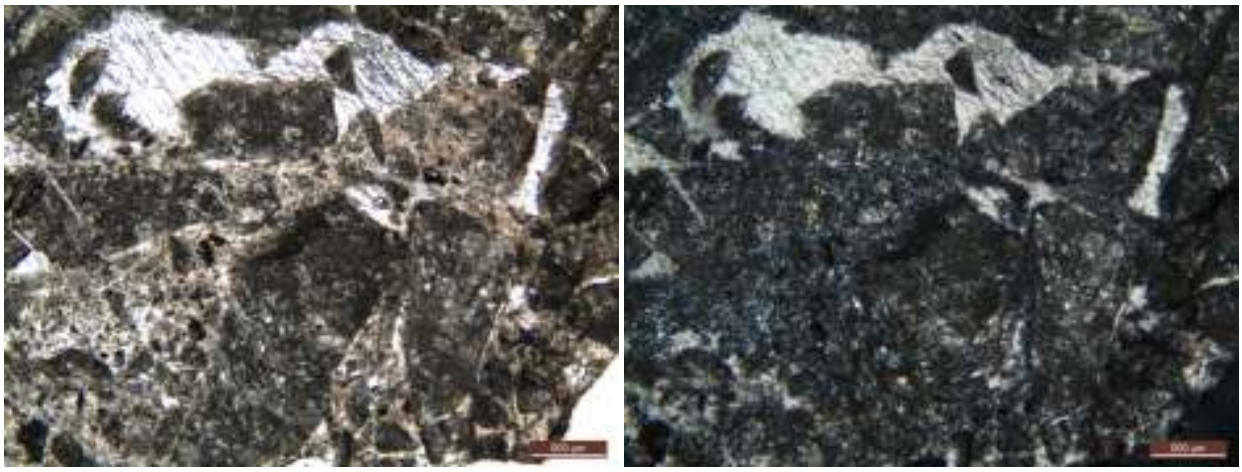
Carbonate is present in some of the chips as porphyroblastic material (crystals up to 5 mm in size).

Although there is prima facie evidence to suggest many of the chips are tuffaceous or volcaniclastics, there is also strong evidence to suggest that some of the rocks are cataclasites.

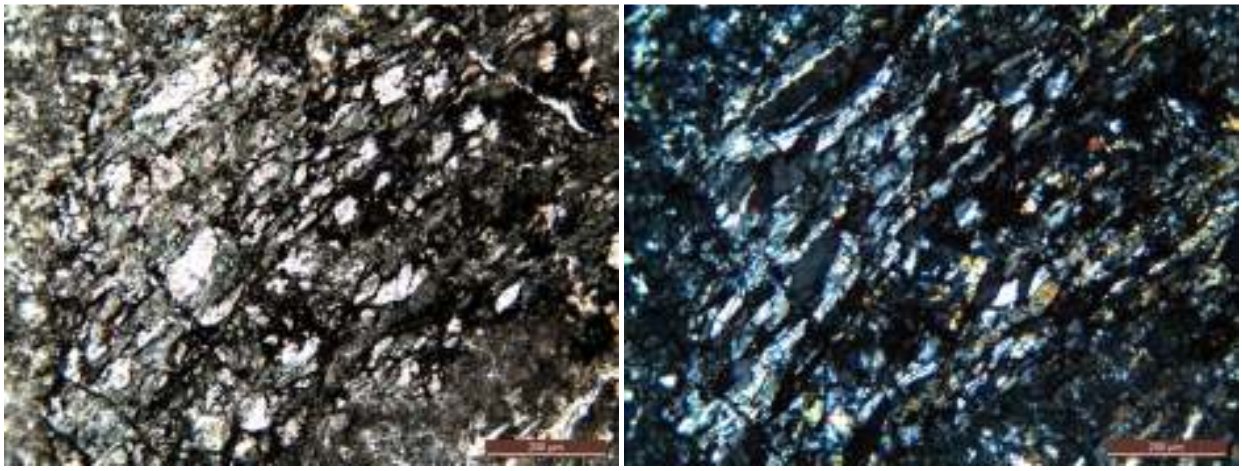
VSAC 33 23-24

Petrographic name: Highly altered cataclasites/intrusive breccias/?volcaniclastics

The polished thin-section consists of 11 chips (average size ~1.5 cm) comprising a wide range of highly altered (e.g. kaolinised, haematitised, feldspathised, carbonated) fault breccias (Figs 75-76). Some chips are sheared and foliated. One chip contains green hornblende (Figs 77-78), possibly related to former porphyritic/poikiloblastic crystals, similar to material seen in VSAC 20 32-34.



Figures 75 & 76. PPL & XP views. *(Intrusive) breccia. Note secondary carbonate (colourless). Scale bar = 0.5 mm.*



Figures 77 & 78. PPL & XP views. *Semi-poikilitic/poikiloblastic hornblende, possibly representing a former tonalitic rock fragment. Scale bar = 0.2 mm.*

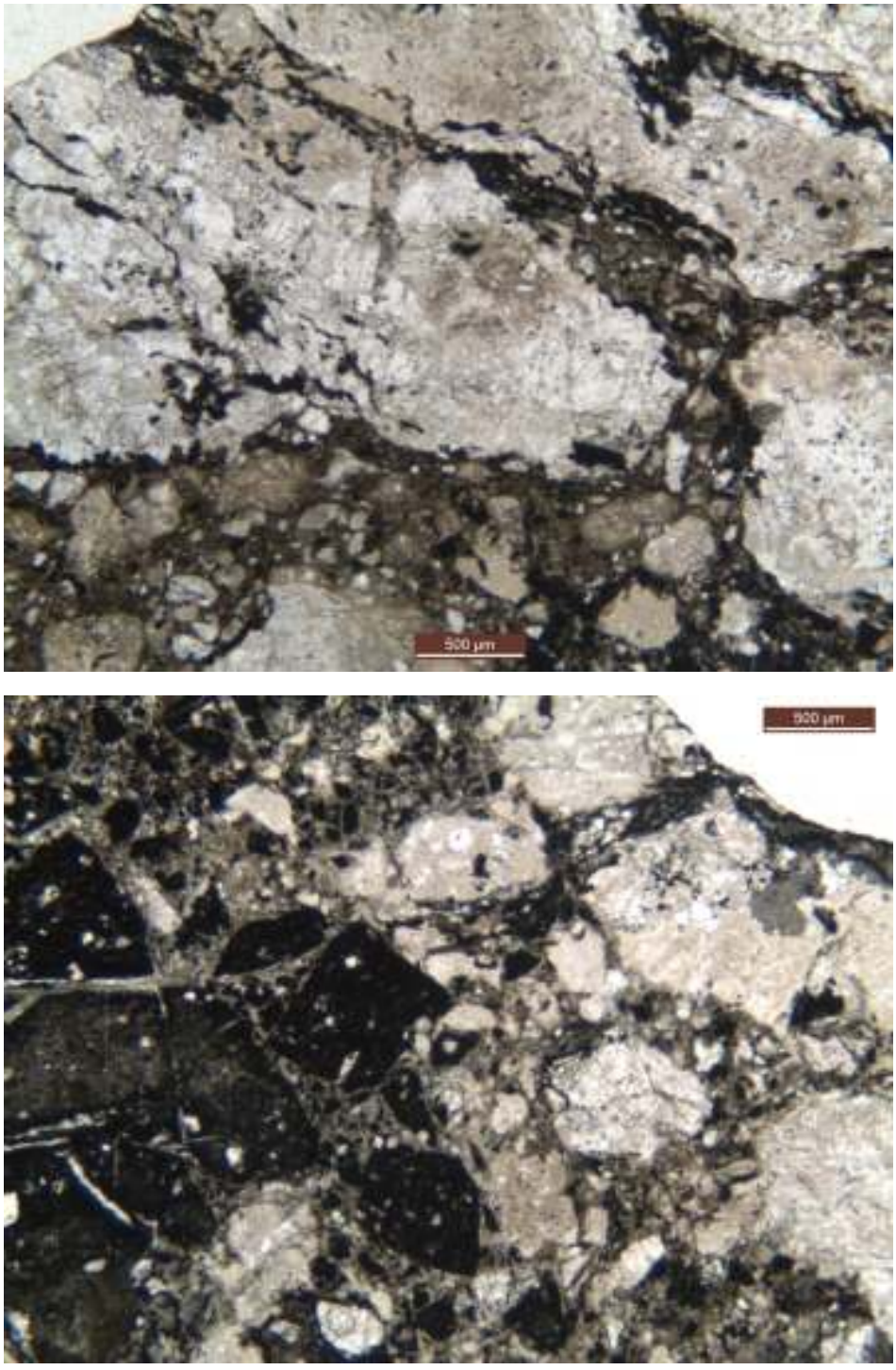
Carbonate replacement is strong in places, occupying interstitial zones between fragmented host rock, occurring in veins up to 10 mm thick and replacing former crystals (e.g. feldspar).

Comment. My favoured interpretation of the rocks represented in this polished thin-section is that they are intrusive breccias produced by the intrusion of dacitic-andesitic lamprophyre into granitoids that had been brecciated by hydraulic fracturing processes. This may have been accompanied with, or followed by, gas-streaming, which resulted in the rounding of some of the clasts.

VSAC 34 47-48

Petrographic name: Highly altered cataclasites/ fault breccia/ intrusive breccias in granitoids

The polished thin-section consists of 16 chips (average size ~15 mm; range = 3-26 mm) comprising a full spectrum of variably deformed and recrystallised hornblende- and biotite-bearing granitoids that grade into fault-breccias (Figs 79-80), some of which look like tuffs/volcaniclastics.



Figures 79 & 80. PPL. *Two different chips demonstrating the progressive disaggregation and brecciation of granitoids by the intrusion of lamprophyric magma. Scale bar = 0.5 mm.*

However, there is irrefutable evidence of the progressive disaggregation of the granitoid rocks, with the penetration of the “tuff’ (i.e. intrusive breccia) into fractures (e.g. Fig. 79)..

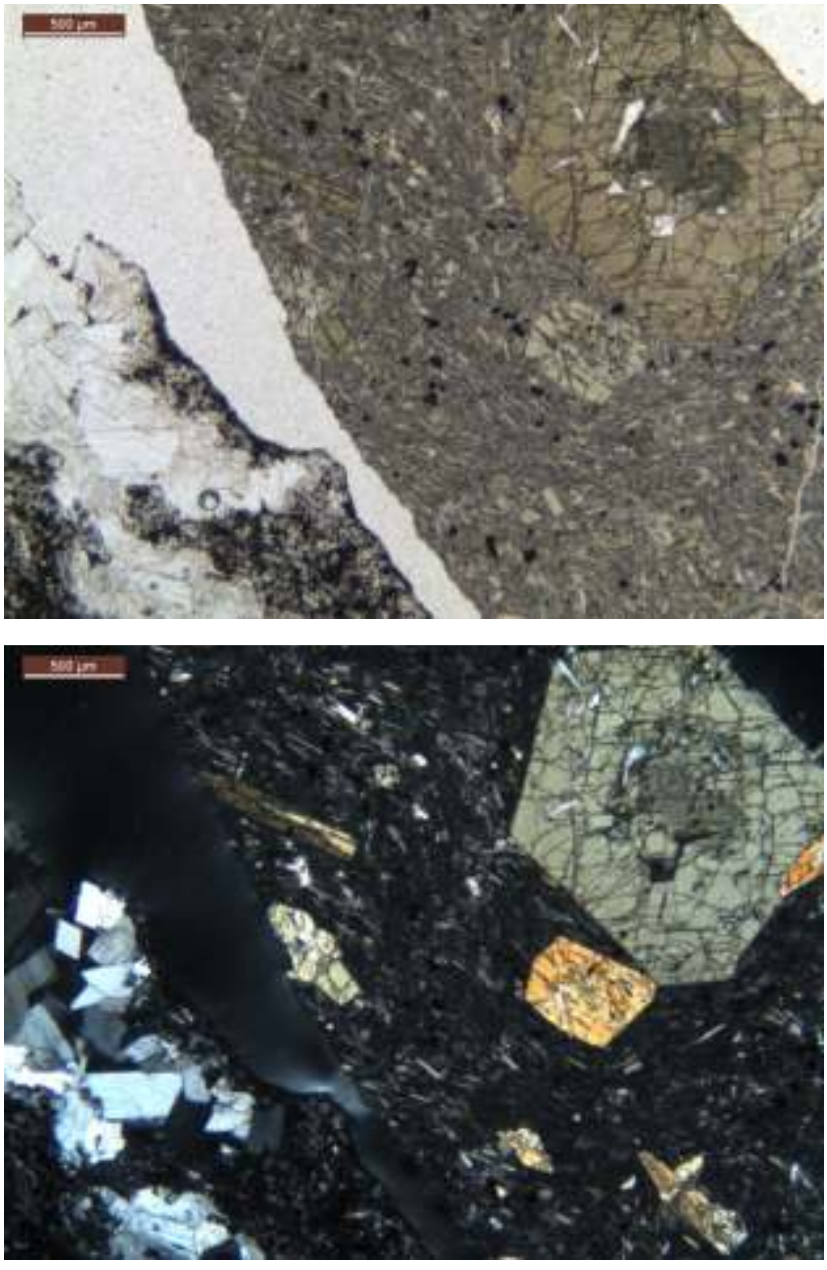
A very unusual feature of the rock is the blackening of many of the former minerals (especially hornblende and biotite) and clasts when viewed under the microscope (Fig. 80).

VSAC 35 39-41

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 26 chips (average size ~10 mm; range = 3-15 mm) comprising dacitic-andesitic hornblende lamprophyre (Figs 81-82), some of which are blackish (see Fig. 81) and most of which are veined by late-stage alkali feldspar (see Figs 81-82). Several chips contain xenocrystic feldspar.

Hornblende phenocrysts are commonly euhedral. A few show euhedral zoning and several have greenish cores (see Fig. 81).



Figures 81 & 82. PPL & XP views. *Two chips of hornblende lamprophyre, one with euhedral, zoned hornblende, the other with late-stage euhedral ?alkali feldspar. Scale bar = 0.5 mm.*

VSAC 36 7-8

Petrographic name: Weakly altered dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 22 chips (average size ~10 mm; range = 3-18 mm) comprising slightly different variations of dacitic-andesitic hornblende lamprophyre. Some have a cryptocrystalline groundmass and were probably glass-rich, originally.

Hornblende is glomeroporphryritic in places. A few phenocrysts are intergrown with or replaced by alkali feldspar.

Most of the chips are traversed by alkali feldspar. Some are also cut by carbonate veins.

VSAC 36 27-28

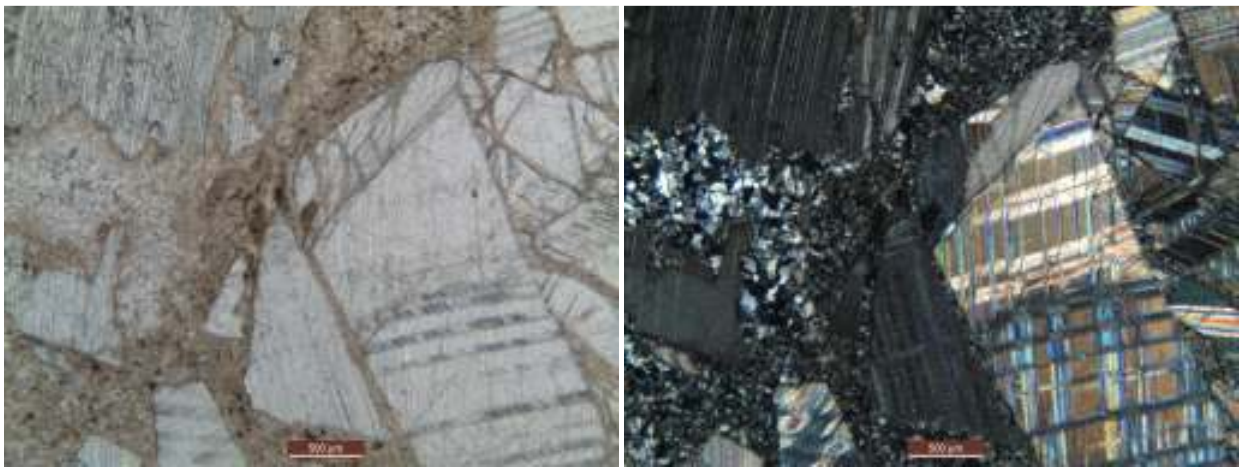
Petrographic name: Moderately altered, deformed and recrystallised hornblende- and biotite-bearing granitoids (some quartzitic)

The polished thin-section consists of 17 chips (average size ~10 mm; range = 3-15 mm) comprising mainly medium- to coarse-grained hornblende- and biotite-bearing granitoids. Several of them are very quartz-rich, ~80%, possibly reflecting a very coarse-grained granitoid precursor. Comparatively coarse-grained Fe-Ti oxides make up to 10 % of some of the granitoid chips (Figs 83-84).

Figures 83 & 84. PPL & XP views. *Fe-Ti oxides in a hornblende- and biotite-bearing granitoid. Scale bar = 0.5 mm.*

One chip in the polished thin-section, measuring 10 x 6 mm, consists of poikilitic plagioclase enclosing anhedral quartz, producing a coarse “pegmatitic” texture.

Three chips in the polished thin-section are dominated by well-crystallised medium- to coarse-grained carbonate, generally in a microcrystalline “groundmass” of crystalloblastic alkali feldspar, with minor chlorite and elongate hornblende crystals (Figs 85-86). It is possible that the chips were originally dacitic-andesitic lamprophyre.

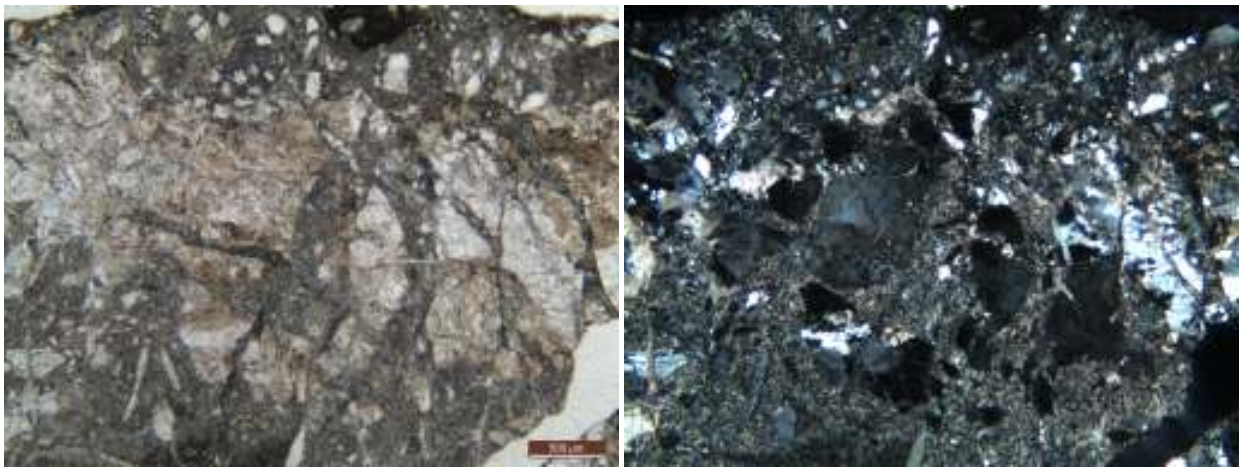


Figures 85 & 86. PPL & XP views. *Carbonate-dominated rock chip. Scale bar = 0.5 mm.*

VSAC 40 37-38

Petrographic name: Highly altered fault and intrusive breccias derived from hornblende- and biotite-bearing granitoids

The polished thin-section consists of ~38 chips (average size ~8 mm; range = 2-15 mm), most of which are fault- and intrusive-breccias derived from hornblende- and biotite-bearing granitoids. All types of gradational relationships of disaggregation are observed (Figs 87-88).



Figures 87 & 88. PPL & XP views. *Brecciation and disaggregation of granitoid. Matrix comprises mainly ?alkali feldspar and white mica. Scale bar = 0.5 mm.*

The granitoids rocks were originally mostly medium- to coarse-grained. Now they show all degrees of deformation, fracturing, recrystallisation and alteration (i.e. kaolinisation). Many now contain secondary carbonate and epidote.

One chip contains a sharp contact between microcrystalline-cryptocrystalline cataclasite/mylonite and disaggregated granitoid (Figs 89-90).

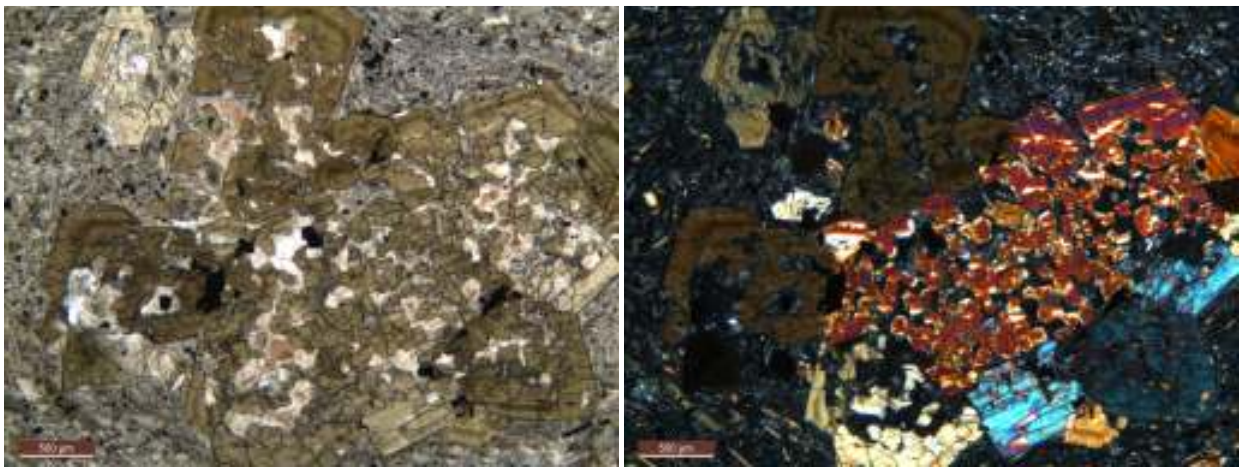
Figures 89 & 90. PPL & XP views. *Cataclastic contact/zone with brecciated granitoid. Scale bar = 0.5 mm.*

VSAC 41 11-12

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 18 chips (average size ~10 mm; range =3-23 mm) comprising dacitic-andesitic hornblende lamprophyre with superb euhedral hornblende phenocrysts and trachytic-textured groundmasses.

Hornblende phenocrysts range up to 3 mm in size. In some places they occur in glomeroporphryritic clusters (Figs 91-92). Some phenocrysts show euhedral zoning and some are intergrown with alkali feldspar (Figs 91-92) and/or the felsitic groundmass material (Fig. 93).



Figures 91 & 92. PPL & XP views. *Glomeroporphyritic hornblende, showing euhedralism, zoning and intergrowth with alkali feldspar (and, in places, groundmass). Scale bar = 0.5 mm.*

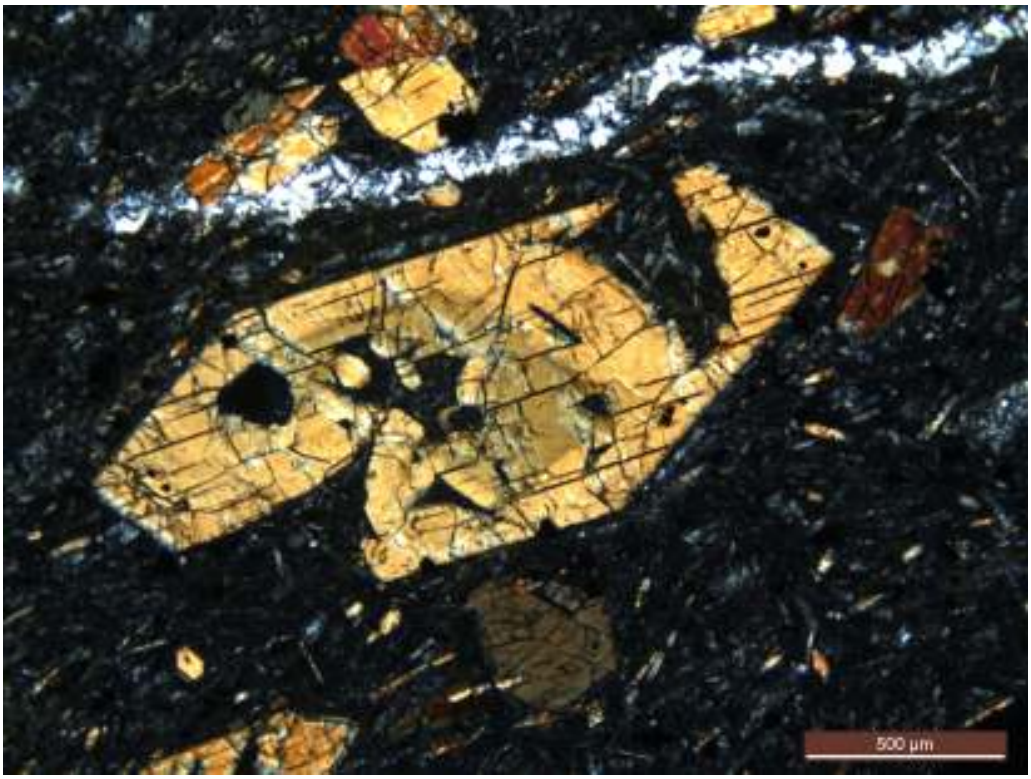
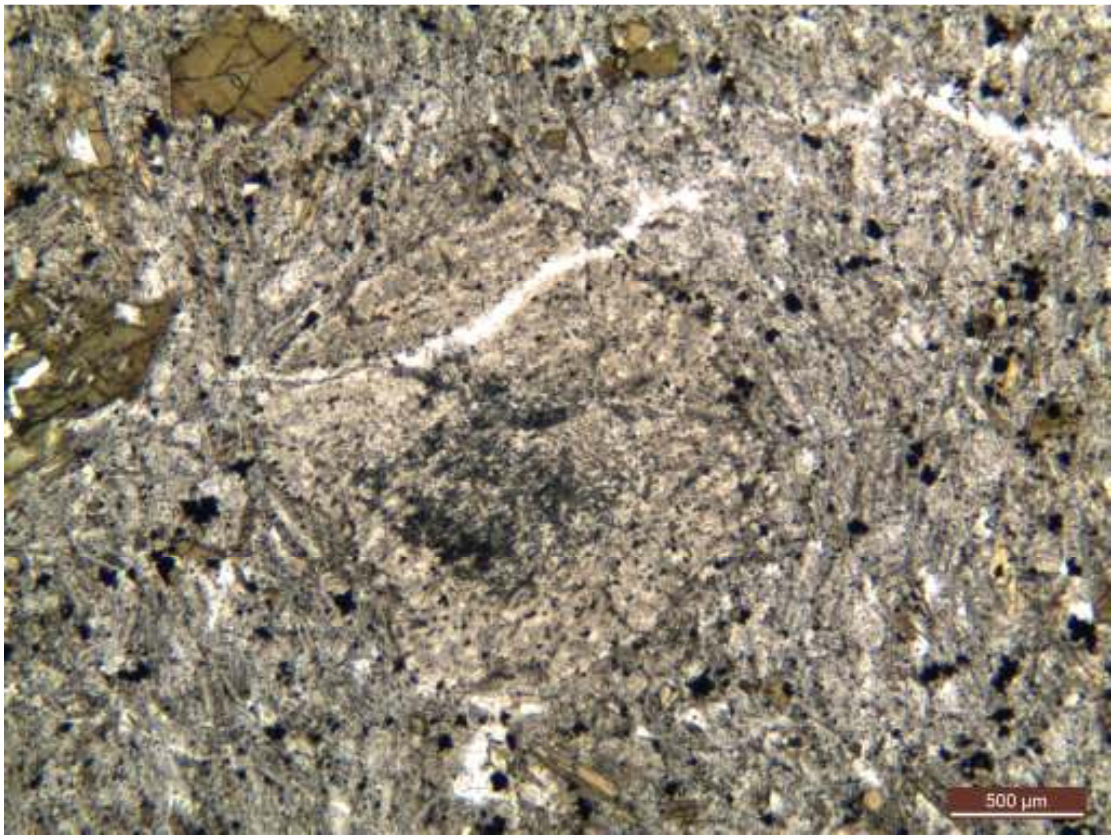
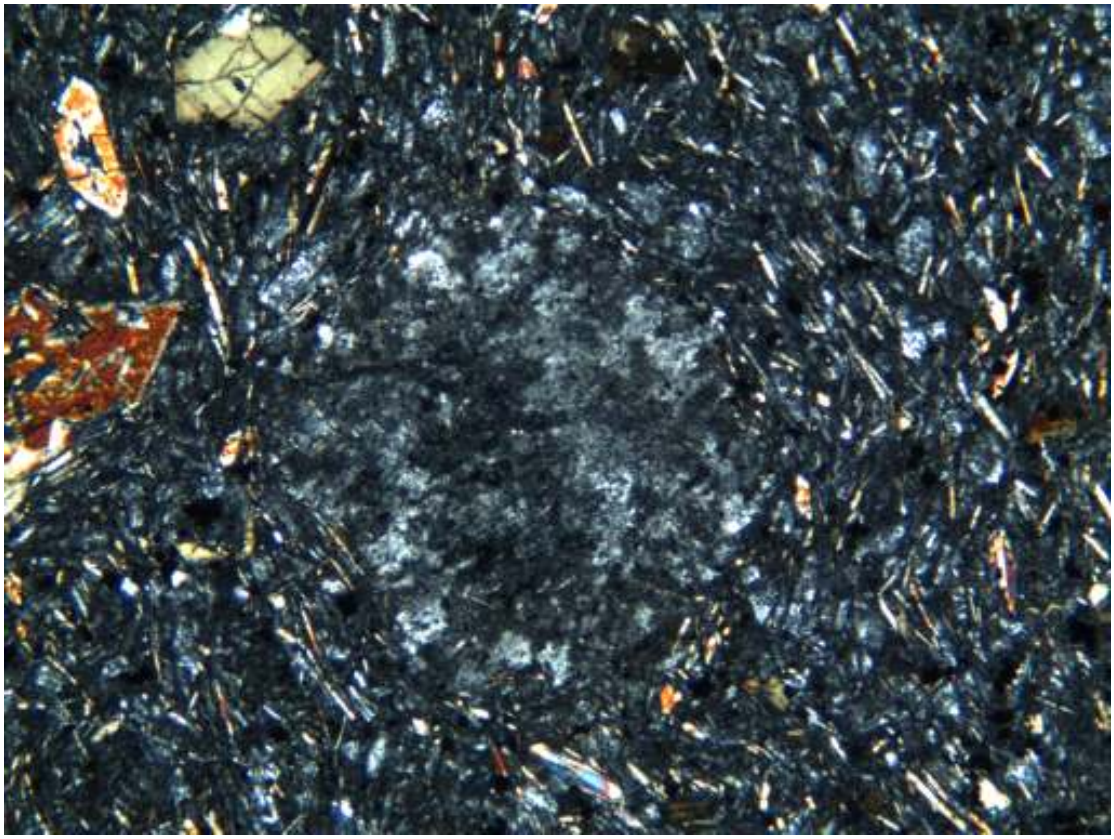


Figure 93. XP. *Hornblende phenocryst embayed by felsitic groundmass material. Note zoning in the hornblende phenocryst and the presence of a thin alkali feldspar vein. Scale bar = 0.5 mm.*

Locally, minor feldspar xenocrysts, strongly recrystallised, are present (Figs.94-95).





***Figures 94 & 95. PPL & XP views**. Recrystallised feldspar xenocryst in hornblende lamprophyre. Scale bar = 0.5 mm.*

VSAC 41 18-19

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of ~42 chips (average size ~8 mm; range = 1-16 mm) comprising dacitic-andesitic hornblende lamprophyre in all degrees of alteration by kaolinite/saussurite, alkali feldspar and carbonate.

Many good examples of “late-stage” penetration of alkali feldspar into the rock are present.

VSAC 41 19-20

Petrographic name: Dacitic-andesitic hornblende lamprophyre

The polished thin-section consists of 24 chips (average size ~12 mm; range = 3-18 mm) comprising dacitic-andesitic hornblende lamprophyre. There are many classic textures, including euhedral zoning in the hornblende.

Several chips are dominated by secondary alkali feldspar. Carbonate is abundant in one of them.

VSAC 43 12-13

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)

The polished thin section consists of 29 chips (average size ~10 mm; range = 2-20 mm) comprising moderately to strongly altered, partly medium-grained crystalloblastic devitrified, dacitic-andesitic hornblende lamprophyre. One chip contains a classic intrusive contact between the lamprophyre (very fine-grained) and biotite granitoid (Fig 96).

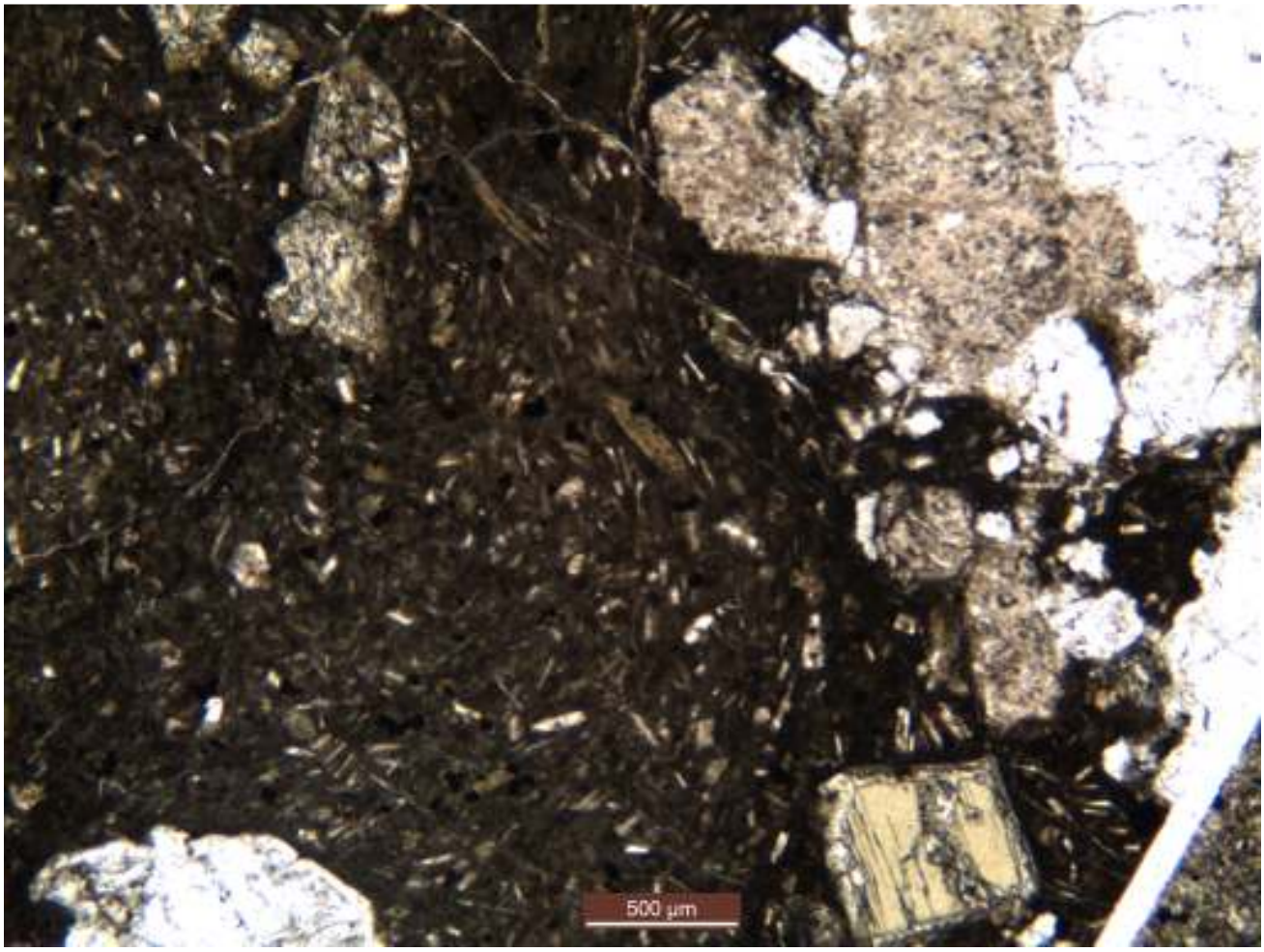


Figure 96. PPL. *Intrusive contact between hornblende lamprophyre and granitoid. Note hornblende phenocrysts (partially to completely altered), glassy nature of the matrix and the flaking off of granitoid pieces. At the SE corner of the photograph the edge of an adjacent chip is visible. Scale bar = 0.5 mm.*

Hornblende phenocrysts are partially to completely altered (Figs 97-98), principally to two main types of colourless phyllosilicates. One very fine-grained, the other is more-or-less cryptocrystalline. The first type has a moderate birefringence and in some ways looks slightly like talc pseudomorphing olivine, hence the incorrect, earlier interpretations (e.g. see VSAC 02 17-18, Fig. 12). The evidence in this sample clearly shows that pseudomorphs that look like olivine are in fact after hornblende (Figs 97-98).

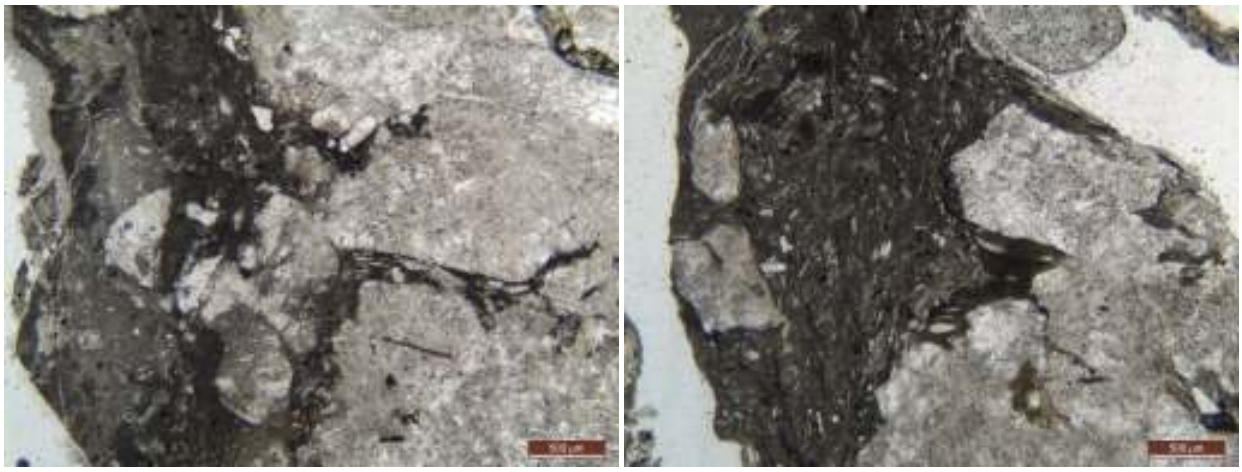
Figures 97 & 98. PPL & XP views. *Partially altered hornblende phenocryst with a morphology that mimics olivine. Alteration products comprise mainly very fine-grained and cryptocrystalline varieties of ±colourless phyllosilicates. Scale bar = 0.2 mm.*

Many of the chips show fine- to medium-grained crystalloblastic devitrification textures.

VSAC 43 25-26

Petrographic name: Variably altered dacitic-andesitic hornblende lamprophyre (intrusive into biotite granitoid)

The polished thin-section consists of 16 chips (average size ~10 mm; average = 2-24 mm) comprising moderately to strongly altered dacitic-andesitic hornblende lamprophyre. Three chips contain classic intrusive contacts with biotite granitoid (Figs 99-100).



Figures 99 & 100. PPL views. *Two views of the intrusive contact between glassy lamprophyre and biotite granitoid. Note that the lamprophyre has flaked off pieces of the granitoid and intruded into fractures in the granitoid. Scale bar = 0.5 mm.*

The rock chips in the polished thin-section are similar to above (VSAC 43 12-13).

Zoned hornblende and medium- to coarse-grained devitrification textures are present in places.

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19 February 2010