SWC: #1

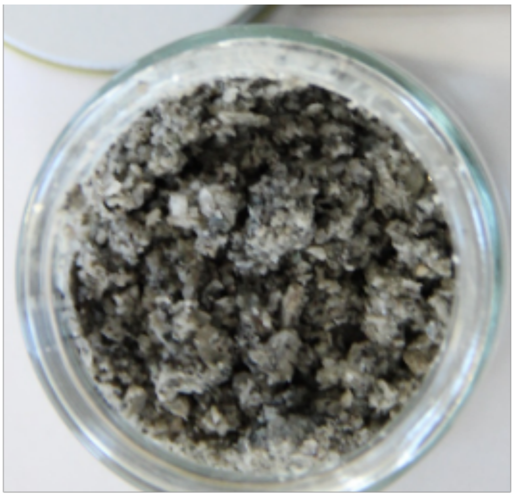
Sampling depth: 4199.8 m MD

Matrix lithological description: not fully available, sample ground up during coring process, negative gamma peak and high amount of clay residue after washing (Cotton in 2020)

Structures visible: no

Macroscopic description: fine cuttings instead of core, very dirty wash water, strong “organic” smell, sample was very sticky, significant amounts of drilling mud/ black residue resisting and sticking onto the rock pieces of the cuttings, some grains seem to even have a crust from the left-over drilling mud, rock type difficult to describe due to the state of the sample.

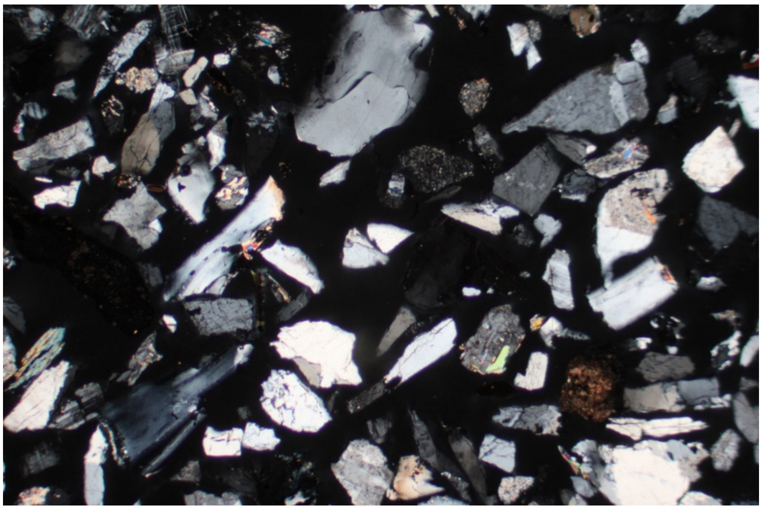
Major mineralogy: quartz, alkali-felspar, plagioclase with fine-grained white mica



Minor mineralogy: muscovite, biotite

Accessory mineralogy: chlorite, tourmaline, few opaque, black, large, round mineral grains

Microscopic description: due to the litter preparation (ground, polished thin section of cuttings), the description here is not comparable to the descriptions of the rest of the SWC thin sections. Major and minor minerals could be identified and also the accessories. Quartz, alkali-felspar and clearly altered plagioclase with fine-grained white mica are most abundant followed by black and white of mica. Chlorite, tourmaline, and a few opaque, black, large, round mineral grains are subsidiary present. The structure of the rock cannot be identified but it is visible, that the rock was not cataclased as rather large crystal grains are seen in the figures.



Alteration: present in many plagioclase grains but not very severe, other grains are only partly altered in some areas, tourmaline and biotite grains look fresh and unaltered

Additional photos: present (2x); thin sections: #1a_pol, #1b_pol, #1c

SWC: #2

Sampling depth: 4299.8 m MD

Matrix lithological description: quartz 35 %, feldspar 50 %, mica 8 %, other 7 %, medium-grained, pheonocyrysts not aligned (Cotton in 2020)

Structures visible: No visible macro-fractures but possible porosity visible in matrix (Cotton in 2020)

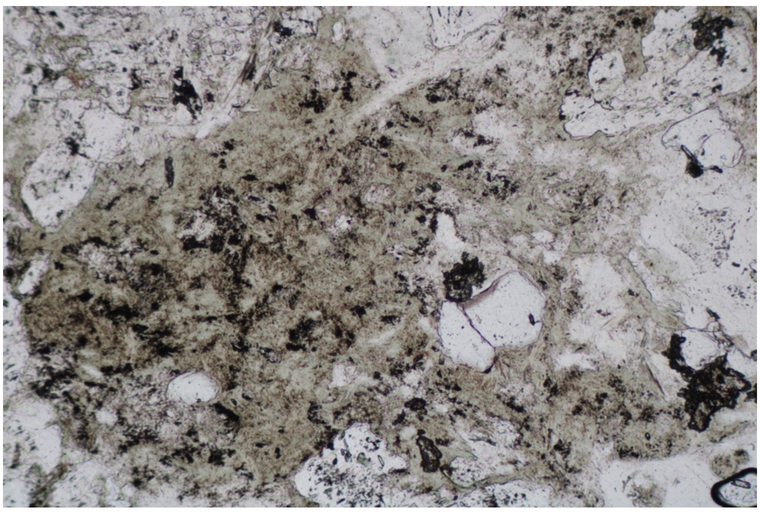
Macroscopic description: black, grey and white non-oriented minerals alternate with both types of mica visible. The white feldspar and quartz grains reach mm to cm size. This core shows already macroscopically signs of alteration by changing its colour into yellowish/ orange in some parts, especially in the white feldspar grains. Other observations are a possible suspected porosity in the matrix of the core, section on top of the core shows a layer of mud, muscovite is the dominant mica (Cotton in 2020), crystals interlocking.

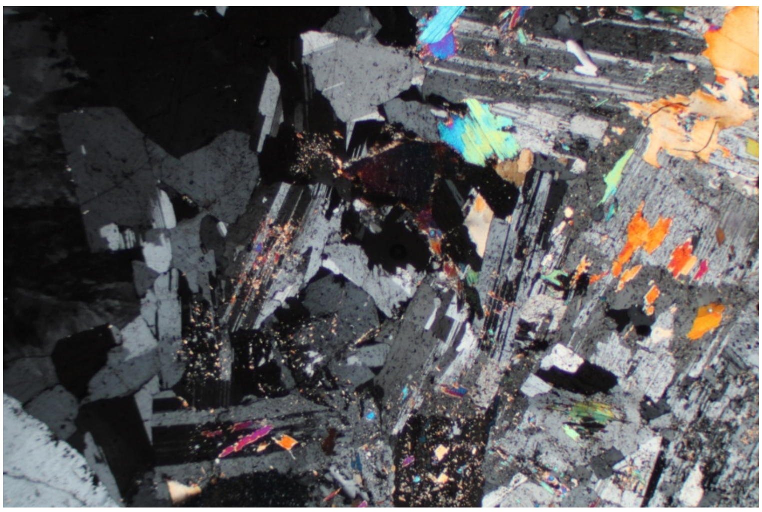
Major mineralogy: plagioclase > alkali-felspar in form of chess board albite > quartz = muscovite

Minor and accessory mineralogy: chlorite >> biotite, apatite, epidote, titanite

Microscopic description (maxi-sized polished thin section)**:** this thin section has medium to large-grained, non-equigranular matrix made up from feldspar, quartz and mica. The quartz grains show a undulose extinction, sub grain formation and many non-aligned fluid inclusions. The plagioclase shows polysynthetic twinning with stump terminations of the twinning lamellae. This is a sign of primary magmatic origin and indicates twinning while growing. Basically it is a growing error of the feldspar. Plagioclase is very abundant and is often altered in form of fine-grained white mica growth from the centre of the grains. Towards the rims of the plagioclase the sericitization decreases, this it is a zonal alteration of the plagioclase, probably due to a zonation in the chemistry of the crystals. Porosity is to be assumed in altered plagioclase grains as they are partly dissolved. The alkali-felspar occurs in a special appearance, which is a chess board twinning pattern. This chess board or gridiron texture of the feldspar is caused by twinning and looks in the thin section under the microscope like the pattern of a chess board with alternating white and black fields. Most probably this is a result of metasomatic replacement of alkali-felspar (Becke, 1906). According to Ogniben, 1956, chess-board albite forms at the expense of pre-existing microcline. In the thin section SWC #3, all former alkali-felspar were transformed into this chess board albite and show the chess board twinning pattern. Chess board albite has a higher concentration in sodium as their “host mineral” the alkali-felspar. These albite grow wide-spread and in large crystals and they include mineral grains of plagioclase.

Muscovite exists as euhedral, primary grains from type I and III, but also fine-grained white mica from type II is present (especially in the plagioclase). Often, the fine-grained white mica grows together with chlorite (secondary; ether propylitic or vein alteration). It has a fine- grained matrix and includes in numerous areas black, opaque spots (possibly organic matter). Chlorite is abundant, grows wide-spread over the grains of other present minerals in little acicular aggregations on the rims of quartz crystals, muscovite or feldspar. Here the chlorite also grows independently from biotite or from cleavage planes, this means it is not pseudomorph, but newly-grown. Biotite is present but only sporadic. The chlorite grains include crystals of epidote, titanite, larger, euhedral apatite and possibly also oxides or ores. Titanite and epidote are secondarily-grown and do not belong to the primary magmatic components. For their growth a calcium-bearing fluid is necessary, which is either available through external fluids or after transformation processes in other minerals. This thin section in general assumed to be originating from a zone in alteration neighbourhood, where fluids were attendant and somehow able to circulate. It was assumed for SWC #2, that calcite could be observed in the thin section.





Alteration: signs of advancing alteration such as large-spread medium-severe chloritization, the whole sample was possibly affected by metasomatism (hydrothermal metasomatism), former white mineral grains partly change to a yellowish colour on their surfaces (visible macroscopically on the plugs surface)

Additional photos: present (6x); thin sections: #2a_pol, #2b_pol, #2b, #2c, #2d, #2e_pol, #2f_pol

SWC: #3

Sampling depth: 4243.0 m MD

Matrix lithological description: quartz 35 %, feldspar 50 %, mica 8 %, other 7 %, medium-grained (Cotton in 2020)

Structures visible: one main irregular fracture running roughly parallel to core axis, aperture >1 – 2 mm, mostly no filling (open) and quartz infill in some veins, other fractures coming from the main one (Cotton in 2020)

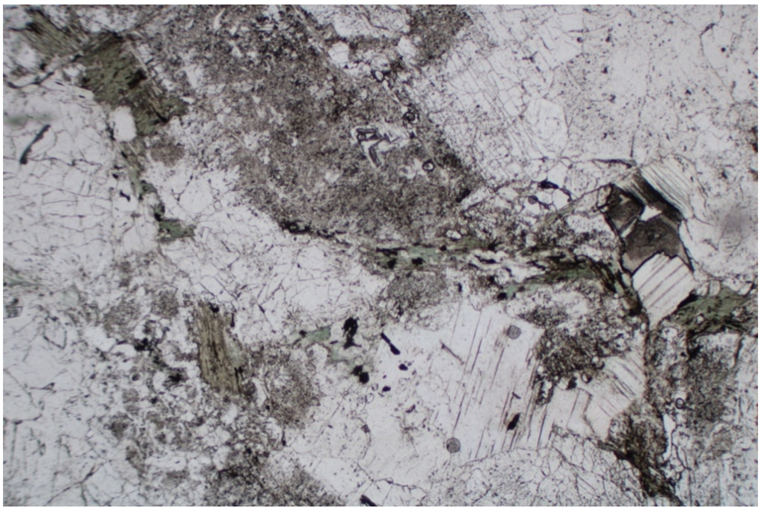
Macroscopic description: Numerous, large white and grey mineral grains alternate with fewer black ones. The sample exhibits quartz grains and both kinds of mica in a white and non-oriented feldspar matrix. They reach grain sizes in the range of centimetres. The core can be classified as "white mica intensive granodiorite". Signs of strong alteration and an "unfresh" impression along the fracture appear. The plug changes its colour and turns green and brown in several spots. The clearly recognizable fracture on the sawn 2 cm plug is macroscopically visible and goes through the whole sample. Elongated, "needle-like" dark minerals (tourmaline but could possibly be biotite as well) are visible, chlorite content can be estimated to ~3 % (Cotton in 2020), crystals interlocking.

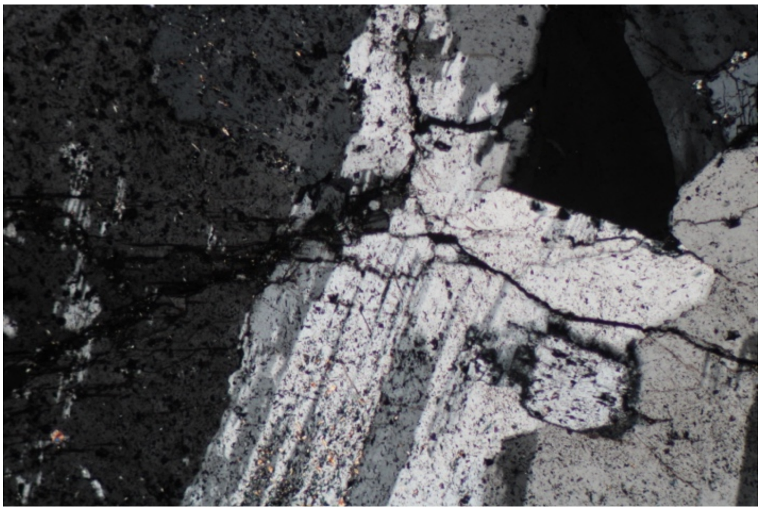
Major mineralogy: alkali-felspar in form of chess board albite > quartz = plagioclase

Minor and accessory mineralogy: muscovite = biotite > chlorite > apatite

Microscopic description (normal-sized polished thin section)**:** consisting mainly of very coarse-grained quartz and feldspar (grain sizes in up to cm-range). Plagioclase and alkali-felspar both are present. The alkali-felspar occurs with its chess board twinning pattern.

Chlorite is relatively abundant as a secondary phase and also muscovite is an exceptionally frequent mineral. The plagioclase shows polysynthetic twinning and is intensely sericitized. Anhedral quartz exhibits some undulose extinction and the formation of sub grains pointing to a (weak) crystal-plastic deformation. Quartz crystals occasionally contain inclusions of euhedral apatite. Additionally, aligned fluid inclusions are abundant. White mica occurs in three "varieties" or "types": type I is a coarse-grained muscovite which is interpreted to be of primary magmatic origin. Some grains reveal undulose extinction pointing to (minor) ductile deformation. Type II is a very fine-grained secondary fine-grained white mica, which often grows on the cost of already existing plagioclase. Finally, type III is coarser-grained then type II and occurs as an alteration product within plagioclase. Former biotite is in most cases completely chloritized and exhibits a pleochroism with intense green, sometimes pale yellow or brown colours. Within the former biotite, titanium and/or iron phases occur as needle-shaped inclusions. The latter probably represent exsolution phenomena that were formed during the transformation from biotite to chlorite. The minerals are dark brown or reddish coloured and might be rutile, titanite or partly hematite. In thin section SWC #3, no tourmaline or other accessories except apatite is present. But there are fractures observable and within these micro veins are sometimes dark, opaque spots included, which is a round phase (possibly ores or organic matter/ trapped hydrocarbons).





Alteration: signs of advancing alteration, medium-severe to strong, possibly affected by metasomatism

Surface of borehole-facing wall (ESEM): many spheres of hydrocarbons, montmorillonite (might derive from drilling mud)

Additional photos: present (8x); images before and after-CFT (8x); thin sections: #3a_pol, #3b, #3c, #3d_pol, #3e_pol; ESEM: in attached excel file (4x)

SWC: #4

Sampling depth: 4244.8 m MD

Matrix lithological description: quartz 35 %, feldspar 50 %, mica 8 %, other 7 % (Cotton in 2020)

Structures visible: 1 fracture ~280 ° from vertical, 1.5 cm long, <0.5 mm aperture (Cotton in 2020)

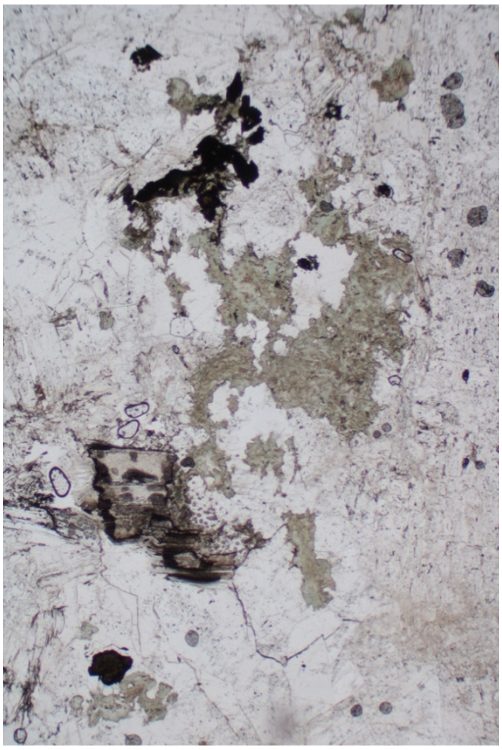
Macroscopic description: medium-grained matrix with alternating white and dark minerals, both kinds of mica visible but with a larger ratio of muscovite over biotite. The darker minerals seem to have a greenish staining. The white feldspar reach the largest grain size here (mm to cm). Other observations are, that some white clay mineral is sticking on the sample and or including possibly chlorite. Phenocrysts of feldspar ~1 cm in length (Cotton in 2020), crystals interlocking.

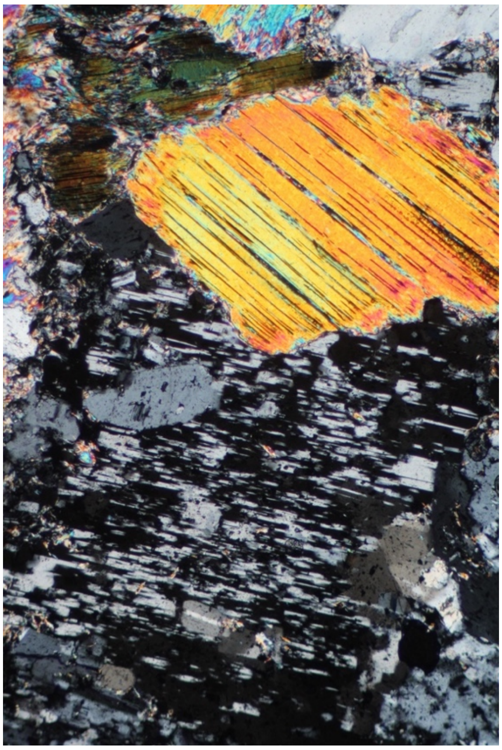
Major mineralogy: chess board albite >> quartz = muscovite = fine-grained white mica > plagioclase

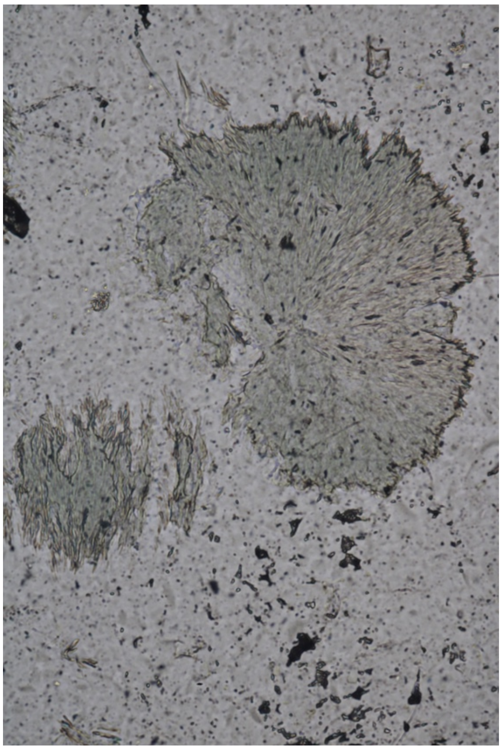
Minor and accessory mineralogy: chlorite > apatite, titanite, very few biotite

Microscopic description (maxi-sized polished thin section)**:** This thin section is similar to the sample #2 with medium to large-sized, euhedral crystals of chess board albite, quartz, muscovite and plagioclase. The quartz crystals are of variable grain size (mm to cm-range), seem to be slightly deformed or bended and contain un-aligned fluid inclusions. Chess board albite (no alkalifeldspar) is present in pegmatitic, euhedral, twinned grains, that include many small, non-oriented and unaligned plagioclase crystals inside. The plagioclase is variable grainsized and show polysynthetic twinning. White mica is present in the form of primary magmatic muscovite (type I) and also in the fine-grained sericitic generation (type II). On the costs of other minerals, newly-grown chlorite spreads in numerous fine needles over the matrix. Often there are black elongated grains included. The newly-grown chlorite grows columnar radial, which is unusual, and sometimes the forms look like "suns". Accessorily there are euhedral apatite, titanite and biotite enclosed.

In the thin section, there are numerous fractures with µm-wide apertures enclosed. Sometimes these veins proceed through entire grains. Further it is to notice, that on the rim of one large chess board albite, a high and colourful interference colour mineral grows, secondarily along the mineral boundaries. One theory is, that this secondary mineral (maybe calcite) precipitated here, as the fluid flow happens along fractures, which are also depicted on the photo beneath (left). As the fractures do not continue around the mineral, the precipitation is limited to one side of the grain. This is to see on the right side of the bright yellow muscovite grain of the picture to the right.



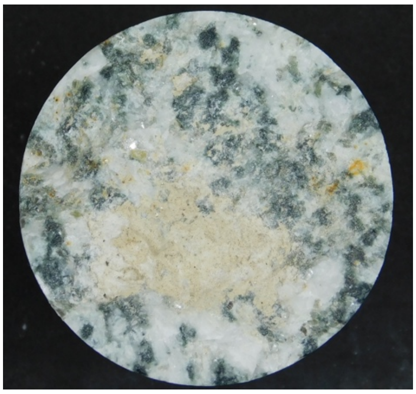




Alteration: signs of advancing alteration such as growth of chlorite in some parts, the sample has probably been affected by metasomatism (hydrothermal metasomatism or chloric alteration)

Surface of borehole-facing wall (ESEM): montmorillonite (possibly originating from the drilling mud), hydrocarbons, halite, feldspar altered on surface to Fe-containing mineral (maybe chlorite), Al, Si, Fe, O found in EDX analysis

Additional photos: present (7x); images before and after-CFT (10x); thin sections: #4a_pol, #4b_pol, #4c, #4d, #4e, #4f; ESEM: in attached excel file (5x)



SWC: #5

Sampling depth: 4248.1 m MD

Matrix lithological description: quartz 30 %, feldspar 50 %, mica 8 %, other 12 % (Cotton in 2020)

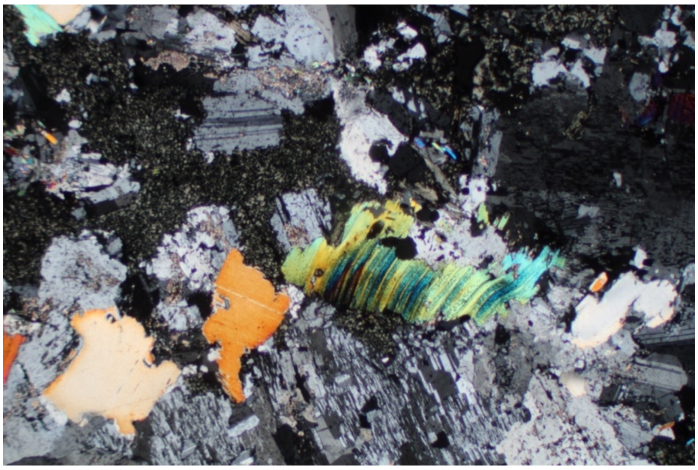
Structures visible: no obvious fractures (Cotton in 2020)

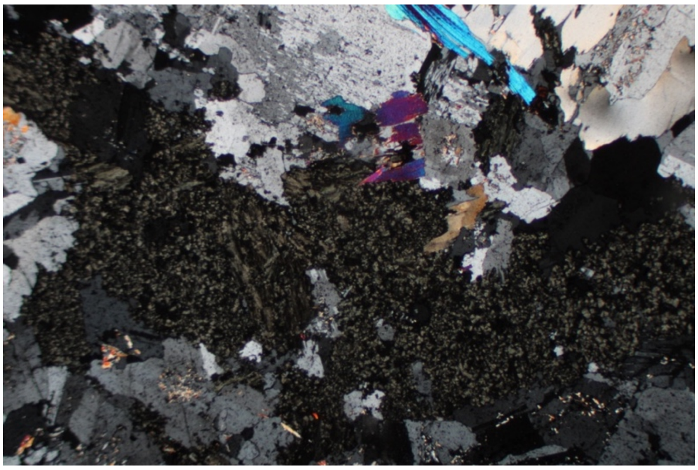
Macroscopic description: matrix and included non-oriented minerals are coarser than for SWC #4 in a medium-grained matrix. White and dark minerals alternate in this sample, both kinds of mica are visible. As in sample #4, the dark minerals appear to have a green staining and a change of colour into yellow/ brown is visible in some sporadic areas (possibly alteration). Other observations: Very dominant dark green accessory mineral like chlorite or could be tourmaline as well. Muscovite in this sample very abundant, large feldspar phenocrysts in sample orientated 285 - 350 ° from vertical core (Cotton in 2020), crystals interlocking.

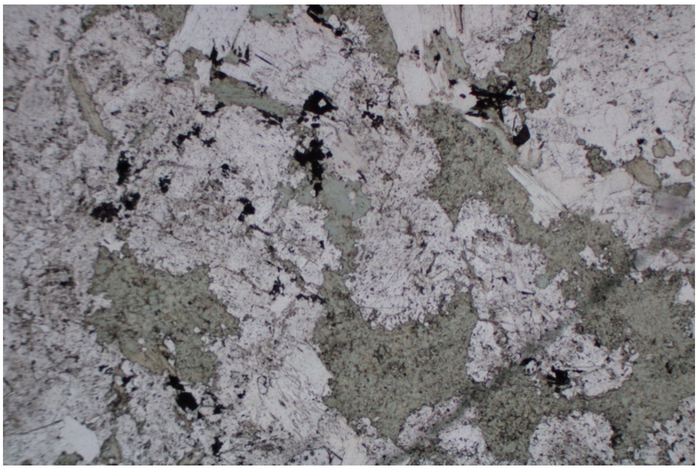
Major mineralogy: chess board albite (former alkali-feldspar) > quartz > chlorite > plagioclase

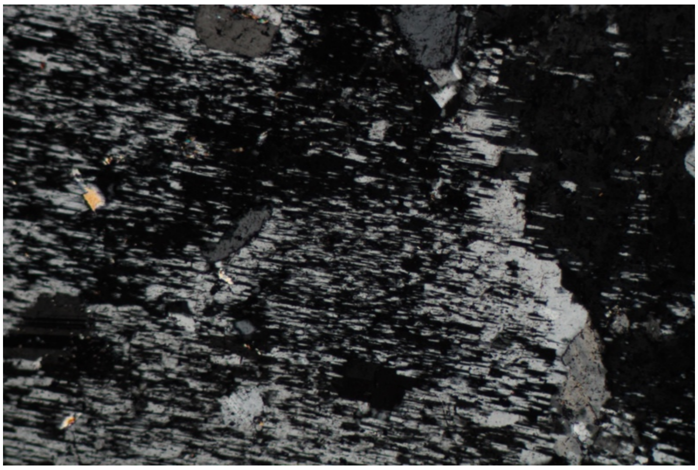
Minor and accessory mineralogy: muscovite > titanite > apatite > biotite

Microscopic description (maxi-sized polished thin section)**:** alkali-feldspar in form of chess board albite and quartz are the major components of this thin section. Large subhedral quartz grains make up around 10 vol.-% of this thin section. They display numerous un-aligned fluid inclusions and strong undulose extinction and sub grain formation. The chess board albite grains are pegmatitic and often include medium-sized and smaller parts of plagioclase crystals with distinct polysynthetic twinning. As the primary alkali-felspar usually is a late magmatic phase, the included smaller grains of plagioclase are older than the alkali-feldspar with high probability. This also applies for the rest of the trapped grains of plagioclase within any alkali-felspar. Primary white mica from type I are large and show often deformation. Sometimes they include crystals of hexagonal, euhedral apatite. Additionally, newly-grown chlorite is very abundant and spreads over large areas of the matrix. It grows in form of rosettes and is in this thin section not pseudomorph as in many other thin sections, but grows in its own small crystals. Especially abundant it grows in mineral grain crotches, so it is not dependent on the former growth of biotite. Extraordinary is the interference colour of the chlorite (abnormal interference colours), that points towards a deviant composition. Few biotite occurs. Further it is possible, that also calcite is present as accessory mineral. This thin section was presumably affected by metasomatic processes.









Alteration: signs of advancing alteration, wide-spread newly-grown chlorite with unusual texture, the sample was probably affected by hydrothermal metasomatism, former light minerals partly changed to a brownish colour

Surface of borehole-facing wall (ESEM): hydrocarbons, halite

Additional photos: present (9x); thin sections: #5a_pol, #5b_pol, #5c, #5d_pol, #5e_pol; ESEM: in attached excel file (2x)

SWC: #6

Sampling depth: 4250.6 m MD

Matrix lithological description: quartz 40 %, feldspar 50 %, mica 7 %, other 3 % (Cotton in 2020)

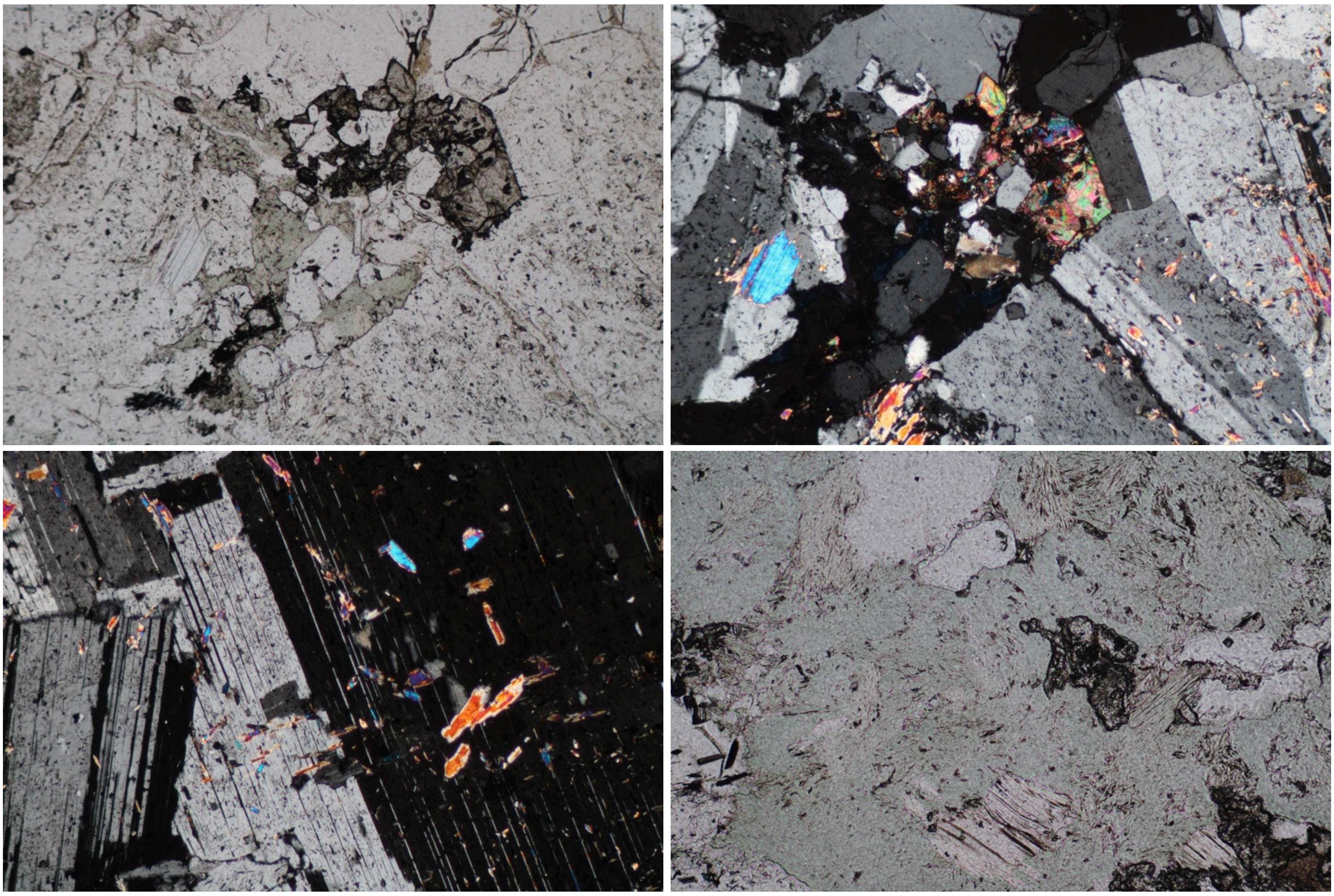
Structures visible: macro-fracture ~3.5 cm long, 130 ° from vertical (Cotton in 2020)

Macroscopic description: coarse-grained matrix with non-oriented light and dark components, both types of mica are present, classified as white mica intensive granodiorite including mm- to cm-grained white feldspar, quartz and mica. Other observations: sample snapped in three places, possibly along lines of weakness and natural fracture planes, not possible to tell fracture aperture because if this. Face of fracture plane dominated by quartz and soft infill in places, but treat with caution as it could be drilling mud related. Some matrix porosity is assumed to exist (Cotton in 2020).

Major mineralogy: quartz = plagioclase > alkali-felspar as chess board albite

Minor and accessory mineralogy: muscovite > chlorite > fine-grained white mica > apatite, titanite, accessory black, bulky, unshaped minerals

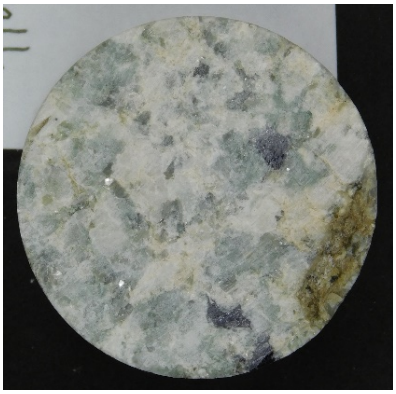
Microscopic description (normal-sized polished thin section)**:** large euhedral and frequent crystals of alkali-felspar, that appear in form of chess board albite with Karlsbad twins are to notice at first. Primary magmatic muscovite is also euhedral and frequent. Many euhedral and subhedral quartz grains with natural fluid inclusions occur. Additionally, sericitizised plagioclase with polysynthetic twinning is a main component of the thin section. In this thin section biotite is absent. Chlorite is abundant and grows widely in directionless rosettes and sheaves and also in fine needles that are fine-grained (~ 10 µm). The newly-grown chlorite spreads over considerable areas of this thin section. Pleochroitic tourmaline is present as accessory mineral as well as secondary titanite, that has a brownish intrinsic colour and grows twitchy, usually together with chlorite. Very small crystals of fine-grained white mica (assumingly from type III) are to find not only in the plagioclase grains but also in chess board albite. Aligned fluid inclusions are contained in the quartz crystals. Cataclastic features such as microscopical fractures can be observed for this thin section. SWC #6 can be classified according to their thin section analysis as “white mica intensive granodiorite”.



Alteration: signs of advancing alteration such as wide-spread newly-grown chlorite, growth of fine-grained white mica (medium-spread) especially in plagioclase, growth of chlorite and sericitization, this sample was possibly affected by hydrothermal metasomatism

Additional photos: non present; thin sections: #6a, #6b_pol, #6c, #6d, #6d_pol, #6e_pol, #6f_pol

SWC: #7



Sampling depth: 4253.4 m MD

Matrix lithological description: quartz 35%, feldspar 45%, mica 8%, other 12% (Cotton in 2020)

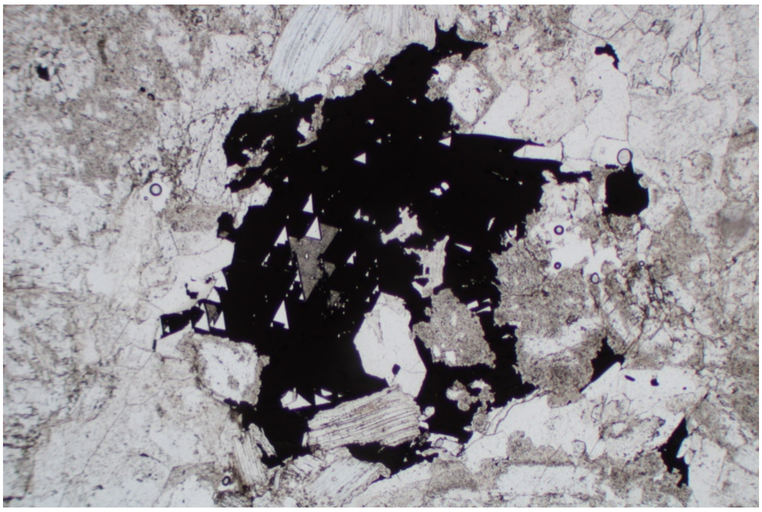
Structures visible: some minor fractures in parallel with break at 'top' of core. Break in sample at 'top' of core, 138 ° from vertical (could be due to natural weakness in rock/natural fracture), possible some clay mineral on fracture plane (white, crumbly and soft) (Cotton in 2020)

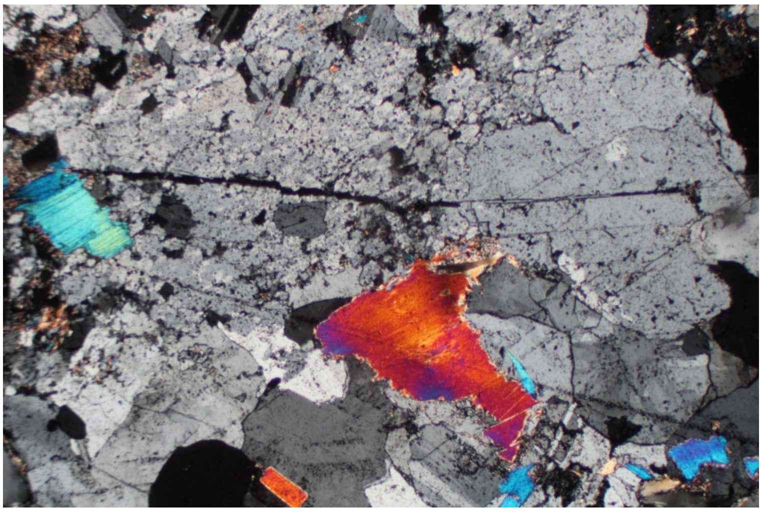
Macroscopic description: small to medium-grained matrix in which muscovite is visible, dark mica is absent. Crystals usually interlocking, non-oriented feldspar and quartz reach the largest grain size (mm to cm), additionally mm-large grains of an purple shimmering ore mineral are visible (possible PbS or Pb-oxide). White and greenish feldspar alternate (greenish minerals affected by alteration?). Other observations are: possible matrix porosity at grains boundaries and occurrence of clay minerals.

Major mineralogy: chess board albite (former alkali-felspar) > quartz > muscovite = plagioclase > fine-grained white mica

Minor and accessory mineralogy: apatite, titanite ?, galena or phases of iron oxides

Microscopic description (maxi-sized polished thin section)**:** concerning its mineralogical inventory, this thin section is alike #2, #4 and #5. But it displays two large areas, where the thin section is completely black and opaque. On its sides, the surface begins to separate from the rest of the interconnection and breaks up in form of triangles. It looks artificial but these are presumably ore mineral accumulations that broke up during preparation. The cubic ores could be cassiterite (SnO_2) or galena (PbS). They probably grew in a post magmatic phase, with a subhedral morphology. The ores are therefore young and have nothing to do with the primary magmatic inventory of the rock. In general the thin section is likely to be affected by deuteric alteration because chess board albite is present. The thin section looks altered and in many areas, small fine-grained white mica crystals overgrow the plagioclase in wide areas. Additionally there are small crystals of fine-grained white mica included into most of the plagioclase crystals as well. The white mica grows on cost of the other present minerals, except the quartz, that looks the most pristine concerning the sericitization. Additionally to the small fine-grained white mica crystals, the thin section contains also larger crystals of white mica. This speaks for at least two generations of white mica. The large crystals of muscovite are magmatically-grown and belong to the primary magmatic components of this granite and the second generation are the small crystals of fine-grained white mica, which are hydrothermally-grown and most probably connected to alteration processes. The quartz looks deformed in parts but the mineral borders are clearly to detect. Overall there is not much quartz incorporated for a granite, similar to the thin section of #5. Observable is an unusual zonal built up of the quartz crystals and also fluid inclusions are visible. The plagioclase shows in some parts zonal composition as well. Here, there is almost no biotite present and also no chlorite, but apatite is enclosed. Accessorily the thin section contains the mineral with the high interference colour and the high relief, but only sporadic (supposable calcite). The thin section contains in small amounts phases of orange iron oxides, that occur in small crystals, which grow in inter-mineralogic borders and crotches of feldspar. These are iron hydroxides on the rims of other mineral grains. Large grains are the chess board albite, quartz and muscovite.





Alteration: the sample shows signs of advancing alteration such as formation of chess board albite and growth of fine-grained white mica, additionally larger fractures are microscopically visible

Surface of borehole-facing wall (ESEM): montmorillonite (probably originating from the drilling mud), hydrocarbons, halite, Pb-oxide

Additional photos: present (5x); images before and after-CFT (6x); thin sections: #7a, #7b_pol, #7c_pol, #7d; ESEM: in attached excel file (2x)

SWC: #8

Sampling depth: 4378.5 m MD

Matrix lithological description: quartz 32%, feldspar 50%, mica 8%, other 10%, medium-grained, larger feldspar phenocrysts 1.2 cm long (Cotton in 2020)

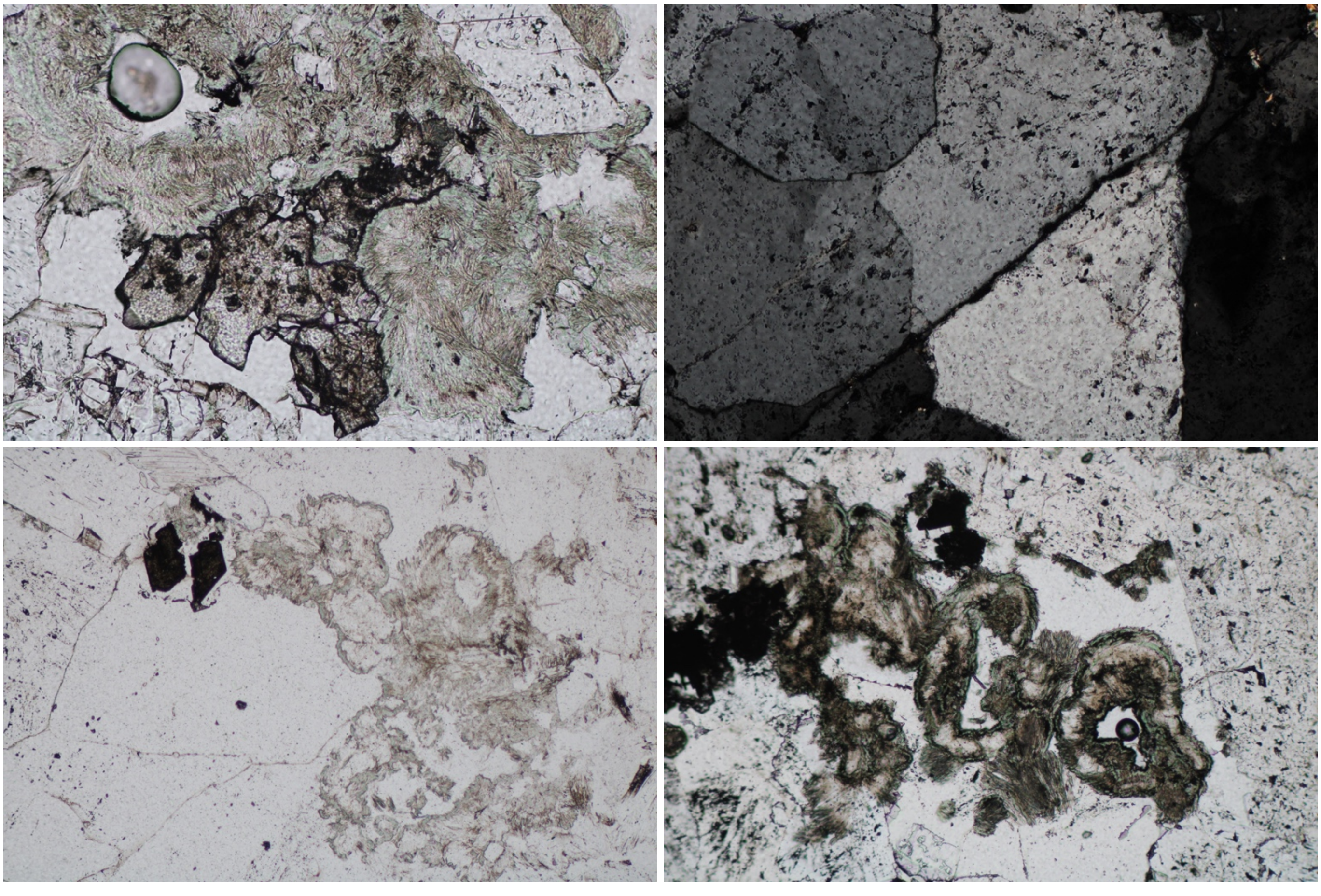
Structures visible: no obvious fractures, some matrix porosity (Cotton in 2020)

Macroscopic description: non-oriented small to medium-grained matrix where only the feldspar are larger. The white and the greenish minerals alternate similar to SWC #7 but without the ore minerals. Only muscovite is visible and no biotite. There is a change of colour in some parts from white to yellowish (alteration). Other observations are, that the phenocrysts are aligned, core #8 is darker than core #7 with accessory minerals making up much of its matrix, crystals not interlocking (Cotton in 2020).

Major mineralogy: former alkali-felspar in form of chess board albite > quartz > muscovite = plagioclase

Minor and accessory mineralogy: chlorite > titanite, epidote = apatite

Microscopic description (maxi-sized polished thin section)**:** the SWC #8 sample resembles the thin section #7 according to it´s mineralogical inventory. Quartz crystals are subhedral, show undulous extinction and indicate many large, non- oriented fluid inclusions. The chess board albite grains are euhedral and pegmatitic and include numerous smaller sericitisized plagioclase inclusions. Primary magmatic muscovite is present to estimate same amounts as plagioclase. Wide-spread newly- grown, secondary, strongly greenish chlorite overgrows large areas of the thin section, even if in the XRD analysis not much chlorite was detected. It includes many small but also large opaque, black spots and grains. Another feature about the chlorite is, that it has a rim from darker matter, that frames the green chlorite needles as it is to see on the photo from SWC #8 in the appendix. This roundish, actinomorphic and radial columnar form is a unusual for chlorite. This black rim could be aligned organic matter or possibly hydroxides or ores (this is probably, as the black grains exhibit a very distinct rhomboedric form). Accessorily occurs apatite, biotite is absent. The quartz, plagioclase and chess board albite grains look weathered and altered in general in the bright field. Other features, that appear in the bright field are cracks and fractures, that proceed through the thin sections, divides grains and interrupts mineralogical interconnections. The fractures are not open (no aperture), but they are filled in some parts with ether spots of black, opaque matter, or there it is white in between. This picture shows, that it could be a matter of natural trapped hydrocarbons, as they are aligned within the fracture (to be confirmed).



Alteration: advancing alteration and sericitization within this sample, large-spread newly-grown needle-like chlorite, fractures visible

Additional photos: present (6x); thin sections: #8a, #8b_pol, #8c, #8d, #8e, #8f_pol

SWC: #9

Sampling depth: 4896.7 m MD

Matrix lithological description: quartz 40%, feldspar 50%, mica 5%, other 5% (Cotton in 2020)

Structures visible: one small fracture running roughly parallel to core access from 'bottom' of core 1 cm in length (Cotton in 2020)

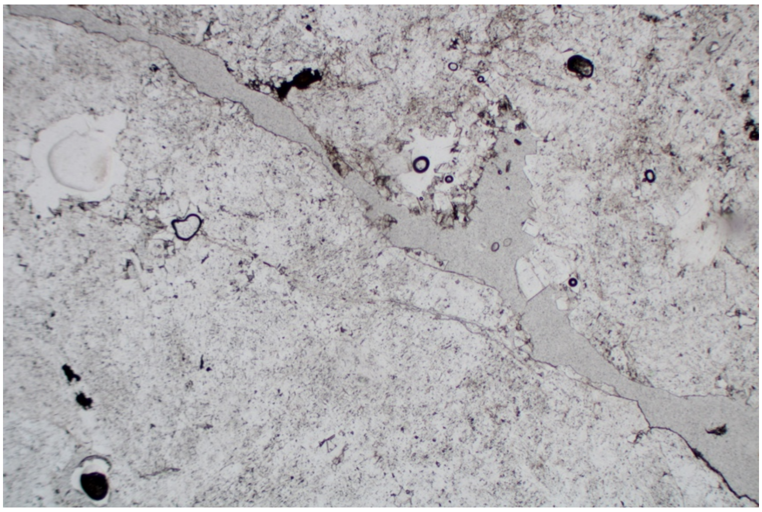
Macroscopic description: at the first glance the sample looks greenish and much lighter than SWCs #4, #7 and #8. No biotite or any other dark minerals are macroscopically visible, only muscovite shimmers on the sawn surface. The fine-grained (mm-range) matrix shows in small areas a change of colour into yellowish/ brown (possibly alteration). Other observations: very white in colour with apparent matrix porosity, sample could be a quartz vein fracture fill?

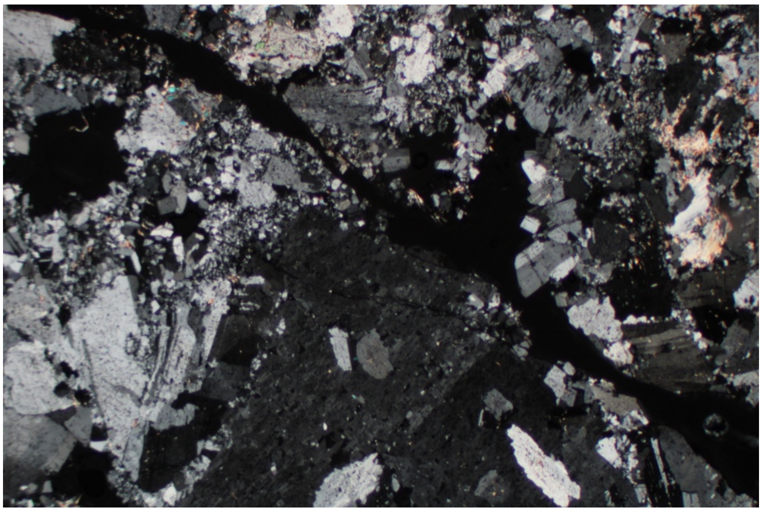
Major mineralogy: alkali-felspar in form of chess board albite > plagioclase > quartz

Minor and accessory mineralogy: muscovite = fine-grained white mica > tourmaline, apatite, titanite, ore minerals ?

Microscopic description (maxi-sized polished thin section)**:** the mineralogical inventory consists of vari-granular quartz of small and medium-sized grains and pegmatitic, euhedral plagioclase and chess board albite. The quartz grains exhibit plenty subgrain formation, undulous extinction and numerous random, non-aligned fluid inclusions. The plagioclase shows very often polysynthetic twinning and the chess board albite grains include many smaller plagioclase crystals. White mica is present in generation II and III, this means small and medium-sized grains, which are sometimes deformed. Only in some parts in between the grains signs of sericitization are to find. Also only very few biotite and chlorite is present in this sample. Accessorily there exist small crystals of euhedral tourmaline, apatite, titanite and opaque, black grains, possibly ores, that show mostly a distinctive form.

There are many newly-grown and very fine-grained quartz crystals to find, that are secondary and certainly not from magmatic origin. This means, that quartz has been dissolved and recrystallized. It is very probably, that there circulated a fluid poor in silica, that solved quartz grains and later precipitated these fine-grained crystals again. This also means, that there must have existed “open” porosity for the fluid to circulate and precipitate newly formed phases. The crystals have grown into the void spaces created by natural fractures. This is a strong indication for hydrothermal alteration or vein alteration. The precipitation of carbonates is also possible in this context, as small rim-like grains could be observed in few areas around other grains, that possibly could be calcite. Other than in the thin sections, neither calcite nor other carbonates could be found. In the thin section it is to see, that there appears a large vein, that interrupts whole mineral grains and is longer than the thin section. It has an aperture of a few centimeters and is visible with the pure eye. Due to preparation, it is filled with glue, air bubbles and sometimes also opaque bubbles appear, which could be with a chance trapped hydro carbons. Additionally to the larger fracture, there are numerous more thin cracks and fissures, that appear within the minerals. These fissures are more or less orientated towards the same direction. If the fractures are open, with no precipitated secondary crystals on its inside borders, they are likely artificial such as created by drilling (?) and the hydrocarbons might come from the used drilling mud (to be confirmed).





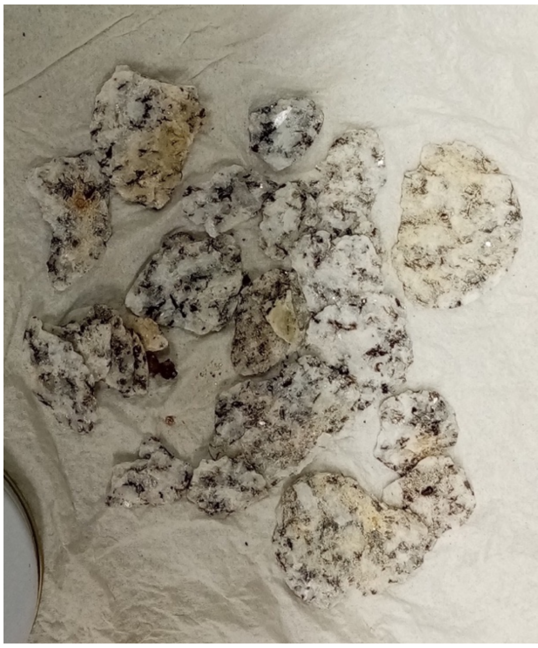
Alteration: signs of advancing alteration where the thin section was possibly affected by hydrothermal metasomatism, it exhibits large fractures that part the mineral grains, growth of fine-grained white mica (medium-spread)

Surface of borehole-facing wall (ESEM): montmorillonite (component of bentonite in drilling mud), Fe-Cl-O containing mineral

Additional photos: present (8x); images before and after-CFT (8x); thin sections: #9a, #9b_pol, #9c, #9d, #9d_pol, #9e_pol; ESEM: in attached excel file (3x)

SWC: #10

Sampling depth: 4895.7 m MD



Matrix lithological description: quartz 35 %, feldspar 50 %, mica 12 %, other 3 % (Cotton in 2020)

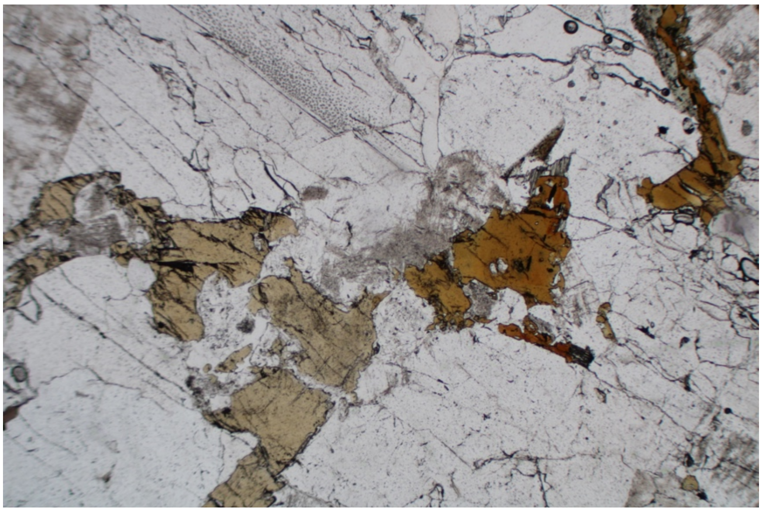
Structures visible: possible foliations or cracks resulting from stress relief when pulling core to surface (Cotton in 2020)

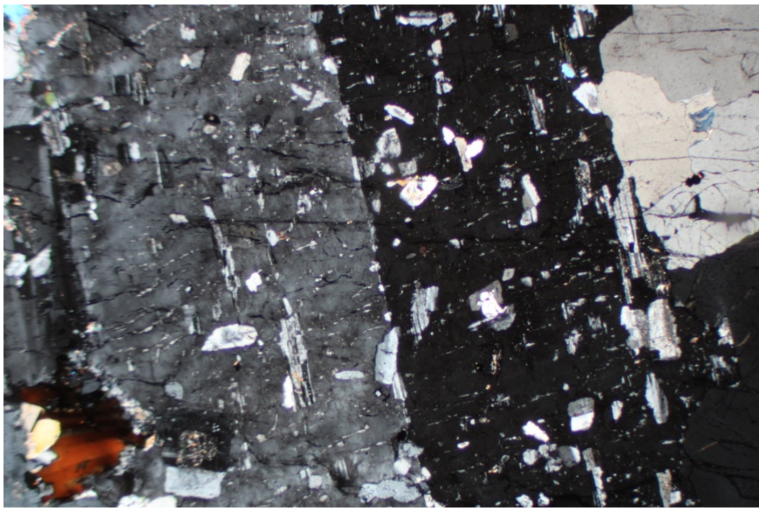
Macroscopic description: pieces and discs in several sizes, large quantities of drilling mud sticking onto the sample which results in very dirty wash water after the ultra-sonic wash, after cleaning #10 is a fine to medium-grained light type of syenite or syenogranite. Muscovite and biotite are present but much larger amounts of white components compared to dark components. Several signs of change of colour into a brownish yellow, which is likely to be caused by alteration. Due to the strong discing of the plug, the change in colour could also originate from drilling mud. Further observations: core broken into discs, lots of mud content and possible foliations on core discs. Core seems to be fairly high in biotite, cross reference with QEMScan from cuttings sample 4890m (Cotton in 2020).

Major mineralogy: microcline >> quartz = plagioclase

Minor and accessory mineralogy: muscovite > biotite > tourmaline > chlorite > apatite > ore minerals

Microscopic description (normal-sized polished thin section)**:** this thin section contains large euhedral crystals of alkali-felspar with microcline pattern and twinning (Karlsbad), that exhibit pertites (demixing lamination). The large alkali-felspar include many mm-sized grains of smaller, euhedral plagioclase grains. Quartz is subhedral, abundant but less than alkali-felspar and exhibits in parts aligned fluid inclusions. Plagioclase is slightly sericitizised but less than in other thin sections. As only the plagioclase shows sericitization and therefore alteration, the chemistry of the present fluid seemed to interact only with these kind of feldspar. Generally, this thin section looks very different than SWC #3 and #6, the mineral grains look more pristine and exhibit lesser black spots. The major minerals include in many parts idiomorphically-grown (euhedral), hexagonal apatite. Biotite occurs in large elongated grains with ether reddish brown or light brown colours and is only in parts, along cleavage planes, chloritized. Therefore chlorite is present but not very frequent and only appears in small areas. The biotite does not show pleochroictic holes but still might include some zircons or ilmenite. Very large euhedral tourmaline crystals are to find, which display numerous cracks. These fractures can possibly be filled with ilmenite or other secondary minerals, that appear dark in the thin section. One assumption is, that hydrocarbons were trapped inside these cracks but this cannot be confirmed. Generally, the thin section exhibits small fractures (<<1 mm).





Alteration: microscopically not many signs of alteration, this thin section is assumed to be the "primary magmatic composition", beginning alteration/ sericitization, sometimes chloritization of biotite but besides that "fresh" sample

Additional photos: present (1x); thin sections: #10a, #10a_pol, #10b, #10c, #10d_pol

SWC: #11

Sampling depth: 4893.7 m MD

Matrix lithological description: quartz 45%, feldspar 45%, mica 8%, other 2% (Cotton in 2020)

Structures visible: fracture ~145 ° from vertical (Cotton in 2020)

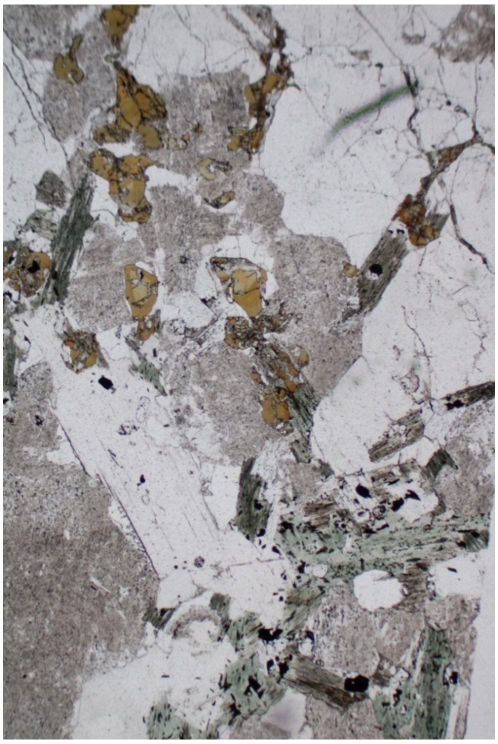
Macroscopic description: medium-grained matrix with non-oriented black, grey and white minerals, both kinds of mica present, granitoid with (microclinic) potassium feldspar, quartz, muscovite and biotite. Further observations: core broken along natural plane of weakness, some clay mineral observed on plane. Evidence that this is a natural fracture includes straight edge of point of failure. There is also an orange staining on the potential fracture plane, as was noted in many of the cutting samples (possibly hematite and could it be evidence for fluid flow?). Sample #11 is quartz rich (Cotton in 2020).

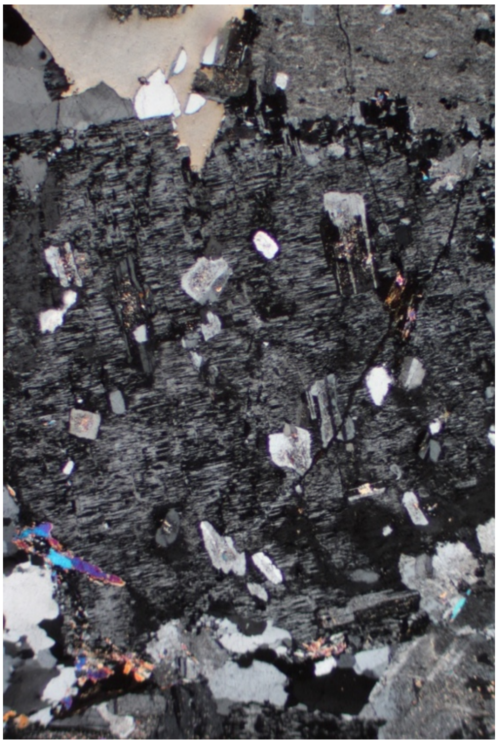
Major mineralogy: alkali-felspar, microcline > quartz > plagioclase

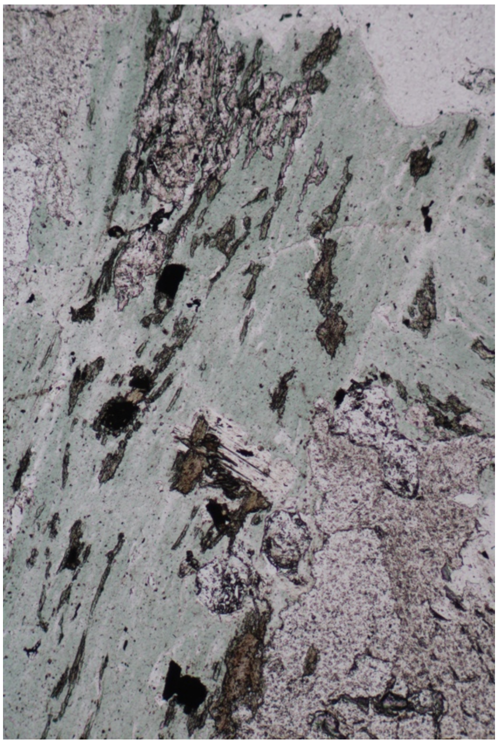
Minor and accessory mineralogy: muscovite >> biotite, chlorite > tourmaline > titanite maybe epidote > apatite

Microscopic description (maxi-sized polished thin section)**:** this thin section differs from the previous ones. Abundant are large, euhedral alkali-felspar with microclinic pattern, that are with a high probability from magmatic origin. They show pertites (separation/ demixing/ exsolution lamination). Second frequent mineral is quartz, followed by plagioclase that shows polysynthetic twinning and are usually smaller than the alkali-felspar. Large euhedral crystals of primary muscovite (type I) but also columnar fine-grained white mica (type II and III) inside and around plagioclase is present. Exceptionally amounts of chlorite and chloritized biotite especially along cleavage planes with a strong colour of green are visible. Within the former biotite which transformed to chlorite, numerous round and completely black, opaque spots are included. They exclusively occur in chlorite in this case and could be hydroxides or ores. Accessorily there is a red and brownish mineral with a rectangular, elongated form to observe, possibly titanite or epidote. Also present is euhedral apatite, large grains of pleochroitic tourmaline and few non-transformed biotite. This sample seems very pristine and was affected at the most by propylitic alteration, which is a post magmatic transformation at the end of the crystallization process under the addition of water, CO_2 and possibly locally sulphur, with no appreciable H^+ metasomatism (Ledésert, 2021).

Smaller veins and fractures occur in this thin section, that rupture mineral grains or proceed on the sides and edges of the grains further through the section. This time the vein has a minor aperture, less than a millimeter wide open and not visible with the pure eye. Within these smaller fractures potentially calcite was observed. It could be classified as an ordinary granite with the typical components quartz, feldspar, two mica (and secondary minerals such as chlorite).







Alteration: almost no alteration features e.g. sericitization visible or not very severe, sample predominantly seems fresh and unaltered besides the increased amounts of chlorite and chloritized biotite

Surface of borehole-facing wall (ESEM): illite and no spheres of hydrocarbons

Additional photos: present (1x); thin sections: #11a, #11b, #11c_pol, #11d_pol; ESEM: in attached excel file (2x)

SWC: #12

Sampling depth: 4895.7 m MD

Matrix lithological description: quartz 35%, feldspar 50%, mica 10%, other 5% (Cotton in 2020)

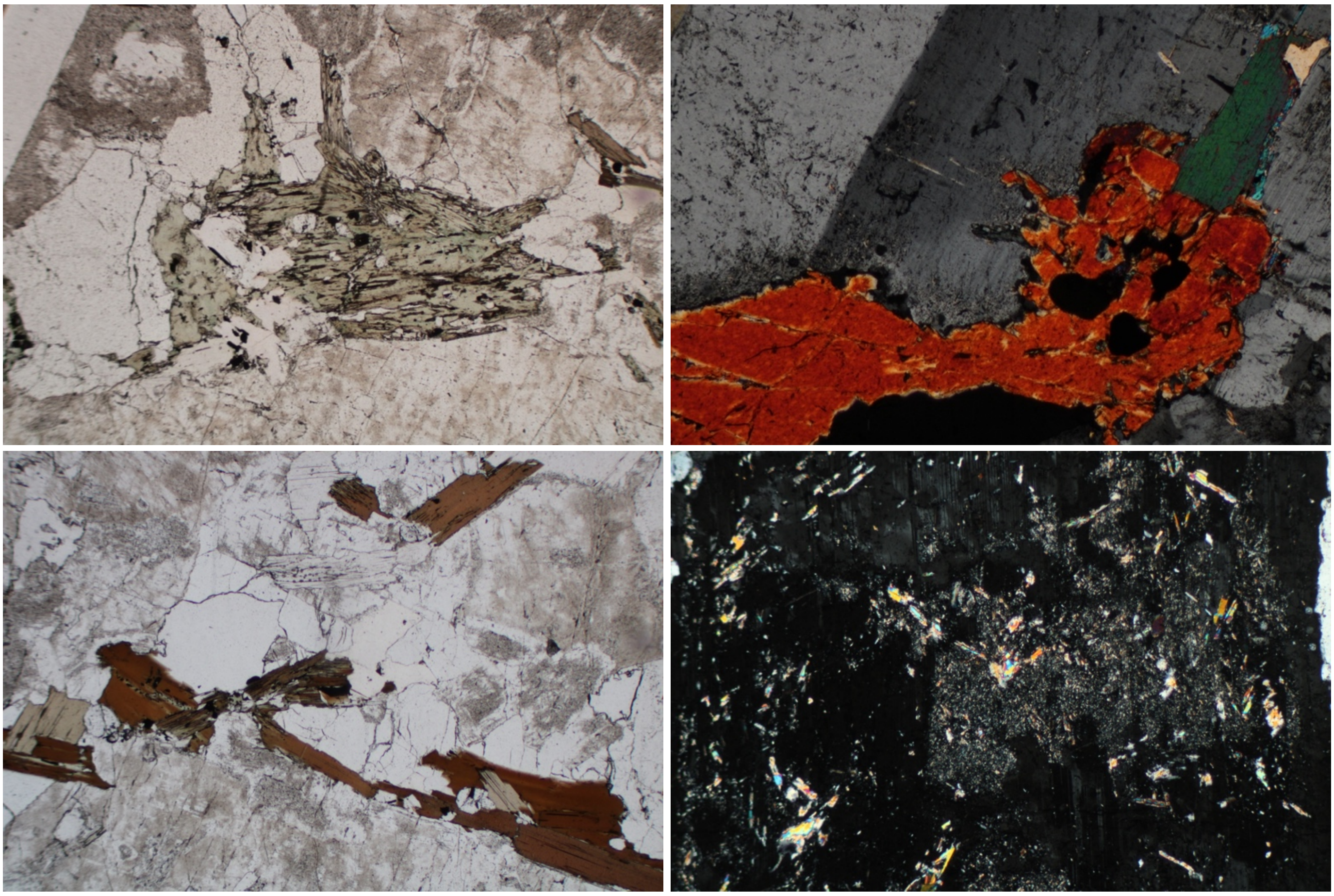
Structures visible: fractures or stress relief evidence parallel to core discing (Cotton in 2020)

Macroscopic description: from the macroscopic point of view, this sample is very close to sample #10. Classified as syenite or syenogranite, it has a black and white matrix with large feldspar and fine-grained biotite and muscovite. A change of colour in some areas towards a brownish yellow is visible, which again could be alteration-caused or possibly drilling mud, compare sample #10). Additional observations: core sample broken into discs and different components. Does the discing exploit natural planes of weakness in the rock? Looks like open aperture fractures but surface expression only. Potential evidence of quartz stretching and alignment of the mica (Cotton in 2020).

Major mineralogy: microcline > quartz > plagioclase

Minor and accessory mineralogy: muscovite > biotite = chlorite > apatite

Microscopic description (normal-sized polished thin section)**:** this thin section is similar to the one from the same depth (#10), major components are large euhedral crystals of alkali-felspar, euhedral minerals of both types of mica and quartz crystals, which are subhedral and in some cases exhibit subgrain formation and numerous aligned fluid inclusions. The plagioclase shows sericitization from generation/ type II and III and is partly transformed into the fine-grained white mica. However, #12 contains more secondary chlorite than #10 and exhibits opaque, black lamellar spots along cleavage planes in between its green colour. The pleochroitic biotite, that grows in its shape-preferred orientation, is not only chloritized along planes with lower mechanical properties (cleavage planes), but for some grains entirely transformed by changing from a strong brown to a slight green. One large tourmaline mineral is present with 3 mm-sized black, round and euhedral inclusions of maybe titanite, epidote (?) or possibly ore or oxide minerals. #12 would be classified as syenite or syenogranite as it shows clear differences to the thin sections from other depths.



Alteration: microscopically not many signs of alteration in this sample, it has an assumed “primary magmatic composition”, beginning alteration/ sericitization is to find, sometimes chloritization of biotite but besides that it seems to appear as a“fresh” sample

Additional photos: present (1x); thin sections: #12a, #12b, #12c_pol, #12d_pol, #12d

SWC: #13

Sampling depth: 4474.4 m MD

Matrix lithological description: not possible due to the fact, that the sample grounded up during coring process (Cotton in 2020)

Structures visible: NA

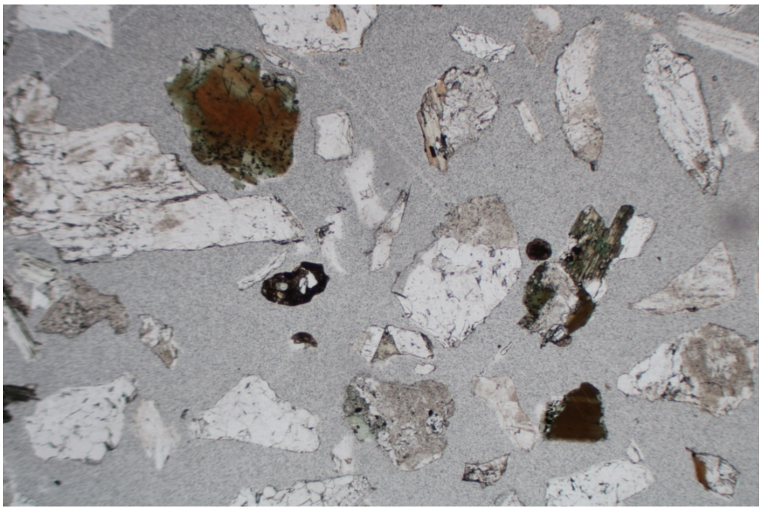
Macroscopic description: fine cuttings that resulted in very dirty wash water after ultrasonic wash, similar to sample #1, drilling residue sticking to the cuttings, due to the state of the sample, a macroscopic classification is difficult.

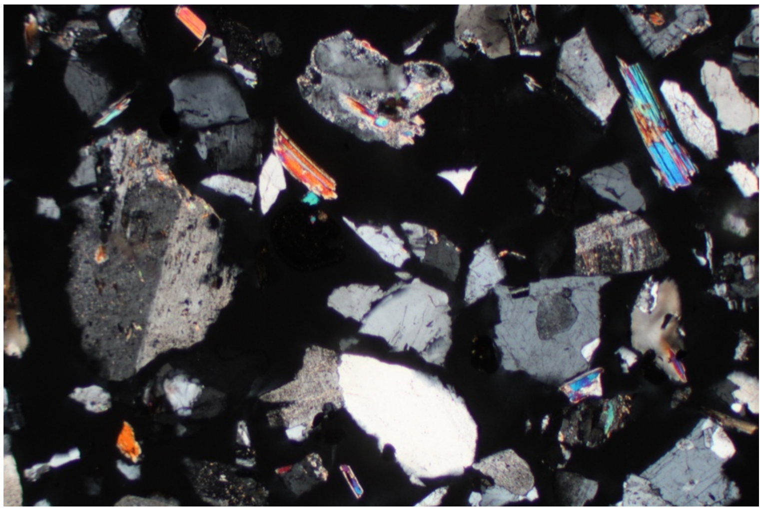
Major mineralogy: quartz, plagioclase with fine-grained white mica

Minor mineralogy: alkali-felspar, muscovite, biotite

Accessory mineralogy: chlorite, tourmaline, grains of a round opaque black mineral

M**icroscopic description:** due to the litter preparation (ground and polished thin section of cuttings), the description is not comparable to the thin sections, that still contain their structure and texture (polished thin sections of intact plugs). The grains within the thin section seem to be sharper than the grains in the thin section of sample #1. Besides that, they are similar. Major components could be identified which are quartz and plagioclase with twinning including small grains of fine-grained white mica. The plagioclase grains are slightly altered and so are the biotite crystals, that show beginning chloritization around its rims. Minor components are alkali-felspar, muscovite and biotite. Additionally chlorite, tourmaline and grains of a round opaque black mineral are present.





Alteration: not significantly severe, signs of alteration present on some plagioclase grains, additionally beginning chloritization of biotite, difficult to identify due to litter preparation, sometimes grains seem deformed (?)

Additional photos: present (3x); thin sections: #13a_pol, #13b_pol, #13c

SWC: #14

Sampling depth: 4474.4 m MD

Matrix lithological description: quartz 30 %, feldspar 50 %, mica 15 %, other 5 % (Cotton in 2020)

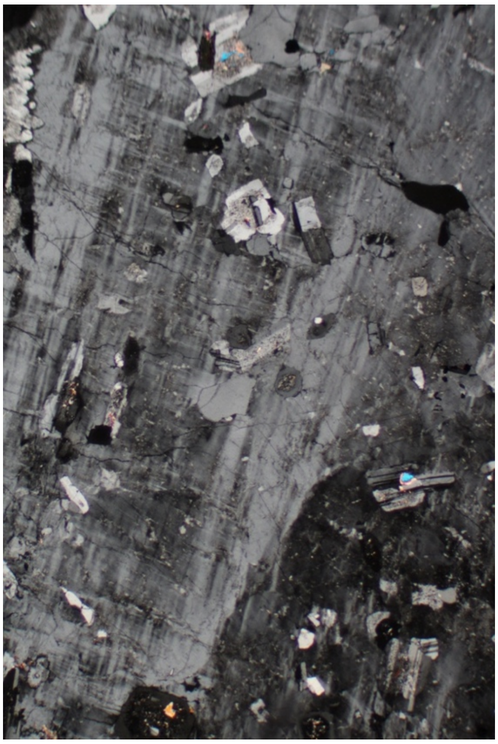
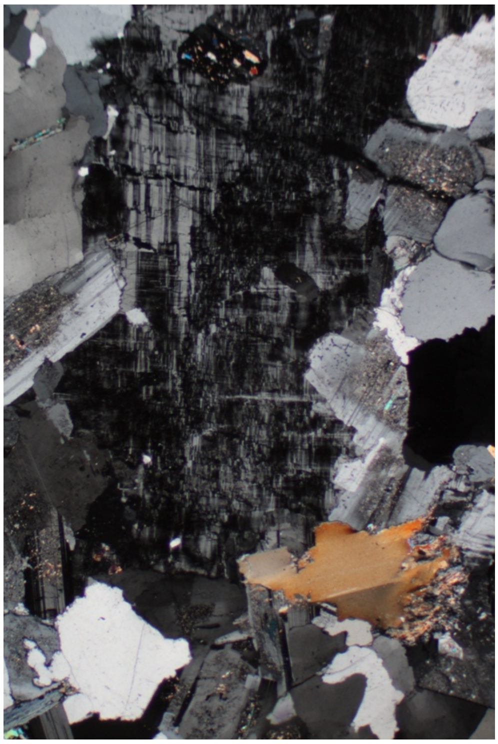
Structures visible: stress relief fracturing (Cotton in 2020)

Macroscopic description: #14 has a medium to coarse-grained matrix with large cm-grains of white feldspar. Both types of mica and grey quartz grains visible in a non-oriented structure. In some areas, a change of colour from the light tones of white and grey towards yellow or brown is to observe macroscopically, which could hint towards alteration. Further observations: SWC was broken into several pieces and black smear was sticking on the side of this sample (unsure whether it is superficial or filtrated into micro-fractures). Additionally there is some orange staining on the cross-sections of the discs (and assumingly some clay mineral or drill mud residue). Seemingly no preferential alignment of mineral orientation as seen in previous samples (Cotton in 2020).

Major mineralogy: alkali-felspar (microcline) > quartz > plagioclase

Minor and accessory mineralogy: muscovite = biotite > tourmaline > chlorite > apatite

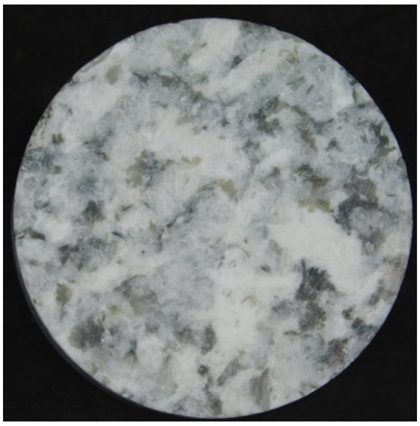
Microscopic description (maxi-sized polished thin section)**:** there are numerous, euhedral and pegmatitic quartz and alkali-felspar crystals present in this sample. The quartz grains are almost rounded and show a strong undulous, radial extinction. Simons et al., 2016 calls this "globular quartz" but does not show thin sections from this special microfabrics of the quartz. Chess board albite does not exists but potassium feldspar with microclinic patterns and twinning (Karlsbad). They include in many cases numerous grains of plagioclase inside its mineral matrix. The plagioclase exhibits polysynthetic twinning and are on their rims non-weathered and unaltered, but show very often significant growth of fine-grained white mica (zonal sericitization) in their grain centers. The primary muscovite crystals are medium-sized to large (type I), very large ones are absent. Type II and III fine-grained white mica is intermediately-spread. Euhedral biotite is abundant, which shows a shape-preferred orientation. It shows a pleochroism with pale red and strong brown colours. Latter indicates, that the biotite contains increased concentrations of iron and/or titanium. Mostly it is not yet transformed into chlorite yet, in some parts the biotite is beginning to be transformed into chlorite, which is a sign of propylitic alteration. Compared to the other thin sections, there are relatively numerous amounts of biotite, fewer rates of chlorite and relatively minor parts of primary muscovite. Accessorily large grains of pleochroitic tourmaline, titanite and apatite are to find. Rarely, grains of an opaque, round phase, that could possibly be ores or trapped hydrocarbons were observed as well.

Alteration: microscopically not many signs of alteration, this sample seems to inherit the assumed "primary magmatic composition", only beginning alteration/ sericitization could be observed, sometimes chloritization of biotite but besides that, "fresh" sample with microclinic alkali-felspar and pristine looking quartz grains

Additional photos: non present; thin sections: #14a, #14b_pol, #14c_pol

SWC: #15



Sampling depth: 4512.6 m MD

Matrix lithological description: quartz 30%, feldspar 55%, mica 10%, other 5% (Cotton in 2020)

Structures visible: fracture at 120 ° from vertical, length ~1.8 cm, clean break and some evidence of fractures in sample (Cotton in 2020)

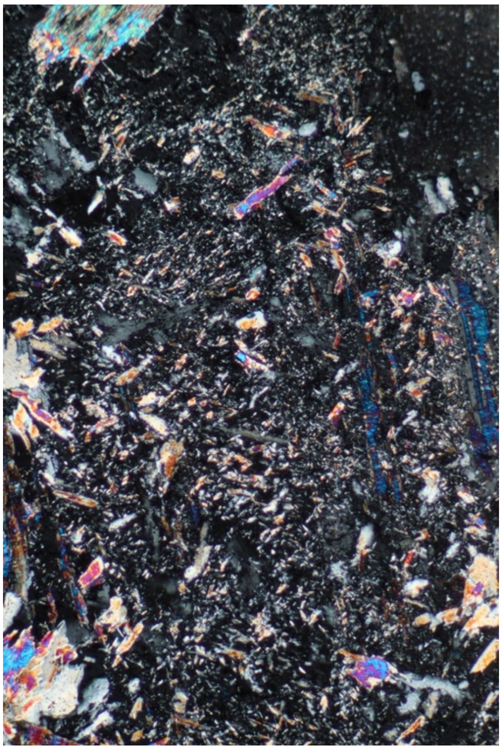
Macroscopic description: this sample has a non-oriented, medium-grained matrix, that lacks the greenish touch as observed in some of the other SWCs. A predominant ratio of the matrix is made of white and grey grains but also includes both types of mica. Macroscopically this sample does not show signs of alteration but looks like a “fresh” granitoid. Additional observations: larger (~2 cm) feldspathic phenocrysts interlocking with quartz and accessory minerals, dark mineralisation present, chlorite and orange staining. Black smear across sample from 'black gunk' (Cotton in 2020).

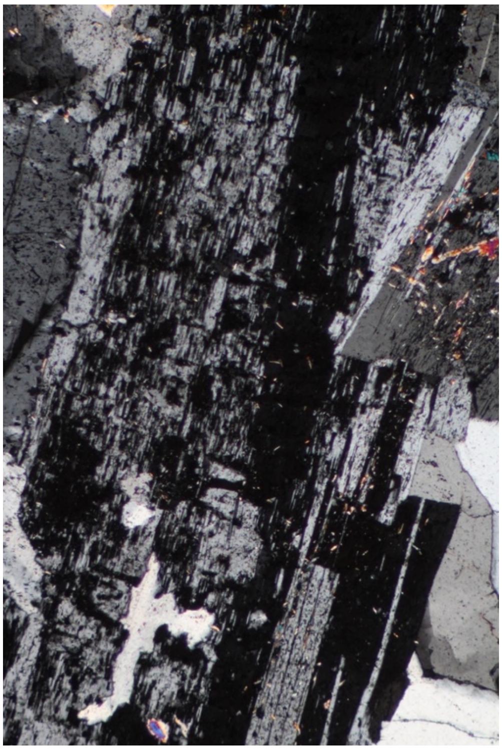
Major mineralogy: alkali-felspar in form of chess board albite = plagioclase > quartz > fine-grained white mica

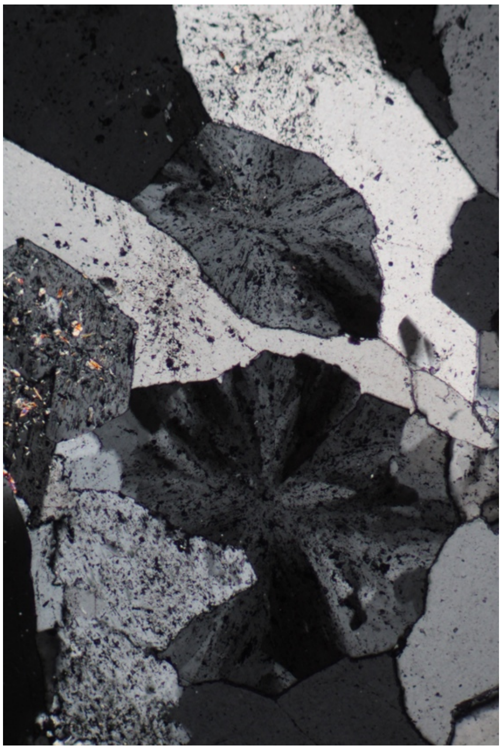
Minor and accessory mineralogy: muscovite > chlorite in former biotite > apatite

Microscopic description (maxi-sized polished thin section)**:** both kinds of feldspar are large, euhedral and multitudinous, the alkalifeldspar is transformed to chess board albite and the plagioclase shows its polysynthetic twinning. The quartz grains exhibit numerous radial aligned fluid inclusions, which speak for secondary inclusions, theoretically containing information about the hydrothermal fluid. Additionally the quarts grains exhibit undulous extinction and again, like in SWC #14, a “globular quartz” form (compare photos in the appendix). The three generations of white mica are observable, primary magmatic muscovite but also wide-spread fine-grained white mica, especially central on the plagioclase grains, this makes a clear zonal appearance for the significant sericitization. Chlorite is abundant as chloritization of biotite, not so much newly-grown, which indicates towards propylitic alteration. There are numerous apatite present, tourmaline is absent.

The thin section also includes smaller fractures and veins, that are not as significant as in some of the samples before. Exceptional for SWC #15 is, that the degree of alteration and sericitization is very strong. Only the samples from #16p1, #16p2 and #18 exhibit stronger alteration.







Alteration: microscopically severe signs of advancing alteration, this thin section has possibly been affected by hydrothermal metasomatism, indicated by the growth of fine-grained white mica (medium-spread) especially in plagioclase

Surface of borehole-facing wall (ESEM): Fe-Cl-O containing layer on the sawn surfaces of the minerals´ grains, illite, slight alteration of the feldspar, montmorillonite (with high probability from drilling mud), hydrocarbons

Additional photos: present (6x); images before and after-CFT (8x); thin sections: #15a_pol, #15b_pol, #15c_pol, #15d_pol; ESEM: in attached excel file (6x)

SWC: #16p1

Sampling depth: 4516.3 m MD

Matrix lithological description: quartz 30 %, feldspar 60 %, mica 3 %, other 7 % (Cotton in 2020)

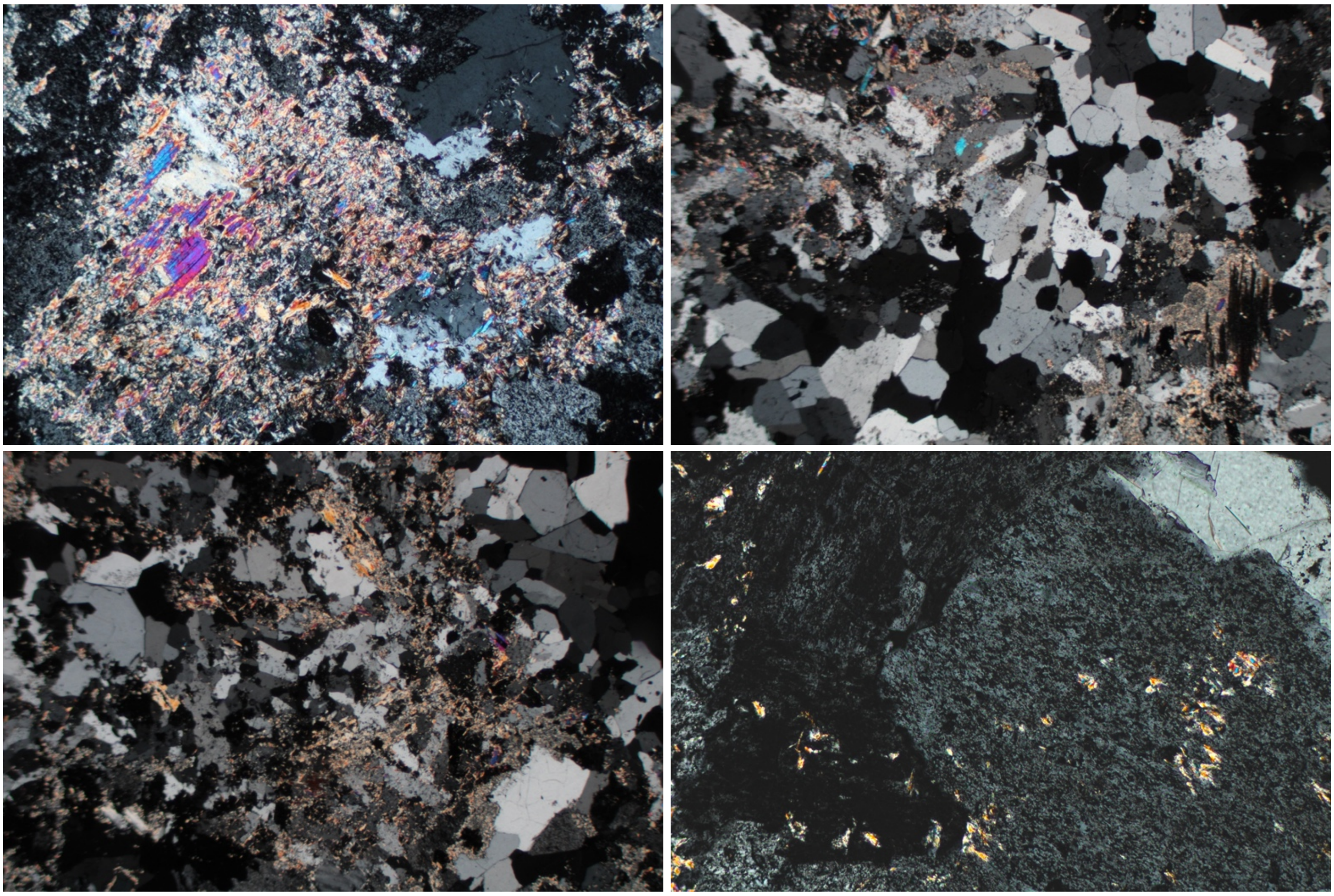
Structures visible: no obvious fracturing (Cotton in 2020), more or less homogeneous distribution of minerals

Macroscopic description: this sample is a twice-drilled-hole-core (“moon form”), ca. 5 cm long and measured to be radioactive (high gamma radiation after side wall coring). It has a fine-grained matrix, is very light in its colour and exhibits a pale green tint. Dark components are entirely missing. It is likely, that this sample originates from a quartz vein. Further observations: the core samples #16p1 and #16p2 had highest radiation reading (possibly fracture infill, additionally very light in colour to contain pitchblende). Some black smear sticking on the samples and orange staining on cross section of core pieces is present. The sample was originally broken into 4 pieces and due to the number of attempts to retrieve a core had smooth edges and sections missing. Some potential evidence of porosity is to find on the cross sections of the cores (Cotton in 2020).

Major mineralogy: quartz > alkali-felspar > muscovite, fine-grained white mica

Minor and accessory mineralogy: chlorite > titanite/ epidote ?

Microscopic description (normal-sized polished thin section)**:** SWC #16p1 does not resemble to the previous thin sections. It is to large amounts (~ 65 vol %) made up of quartz crystals, the rest are alkali-felspar (~ 15 vol %) and white mica (~ 20 vol %). White mica exists as medium-grainsized magmatic muscovite (type I) and also as sericitic white mica (type II and III). Most minerals grow ether anhedral or subhedral, do not reach large grain sizes and are mostly equigranular, except the fine-grained white mica. Many of the feldspar, hereby it is a question of alkali-felspar, not plagioclase, are completely taken over by the fine-grained white mica (sericitization) which grow independently of grain boundaries or cleavage plains. In the bright field, colourful grains such as biotite, chlorite or pleochroitic tourmaline do (almost) not exist. There are very few euhedral, roundish, blotched mineral grains but without an exact shape to find, which are interpreted as epidote grains.



Alteration: very strong and highly severe alteration visible, matrix is fully sericitizised, strongly changed or transformed former plutonic rock, only quartz is still abundant as only recognizable mineral besides the fine-grained white mica

Additional photos: present (1x); thin sections: #16p1a_pol, #16p1b_pol, #16p1c_pol, #16p1d_pol

SWC: #16p2

Sampling depth: 4516.3 m MD

Matrix lithological description: quartz 30 %, feldspar 60 %, mica 3 %, other 7 % (Cotton in 2020)

Structures visible: no obvious fracturing (Cotton in 2020), more or less homogeneous distribution of minerals

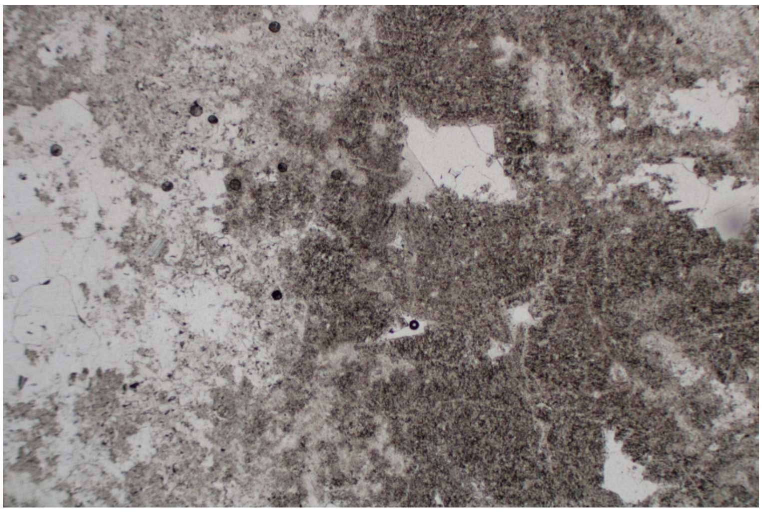
Macroscopic description: #16p2 is the rest of the core sample #16p1. It is also a twice drilled core with two pieces in "moon form", measured to be radioactive (high gamma radiation after side wall coring). It has a fine-grained matrix with many white components, so very light in its colour and exhibits a pale green tint. The sample lacks any dark minerals e.g. biotite or tourmaline. It is likely, that this sample originates from a quartz vein. Further observations: see core description #16p1 (Cotton in 2020).

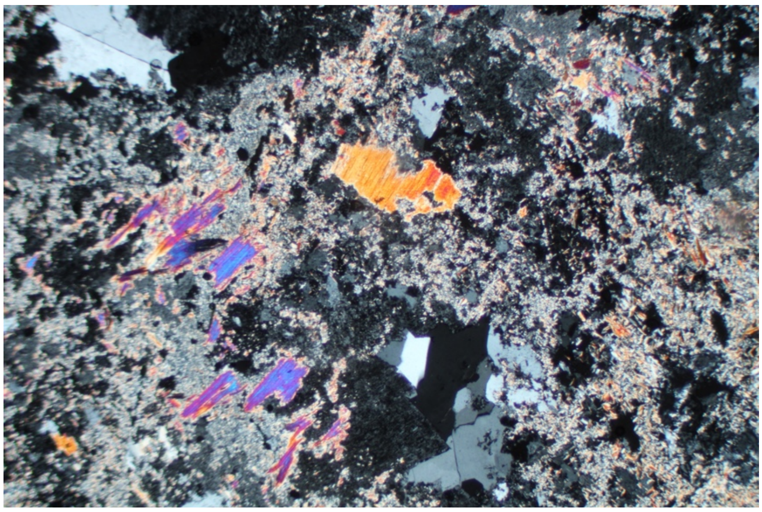
Major mineralogy: quartz >> muscovite, fine-grained white mica > feldspar ? (matrix sericitisized)

Minor and accessory mineralogy: only identifiable, accessorily mineral is titanite here

Microscopic description (normal-sized polished thin section)**:** SWC #16p2´s thin section is similar to #16p1 from the same depth, with an equigranular matrix mainly consisting of subhedral quartz, alkali-felspar and white mica. The quartz grains exhibit undulose extinction, few fluid inclusions and subgrain formation. Additionally, #16p2 includes more and larger primary muscovite grains (type I) and the ratio of quartz seems to be increased towards #16p1. The thin section exhibits broad alteration in form of sericitization so that there is nothing left from the original magmatic microfabric of the rock. It was completely overprinted by hydrothermal alteration, which is assumed to be linked to vein alteration, not propylitic alteration. Additionally it was assumed, that inside the altered feldspar and quartz crystals and at their boundaries, trapped organic matter, e.g. hydrocarbons from the formation could be included. But this is for the moment only an assumption, as it could not be verified yet.

The two thin sections (#16p1 and #16p2) are different to all the other samples because of the fine equigranular matrix. Exceptional is the lack of plagioclase and the severely wide-spread and complete sericitization. Assumable the samples originate from a corridor or path way, possibly a quartz vein, it is not a granite rock type any more, as it is so strongly transmuted.





Alteration: very strong and severe alteration visible, matrix is fully sericitizised, strongly changed or transformed former plutonic rock, only quartz is still abundant as only recognizable mineral besides the fine-grained white mica, similar to #16p1

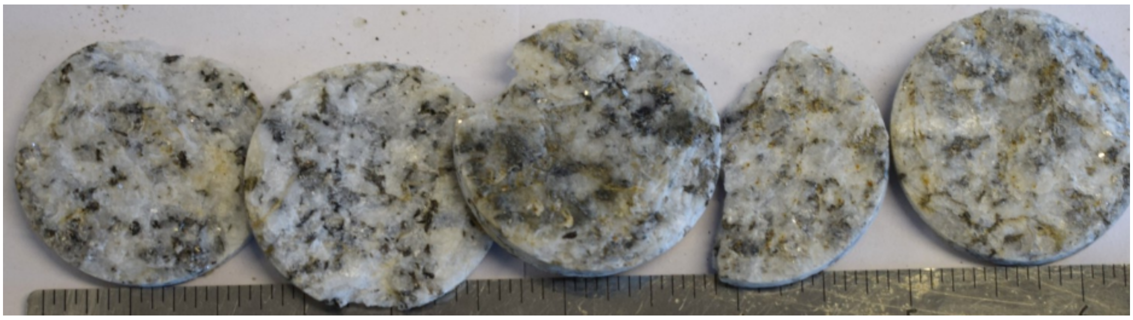
Additional photos: present (2x); thin sections: #16p2a, #16p2a_pol

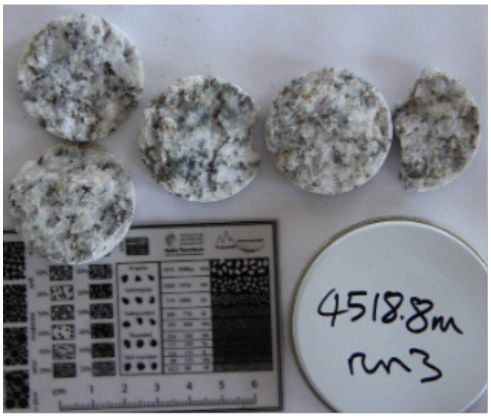
SWC: #17

Sampling depth:
4518.8 m MD

Matrix lithological description:
quartz 30 %, feldspar 50 %, mica 15 %, other 5 % (Cotton in 2020)

Structures visible: stress relief fracturing (Cotton in 2020)



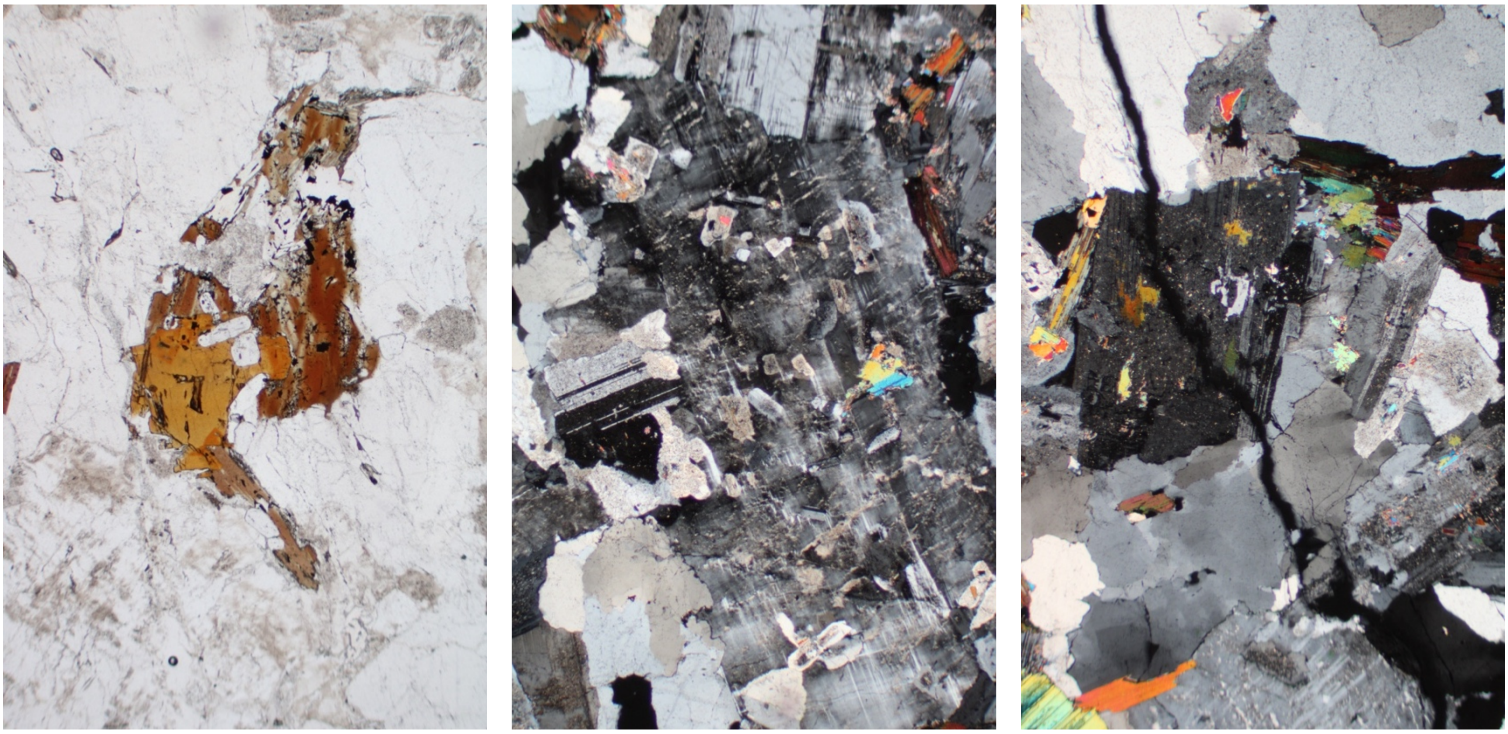


Macroscopic description: sample # 17 consists of several flat discs and pieces. This core is similar to sample #14 and exhibits both; biotite and muscovite in a fine to medium-grained non-oriented matrix of white feldspar and quartz grains. Besides the slivering into the cm-large discs, the granodiorite looks pristine and fresh. Further observations: more 'typical' granite such as core sample #14, much more biotite evident in core sample than in cuttings (Cotton in 2020). A change of colour is visible on the surface as white grains turn yellowish and brown.

Major mineralogy: alkali-felspar >= quartz = plagioclase

Minor and accessory mineralogy: muscovite, tourmaline, biotite > chlorite, apatite

Microscopic description (maxi-sized polished thin section)**:** quartz and feldspar are to approximately equal amounts present and exhibit in some areas fluid inclusions. The quartz grains are euhedral to subhedral, large and grow in multi-grain aggregations, but look deformed as they exhibit sub-grain formation and oscillatory extinction. Both types of feldspar are large and euhedral. The plagioclase has polysynthetic twinning with the characteristic lamellar pattern and is in wide-spread areas zonal overgrown by fine-grained white mica in the centre. The alkali-felspar exhibit microclinic patterns and twinning. The crystals are not transformed to chess board albite and include many small grains of sericitisized plagioclase. The primary muscovite grows numerous and in large, euhedral aggregates. Biotite and muscovite are estimated to an equal ratio included (~ 5 to 10 vol.-%). White mica additionally exists as fine-grained white mica from type II and III. There are many mostly medium-sized crystals of pleochroitic biotite to find, in parts large individuals, that are in some cases chlortizised. Black needles are enclosed inside the biotite, assumingly of titanium, ore grains or oxides. Newly-grown chlorite is absent, only chloritization of biotite along cleavage planes is to find, that would belong with a high probability to propylitic alteration processes. The thin section comprises large pleochroistic tourmaline grains, that sometimes include euhedral apatite grains and black spots, grains or pieces of an opaque mineral. A medium-sized fracture runs through the mineralogical interconnection, which devides grains of feldspar, quartz and mica. Additionally smaller fractures exist, that are not connected and disjointed to each other. This sample would be classified as two-mica-granite. With the help of the thin sections, the existence of the (in advance expected) microfractures could be proven.



Alteration: no significant signs of alteration in this sample, only in few parts chloritized biotite is present, this thin section shows an assumed “primary magmatic composition”, it is a “fresh” sample with pristine looking feldspar and quartz mineral grains

Additional photos: non present; thin sections: #17a, #17b_pol, #17c, #17c_pol, #17d_pol

SWC: #18

Sampling depth: 4524.2 m MD

Matrix lithological description: quartz, mica and feldspar present, fine-grained (Cotton in 2020), conspicuous is the strong dark green colour, that differs very much from the other samples

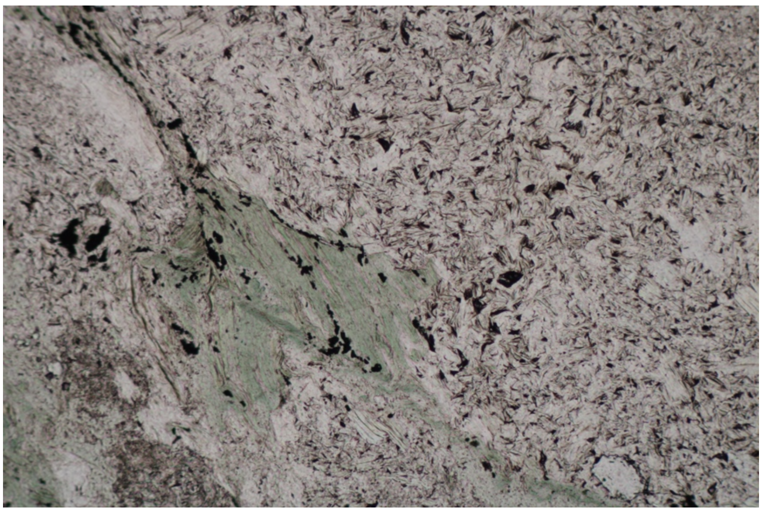
Structures visible: 2 fractures present (one in core and one 'on top' of core). Main fracture 130 ° from vertical from 'top' of fracture, no aperture or fracture fill data although mud present on fracture plane. Second fracture parallel to core axis, aperture <1 mm, infill white (possible clay mineral or feldspar), measured 5.1 cm in length (Cotton in 2020)

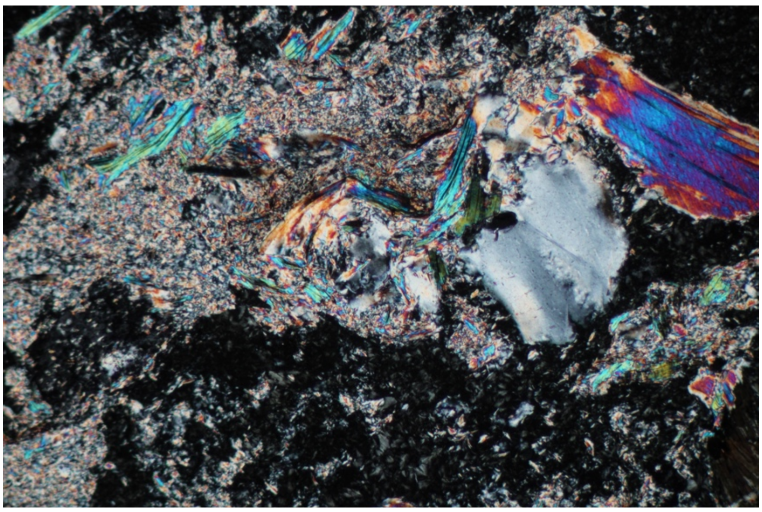
Macroscopic description: this core differs very much from the rest of the SWCs with its intense dark green colour. It cannot be classified as granite or granodiorite even. This 5 - 6 cm long core is measured to be radioactive (high gamma radiation). One plug was sawn from the core. Mica is visible with the pure eye, it is difficult to differ between muscovite or biotite due to the dark colour of the sample. Further notes: unique compared to all other core samples, very dark in colour and green. Contains components of granite but does not resemble granite. Core sample #18 could be mineralised fracture fill. It is dense and crystalline (possibly contains pitchblende given to its high gamma reading) (Cotton in 2020).

Major mineralogy: quartz = chlorite = muscovite, fine-grained white mica (entire matrix sericitisized and chloritized)

Minor and accessory mineralogy: not possible to identify

Microscopic description (normal-sized polished thin section)**:** side wall core #18 consists to major constituents of white mica, chlorite and anhedral or subhedral, highly deformed quartz grains. White mica occurs in the three “generations/ varieties/ types”: type I is the coarse-grained muscovite which is interpreted to be of primary magmatic origin. Some grains reveal undulose extinction pointing to (minor) ductile deformation. Type II is the secondary, very fine-grained white mica, which often grows on the cost of already existing plagioclase. Finally, type III is coarser-grained then type II. #18 exhibits especially the form of type II, sericitic mica. There are also larger minerals from strongly deformed primary muscovite (type I) and quartz, that shows a strong undulose extinction and what seems to be a localized, mechanical deformation. The large minerals do not show shape-preferred orientation. Major parts of the matrix was invaded by epigranular fine-grained white mica and chlorite, the former microfabrics and the differentiation of the magmatic rock completely faded. Chlorite grows secondary and independently from former biotite or cleavage planes, latter was completely changed into chlorite. In between and inside the chlorite, many black and small minerals with a rectangular elongated shape accumulate, which show a varicoloured interference colour. In parts the opaque, black spots look aligned (could be organic matter). Overall, the alkali-felspar is strongly sericitizised, the biotite is fully chloritized, otherwise a lot of newly-grown, secondary chlorite occurs and white mica is present ether as fine-grained white mica or in larger euhedral, primary crystals, which show strong deformation. This would argue for a shear strain zone. The large muscovite crystals are so strong deformed, that they completely lost their initial crystal form. Suggested was a mylonitic fabric, dynamic recrystallization or crystal plastic cores as explanations for this exceptional signal of sample #18 (Shail in 2020).





Alteration: very strong and severe alteration visible, matrix is fully sericitizised, additionally deformation on muscovite and quartz grains exists, further large amounts of chlorite are visible (chloric and sericitic alteration), this sample is a strongly changed or transformed former plutonic rock

Surface of borehole-facing wall (ESEM): illite, montmorillonite (with high probability from drilling mud), hydrocarbons

Additional photos: present (1x); images before and after-CFT (7x); thin sections: #18a_pol, #18b, #18c, #18d, #18e_pol, #18f, #18g_pol; ESEM: in attached excel file (3x)

SWC: #19

Sampling depth: 4665 m MD

Matrix lithological description: quartz 30%, feldspar 50%, mica 15%, other 5%, medium-grained (Cotton in 2020)

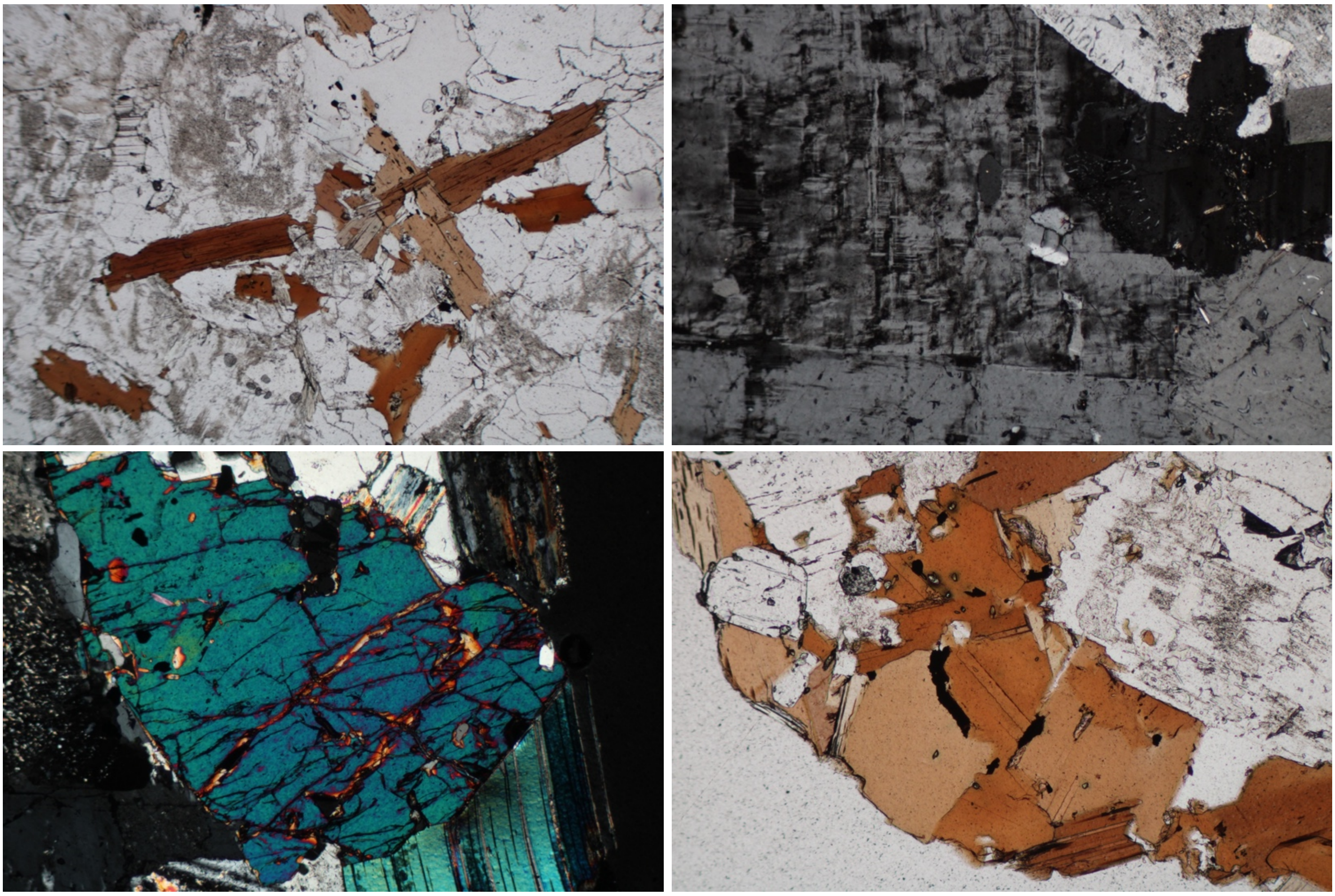
Structures visible: possible stress relief fractures perpendicular to the core axis; infilled with black "gunk"? If not black smear, infill is preferentially orientated to align with potential stress relief fractures (Cotton in 2020)

Macroscopic description: #19 has a medium- to coarse-grained matrix. Non-oriented white, grey and black minerals alternate, also few brownish mineral grains are visible. White and dark mica is present to a similar ratio. This core can be classified as granitoid with (microclinic) potassium feldspar. Assumed "primary magmatic composition", only beginning alteration/ sericitization, sometimes chloritization of biotite. Further observations: some black smearing in small fractures present. The core sample #19 was stuck in the tool and is broken into two pieces. Sample appears to be rich in biotite (Cotton in 2020).

Major mineralogy: quartz >> alkali-felspar/ microcline = plagioclase > muscovite = biotite

Minor and accessory mineralogy: tourmaline > chlorite, titanite, ore minerals?

Microscopic description (normal-sized polished thin section)**:** There are large subhedral crystals of quartz, euhedral alkali-felspar, plagioclase, muscovite, and numerous biotite contained in this thin section. The quartz shows numerous non-aligned fluid inclusions. The alkali-felspar grows in mega crystals, almost pegmatitic and exhibits a microclinic pattern with perlites. Plagioclase exists in equal amounts as the alkali-felspar and has a zonal, beginning sericitization, where the fine-grained white mica crystals start to grow from the core of the crystal, the rim is not affected so far. Biotite grows in large, elongated, euhedral grains and shows a strong pleochroism with deep brown, orange or dirty yellowish colours. It is in some seldom parts chloritized and encloses on the boundaries of grains opaque, black inclusions, that could possibly be ore minerals or oxides. Large pleochroitic tourmaline grains exist several times with inclusions of opaque, black spots and also euhedral apatite. The apatite is numerous, in various sizes and exhibits cleavage planes. Sometimes there is titanite present, which grows usually next to biotite or muscovite crystals.



Alteration: not significantly severe or advanced, sample predominantly seems fresh and unaltered

Surface of borehole-facing wall (ESEM): few hydrocarbon spheres, large abundances of montmorillonite (originating from the drilling mud probably), illite, As-containing minerals (light colour)

Additional photos: present (10x); images before and after-CFT (7x); thin sections: #19a, #19b, #19c_pol, #19d, #19d_pol; ESEM: in attached excel file (4x)