## Petrography

*Host rocks*

Marble has a granoblastic texture (Fig. 1A). Calcite and dolomite are xenoblastic and define a shape preferred orientation which forms a continuous foliation. Siliceous layers are composed of quartz, zoisite, titanite, and tremolite ± microcline. Where siliceous banding is > 50% of the rock, the rock is classified as calc-silicate gneiss. Quartz is xenoblastic with straight to curved grain boundaries. Zoisite is subidioblastic and occurs in aggregates. Tremolite laths are subidioblastic. Microcline is xenoblastic with sweeping extinction and grid twins. Titanite is subidioblastic.

Calc-silicate schist is lepidioblastic (Fig. 1B). The schistosity is defined by bladed, subidioblastic tremolite, and plagioclase, which is xenoblastic and interstitial with respect to tremolite.

Schist and calcareous schist textures are lepidioblastic (Fig. 1C) and phases are quartz, muscovite, biotite and garnet ± staurolite ± kyanite. Quartz is xenoblastic with straight grain boundaries and sweeping extinction. Muscovite is idioblastic with sweeping extinction. Biotite is xenoblastic and kinked with inclusions of muscovite, quartz, and opaque oxides. Chlorite is xenoblastic, has kinked cleavage and over-grows biotite. Garnet is idioblastic to subidioblastic and contains inclusions of quartz, biotite, opaque oxides, and chlorite. Staurolite blocks are poikioblastic with inclusions of quartz, and Fe-Ti oxides.

Quartzite has a granoblastic texture (Fig. 1D). Quartz is xenoblastic, with curved grain boundaries and undulose extinction. Biotite books are subidioblastic.

*Intrusive and migmatitic rocks*

Vega granodiorite textures range from hypidiomorphic to allotriomorphic granular (Fig. 2A). Cordierite-bearing varieties are hypidiomorphic granular. Quartz (51–12%) is anhedral with sweeping undulose extinction and "chessboard" subgrain configuration. Plagioclase (52–7%) blocks are subhedral to anhedral, and exhibit normal zoning with $An_{29}$ cores and $An_{20}$ rims. K-feldspar (65–12%) is anhedral to subhedral with sweeping extinction. Some grains exhibit perthitic texture and many grains are sericized. Myrmekite is common. Biotite is anhedral to subhedral and grains exhibit sweeping extinction. Some biotite grains are "kinked." Cordierite + quartz + biotite aggregates make up dendritic and nodular cordierite, with proportions of ~50% anhedral, equant cordierite, 45% anhedral, equant quartz and 5% biotite. Quartz has undulose extinction and cordierite has uniform extinction. In the aggregates, biotite occurs as euhedral books. Accessory phases in granodiorite are garnet, Fe-Ti oxides, sillimanite (fibrolite after cordierite), garnet, zircon and apatite.

Cordierite-free Vega granodiorite is allotriomorphic granular. Quartz (47–29%) is anhedral and exhibits undulose (sweeping) extinction. Grains define a shape preferred orientation (SPO). Plagioclase (52–7%) is anhedral and blocky. Compositional zoning is uncommon and compositions are ~$An_{25}$. K-feldspar (56–12%) is anhedral. Biotite is anhedral with sweeping extinction and displays conjugate deformation twins. In some cases, biotite grains are deflected around quartz grains. Accessory phases are garnet,

zircon, monazite and Fe-Ti oxides. Accessory phases are common inclusions in biotite. Chlorite and white mica after biotite are common.

Fugleværet granodiorite is hypidiomorphic granular (Fig. 2B and 2C). Quartz (42–20%) is anhedral, grain boundaries are embayed, and "chessboard" subgrain configuration is common. Plagioclase (55–41%) occurs as subhedral to euhedral blocks and laths with weak normal compositional zoning. Compositions range from $An_{37}$ cores to $An_{23}$ rims. Iron-Ti oxide, zircon, biotite, and apatite inclusions are rare in plagioclase. K-feldspar (67–8%) is anhedral to subhedral and is commonly sericized. Biotite is subhedral and blocky with Fe-Ti oxide inclusions along cleavage planes and grain boundaries. Pinitized cordierite phenocrysts are anhedral to subhedral and range from 0.5– 2.5 mm in diameter. Nodular cordierite is similar to that described in the Vega granodiorite. Accessory phases are almandine garnet ($X_{Grs}$ = 0.10, $X_{Prp}$ = 0.08, $X_{Alm}$ =0.80, $X_{Sps}$=0.02), zircon, and apatite.

Garnet biotite granite and biotite granite range from hypidiomorphic to allotriomorphic granular (Fig. 2D). Quartz (50–26%) is anhedral with sweeping extinction and rectilinear subgrains. Plagioclase (44–33%) is anhedral and blocky, with uniform extinction. Plagioclase compositions are ~$An_{26}$. Plagioclase grains enclose biotite, calcite and white mica. K-feldspar (57–29%) is anhedral and blocky. Biotite is subhedral to anhedral and displays sweeping extinction. Garnet is subhedral, equant and may include quartz, biotite, Fe-Ti oxide, rutile, allanite, clinozoisite, and tourmaline. Accessory phases are zircon, titanite, and apatite. Secondary phases are white mica and calcite.

Intrusive migmatite (Fig. 3A) and contact diatexite (Fig. 3B) are allotriomorphic to hypidiomorphic granular. Quartz (50–26%) is anhedral with sweeping extinction, rectilinear subgrains and biotite is a common inclusion. K-feldspar (52–28%) blocks are anhedral and exhibit sweeping extinction. Plagioclase (44–33%) laths are subhedral and commonly exhibit sweeping extinction; compositions range from $An_{46}$ in massive diatexite to $An_{25}$ in layered diatexite. Biotite books are subhedral, with sweeping extinction and conjugate deformation bands in some grains. Common inclusions in biotite are zircon, titanite, and Fe-Ti oxides which are present along grain boundaries and cleavage planes. Kyanite laths are subhedral and only occur in contact and massive diatexite (Fig. 3C). Staurolite is anhedral and includes anhedral quartz chadocrysts. Garnet ranges from anhedral to subhedral and compositions are almandine ($X_{Grs}$ = 0.03, $X_{Prp}$ = 0.11, $X_{Alm}$ =0.75, $X_{Sps}$=0.11). In some cases, garnet encloses anhedral quartz, biotite, or chlorite. Muscovite after sillimanite is fibrous(?) and occurs in clusters that overgrow kyanite and staurolite. Subhedral muscovite books (20% mode) are secondary after K-feldspar. Accessory phases are Fe-Ti oxides, rutile, allanite, zoisite, apatite, and zircon. Secondary anhedral calcite is interstitial or occurs as inclusions in K-feldspar.

Leucocratic migmatite ranges from hypidiomorphic to allotriomorphic granular. Interstitial quartz is anhedral, with rectilinear subgrains that exhibit sweeping extinction. Plagioclase (~$An_{22}$) is subhedral to anhedral and blocky. K-feldspar is anhedral and sericized. Accessory phases are biotite and Fe-Ti oxides, with secondary calcite, epidote, and chlorite.

Leucocratic quartz syenite is hypidiomorphic granular. Quartz is interstitial, anhedral, exhibits undulose extinction, and ranges from 100 to 750 µm in diameter. Perthitic K-feldspar is anhedral and blocky, with inclusions of biotite, muscovite, plagioclase and quartz. Subhedral plagioclase (~$An_{24}$) laths reach 1 mm in length and commonly have bent albite twins. Biotite is anhedral to subhedral and occurs as books 50 to 200 µm long.

Granitic dykes are hypidiomorphic granular. Quartz (45%) is anhedral and interstitial, with rectilinear subgrains. Perthitic K-feldspar is anhedral and blocky with patchy undulose extinction. Plagioclase ($An_{28-25}$) is anhedral and blocky with uniform to undulose (sweeping) extinction. Biotite is anhedral, with bent crystals that exhibit deformation twins. Accessory phases are subhedral cordierite, almandine garnet ($X_{Grs}$ = 0.14, $X_{Prp}$ = 0.06, $X_{Alm}$ =0.77, $X_{Sps}$=0.02), prismatic tourmaline, titanite(?), zircon, Ti-Fe oxide, and chlorite, which is secondary after biotite.

Hornblende biotite tonalite is hypidiomorphic granular, with anhedral, interstitial quartz. Plagioclase laths are subhedral, with concentric, normal zoning ($An_{44-36}$). Plagioclase grains define a good shape preferred orientation (SPO) and some exhibit tapering deformation twins. Biotite is anhedral, with sweeping extinction and it has a good SPO. Amphibole is classified as magnesiohornblende (Leake *et al.* 1997) and forms pale green, anhedral laths. The amphibole is intergrown with biotite and defines a poor SPO. Accessory phases are Fe-Ti oxides, zircon, zoisite, and apatite.

Biotite hornblende quartz diorite is hypidiomorphic granular (Fig. 4), with euhedral to subhedral plagioclase. Laths that are euhedral show normal or reverse zoning

($An_{52-45}$). Poikilitic amphibole shows uniform to slightly sweeping extinction and has chadocrysts of biotite, quartz, and Fe-Ti oxides. Interstitial biotite is subhedral and interstitial quartz is anhedral, with patchy extinction. Fe-Ti oxides are accessory minerals and clinozoisite is secondary after plagioclase.

**Enclaves**

Photographs of selected metasedimentary, mafic, and ultramafic enclaves in the Vega intrusive complex are presented in Figure 5a–f.

**References**

Leake, B.E., Woolley, A.R., Arps, C.E.S., Birch, W.D., Gilbert, M.C., Grice, J.D., Hawthorne, F.C., Kato, A., Kisch, H.J., Krivovichev, V.G., Linthout, K., Laird, J., Mandarino, J.A., Maresch, W.V., Nickel, E.H., Rock, N.M.S., Schumacher, J.C., Smith, D.C., Stephenson, N.C.N., Ungaretti, L., Whittaker, E.J.W & Youzhi, G. 1997. Nomenclature of amphiboles: report of the subcommittee on amphiboles of the international mineralogical association, commission on new minerals and mineral names. *The Canadian Mineralogist*, **35**, 219–246.

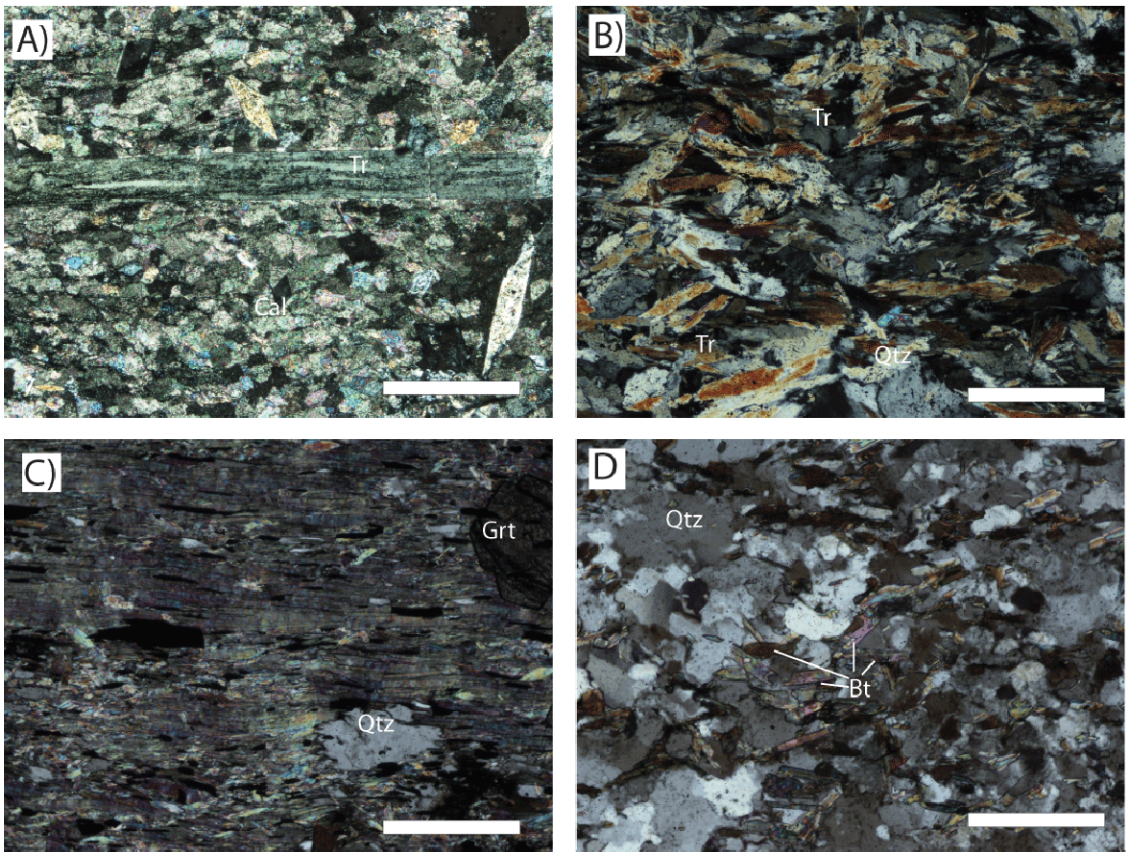


Fig. 1. Photomicrographs of host rocks. A) Marble sample CVG-6 (under cross polarized light). Scale bar is 0.75 mm long. B) Calc-silicate sample VGWM-23 (under cross polarized light). Scale bar is 0.3 mm long. C) Biotite schist sample VGWM-125G (under cross polarized light). Scale bar is 0.3 mm long. D) Quartzite sample VGWM-134 (under cross polarized light). Scale bar is 0.3 mm long.

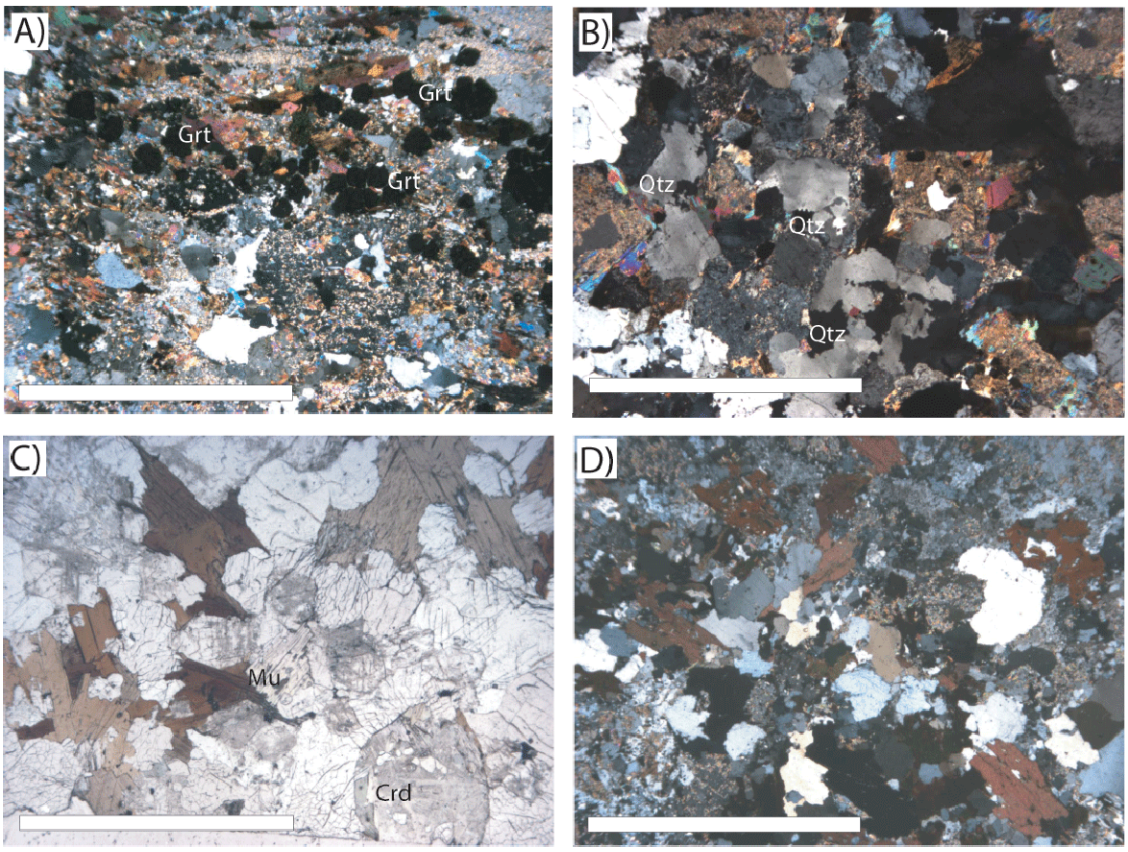


Fig. 2. Photomicrographs of intrusive rocks. The scale bars are ~3 mm long. A) Vega granodiorite sample VGWM-9 (under cross polarized light). B) Fugleværet sample VGWM-74 (under cross polarized light). Quartz shows patchy to "chessboard" extinction pattern. C) Fugleværet sample F2. D) Biotite granite sample VGWM-35 (under cross polarized light).

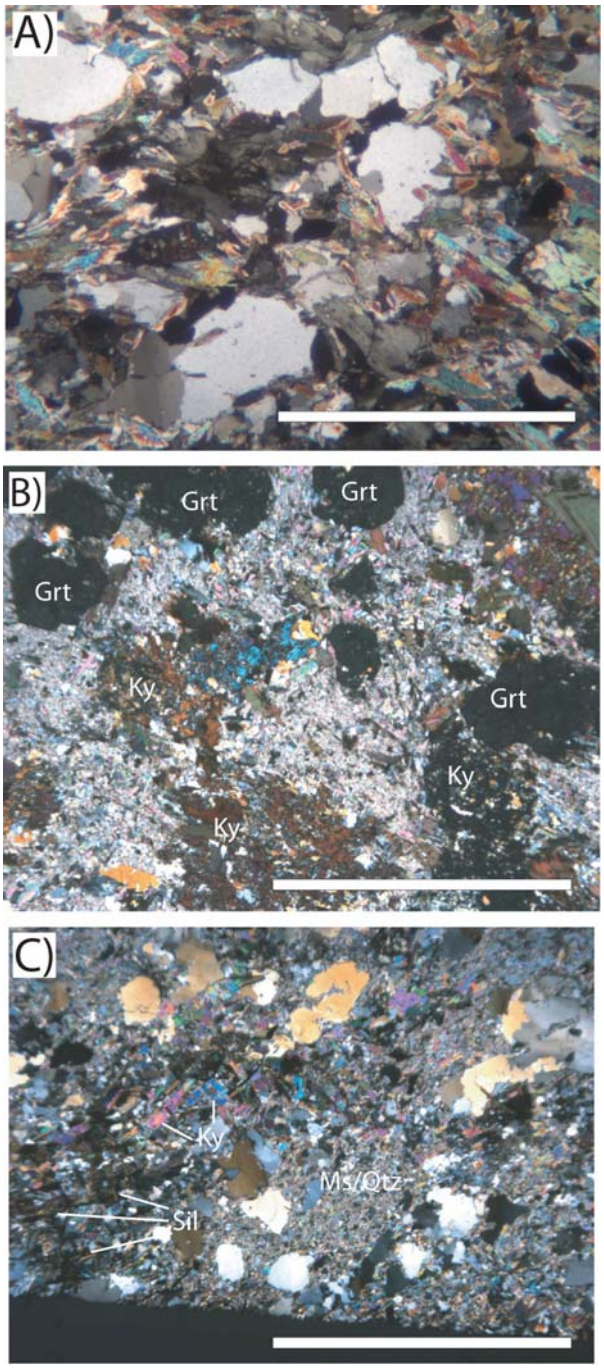


Fig. 3. Photomicrographs of migmatite. A) Diatexite NWV-4 (under cross polarized light). Scale bar is 1.3 mm long. B) Contact migmatite VGWM-20-1 (under cross polarized light). Scale bar is ~3 mm long. C) Massive diatexite from Ylvingen, sample VGWM-34 (under cross polarized light). Scale bar is ~3 mm long.

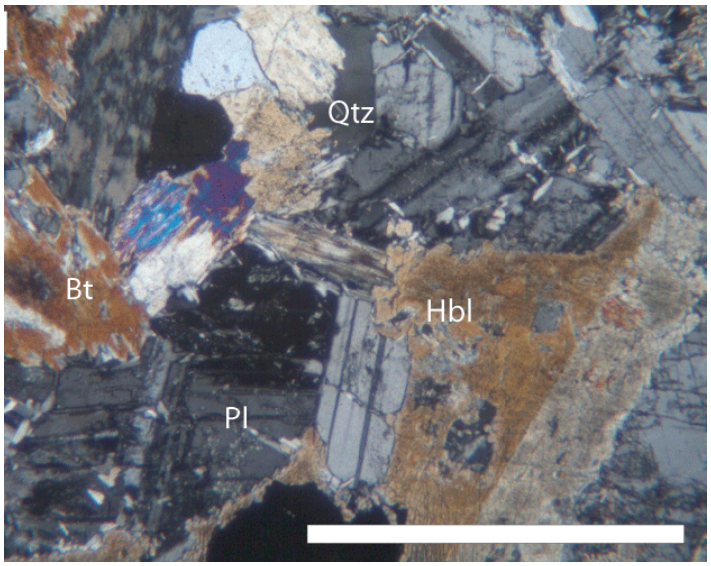


Fig. 4. Photomicrograph of biotite hornblende quartz diorite sample VG12a (under cross polarized light). Scale bar is 1.3 mm long.

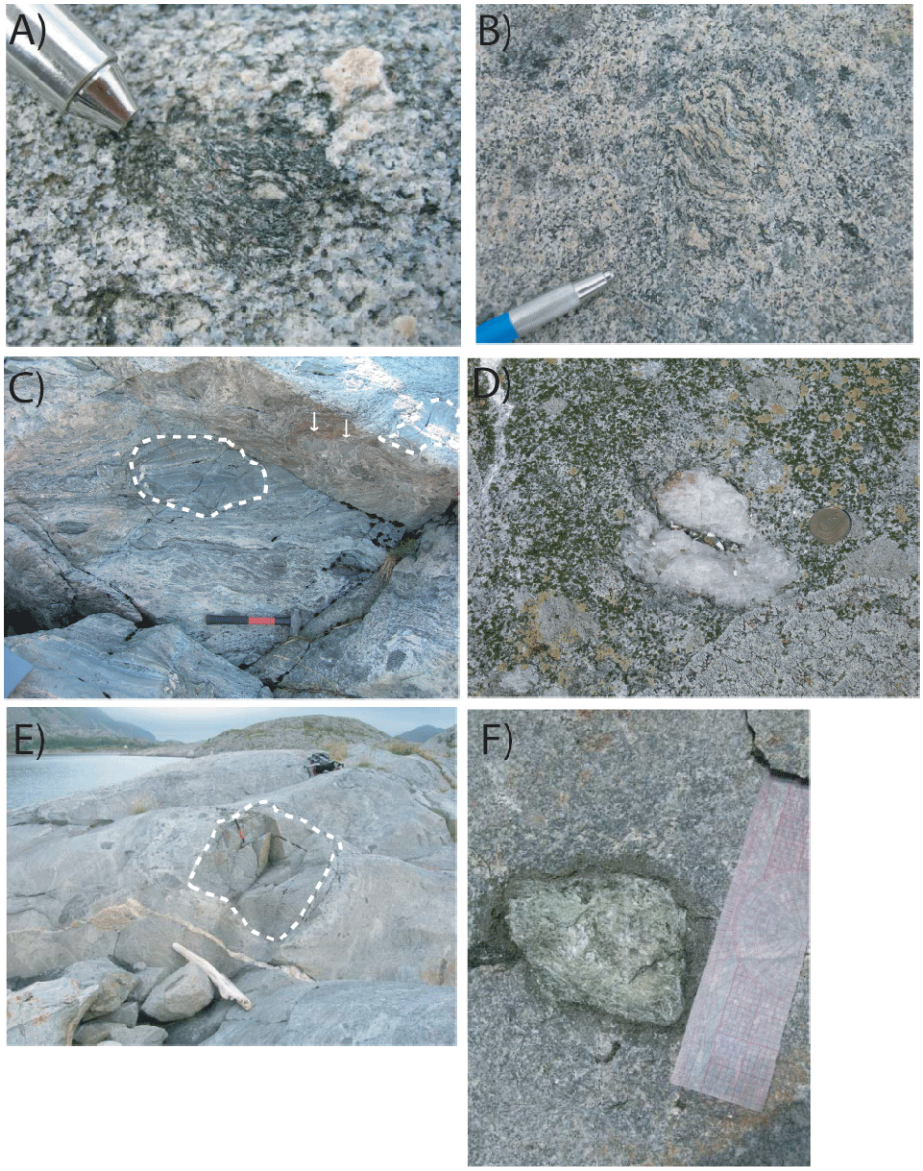


Fig. 5. Selected enclaves observed in the Vega intrusive complex. A) Garnet-bearing surmicaceous schist next to rounded K-feldspar phenocrysts near UTM 631584E, 7278573N. Pen is ~6 mm wide. B) Migmatitic gneiss with gradational contacts near UTM 636150E, 7279750N. Pen is ~6 mm wide. C) Fine grained blue-gray gneiss near UTM 633625E, 7278442N. Hammer is ~ 40 cm long. Dashed white line and arrows mark enclave positions. D) Quartz resister (bull quartz) in Fugleværet granodiorite near UTM 618350E, 7281650N. Coin is ~2.5 cm in diameter. E) Hornblende bearing tonalitic enclave (dashed white line) south of station VGWM-13 (UTM 631584E, 7278573N). Hammer is ~40 cm long. F) Meta-ultramafic enclave (retro-grade to talc and actinolite), near UTM 629400E, 7288000N. Ruler is ~15 cm long.