Dalradian host rocks and contact hornfelses, Ballachulish Igneous Complex - an excursion

Excursion for Day 2

Rock types and intrusive relationships of the igneous complex

The aim of of this excursion is to view the rock types and intrusive relationships within the igneous complex. Special attention is given to the early two-pyroxene monzodiorite, and to the contrasting intrusive relationships of the later granite with the monzodiorite-diorite shell. (Figure 9) shows locations on geological and topographic maps for most of the itinerary.

Note: This traverse of the rocks of the igneous complex involves a fairly strenuous walk across rough ground, with an elevation gain of about 700m over 2 km, up to the summit of Sgorr Dhonuill. Walking boots, a compass and an altimeter are strongly recommended, hut no special mountain climbing skills are called for, and on a fine day the view from Sgorr Dhonuill is magnificent. If vehicular access to the Forestry roads is obtained, then the actual walking distance is only about 5 km. However, to gain such access you will need to have obtained a key to the forest gates, from the Forest Enterprise office in Oban (see section on Logistics for Field Excursions).

Table 2 Rock types and intrusive relationships, Ballachulish Igneous Complex - an excursion

	Grid ref.	Features
Stop 2-1 Glen Duror	[NN 0150 5430]	Xenolith-rich quartz diorite
Stop 2-2 Parking place in Glen Duror	[NN 0425 5435]	Biotite-poikilitic two pyroxene monzodiorite, and start of the foot traverse
Stop 2-3	[NN 0410 5445]	K-feldspar-porphyritic quartz monzodiorite of major apophysis of the later 'granite'
Stop 2-4	[NN 0405 5455]	Crushed and altered zone in two pyroxene monzodiorite
Stop 2-5	[NN 0395 5460] to [NN 0390 5470]	Varieties of two pyroxene monzodiorite
Stop 2-6	[NN 0385 5485]	Late stage rhyolite dyke
Stop 2-7 Edge of Sgorr Dhonuill plateau	[NN 0345 5515]	Partially hydrated augite monzodiorite, showing the transition front two pyroxene monzodiorite into the hybrid transition zone
Stop 2-8	[NN 0350 5545]	Pink biotite-hornblende quartz monzodiorite, representative of the hybrid transition zone
Stop 2-9	[NN 0370 5550]	Pink biotite-hornblende granodiorite of the central granite
Stop 2-10	[NN 0405 5555]	Summit of Sgorr Dhonuill

Stop 2-1. Xenolith-rich quartz diorite. [NN 0150 5430]

Directions: From the A828 road, take the Auchindarroch turnoff, about 300 m north of the Duror Hotel (see Coloured Map (Map 1)). Set odometer to zero at this turnoff. Follow the main paved road 0.75 miles (1.2 km), to where a paved road forks off to the right, whilst straight ahead the paving gives way to a dirt track which soon forks to give two tracks both barred by gates. You should proceed to the left-hand gate [NN 0050 5515], which is usually locked, but may be opened with the Forest Enterprise key (see above). From the gate follow the 'main' (most 'straight-on') forestry road track,

avoiding the road to the right at (1.9 miles (1.5 km). At 1.65 miles (2.6 km), as measured from the A828, stop at an exposure on the north side of the road, immediately beside where the road forks. This is Stop 2-1 (refer to (Figure 10) for location of Stop 2-1).

Description: The rock is a xenolith-rich marginal phase of the early diorite phase of the igneous complex. The main rock type is a coarse grey hornblende+biotite±clinopyroxene-bearing quartz monzodiorite, with some darker, finer grained patches with diffuse boundaries on cm-dm scale. Occasional coarse pink feldspathic veins occur. Many sizes of xenoliths are present, most of which are metapelite or more rarely quartzite, and which overall have an orientation striking about 030° (Weiss, 1986).

View up Eas nom Meirleach: Looking to the north-east towards Beinn a' Bheithir, one looks up a conspicuous steep-sided gulley (Eas nam Meirleach). This gulley is the physiographic expression of the Ballachulish wrench fault (see Coloured Map (Map 1)(Map 1)). On the left (west) of the gulley are abundant light coloured exposures of the central granite, which contrast with the lower-standing, darker exposures of the two pyroxene monzodiorite on the right (east) of the gulley.

Stop 2-2. Biotite-poikilitic, two-pyroxene monzodiorite and start of the foot traverse. [NN 0425 5435], 320m

Directions: At Stop 2-1, take the right hand fork, which goes downhill and joins with a lower road at about 1.75 miles or 2.8 km (still measuring from the A828).

Note: this fork, joining the upper and lower road was constructed in the late 1980's and so does not appear on the 1978 Ordnance Survey map, although it has been added to the Coloured Map (Map 1) and (Figure 10).

Continue along the main road track beside the River Duror. At 2.05 miles (3.3 km), a small hydro dam is seen in the River Duror. At 2.25 miles (3.5 km) proceed through gateposts (gate may be missing). At about 2.9 miles (4.6 km) a road comes in from the left. Turn left (north) on this road. At 3.05 miles (4.9 km), turn right at an intersection. Continue on along the road until an exposure is encountered on the left hand (north) side of the road at 3.95 miles (6.3 km) [NN 0425 5435]. This is Stop 2-2 (Figure 9). Park the vehicle on the opposite side of the road/track from the exposure. Set altimeter to 320 m.

Note: Stop 2-2 and the parking area are about 100m beyond the termination of the upper forest road as shown in the 1978 1:25,000 Ordnance Survey topographic map. In the late 1980's the old road was extended eastwards to join with the lower forestry road at [NN 0445 5440], as shown in the Coloured Map (Map 1) and (Figure 9).

Description: The rock is a grey-brown, medium-grained, two-pyroxene diorite with large (1 to 3 cm across) poikilitic crystals of biotite. Occasional coarse pink granite veins cut the diorite. The emplacement temperature of this rock is estimated to have been about 1100 °C (Weiss & Troll, I989).

Stop 2-3. Medium-grained K-feldspar-porphyritic quartz monzodiorite. [NN 0410 5445], 350m

Directions: From Stop 2-2, walk about 150m westwards and downhill to where a small burn crosses under the road. Follow NW up the burn up to an exposure at an elevation of 350m, just below a fence which in 1999 marked the boundary between new growth forest (below) and old growth forest (above). Note: the density and type of forest cover may vary substantially from that described herein, depending on when this excursion is attempted.

Description: This rock is clearly more leucocratic than the two-pyroxene monzodiorite of locality 2-2, and lacks poikilitic biotite. The rock is a quartz monzodiorite with pink K-feldspar phenocrysts, fine- to medium-grained biotite crystals and relic clinopyroxene crystals rimmed by amphibole. Diorite blocks in the quartz monzonite have been reported nearby. The quartz monzodiorite is part of an apophysis of hybrid granite (see (Figure 9) and Coloured Map (Map 1)) that cuts sharply the two-pvroxene monzodiorite between elevations of about 310 and 370 m along the burn, although the contacts are not well exposed at present. The hybrid granite apophysis is interpreted by Weiss & Troll (1989) as being part of a ring dyke structure. The sharp intrusive boundaries between granite and monzodiorite, which have been found near this vicinity, contrast with the gradational transition seen later ill the traverse.

Stop 2-4. Crushed and altered zone in monzodiorite. [NN 0405 5455].

Directions: Continue upstream from Stop 2-3, crossing tile fence into the older forested area (as of 1999). About 30 m beyond the fence are more outcrops of quartz monzodiorite. Continue on to a fork in the burn where there are several weathered exposures.

Description: The exposures are of dioritic rocks, locally showing injections of pink (feldspathic) veins (2mm-2cm). The rocks are variably fractured and altered with some zones of extensively crushed and friable rock. This zone of cataclasis and alteration. up to 30 m width in some places, is associated with a steeply dipping wrench fault of about 100 m sinistral displacement that cuts the rocks of the igneous complex (see Coloured Map (Map 1) and (Figure 9)).

Stop 2-5. Varieties of two-pyroxene monzodiorite. [NN 0395 5460]–[NN 0390 5470], 400–450m.

Directions: From Stop 2-4, ascend along the left (west) fork of the burn; ignore a smaller branch to left (west), which occurs at about 430 m. There are extensive exposures in the burn and on surrounding grassy slopes.

Description: The rock type through this interval, above the crush zone of Stop 2-4, is dominantly fresh, grey, biotite-poikilitic, two-pyroxene monzodiorite such as seen earlier. Considerable variations in grain size and colour index are seen throughout this interval. Occasional granitic veins cut the monzodiorite.

Stop 2-6. Late stage rhyolite dyke. [NN 0385 5485], 590m.

Directions: From Stop 2-5, continue ascending the burn, following it through a ca. 10Om closed-in forested interval (as of 1999) which ends at a fence at about 520 m. Cross the fence onto open grassy slopes and leave the burn you have been following and take the next burn to the east. Ascend NW up this burn to locality 2-6. Along the way further exposures of the poikilitic biotite two-pyroxene monzodiorite may be seen.

Description: In and around the burn are several exposures of very fine-grained (aphzmitic), pink felsic rock with small K-feldspar and plagioclase phenocrysts (porphyritic rhyolite). These exposures are part of a generally EW-striking, steeply dipping 5 m wide rhyolitc dyke that cuts through the igneous complex. Further to the east, the dyke is itself cut by the crush zone seen at Stop 2-4.

Stop 2-7. Partially hydrated augite monzodiorite. [NN 0345 5515], 895m.

Directions: Continue to ascend the burn above Stop 2-6, which begins to veer upslope to the WNW instead of NW, eventually reaching the plateau margin. Stop 2-7 is on a local high point on the south edge of the plateau, where there are fairly clean exposures all around.

Description: Occurring throughout the interval between Stops 2-6 and 2-7 are exposures of biotite-poikilitic two-pyroxene monzodiorite, showing variable grain size and mafic mineral content and locally containing schlieric portions. As elevation increases, the diorite overall appears to become more leucocratic, with orthopvroxene decreasing and hornblende and non-poikilitic biotite increasing. The change is most noticeable above about 850m, although it is discernible above about 750m.

At Stop 2-7, the rock shows gradations from relatively homogeneous augite-biotite-hornblende±orthopyroxene diorite, which is more leucocratic than the two-pyroxene monzodiorite of Stops 2-2 to 2-6, to slightly pink biotite-hornblende diorite with biotite occurring as individual small crystals as well as poikilocrysts. Rarely quartz is seen. Cross-cutting veins of granite pegmatite (2–20 cm) are seen locally.

To the west and north of Stop 2-7, the diorite becomes more leucocratic, with increasing K-feldspar and quartz (making a quartz monzodiorite). In the same interval, biotite and hornblende increase at the expense of orthopyroxene and augite. Further to the west, the quartz monzodiorite becomes increasingly veined by small pegmatites.

Stop 2-8. Pink biotite-hornblende quartz monzodiorite. [NN 0350 5545], 880 m.

Directions: From Stop 2-7, bear 005° across boggy ground with scattered boulders and some low-weathering exposures to a small, prominent rocky knoll on the northern edge of the plateau.

Description: The rock is a pink, variably quartz-hearing, weakly K-feldspar porphyritic granodiorite with biotite and hornblende crystals. The hornblendes occasionally contain relic cores of augite. This rock is characteristic of the hybrid transition zone between the central porphyritic granite in the centre of the igneous complex (Stops 2-9 and 2-10), and the pyroxene-bearing monzodiorites and diorites seen earlier in the traverse (Stops 2-2 to 2-7). The gradational nature of the contact between the granite and quartz diorite suite contrasts with the sharp contact between the granite apophysis and two pyroxene monzodiorite near Stops 2-2 and 2-3; it suggests that the granite in this more central locality intruded the more fractionated diorites when they, were still partially molten, resulting in a zone of magma mixing and hybridization.

Stop 2-9. Pink biotite-hornblende granodiorite. [NN 0370 5550], 920 m.

Directions: From Stop 2-8, continue ENE for about 200 m, ascending the rock-strewn slope on the northern edge of the plateau towards the summit of Sgorr Dhonuill.

Description: The rock is a pink, K-feldspar porphyritic, biotite-hornblende granodiorite containing more quartz than the previous locality. This rock is representative of the normal, unhybridized facies of the central 'granite'. Some hornblende crystals retain relic cores of clinopyroxene. Rare, cm-scale metapelitic xenoliths and schlieric portions are seen, possibly indicating a near-roof portion of the granite. The emplacement temperature of the central 'granite' is estimated at about 850 °C (Weiss & Troll, 1989).

Stop 2-10. Summit of Sgorr Dhonuill. [NN 0405 5555], 1001 m.

Directions: Continue up to the summit of Sgorr Dhonuill.

Description: Enjoy the view; pick up a boulder and put it on the cairn. The rock in the vicinity of the summit is biotite-amphibole granodiorite much like that seen at. Stop 2-9.

Options from summit of Sgorr Dhonuill.

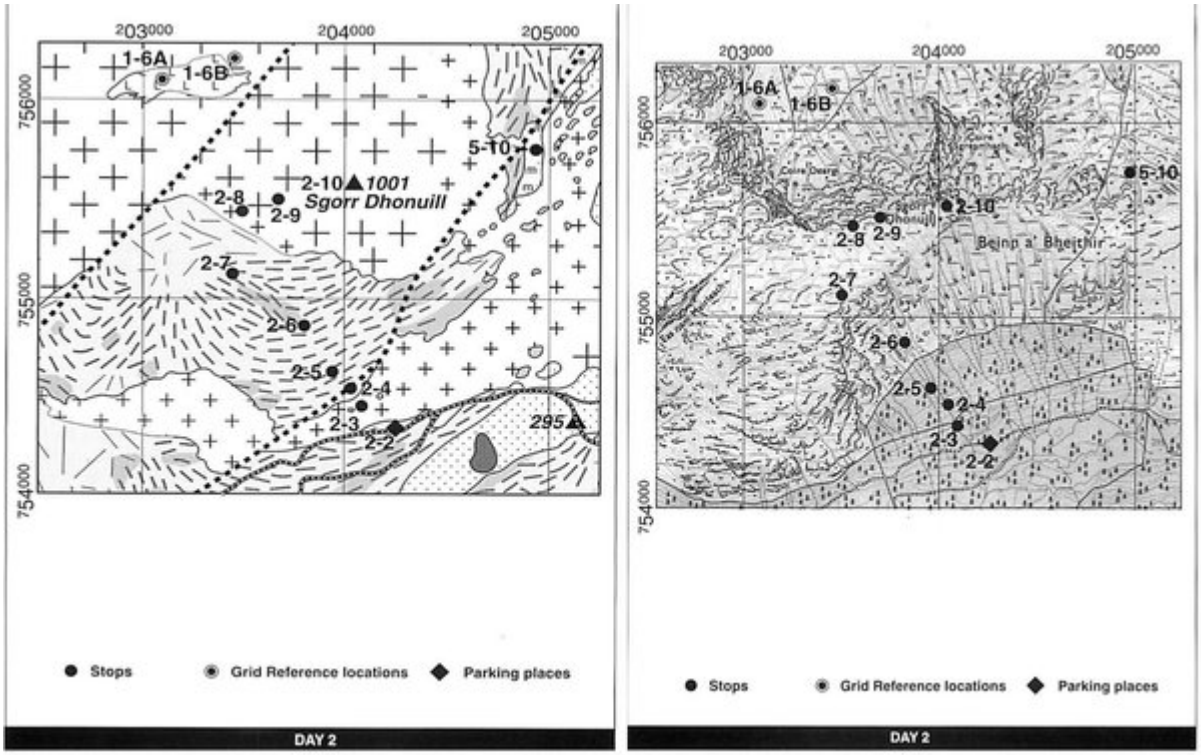
Descend back into Glen Duror and return to your vehicle. A good route is to proceed down the path leading east from the summit of Sgorr Dhonuill to the bealach (col or pass) between Sgorr Dhonuill and Sgorr Dhearg [NN 0480 5550], and descend the grassy slopes into Glen Duror more or less beside a fence that descends into the glen.

Visit the late monzogranite and Cu-Mo mineralisation (at localities 1-6A and 1-6B — see notes for Day 1 excursion). For this proceed down the western flank of Sgorr Dhonuill and descend northwards into Coire Dearg at the head of Gleann a' Chaolais (see description under Stop 1-6). If you choose this option, you will most likely want to be met by a vehicle at Stop 1-6, which is at the end of a footpath descending from Stops 1-6A and 1-6B (instructions for driving to this locality are given under Stops 1-5 and 1-6).

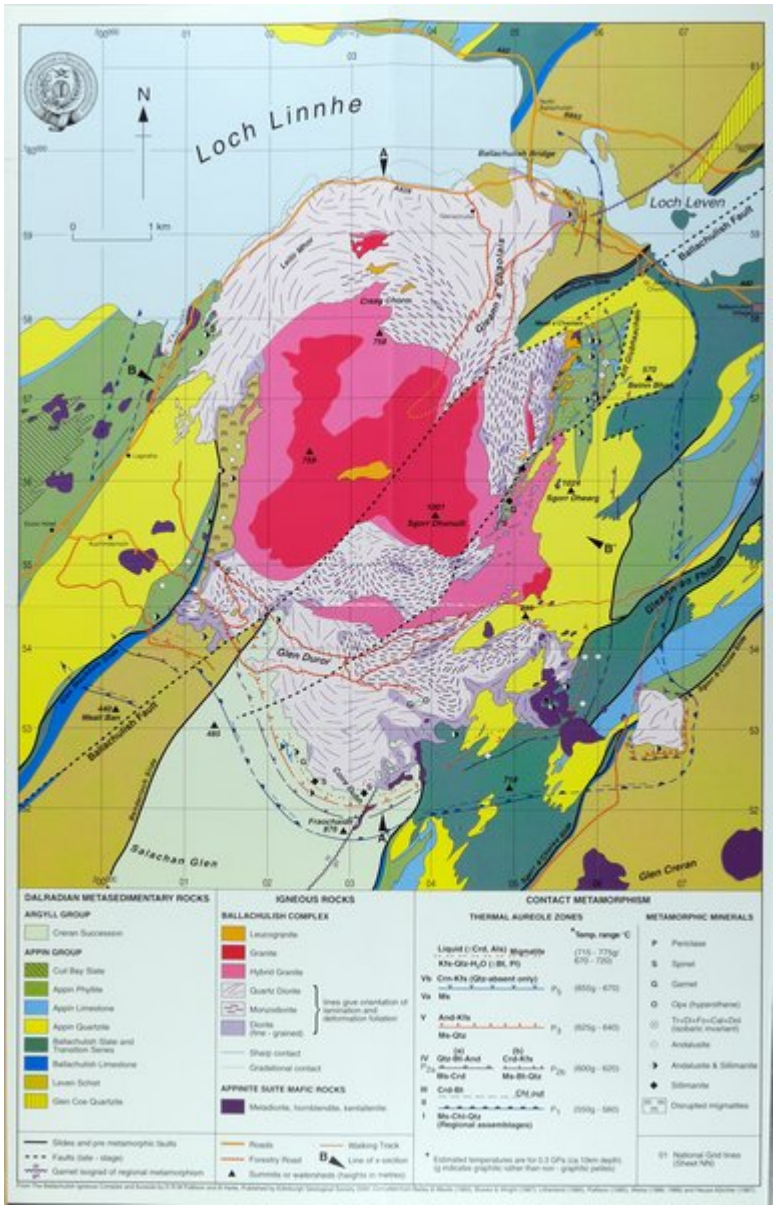
Complete the ascent of both the Beinn a' Bheithir Munros, by proceeding along the ridge eastwards of Sgorr Dhonuill and ascend Sgorr Dhearg.

Examine the spectacular 'chocolate-tablet migmatites' of Stop 5-10 (described under Day 5 excursion). For this, proceed along the ridge eastwards of Sgorr Dhonuill and then go downslope northwards from the bealach between Sgorr Dhonuill and Sgorr Dhearg (see description under Stop 5-10). If you visit these migmatites you will probably wish to arrange a pick-up by a vehicle in Gleann a' Chaolais (a convenient place for pick-up is at [NN 0470 5695], which is at the bottom of a rough footpath coming down from the bealach).

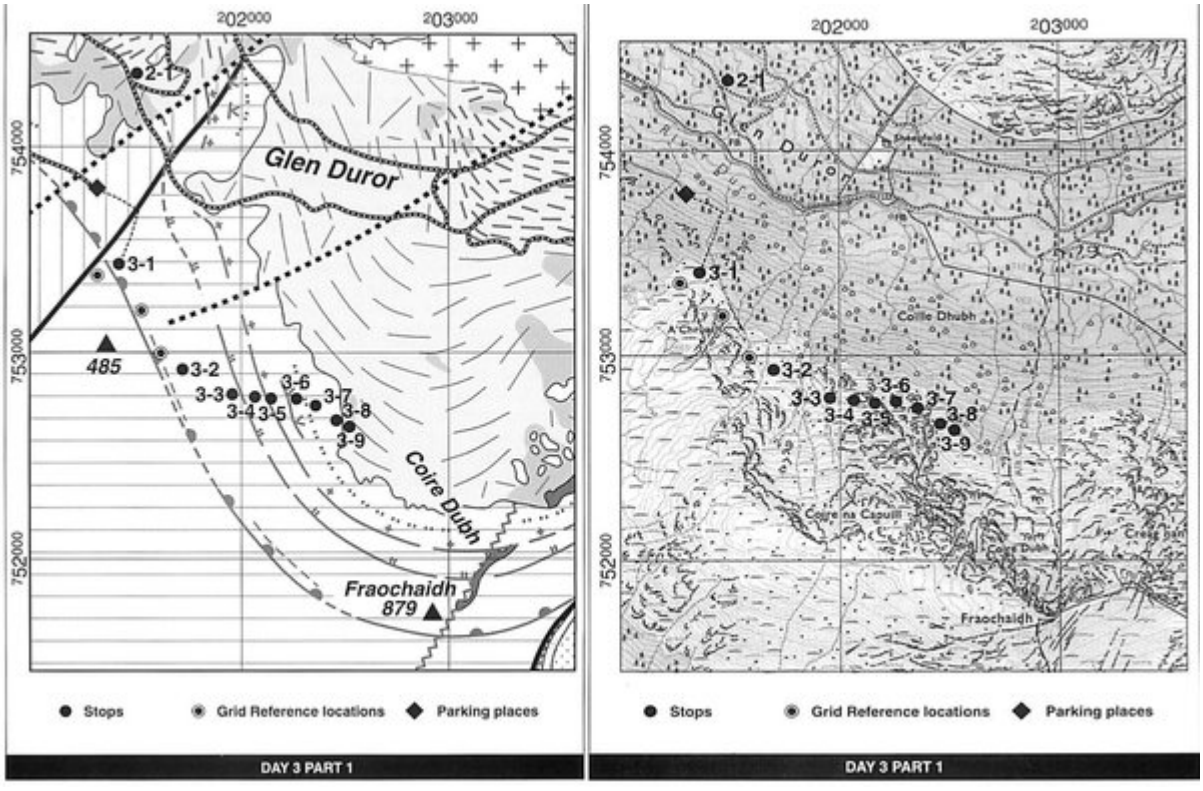
End of day 2



(Figure 9) (a) Geological map showing location of field stops for Day 2 (see (Figure 7)) for key to geological map) See (Figure 10) for Stop 2-1 (b) Corresponding topographic map showing location of field stops for Day 2 (reproduced with permission of the Ordnance Survey).



(Map 1) Geological map of the Ballachulish Igneous Complex and aureole. (map in endpocket).



(Figure 10) (a) Geological map showing location of field stops for Day 3 Part 1, Fraochaidh traverse, (see (Figure 7) for key to geological map). (b) Corresponding topographic map showing location of field stops for Day 3 Part 1 (reproduced with permission of the Ordnance Survey).