Zeitschrift: Schweizerische mineralogische und petrographische Mitteilungen = Bulletin suisse de minéralogie et pétrographie

Band: 56 (1976)

Heft: 1

Artikel: Note on the modal compostition of the antigorio gneiss (Lepontine Alps, Northern Italy)

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DOI: https://doi.org/10.5169/seals-43679

Schweiz. mineral. petrogr. Mitt. 56, 101–103, 1976

Note on the Modal Composition of the Antigorio Gneiss (Lepontine Alps, Northern Italy)

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With 1 figure

Abstract

Modal analysis of some 200 specimens from the Antigorio gneiss mass (Lower Pennine zone, Central Alps) shows that its composition varies from monzogranitic through granodioritic to quartz dioritic without being related to mappable lithologic units in the field.

The Antigorio gneiss is the main constituent of the Antigorio nappe in the Lower Pennine zone of the western Lepontine Alps (cf. SPICHER, 1972). It represents an igneous intrusive complex, probably of late Hercynian age, which was deformed and subjected to high-grade metamorphism during the Alpine orogeny. The compositional variations in this gneiss, which in the field is monotonously homogeneous and undifferentiated (except for obvious variations in the degree of development of its Alpine foliation and lineation), have been studied in a small area (see inset., Fig. 1). Modal analysis was carried out by automatic point-counter on thin-sections cut perpendicular to the gneiss foliation and stained for alkali felspar and plagioclase (MILNES, 1964). Counting was done on a system of traverses at right angles to the foliation trace: the traverses were 1 mm apart and the counting points spaced at 0.2 mm. Over 200 thin-sections were analysed in this way, counting an average of 2000 points per section.

It has come to my notice that this data was not included in the only existing compilation of modal analyses from gneisses of the Lepontine area (STRECKEISEN, 1967, Fig. 53), so the results are now presented here (Fig. 1). The main body of the gneiss compositions falls within the monzogranitic and granodioritic fields of the STRECKEISEN classification scheme, with a significant overlap into the quartz-dioritic field (cf. STRECKEISEN, 1967, Fig. 5a). These compositional

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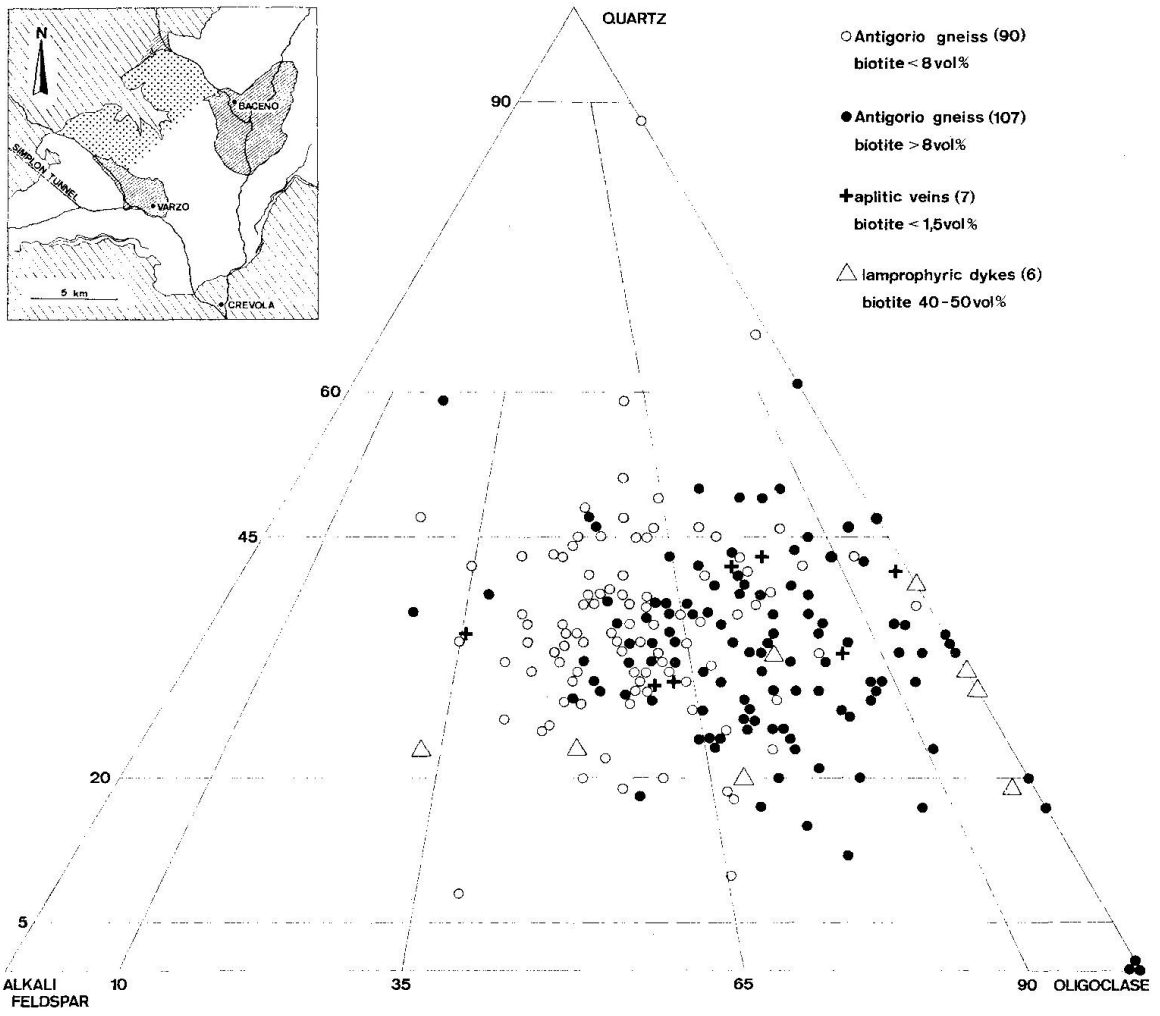

Fig. 1. Q-A-P diagram showing the variations in modal composition of specimens from the Antigorio gneiss in the Varzo–Baceno area, Lepontine Alps. In the granitic gneisses, perthite was counted as alkali felspar and myrmekite as plagioclase (oligoclase). The inset map summarizes the geological situation: unornamented and stippled – Antigorio nappe (the specimens are from the stippled area); light shading – rocks lying above the nappe; dark shading – rocks lying below the nappe.

variations do not seem to be represented by mappable units in the field, although in one area a vague transition between a light and a dark facies of the gneiss (with less than and more than 8 vol% biotite respectively; see MILNES, 1965, Plate II) has been distinguished. The light facies gneisses tend to be monzogranitic, the dark facies granodioritic (Fig. 1), but there are many exceptions in both fields. The gneiss is cut by numerous aplitic veins and sparse lamprophyric dykes or sills, both also showing the same wide range in felspar ratio, which is rarely concomitant with that of the adjacent gneiss. A few samples with extreme compositions were found (e.g. quartzitic rocks with quartz > 60 vol%, and dioritic rocks with no quartz or alkali felspar, see Fig. 1), but

in these cases always as bodies or layers recognizable in the field and of extremely limited extent.

There is little doubt that we are here dealing with a pre-Mesozoic igneous intrusive complex, since stratigraphic contacts with marbles representing metamorphosed Mesozoic (? Triassic) limestones and dolomites are preserved, truncating the aplitic and lamprophyric sheets. Also, rounded boulders of light facies granite are commonly found in the marbles near to the contact (MILNES, 1964). However, some of the compositional variations discovered may be due to mineralogical adjustments caused by penetrative deformation and recrystallization during the Alpine orogeny. In particular, this seems to have caused the progressive breakdown of felspars to white micas (see MILNES, 1965, Plate II [c]; schistose gneisses from obvious shear zones are not included in Fig. 1), as well as unmixing of the original perthites and recrystallization to mosaics of alkali felspar and plagioclase grains. Although it involves no change in bulk composition, this latter process causes an effective shift of mineral composition to the plagioclase side, since perthites are otherwise counted as only alkali felspar. Strongly foliated rocks tend to contain a somewhat greater proportion of plagioclase than undeformed (unfoliated) samples of the same biotite content, so the overlap into the quartz-diorite field may not be a primary feature of the igneous complex.

The modal analyses, the accompanying thin-section descriptions, and descriptions of the field relations of each specimen (with 1 : 5000 location maps) are deposited in the library of the Geologisches Institut, Eidgenössische Technische Hochschule, Zürich. The thin-sections and specimens are at the Mineralogisch-Petrographisches Institut, Universität Basel.

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Manuscript received January 31, 1976.