# Microstructure and fabric development in a gabbro of the Val Malenco

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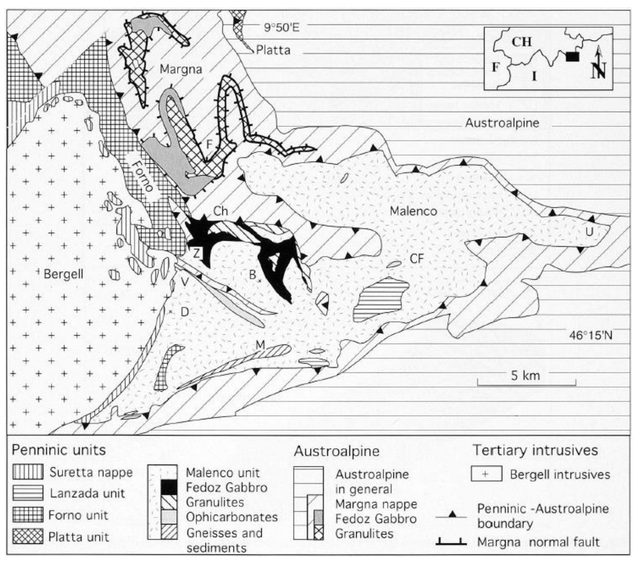
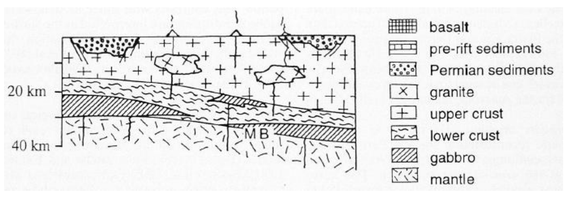
## 1. Introduction

The Val Malenco gabbro is located in the area of Monte Braccia – Lago Pirola.
During the Permian period, the Malenco gabbro complex intruded the interface of the Adriatic's lowermost continental crust and the overlying subcontinental upper mantle (Hermann, 2001). This gabbro intrusion at the mantle-crust boundary.

The main aim of this study is to investigate the influence of newly formed minerals and the reduction in grain size on the deformation mechanisms during Alpine collision.




Tectonical map of the Val Malenco region. (Hermann & Müntener, 1996)




Magmatism and gabbroic intrusion during Permian extension. (Hermann & Müntener, 1996)

## 2. Methods

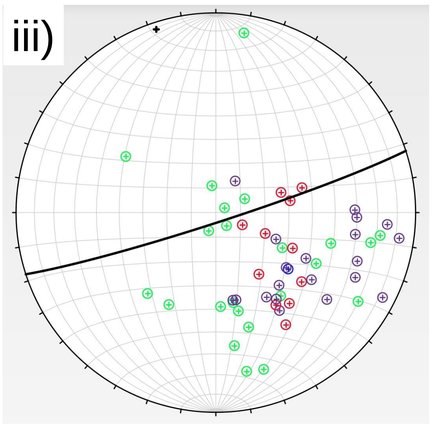
- Field work (including sampling and mapping of lenses)
- Petrographic studies (optical microscopy and SEM)

## 3. Results

### 3.1. Fieldwork

The focus of this study is on the gabbro northeast of the Lago Pirola damThe gabbro is about 200 m thick and consist of the greenshist facies minerals amphibole, chlorite, albite and clinozoiste.
The structure of the gabbro varies at the meter scale with lenses that show no deformation surrounded by shearzones with an intense foliation. The measured direction of lineation and fold axis in the field is South – East.

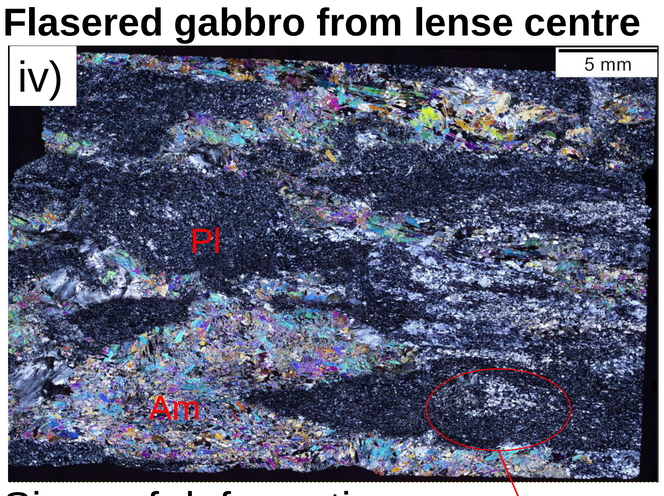





i) Coarse grained, flasered gabbro (centre of lense)
ii) Thin lineated and folded gabbro
iii) Stereonet of field measurements (red: lineation, green: smaller fold axis, violet: bigger fold axis)

### 3.2 Optical Microscopy

**Flasered gabbro from lense centre**

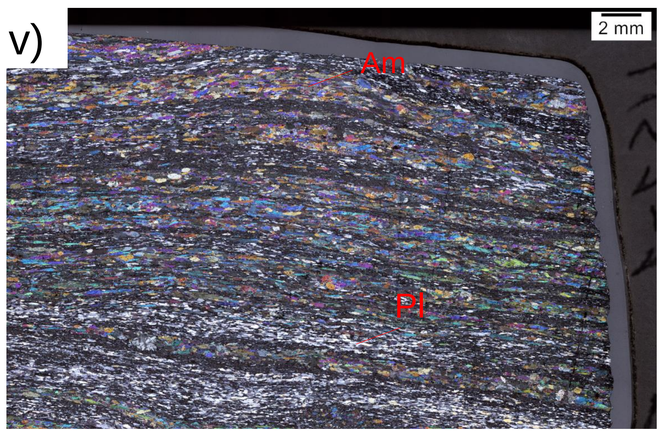



- Unregulated mineral assemblage
- Mineral clusters forming amphibole + chlorite rich and albite + clinozoesite rich flasers (mm – cm size)
- Various grain sizes from µm – mm
- Inclusions

Signs of deformation:

- subgrain rotation (SGR) of albite in centre of flasers (→ still magmatic texture of former plagioclase and pyroxene with Alpine minerals growing in a random orientation)
- partly stretched albite
- Zoning

**Fine lineated gabbro**




- Mostly Alpine mineral assemblage
- Mineral lineation (µm – mm thickness)
- ~ uniform mineral size (µm)
- Plagioclase rich and amphibole rich alignment
- Inclusion

Deformational features: lineation/ preferred orientation, stretched minerals, SGR

## 4. Conclusions

First results of optical microscopy show a transmission from coarser grained and randomly oriented minerals to a regulation and grain size reduction during post-intrusive deformation. There are few to no relicts of the pre-deformational mineral distribution. Even the core of the lense, that in the field seems to be undeformed, shows signs of deformation. This indicates a complete post-intrusive deformational overprint. Recrystallization appears in crystallographic preferred orientation. The section in Fig. (v) shows Albite with unregulated Clinozoesite inclusions that could indicate constant P-T condition post-deformation.

## 5. Outlook

- Optical microscopy for further deformational features
- Measuring of grain size and calculation of strain, and recrystallization rates
- Petrographic studies with SEM to analyse mineral compositions and possible element exchange during deformation
- Modelling of P-T conditions during deformation

References

Hermann, Joerg & Müntener, Othmar. (1996). Extension-related structures in the Malenco-Margna-system: Implications for paleogeography and consequences for rifting and Alpine tectonics. Schweizerische Mineralogische und Petrographische Mitteilungen. 76. 501-519. 10.5169/seals-57712.

Hermann, Joerg. (2001). Differentiation of Mafic Magma in a Continental Crust-to-Mantle Transition Zone. Journal of Petrology - J PETROL. 42. 189-206. 10.1093/petrology/42.1.189.