

# Research on metamorphism

Autor(en): **Trommsdorff, V.**

Objektyp: **Article**

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

Band (Jahr): **59 (1979)**

Heft 1-2

PDF erstellt am: **11.07.2024**

Persistenter Link: <https://doi.org/10.5169/seals-46053>

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## **Research on Metamorphism**

Report by *V. Trommsdorff\**)

Research on Metamorphism may be regarded as a marginal topic within the Geodynamics Project. However, considerable activity in this field has also contributed to an understanding of crustal movements in the Swiss Alps.

During the period 1971-1979 three Swiss colloquia on Metamorphism were held (1973 at University of Fribourg; 1976 at University/ETH at Zürich and 1979 at University of Lausanne). At the twenty-fifth anniversary of the Schweizerische Mineralogische und Petrographische Gesellschaft, a 600 page volume on Alpine metamorphism in the Alps was published (general review by FREY et al 1974).

In addition, the Swiss part of the metamorphic map of Europe (E. NIGGLI 1973) was finished during this period, and a map on Alpine Metamorphism in the Alps was published (FREY et al 1974).

Field and laboratory work on Alpine metamorphism was focused on three main topics:

- 1) *Mapping of isograds (other than already known) on a regional scale and in variable rock compositions*: marly and pelitic rock (FREY 1974; WENK, H.-R. et al 1974), mafic rocks (DIETRICH et al 1974), carbonate rocks (TROMMSDORFF 1972), ultramafic rocks (TROMMSDORFF and EVANS 1974). These new data helped to refine, but did not drastically change, the pattern that was recognized earlier.
- 2) *Mapping of isograds in relation to structure on a local scale* i.e. Simplon area (STRECKEISEN and WENK 1974), Misox area (P. THOMPSON 1976), Lukmanier (FOX 1975). These isogradic surfaces are subvertically (Simplon) to steeply north (Lukmanier, Misox) dipping and crosscut lithological and structural boundaries. P-T estimates of metamorphism along the Swiss Geotraverse (FREY et al 1976) are for geometric reasons in conflict with the above observations. This problem still remains to be solved.

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In the Glarus Alps (FREY et al 1973) and in the northwestern Swiss Alps (MULLIS 1979), Alpine isograd patterns were recognized that predate nappe formation and are thus transported.

- 3) *Evaluation of polyphasic Alpine metamorphism in the Swiss Alps and relative location of metamorphic events in both space and time on the basis of combined petrographic and structural evidence* (AYRTON & RAMSAY 1974). In wide areas of the Pennine nappes, an early Alpine high-pressure metamorphism has been recognized (BEARTH 1974). In the Central Alps very high-pressure subduction zone metamorphism of unknown age has been analyzed (EVANS et al 1979). These high-pressure parageneses were in most places overprinted by mineral assemblages of lower pressures and often higher temperatures. In many areas these metamorphic phases were accompanied and then outlasted by Alpine vein- and fissure mineral formation. Studies of fluid inclusions in these veins and fissures revealed P-T data that are useful for the understanding of the Alpine uplift history (POTY et al 1974, MERCOLLI 1979). In the Eastern Bergell area regional metamorphism is overprinted by contact metamorphic assemblages (TROMMSDORFF & EVANS 1972), both events being separated by intrusion of andesitic dykes (GAUTSCHI und MONTRASIO 1978). Early, rapid and later, moderate uplift then brought the Bergell Alps into their present position (MILLER et al 1978).

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Manuscript received July 23, 1979