GRANITE TYPES AND PLUTONIC EVOLUTION IN THE ÖTZTAL-STUBAI BASEMENT COMPLEX – EVIDENCE FOR A SARDIC TECTONOTHERMAL PHASE IN THE ALPS?

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Based on earlier works of HAMMER (e.g. 1929), SCHMIDEGG (1964), HOINKES et al. (1996) and a large set of our own geological, mineralogical and geochemical data, four main groups of granitoid rocks can be distinguished in the polymetamorphic Austroalpine Ötztal-Stubai basement complex (ÖSC):

1) **migmatites**.
2) coarse-grained, **biotite-rich, porphyritic granite gneisses** (S-type) with K-feldspar phenocrysts up to 8 cm long.
3) medium-grained, equigranular **metatonalites and metagranodiorites** (I-type).
4) medium- to coarse-grained, two-mica granite gneisses (S-type), often leucocratic, mostly with K-feldspar phenocrysts up to several cm, and with variants of fine-grained, **muscovite-rich granite gneisses**.

Field evidence suggests that the migmatites (1) and the biotite-rich, porphyritic granites (2) formed mainly from melting of metasediments in a deep-seated crustal level under high T conditions. U–Pb monazite dating suggests that this phase of crustal melting occured in the first half of the Ordovician. Both the porphyritic granites and the migmatites were intruded later and crosscut by the I-type tonalites to granodiorites (3). The generally discordant, sharp contacts of the tonalite and granodiorite intrusions to their roof-rocks, and the development of a fine-grained, leucocratic rim facies indicate that these younger I-type granitoids intruded at a high level in the crust (fig. 1). This means that groups 1 and 2 had already cooled and exhumed to upper crustal levels by that time. Intrusive contacts between the two-mica granite gneisses (4) and the other granite types have not be found as yet. However, as this leucocratic granite type does not show any significant anatectic contacts with the country rocks, it seems that it intruded at a high crustal level also.

The granitoid plutonic rocks of the ÖSC are evidence for extreme thermal regimes in the crust during the Lower Ordovician, coupled with widespread melting. Thus, these rocks could be witnesses of a Sardic (?) tectonothermal event in the Alps.

HAMMER, W. (1929): - Jb. Geol. B.-A., 79, 87–128.

HOINKES, G., THÖNI, M., BERNHARD, F., KAINDL, R., LICHEM, Ch., SCHWEIGL, J., TROPPER, P. (1996): - Preprint.

SCHINDLMAYR, A., SCHERMAIER, A., FRASL, G., FINGER, F., FRIEDL, G., VON QUADT, A. (1996): - TSK 6 Salzburg, Abstract Band, 370–373.

SCHMIDEGG, O. (1964): - Verh. Geol. B.-A., H. 1, 24–47.

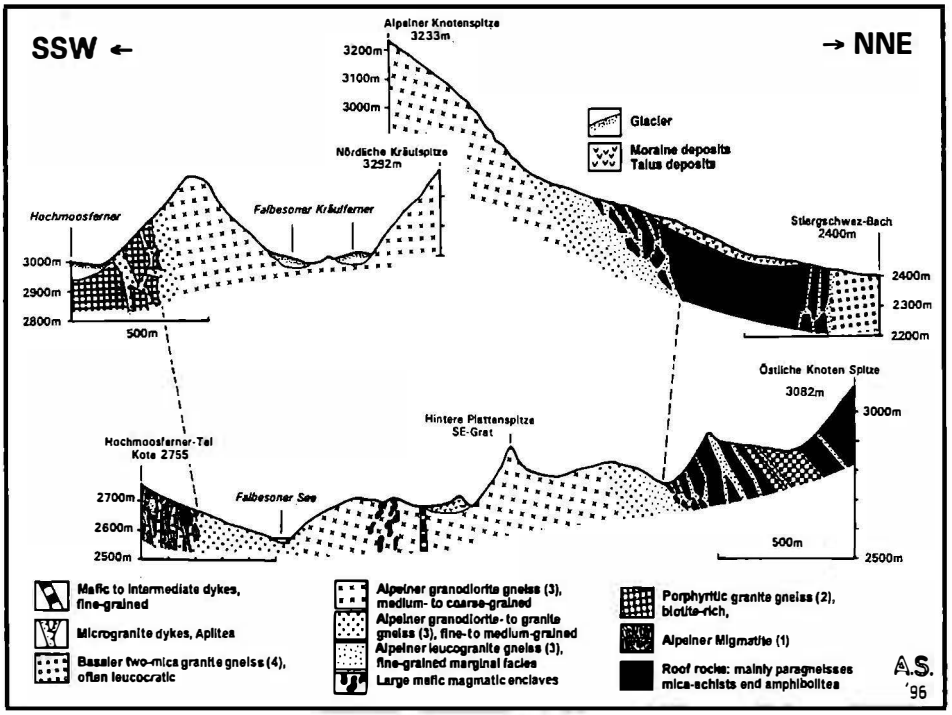

Fig. 1:
Idealised SSW-NNE cross-sections through the Alpeiner Massif (Stubaier Alps), ca. 2 km west of Neue Regensburger Hütte, showing the relative intrusiv relations between the main granite types. Faults are not included. For more detailed descriptions of the granite types see in SCHINDLMAYR et al. (1996). Vertical scale as horizontal.