

GEOCHRONOLOGICAL STUDIES ON ECLOGITES OF THE SILVRETTA NAPPE/CENTRAL ALPS

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The Silvretta nappe, one of the upper Austroalpine units, is situated in the eastern part of Switzerland and covers also Austrian regions of Tirol and Vorarlberg. The dominant crystalline complex of the nappe consists mainly of metabasites, paragneisses and a large variety of orthogneisses.

Eclogites are outcropping in the easternmost part of the nappe near the Engadin window. MAGGETTI & FLISCH (1993) suggested a dominating Precambrian HP-event (HP I) for their formation.

The orthogneisses are divided into two groups, the so-called »Older Orthogneisses« and the »Younger Orthogneisses« (also known as »Flüelagranitic Association«). For the »Mönchalpogneiss«, one of the »Older Orthogneisses«, MAGGETTI (1986) described HP-relicts what he interpreted as a second HP-event (HP II) and used as a relative age control for the petrogenetic succession. The Mönchalpogneiss bears xenoliths of well preserved gabbros and older deformed paragneisses, as well as eclogites. This xenolith association was interpreted as uptaken wallrocks during the primary emplacement of these anatectic granitoids, suggesting an earlier eclogite formation event (HP I) of probable Precambrian age.

Absolut age determinations of both postulated HP events are lacking.

The S-type dominated granitic »Older« orthogneiss varieties provide a maximum age for the HP II-event. The age variation is well defined with the CLC (»Cathodoluminescence Controlled«) single zircon dating method of POLLER, LIEBETRAU & TODT (1996).

Concordant Cambrian ages define the first anatectic processes producing the granitoid protolith of the Mönchalpogneiss (527 ± 4 Ma) and of the augengneiss type Tschuggen (550 ± 4.5 Ma).

A major Ordovician overprint is constrained by a concordant CLC dated single zircon (461 ± 4 Ma) of the Mönchalpogneiss. This age correlates with multi grain discordia lines of the same rock and with single grain data of adjacent gabbros (POLLER et al. 1996, 460–470 Ma). The gabbro intrusions and the related strong thermal overprint of the Mönchalpogneisses were followed by a major anatectic phase which produced the widespread protolith of the HP-lacking »Flüelagranitic Association«. Their youngest concordant crystallisation ages are scattering between 422 ± 2 Ma and 431 ± 3 Ma defining a minimum age of the HP II-event.

The eclogites were sampled as boudins in large amphibolitic bodies. The recently obtained U-Pb zircon data of these samples seem to be related to the thermal overprint due to the intrusions around 460 Ma. Their Pb isotope ratios correlate with measurements of rutiles and indicate an Ordovician age of these minerals. Current investigations are aimed to verify if this age represents an eclogitisation process or only a partial reset by exchange and uptake of common lead components, corresponding to the growth of the detected Ordovician zircons.

If this is the primary age of the rutiles, it would represent the maximum age of the major eclogitisation process because of their existence as inclusions in the eclogite garnets.

It is therefore questionable if the petrographic model of two HP-events can be supported by absolute age determination techniques.

The comparison of U-Pb zircon ages with current Sm-Nd investigations of garnet, clinopyroxenes and whole rock samples will also be presented in order to check the stability and correspondence of the applied isotopic systems and further to constrain the minimum age of the major eclogitisation event.

One highlight of the U-Pb investigations was the separation and dating of small and very rare idiomorphic and obviously pure metamorphic zircons (taken from the grain size fraction <70 μm) which gave a concordant multi grain age of 301 ± 3 Ma for the Variscan amphibolitic metamorphism of the Silvretta nappe.

This result supports the Pb-Pb (308 ± 28 Ma) and U-Pb (306 ± 8 Ma, 304 ± 6 Ma) leaching data from Frei et al. (1995) for staurolite of a Silvretta metapelite. FREI et al. (1995) interpreted these ages as the dating of a prograde part of a Variscan pressure-temperature path.

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