

RATIU Julia (2016): Magmatic rocks of the Berisal Complex (Middle Penninic domain, Valais, Switzerland) geochemistry and zircon geochronology

ABSTRACT

The Berisal Complex is located at the foot of the Bortelhorn, near the Simplon Pass in the canton of Valais, Switzerland. It is part of the Middle Penninic nappes; more specifically it is considered the basement to the Pontis nappe. The rocks from the Berisal Complex present a bimodal aspect, geochemically ranging from basaltic to rhyolitic. The whole area shows banding and lenticular shapes for the rocks. The majority of the rocks are felsic. The basic and intermediate rocks are melanocratic bands (meta-basalts), garnet amphibolites and plagioclase amphibolites. The felsic rocks are meta-granodiorites, leucogneisses and augen gneisses. Other lithologies are plagioclases, paragneisses and leucocratic Alpine veins.

Previous studies resulted in whole-rock Sm-Nd ages of ca. 1 Ga for the felsic and intermediate rocks, whereas the mafic rocks result in 475 ± 81 Ma (Stille & Tatsumoto 1985). The 1 Ga is the oldest documented in the Alps. Zircon geochronology from previous studies result in Cambro-Ordovician ages (Allegre 1974, Hetherington et al. 2008, Gauthiez 2011), which is in line with other lithologies from the Briançonnais domain.

Authors could not agree on the origin and genesis of the Complex. Some say it is a tholeiitic bimodal sequence, others a calc-alkaline continental arc. In light of wholerock major and trace element geochemistry, a calc-alkaline trend is observed for plagioclase amphibolites, meta-granodiorites, leucogneisses and augen gneisses. On the other hand, the melanocratic bands and garnet amphibolites show MORB and OIB affiliations.

Zircon U-Pb geochronology results gave ages of $575.7 \pm 0.7/-3.7$ Ma and 526.0 ± 1.7 Ma for plagioclase amphibolites, $468.90 \pm 2.60/-6.90$ Ma for the leucogneisses, $458.7 \pm 4.3/-3.4$ for the meta-granodiorites, and $458.6 \pm 1.9/-0.6$ Ma for the augen gneisses. Scenarios for (1) zircon inheritance with contemporary Ordovician magmatism and (2) long-lasting Cambro-Ordovician diverse magmatic events are both described in this study. The second hypothesis is preferred over the first, mainly because of the extremely homogeneous zircon populations in the plagioclase amphibolites. In both cases, this sets the originating region on the northern border of Gondwana.