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Monazite as a geochronological recorder of polymetamorphism in the Eastern Alps: selected examples from the Austroalpine (Michelbach Complex, Ortler-Campo Complex) and the Southalpine (Brixen Quartzphyllites)

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Monazite is a powerful petrogenetic mineral by combining geochronological and geothermometric information. EMPA dating of monazite has proven to be an extremely powerful technique when it comes to deciphering the polymetamorphic history of metamorphic rocks. In this study we focus on rocks from the Eastern Alps that were not only affected by regional metamorphism but also by contact metamorphism.
The Ortler Campo Complex was affected by Variscan and Eo-Alpine regional metamorphism. In addition a notable Permian contact metamorphic overprint occurs. The focus of this investigation was the Grünsee area in the innermost Ulten valley where Eocene periadriatic intrusions occur. Monazite dating of hornfelses yielded a complex age pattern with ages ranging from 270 ± 37 Ma to 121 ± 35 Ma and 106 ± 31 Ma and 40 ± 12 Ma. These age clearly reflect to polymetamorphic nature of this basement unit.

The Michelbach basement unit is located in the Defereggen Alps and reached sillimanite- and andalusite-grade conditions during the Permian event. Electron microprobe dating of monazite yielded Variscan ages in the sillimanite- and the andalusite-zone and Permian ages mainly in the sillimanite-zone.

Near the village Franzensfeste/Fortezza (South-Tyrol, Italy) a contact aureole adjacent to the Brixen granite was found. Monazite abundance strongly increases after the breakdown of Variscan garnet from the protolith rocks. Electron microprobe dating of monazites from the contact aureole of the Brixen granodiorite yielded two different ages: an older age of 336 ± 19 Ma representing the Variscan metamorphic event and a younger age of 269 ± 18 Ma representing the Permian contact metamorphic overprint.