Petrological investigations and Pre-Variscan age constraints of contact metamorphic Southalpine basement at the southern rim of the Brixen Granodiorite (South Tyrol, Italy)

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The Permian Brixen Granodiorite is located to the south of the Periatriatic Lineament in the eastern part of the Southalpine basement complex and comprises a series of tonalitic, granitc and granodioritc intrusions which were emplaced during the Permian (280 Ma) into the country rocks of the Variscan Brixen Quarzphyllites. The depth of the intrusion was less than 10 kilometres (P $\leq$0.3 GPa) and solidus temperatures were 670-720 °C. Only a small, about 200 meters wide, contact aureole formed at the southern rim of the Brixen Granodiorite near the village Franzensfeste/Fortezza (South-Tyrol, Italy) which showed an increase in temperatures from 500 °C in the outermost aureole to 610 °C in the innermost aureole. Approaching the contact with the granodiorite, four different zones can be distinguished within the contact aureole, based upon mineralogical, mineral chemical and textural features. Approximately 200 m from the granite contact, the outer contact aureole (zone I) occurs. The rocks from this zone are characterized by two texturally and chemically different generations of micas and the appearance of cordierite. Zone II is characterized by pseudomorphs of cordierite + biotite after garnet. The inner contact aureole (zone III) starts approximately 50 m from the granite contact and shows typical hornfels. This zone is characterized by the first occurrence of andalusite. In the innermost area (zone IV), ca 10 m from the granite contact, spinel and corundum occur.

Laser ablation ICP-MS U-Pb zircon geochronology of detrital zircons from a contact metamorphic sample of the Brixen Quartzphyllite from the innermost part of the contact aureole adjacent to the Brixen granodiorite yielded three different Precambrian concordia ages: zircon cores and an older generation of zircons give a maximum age of 2023±31 Ma, zircon rims and a younger generation of single grains yield a concordia age of 882±19 Ma. A third generation of single zircon grains yields an age of 638±20 Ma. In contrast to Austroalpine quartzphyllite complexes from the Eastern Alps neither Cambrian/Ordovician (570-450 Ma) nor Carboniferous (360-340 Ma) ages on single zircons have been observed so far in these samples. These ages provide evidence of a complex pre-Variscan evolution of the Southalpine basement in a single sample! Geodynamically these data suggest a possible affinity of the Southalpine basement to Gondwana-related tectonic elements as well as a to a possible Cadomian hinterland.

In addition, U-Th-Pb electron microprobe dating of monazites throughout the contact aureole of the Brixen granodiorite yielded two different ages: an „older“ age group of 336±19 representing the Variscan metamorphic event and a „younger“ age of 269±18 representing the Permian metamorphic overprint.

An automatic first arrival detection method using wavelet similarities

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Estimation of travel times by first arrival picking is an essential step in various seismic methods. Currently first arrival times are determined by a specialist manually or using semi-automatic calculation methods. But as the seismic datasets grow larger with the 3D surveys, it is necessary to improve efficiency and speed of the first arrival detection process. There have been various automatic first break picking methods were published. However, an automatic picking method, which is precise, reliable and requires minimum human intervention, hasn't been discovered since the invention of refraction and reflection seismic in the early 20th century. Because environmental noise for instance from raindrops, traffic or electrical noise from power lines can strongly affect in particular energy based picking methods (e.g., Coppens 1985) but also other methods based on cross-correlation techniques, fractal dimensions (Boschetti et al. 1996) or neural networks (Murat & Rudman 1992). In this work, an automatic first break detection method, Wave Area Ratio (WAR), is presented. This model is used to estimate travel times which are furthermore used as a benchmark for the identification of improper picked travel times.

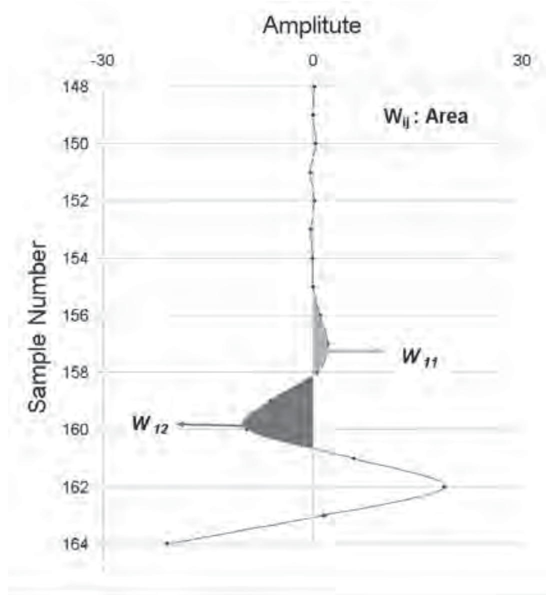

Fig. 1: Wave area ratio for adjacent traces.