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SINGLE ZIRCON PB/PB AGE CONSTRAINTS ON MAXIMUM SEDIMENTATION AGES FOR QUARZPHYLLITE COMPLEXES FROM THE EASTERN AND SOUTHERN ALPS

by

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The widespread Austro-Alpine and South Alpine quartzphyllite complexes are normally interpreted as the infilling of an Early Ordovician (ca. 500 Ma) to Early Carboniferous (ca. 320 Ma) basin. This basin may have initially formed as a back-arc basin on a Late Cadomian metamorphic crust during the Ordovician.
These complexes consist of a rather monotonous series of mainly meta-pelitic rocks with interbedded thick mafic vulcanites, subordinate acidic vulcanites as well as thin carbonate layers. All complexes were overprinted by at least a pre-Permian low-pressure greenschist facies metamorphism. Alpine overprinting, where present, is of variable intensity. Scarce fossil records, mostly conodonts and acritarchs, have given rise to a partly resolved stratigraphy of incomplete known sections. Ages are from Ordovician to Early Carboniferous are reported. However except for some ages reported for the volcanic sequences (Ordovician to Silurian), no unequivocal absolute age data for the time of formation is provided for most of these complexes. K/Ar and Rb/Sr ages on mica date the post-Variscan cooling.

In order to establish more exact time constraints on possible maximum sedimentation ages, the following approach was used: The youngest truly magmatic age found for a given detrital zircon suite defines a maximum sedimentation age for the sampled sediment layer. If the zircon is not of true detrital origin but stems from a syn-sedimentary volcanic rock (ash flow, tuff), the age probably directly reflects the sedimentation age. On the other hand older zircon ages are interpreted as representing a minimum age of the eroded rocks. These ages thereby provide valuable additional information about the age structure of the hinterland. They also allow the tentative correlation of the otherwise unrelatable quartzphyllite complexes. In a preliminary study detrital zircon populations from 5 different quartzphyllite complexes from the Eastern and Southern Alps were investigated by SEM and subsequently dated using the single zircon evaporation technique.

For a sample from the Thurntal quartzphyllite of Eastern Tyrol a minimum magmatic age of 598±190 Ma (uppermost Precambrian) was found. For a probably stratigraphic higher sample unpublished ages for andesitic volcanics are in the range of 500 - 520 Ma (Late Cambrian - Early Ordovician). There is at the moment no additional evidence for Ordovician or younger sedimentation and/or magmatic ages for this quartzphyllite complex.

For a sample from the Gailtal quartzphyllite the maximum sedimentation age found is 341 ± 24 Ma (Visean). This is in strong contrast to published biostratigraphic ages which are all either Silurian or Devonian. A preliminary interpretation of our data is that the sedimentation of the Gailtal quartzphyllite must have occurred well into the Variscan orogenic cycle with the accompanied erosion of Variscan granitoids: therefore, the magmatic rocks formed during the Variscan should have already reached the surface in the Visean, probably implying a rapid exhumation short after their formation.

For samples from the Goldeck quartzphyllite, no definitive maximum age for the sedimentation can be provided. Badly defined youngest magmatic ages found are in the range of 270 - 280 Ma (279 ± 190, and 272 ± 650, Early Permian), i.e. in the age range of post-Variscan cooling. The significance of these ages is not yet clear, but they could be attributed to an inferred Permian thermal overprinting. However petrographic evidence excludes a metamorphic grade high enough for zircon recrystallisation or growth.

For the quartzphyllite complex of Vetriolo (Southern Alps) only Early Proterozoic ages > 1800 (1806 ± 11 and 1952 ± 52 Ma, respectively) were observed, which can not directly be interpreted as maximum sedimentation ages. A possible interpretation is, that sedimentation of the Vetriolo complex had a contribution from the erosion of an old basement which probably was not reworked during the Cadomian. This is a marked difference to the investigated Austro-Alpine complexes, were the presently available hinterland ages are always considerably younger and normally do comprise Cadomian rocks.

Maximum sedimentation ages for the quartzphyllite complex of Recoaro (Southern Alps) are in the range of 473 ± 21 Ma (Middle Ordovician). This is within error identical to some U/Pb zircon ages derived from the volcanics of the Cornelico complex (MELI & KLOTZLI, unpublished data), probably justifying a correlation of the Recoaro and Cornelico complexes.