

U/Pb zircon, U/Pb allanite dating and petrology of the Ennstal Phyllite Zone (Eastern Alps)

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The Ennstal Phyllite Zone is a west-east striking tectonic unit paralleling the Enns valley east of Schladming in the Eastern Alps. The affiliation of this area to either the micaschist units (e.g., Wölz Complex, Rappold Complex) of the Koralpe-Wölz nappe system to its south or to nappes of the “Greywacke Zone” to its north and east is still in debate. In fact, due to similarities with phyllites of the “Greywacke Zone” in the north and phyllonitic garnet-bearing micaschists in the south, no clear lithologic boundary between these units is observable. A large east-west striking shear zone in the south suggests a tectonic boundary between the Wölz Complex and the Ennstal Phyllite Zone. In order to clear this debate and further constrain the tectonic evolution of these units, we present new LA-ICP-MS U/Pb age dating results and PT-calculations for the Ennstal Phyllite Zone as well as for the adjacent units of the Koralpe-Wölz nappe system. Metapelite samples were taken along multiple north–south striking valleys, which transect the Ennstal Phyllite Zone and the northernmost part of the Wölz Complex. Detrital zircon grains from two samples from the Ennstal Phyllite Zone and one sample from the northernmost part of the Wölz Complex were analyzed. In both samples from the Ennstal Phyllite Zone the youngest zircon population yields dates around 550 Ma, but other populations peak at ~625 Ma, 1,000 Ma, 2,000 Ma, 2,200 Ma and between 2,500 Ma and 2,950 Ma. The Wölz Complex sample shows the same peaks but contains two younger grains with an age of 460 Ma and 523 Ma. Therefore, a similar provenance for the investigated parts of both units is interpreted, these ages are, however, in contrast with Palaeozoic marbles within the Wölz Complex and the “Greywacke Zone”. Furthermore, metamorphic allanite from two samples within the Ennstal Phyllite Zone and one sample from the Rappold Complex to the south were analyzed and dated with U/Pb LA-ICPMS. The Rappold Complex sample yields metamorphic ages of 276.6 ± 35.4 Ma for the allanite cores and 100.2 ± 1.5 Ma for the epidote rims. Two samples from the Ennstal Phyllite Zone yield metamorphic ages of 278.5 ± 6.3 Ma located in the southern part of this unit and 103.6 ± 6.4 Ma in the northern part. These ages are interpreted as close to prograde peak metamorphism with higher conditions during the Permian event based on textural features. Although the Ennstal Phyllite Zone shows a similar metamorphic history as the Rappold Complex during the Permian event (~275 Ma), the data point to a hanging-wall position of the Ennstal Phyllite zone during Eoalpine metamorphism (~100 Ma). Therefore, an affiliation of this area with units of the “Greywacke Zone” is suggested.