An adapted tectonic model for the "Central and Eastern Greywacke Zone" – new geochronological and RSCM-data (Styria/Austria)

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The tectonic nomenclature of the Greywacke Zone (GWZ) and its neighbouring "(Quartz-)Phyllite Zones" has often been a matter of debate. Recently, a new tectonic model for the Western GWZ and the Innsbruck Quartzphyllite Zone has been proposed with the splitting of these zones into Königsleiten-, Wildkogel-, Windau-, Stauffen-Höllengebirge nappes (Huet et al., 2019). We here present new geochronological and Raman Spectroscopy of Carbonaceous Materials (RSCM) data and build up a new tectonic model for the Central (C) and Eastern (E) GWZ. Overall, the E-GWZ is tectonically in a hanging wall position with respect to nappes of the Silvretta-Seckau Nappe System and overlain by cover nappes of the Tirolic-Noric Nappe System. Each tectonic element of the E-GWZ is formed by Palaeozoic basement units with a Permo-Mesozoic cover. In present day models, the Veitsch-Silbersberg Nappe-System with slices of the Kaintaleck Metamorphic Complex as substratum is overlain by the Noric Nappe of the Tirolic-Noric Nappe System. In the E-GWZ new RSCM data show maximum temperature between 360 and 535 °C for the Veitsch and Silbersberg nappes. This range is assigned to the Eoalpine Event based on metamorphism in the cover and the cooling ages in the footwall parts. The maximum temperature recorded in the Noric Nappe is mostly 300–350 °C with temperatures between 240–280 °C in its upper parts close to its Permo-Mesozoic cover. The maximum temperature in the investigated parts of the Juvavic Nappe System ranges around 290–315 °C. The situation in the C-GWZ between the towns Schladming and Rottenmann differs from those identified in the East. In the course of mapping around the town Gröbming, new geochronological and RSCM data show that existing hypotheses needs to be revised. The Öblarn Nappe is a newly defined tectonic unit that includes mainly the Ennstal Phyllite Zone and rocks between the villages Irdning and Oppenberg, hitherto assigned to the Noric Nappe. It is underlain by the Donnersbach Nappe (Koralpe-Wölz Nappe System) and overlain by the Veitsch Nappe. It is interpreted as a basement unit belonging to the Tirolic-Noric Nappe System. RSCM data indicate maximum temperatures between 490 and 565 °C with higher temperatures towards the structural lower part in the south. In combination with U/Pb ages on allanite, this peak temperature is interpreted as a result of combined Permian and early Late Cretaceous (see Stumpf et al., this volume). Detrital zircons dated with U/Pb in metasediments yield ages around 550 Ma and ~625 Ma for the youngest populations. In the hanging wall (around Gröbming) graphitic phyllite, metatuff and Devonian marble, assigned to the Noric Nappe, show maximum temperatures between 455–480 °C and 425–430 °C for the uppermost parts. These temperatures are much higher than those for the Noric Nappe in the E-GWZ and fit better to conditions at the basis of the Stauffen-Höllengebirge Nappe in the W-GWZ. An Ar-Ar muscovite age from the latter unit, determined from a sample collected near the village Filzmoos points to Early Cretaceous cooling. The Mandling Nappe as a cover nappe of the Tirolic-Noric Nappe System shows Tmax conditions around 285–325 °C.