The Permomesozoic Stangalm and Rinegg Groups at the base of and within the Gurktal Nappe Complex: lithostratigraphy, correlation and significance for paleogeography and tectonics of the Eastern Alps

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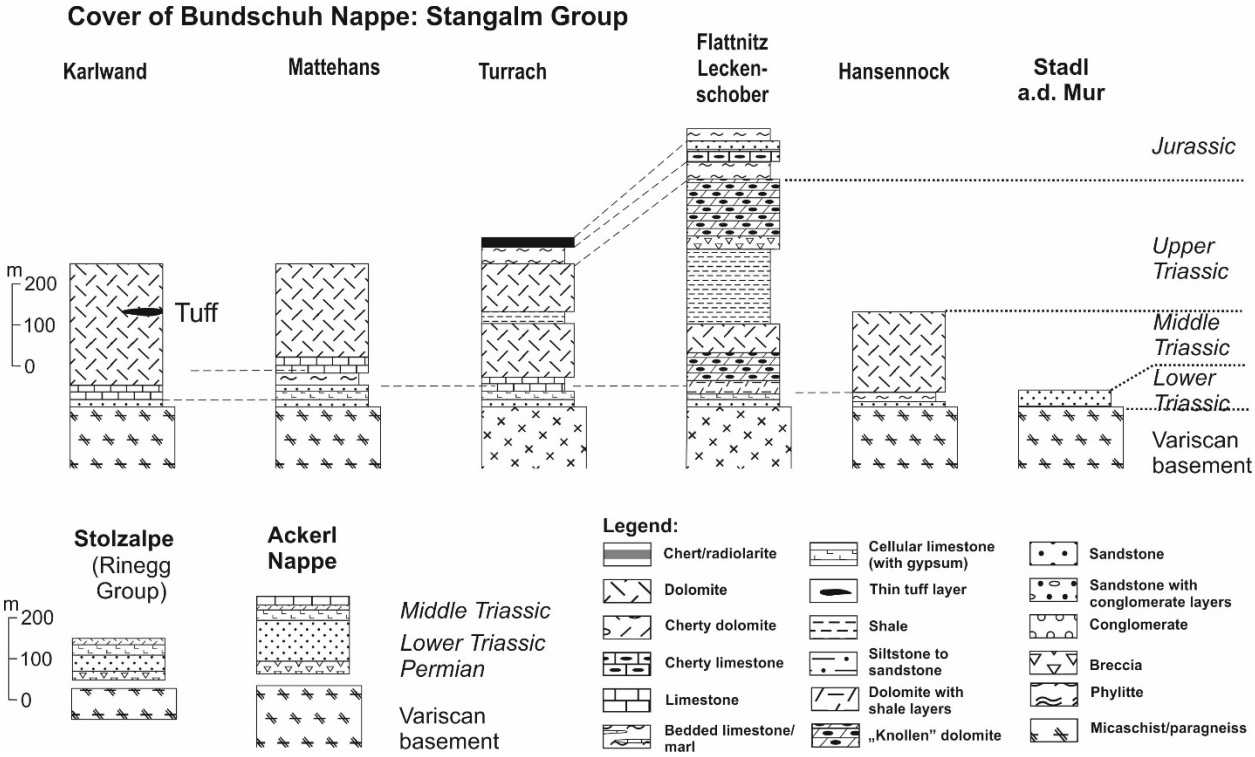
Detached, imbricated and tectonically decapitated cover successions of passive continental margins are often preserved in mountain belts within basement-cover thrust sheets. Based on new mapping of Permomesozoic cover strata underneath and within the Gurktal Nappe Complex, we investigate the lithostratigraphy and the paleogeographic and tectonic origin of the Lower Triassic to Upper Jurassic Stangalm Group and of the here new introduced Permian to Middle Triassic Rinegg Group. The Stangalm Group represents the post-Variscan cover of the Bundschuh Nappe basement and is tectonically overlain by the Gurktal Nappe Complex (with Murau, Pfannock/Ackerl/Rinegg and Stolzalpe Nappes) of the Austroalpine nappe stack. The Stangalm Group was affected by early Late Cretaceous nappe stacking under low-grade metamorphic conditions and subsequent extension during the Late Cretaceous. Lithostratigraphic peculiarities of the Stangalm Group include (Text-Fig. 1): if any, only a thin siliciclastic base including Lower Triassic quartzites (e.g. PISTOTNIK, 1974, 1976; KRAINER, 1984), black phyllites, black calcschists and related synsedimentary sulfidic-sideritic iron mineralizations of Anisian age (REDLICH, 1931), thin dark calcitic marbles, relatively thin Middle and Upper Triassic dolomites separated by Carnian siliciclastic beds. Interestingly, only few rauwacke lenses, mostly subsurface associated with iron ores, were found in the Stangalm Group (REDLICH, 1931). New sections of Carnian slates/phyllites were found west of Turrach. The latter formation shows extreme thickness variations and is very thick in the Flattnitz area (Bockbühel Formation, STOWASSER, 1956) interpreted here to result from synsedimentary normal faulting. Calcschists, cherty limestones are interpreted as Early to Middle Jurassic in age followed by thin Upper Jurassic cherts and cherty limestones (BECK-MANNAGETTA in ANDERLE et al., 1964) and in new found sections southwest of Turrach.

In contrast, the Permian to Triassic Rinegg Group is part of a separate nappe (Rinegg Nappe) around Murau with a thin, strongly sheared Paleozoic phyllitic/phyllonitic basement and a Permomesozoic cover is intercalated between the Murau and Stolzalpe Nappes (THURNER, 1935, 1958). The Rinegg Group ranges from the Permian Alpine Verrucano Formation, Buntsandstein-type quartzites of deltaic deposits, thick Anisian rauwacke and yellowish sandy limestones to potentially Anisian black marble/black calcareous schists (uncertain assignment) (Text-Fig. 1). These Permotriassic strata represent a correlative to a similar Permomesozoic cover of the Ackerl Nappe (Text-Fig. 1) (NEUBAUER, 1980).

The Stangalm Group is exposed from south of Bad Kleinkirchheim and can be followed up to the area south of Kaindorf west of Murau. The stratigraphic base is nearly everywhere present including an angular unconformity at the base (PISTOTNIK, 1976; NEUBAUER & GENSER, 2018). The most complete sections are the Leckenschober section west of Flattnitz with a Lower Triassic to Upper Jurassic succession and a similar section southwest of Turrach. The hangingwall cut-off of the lithostratigraphy can be interpreted as a WNW-directed thrust ramp at the base of the Murau Nappe. In consequence, major portions of the upper Upper Triassic to Jurassic part obviously have been detached and transported towards WNW.

We interpret the very thin siliciclastic, respectively missing successions at the base of the Stangalm Group to represent deposition on a rift shoulder due to surface uplift on a rift shoulder – a feature, which is in contrast with many other Austroalpine Permian to Mesozoic cover successions, where Permian rocks are widespread (e.g. SYLVESTER, 1989). We interpret the Triassic strata of the Stangalm Group to reflect extension of the rifting stage, which also enhanced synsedimentary Early Anisian iron mineralizations potentially related to hydrothermal activity along normal faults. We interpret the thickness variations of the Carnian siliciclastic rocks to reflect

a second stage of extensional faulting during Carnian.
The preservation of Permian siliciclastic sedimentary successions of the Rinegg, Ackerl (NEUBAUER, 1980) and Pfannock (KRAINER, 1984) Nappes shows a clear difference to the Stangalm Group and earlier onset of sedimentation. Several 100 meters thick Permian terrestrial red beds and relatively thin Middle-Upper Triassic carbonate platform sediments at Rossegg (CLAASSEN et al., 1987) and Viktring Permomesozoic strata (SCHÜNEMANN et al., 1982) along the southern margin of the Gurktal Nappe Complex are potential correlatives of the Rinegg Group respectively to the Ackerl/Pfannock cover. This would also imply transport of the Rinegg Nappe from far in the east southeast.
At the northwestern margin of the Stolzalpe Nappe, thick Upper Carboniferous Stangnock and thin Permian Werchzirm cover show the amphibolite-facies grade source terrane, and coral-bearing Lower Carboniferous limestone blocks with close relationships to either Nötsch Carboniferous or Veitsch Nappe, the only areas in the Austroalpine area with Lower Carboniferous shallow limestones (SCHLÖSER et al., 1990). Consequently, a paleogeographic neighborhood of these units must be envisaged.
The new data makes it necessary to reconsider currently popular paleogeographic and tectonic models of the Austroalpine domain. The root zone of the Gurktal Nappe Complex must be at the fault-controlled furrow along the line Rossegg–Viktring (Keutschach fault). This also implies that a major basement unit is missing approximately along this fault.
Furthermore, the term Drauzug-Gurktal Nappe System should be dismissed because: (1) The Drauzug unit does to represent a nappe in contrast to the far-travelled Gurktal Nappe Complex. (2) The paleogeographic dissimilarities of Permian and Triassic successions between some of these units are pronounced (the Carboniferous of Nötsch is a separate from the Drauzug sensu stricto). (3) The eastern paleogeographic extension of the Drauzug unit sensu stricto is in the North Karawanken thrust sheet overlying there the southern margin of the Gurktal Nappe Complex.



Text-Fig. 1: Lithostratigraphic sections of Stangalm and Rinegg Groups, the latter in comparison to the Ackerl Nappe cover. The Rinegg Group is here introduced as a new lithostratigraphic entity.

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