

# Devonian to Permian intrusions in the Zentralgneis Supersuite of the eastern Tauern Window constrained by U-Pb zircon geochronology and geochemistry

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In the course of comprehensive geological mapping, the Geosphere Austria (formerly Geologische Bundesanstalt – Geological Survey of Austria) initiated a systematic geochemical and geochronological characterization of the metamorphic granitoids forming the Zentralgneis Supersuite in the eastern Tauern Window. Three dozens of samples from already defined units (Sonnblick, Siglitz, Romate, Göss, and Hochalm orthogneiss) as well as newly defined units (Säuleck, Kampeck, and Grübelwand orthogneisses) were sampled in four different nappes of the Venediger Nappe-System (Sonnblick, Romate, Hochalm, and Göss nappe).

Major and trace element geochemical analyses indicate three groups. Most of the Sonnblick orthogneiss samples, the Siglitz orthogneiss and other non-leucocratic orthogneisses derive from high-K, calc-alkaline granite with a peraluminous and magnesian composition. The analyzed samples classify as I-type (subordinately S-type) granites formed in volcanic arcs and show no negative Eu-anomaly. The Kampeck, Säuleck, and Grübelwand orthogneiss as well as leucocratic orthogneisses derive from high-Si, calc-alkaline granite, aplite and pegmatite, with a peraluminous ferroan composition. This group classifies as S-type granites formed in a within-plate setting and samples show a clear negative Eu-anomaly as well as comparably low Ba and Sr concentrations. The Romate orthogneiss and one analyzed Sonnblick orthogneiss sample derive from shoshonitic, quartz-monzonite to syenite with metaluminous and magnesian composition. This group classifies as syn-collisional A-Type granites and shows no negative Eu-anomaly with comparably high Eu, U and Th concentrations. The three distinguished groups are found in different nappes of the Venediger Nappe System; however, note that single orthogneiss units can host elements of different characteristics.

U-Pb zircon geochronology further constrains some of the orthogneiss units. A sample of coarse-grained Sonnblick orthogneiss with an augen microstructure yields a Late Devonian age. An atypical fine-grained Sonnblick orthogneiss with small K-feldspar yields a late Carboniferous age and a Siglitz orthogneiss sample yields an early Carboniferous age. Samples from Kampeck, Säuleck and Grübelwand yield middle Permian ages.

Our findings illustrate the complex and long lived intrusion story over 100 Myrs hidden in what is called the Zentralgneis Supersuite. The dominant group corresponding to I-type calc-alkaline plutonism contemporaneous to the Variscan Orogeny took more than 30 Myrs to form. At least in the Sonnblick orthogneiss, this group hosts younger intrusions that remain undefined and unmapped. Later Permian S-type intrusions are for the moment only attested in the Hochalm Nappe. However, based on lithological characteristics these can also be expected in other nappes (e.g. Sonnblick and Göss nappe). Finally, geochronological characterization of the Romate orthogneiss underpins any interpretation of its exotic chemistry. These results stress the importance of combined geochemical and geochronological analyses together with geological mapping for a more comprehensive understanding of the complex geological situation in the eastern Tauern Window.