

Permian–Triassic metagabbros in the Raabalpen basement of the eastern Lower Austroalpine Unit: U-Pb zircon dating and palaeogeodynamic implications

Sihua Yuan^{1,2}, Franz Neubauer², Yongjiang Liu^{3,4}, Johann Genser², Qianwen Huang³, Ruihong Chang², Qingbin Guan^{3,4}

¹ College of Earth Science, Institute of Disaster Prevention, Sanhe, 065201, Hebei, P. R. China; e-mails: yuansihua@126.com; sihua.yuan@sbg.ac.at

² Department of Geology and Geography, Paris-Lodron-University of Salzburg, Salzburg, 5020, Austria; e-mails: franz.neubauer@plus.ac.at; johann.genser@plus.ac.at; ruihong.chang@stud.sbg.ac.at

³ Frontier Science Center for Deep Ocean Multispheres and Earth System, College of Marine Geosciences, Ocean University of China, Qingdao, China; e-mails: liuyongjiang@ouc.edu.cn; HuangQW_31@163.com; guanqingbin@ouc.edu.cn

⁴ Lab. for Marine Mineral Resources, Qingdao National Laboratory for Marine Science and Technology, Qingdao, China

The Lower Austroalpine Raabalpen Complex of the Eastern Alps comprises mainly a purely clastic meta-sedimentary succession of micaschists, migmatitic paragneisses and retrogressed quartz phyllites and phyllonites. The Strallegg Gneiss is a migmatitic, locally aluminosilicate-bearing biotite-rich paragneiss with a wide range of migmatite textures mixed with leucosomes. The migmatites host the widespread “Grobgneis”, a mid-Permian coarse-grained porphyric metagranite (Yuan *et al.*, 2020), Undated metagabbros and amphibolites occur as decameter thick lenses within paragneisses and along margins of the “Grobgneis”. To further understand the palaeogeodynamic setting of the magmatism, we carried out detailed geochronological and geochemical investigations on these mafic rocks.

LA-ICP-MS zircon U-Pb dating of four samples provides the first reliable evidence for the mid-Permian (264.8 ± 1.4 Ma, 265.4 ± 1.4 Ma) and early Triassic (251.9 ± 1.1 Ma, 251.4 ± 1.2 Ma) mafic magmatism of the Raabalpen Complex. Cathodoluminescence images of zircons display clear oscillatory zoning, and Th/U ratios are between 0.3 and 1.2 documenting magmatic formation. Permian–Triassic magmatic bodies and volcanics are widespread not only in the Alps but also in Western Carpathians (*e.g.*, Villaseñor *et al.*, 2021; Huang *et al.*, 2022 and references therein) and other Southeast European Mediterranean Mountain belts (Molli *et al.*, 2020) but the Permian–Triassic geodynamic setting of the Alpine-Carpathian Orogen remains controversial and is crucial for palinspastic reconstructions of the Pangea breakup.

Mafic magmatic bodies and granites in the Lower Austroalpine Unit were almost emplaced during Permian to Triassic times. We contend that mafic and acid magmatic rock groups belong to a bimodal association, tentatively interpreted as a continental rift attributed to the Paleotethys subduction associated with a back-arc stretching (Huang *et al.*, 2022). The metagabbros and amphibolites in the Raabalpen basement are characterized by a continental arc. Considering the Permian–Triassic Pangea breakup, we argue that the Permian–Triassic rifting is modified by the Paleotethys subduction.

Acknowledgements. This study was financially supported by the NSF of China (grant no. 91755212).

REFERENCES

- Huang, Q., Neubauer, F., Liu, Y., Genser, J., Guan, Q., Chang, R., Yuan, S., Yu, S. 2022. Permian–Triassic granites of the Schladming complex (Austroalpine basement): Implications for subduction of the Paleotethys Ocean in the Eastern Alps. *Gondwana Research* 109, 205–224.
- Molli, G., Brogi, A., Caggianelli, A., Capezzuoli, E., Liotta, D., Spina, A., Zibra, I. 2020. Late Palaeozoic tectonics in Central Mediterranean: a reappraisal. *Swiss Journal of Geosciences* 113 (1), 23.
- Villaseñor, G., Catlos, E.J., Broska, I., Kohút, M., Hraško, L., Aguilera, K., Etzel, T.M., Kyle, J.R., Stockli, D.F. 2021. Evidence for widespread mid-Permian magmatic activity related to rifting following the Variscan orogeny (Western Carpathians). *Lithos* 390–391, 106083.
- Yuan, S., Neubauer, F., Liu, Y., Genser, J., Liu, B., Yu, S., Chang, R., Guan, Q. 2020. Widespread Permian granite magmatism in Lower Austroalpine units: Significance for Permian rifting in Alps. *Swiss Journal of Geosciences* 113, 18.