Tectonic history of Proto- and Paleo-Tethys Oceans in the Eastern Alps: Evidence from the Schladming Complex

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The pre-Mesozoic basement of the Austroalpine mega-unit of the Eastern Alps suffered Variscan and Alpine polymetamorphism and magmatism and records important tectonic information since the late Neoproterozoic. The Schladming Complex is an important component of the Austroalpine mega-unit, which can reveal the tectonic history and relationships of tectonic units formed closely related with Proto- and Paleo-Tethys Oceans.

We analyzed the whole-rocks geochemistry, zircon U-Pb ages and zircon Hf isotopy of numerous amphibolites and (meta-)granites from the Schladming Complex. The whole-rock geochemical data show that these rocks generally are depleted in Nb, Ta, Ti and, less reliable, enriched in LILEs (*e.g*., K, Rb, Ba) and show subduction-related features. These features proved the evidence of a "magmatic arc root" proposed by the Neubauer and Frisch (1993).

According to the zircon U-Pb dating results, the inherited zircons of Schladming Complex show similar age peaks with Cadomian basement units, implying that the Schladming basement split off from the northern margin of Gondwana. The ages allow distinction of magmatism and metamorphism of the Schladming Complex into three phases: (1) Early Cambrian to Middle Ordovician (540–480 Ma); (2) Middle Devonian to Carboniferous (380–320 Ma) and (3) Late Permian to Middle Triassic (270–240 Ma). The Early Cambrian to Middle Ordovician magmatism was related to the subduction of the Prototethys Ocean and separated the Schladming basement from the northern margin of Gondwana by formation of a back-arc basin. The Middle Devonian to Carboniferous magmatism and metamorphism reflects the Variscan orogeny in the Eastern Alps resulting from of subduction of Balkan-Carpathian Ocean or of a branch of either the Paleotethys or Rheic Ocean. However, the final assignment to a specific ocean still needs more evidence. The Permian-Triassic A-type granite reflect Permian to Middle Triassic A-type granites associated with back-arc extension in the Schladming Complex, which is related to the subduction of the Paleotethys Ocean and opening of Meliata oceanic back-arc basin (Huang *et al*., 2022).

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