

Variscan I-type granitoids in the Eastern Alps and their geodynamic setting: An updated discussion based on new geochronological results

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Variably deformed granitoids with Devonian, Carboniferous and Permian formation ages, commonly termed “Variscan granitoids”, are widespread in the basement units of the eastern Alps. Many of them are I-type (volcanic-arc-type) tonalites and granodiorites and were, thus, considered to be related to the Palaeotethys subduction system located along the southern Variscan fold belt flank (Finger et al. 1997). However, the issue could be more complicated. New geochronological and geochemical research over the past twenty years has shown that the Variscan I-type granitoids in the Eastern Alps are not cogenetic but form separate plutonic provinces, that were magmatically active at different times. Single granite-forming events likely reflect different tectonic/geodynamic stages during the evolution of the Variscan orogen.

An early generation of Late Devonian to Lower Carboniferous I-type granitoids (370–330 Ma) comprises the dioritic–tonalitic–granodioritic Cetic granitoids of the Helvetic unit (Frasl & Finger 1988; Thöni 1991), the mainly granodioritic Seckau–Bösenstein granitoids (Mandl et al. 2018), and distinct deformed tonalite gneisses in the eastern Tauern Window (“Altkristalline Tonalitgneise” — Schmidt 2017).

A second generation of I-type granitoids with Upper Carboniferous ages (330–300 Ma) occurs in the Eastern Tauern Window (Malta Tonalite, Hochalm Granite, Kölnbrein Granite).

A third, early Permian generation of I-type granitoids (ca. 290–300 Ma) is prominent in the central and western Tauern Window (Venediger Tonalite) and in the Southern Alps.

The following questions must be asked, considering the recent tectonic models for the Variscan orogen (Von Raumer et al. 2013):

- Which of the intra-Alpine Variscan I-type granitoids are directly subduction-related, i.e., formed above an active subduction zone?
- Is it possible that some of the intra-Alpine Variscan I-type granitoids belong to the Rheic and not to the Palaeotethys subduction system?
- Alternatively, is it possible that parts of the intra-Alpine Variscan granitoids have inherited their I-type characteristics from the remelting of significantly older volcanic-arc-type crust, thus being not subduction related in the strict sense.

References

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