Zircon composition at different stages of the Variscan orogeny

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During the orogenic cycle a variety of magmas of different compositions are formed. The most primitive diorites may occur at various stages of an orogeny, along with more abundant and evolved felsic rocks. In the Variscan orogeny, isolated diorite intrusions were formed at 350-340 Ma, during the syn- to late-collisional stage (e.g. monzodiritic rocks of Niemcza Zone, NZ, this study) and at 300-290 Ma during post-collisional extension (e.g. quartz diorites of the Gęsiniec Intrusion, GI). This latter stage was accompanied by voluminous felsic magmatism, which occurred throughout central Europe forming extensive rhyolites (e.g. in the Halle Volcanic Complex, HVC).

In this study we compare **ε**Hf and trace element composition in zircon from intermediate and felsic rocks of different ages and orogenic stages: diorites (~350 Ma, NZ, ~300 Ma, GI), granodiorites (~350 Ma, NZ), and rhyolites (~300 Ma, HVC).

Comparable ranges of εHf values in zircon populations from both the NZ and GI diorites suggest similar mantle sources and/or extent of contamination processes for the older and younger diorites. Zircon data from both localities occupy distinct compositional fields in X-Y plots for many trace elements and elemental ratios. A greater variation in the NZ zircon data suggests crystalization over a longer fractionation path. Indeed, critical parameters such as Eu anomaly and Th/U or Yb/Gd ratios do not correlate with εHf, thus indicating that diorite magma contamination and fractional crystallization are two processes probably separated in time and space. Overall the composition of GI zircon is consistent with fractionation dominated by amphibole whereas that of NZ zircon is by plagioclase. However, trace element parameters vary consistently with εHf when diorite is compared to more felsic rocks of the same age. This implies that the evolution of the dioritic magmas themselves is a separate process from the general mafic-felsic evolution, which, in turn, follows a more predictable assimilation-fractional crystallization path.

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