

Correlation of rift-related metabasalts within the Saxothuringian Zone: Evidence for recurrent Early Paleozoic rifting along the Northern Gondwana margin

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The Palaeozoic palaeogeography of the Peri-Gondwana area, in particular the number of existing oceans and the geodynamic context of their opening and closure, has been widely debated in the literature in recent years. To provide new constraints to this problem, we determined Sr, Nd and Pb isotope compositions in weakly metamorphosed basaltic lavas, sills and dykes from allochthonous units of the Saxothuringian Zone (Frankenberg Klippen, Elbtalschiefergebirge, Ještěd horst) and correlated the new results with existing data for >150 samples from both allochthonous and autochthonous domains of the Saxothuringian Basin and surrounding units.

Three main periods of rift/extensional volcanism can be distinguished in the Saxothuringian Basin realm in both allochthonous and autochthonous domains: (i) early Ordovician (~480 Ma), (ii) Silurian, and (iii) mid-Devonian to early Carboniferous (390–340 Ma).

The first cycle is characterised by post-collisional extension associated with transition from calc-alkaline to mafic alkaline magmas of OIB-like composition. After an interval of quiescence, alkaline magmatism of the OIB type re-appears in the Silurian, with an isotopic signature similar to that of the Ordovician basalts. With progressing extension, a trend from OIB-like towards MORB-like compositions is apparent. The last magmatic cycle begins with bimodal volcanism at the Eifelian–Givetian boundary and dominantly alkaline basaltic volcanism of the OIB type continues until the early Carboniferous. It is present in both allochthonous and autochthonous domains. This cycle is temporally coeval with and has a similar chemistry as volcanism in the Rhenohercynian Zone and marks the beginning of the (re) opening of both Saxothuringian and Rhenohercynian branch of the Rheic ocean. The OIB-type magmas, sourced from subcontinental mantle, and their presence in adjacent units, favour the interpretation of mantle plume-associated rifting rather than back-arc opening of Paleozoic basins.

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