

Zircon geochemistry and geochronology of the volcano-sedimentary rocks of the Kaczawa Complex, the Sudetes (SW Poland): new data for early Palaeozoic development of the Saxothuringian basin

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The Kaczawa Complex, located in the Variscan convergence zone in the Sudetes, SW Poland, contains early Palaeozoic felsic, intermediate to basic volcanic rocks and Cambrian to early Carboniferous sediments, which are all involved in complex processes of the Variscan collision(s). Protoliths of these rocks represent different stages of the development of the Saxothuringian ocean, which started to develop in the early Palaeozoic and ultimately closed in the latest Devonian to early Carboniferous. To provide more insight into the early stages of the development of the Saxothuringian ocean, new LA-ICP-MS U-Pb geochronological and trace element compositional analyses of zircons from some rocks occupying the early Palaeozoic part of the stratigraphic column of the Kaczawa Complex were performed: 1) Oselka metarhyodacites, 2) Lubrza metatrachytes, 3) Radzimowice slates and 4) Gackowa metasandstones.

The U-Pb dating of zircons from the Oselka metarhyodacites yields a crystallization age of 500 ± 5 Ma, while the zircon dating of the Lubrza metatrachytes yields a Concordia age of 495 ± 3 Ma. These data confirm the early Palaeozoic age of volcanism in the Kaczawa Complex, but they strongly suggest not two events but rather a single event of bimodal volcanic activity. Zircon geochemistry (Nb=2.05-24.53 ppm, U=285-2150 ppm, Y=685-18394 ppm, U/Yb=0.40-1.79, and Nb/Yb=0.002-0.021) suggests that the magmas of the Oselka rhyodacites originated by melting of the Cadomian continental crust. The contents of Nb, U, and Yb in zircons (Nb=1.6-168 ppm, U=68-845 ppm, U/Yb=0.26-1/64, and Nb/Yb=0.003-0.248) suggest that trachytic magmas developed partly in a plume-influenced setting.

The accompanying metasedimentary rocks, i.e., Radzimowice slates and Gackowa metasandstones, have comparable detrital age spectra showing Neoproterozoic to early Cambrian maximum depositional ages. The predominance of Neoproterozoic zircons clustering at 580-605 Ma, 630-640 Ma, and 730-770 Ma indicates that the sedimentary basins were mainly supplied by erosion of crystalline rocks of Ediacaran to Tonian ages. Palaeoproterozoic and Archean components (1.7 Ga, 2.0-2.1 Ga, and 2.9-3.0 Ga) are less common, which jointly