Spatial and temporal Sr–Nd–Pb isotope variability of Cenozoic alkaline volcanism in the Bohemian Massif (Central Europe)

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The Cenozoic alkaline magmatic activity, which produced several volcanic complexes and fields over the northern part of the Bohemian Massif (BM), lasted since the Late Cretaceous until the Middle Pleistocene. Most of the volcanic rocks occur within the Eger Rift (ER), but are also dispersed on both flanks as far as 130 km off the rift. The compiled dataset of new and published Sr-Nd-Pb isotope compositions indicates a significant dependence on tectonic evolution. The first period (Late Cretaceous to Paleocene), related to incipient mantle upwelling, produced a dike swarm with high La_N/Yb_N (up to 70) and rather radiogenic $^{143}Nd/^{144}Nd_i$ (0.5127–0.5128) coupled with unusually high $^{206}Pb/^{204}Pb$ (up to 24.24). Late Eocene to Oligocene activity, following a protracted period of magmatic quiescence, is characterized by vast production of erupted magmas, most likely related to lithospheric uplift and partial melting of SCLM with an asthenosperic component. Oligocene rocks have generally lower La_N/Yb_N (10–40) displaying no significant spatial variation, but their Sr-Nd-Pb isotope systematics show a clear trend of westwards increasing radiogenic component (EM). Basalts in Poland have $^{87}Sr/^{86}Sr<0.7035$ and $^{143}Nd/^{144}Nd_i>0.51285$, whereas basalts in western ER have $^{87}Sr/^{86}Sr_i>0.7037$ and $^{143}Nd/^{144}Nd_i<0.51277$. Opening of the ER during the Lower Miocene was associated with a significant decrease in magma production. Most magmas erupted on the rift shoulders span narrower La_N/Yb_N (15–32), and tend towards more DM-like signatures. Pliocene to Middle Pleistocene activity mostly took place on the eastern- and western-most margins of the BM, off the ER. The Plio-Pleistocene trend is marked with a narrow range of DM-like signatures. Progressive change in Nb/Ta with time appears to reflect a change in melting mode from clinopyroxene-rich to clinopyroxene-poor SCLM.

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