Implications for a carbonated peridotite source for intra-continental alkaline mafic lavas from the Siebengebirge Volcanic Field (Germany)

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The Siebengebirge Volcanic Field (SVF) forms part of the Cenozoic Central European Volcanic Province (CEVP). SiO_2 undersaturated mafic rocks from the SVF carry xenocrystic sapphire megacrysts. The trace element composition and the mineral inclusion suite, supported by experimental work, strongly indicate an origin from highly evolved Fe-Mg free carbonatitic melts. LA-ICP-MS U-Pb dating of a syngenetic columbite $(Mn,Fe)_2(Nb,Ta)_2O_6$ inclusion revealed that the sapphires have the same age (24.76 ±0.23 Ma) as the alkaline basalts from the same location that have an Ar-Ar age of between 25.2 and 23.3 Ma [1]. It is therefore most likely that the carbonatite parental to the sapphires, and the alkaline mafic magmas from the SVF were contemporaneously extracted from the same mantle source. A likely candidate for a common mantle source is carbonated peridotite. Such a mantle source has also been proposed by [2] for intra-plate alkaline basalts from Shandong, China. A carbonated peridotite source for the undersaturated alkaline mafics from the SVF is well in accord with the variations in $Na_2O + K_2O$ vs. TiO_2 [3] [4] that follows exactly the experimentally determined carbonated peridotite melt trend [5].

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