Abstract: Numerous studies show that the isotopic variability of back-arc basin basalts could indicate the possible interaction among multiple mantle components or geochemical end-members. Here we present our application of independent component analysis (ICA) to investigate the contributions of the different mantle sources in the northern Lau back-arc basin (NLB) in SW Pacific, based on a compiled geochemical dataset from the Lau back-arc basin, Pacific and Indian Ocean ridges, and Samoan islands. We identified three independent components (ICs) in the five-dimensional space of Sr-Nd-Pb isotopic ratios, which can account for 96.5% of the isotopic variance. On a regional scale in the NLB, there is a broad increase in IC1, IC2 and IC3 from the north to the south. Only IC3 presents obvious decrease from the west to the east, i.e., with decreasing distance from the arc. The correlations between the ICs and incompatible trace elements ratios (i.e., (La/Sm)$_n$, Ba/Th and Th/Nb) were further used to examine the origin of these ICs. Our results suggest that the complex geochemical signatures of NLB basalts can be explained by the addition of Samoan mantle plume materials (IC1), subduction component (hydrous fluid: IC2) and recycled sediment (melt: IC3) to the Lau back-arc mantle.

Key words: Lau back-arc basin basalts, isotopic variability, subduction components, Samoan mantle plume, independent component analysis

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References


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