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Diversity in arc magma controlled by lateral transport of sediments

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Subduction sediments play key roles in geodynamics of subduction zone, arc magmatism diversity, and seismic hazards. Thermo-mechanical models proposed that sediments migrate laterally in the oblique subduction zone [1]. However, the arc magmatism recording the sediment transportation process remains poorly understood. The thermo-mechanical model is best exemplified within the northern margin of the North China Craton (NCC), which underwent diachronous closure of the Paleo-Asian Ocean (PAO) during late Paleozoic [2]. Here, we report Mg-Ba-Sr-Nd-Pb-Hf isotope compositions for mafic arc rocks because of their potential to trace the different origins of metasomatism components responding to the process of the PAO closure. The studied samples have large variations in δ^{26}Mg (-0.28‰ to -0.16‰) and $\delta^{138/134}$Ba (-0.1‰ to 0.33‰) values with highly variable Sr-Nd-Pb-Hf isotopic compositions compared with the primitive mantle. Shallow-level geological processes cannot explain such a large isotopic variation. Instead, their geochemical features reveal the prominent differences in contributions of subduction sediments. Spatially, subduction sediment flux gradually increased toward the ongoing arc magmatism in the scissor-like PAO-NCC convergence zone. Thus, the lateral transport of subduction sediments induced by the diachronous subduction-collision processes alternatively controls the diversity of arc magmatism, especially in extinct convergence zone.

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