Geochemistry of diverse lavas from the Lau Basin：Implications for the complex back-arc mantle dynamics

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Lavas from back-arc basins are generally diverse, and their geochemical compositional characteristics showed that they received the variable contributions from subduction components during petrogenetic process. Comprehensive geochemical considerations for the whole back-arc basin will be helpful for better understanding the complex back-arc evolution. In this study we systematically reviewed major and trace element compositions for Lau Basin lavas, and the data covered all major tectonic units of the basin, e.g., ELSC, VFR, CLSC, NWLSC, NELSC, MTJ and FSC. Lava types are diverse, including tholeiitic basalt, alkali basalt, boninite, basaltic andesite, andesite, dacite and rhyolite, etc.For example, Lavas from VFR include basic-intermediate-acidic lava series, i. e., basalt, basaltic andesite, dacite, and rhyolite, and the NELSC and FSC units contain boninitic rocks. Geochemical compositions of these diverse rock types have been used to indicate Lau Basin back-arc spreadinge dynamics in this study. We suggested that, (1) subduction components mainly include hydrous fluids released from subducted slab and aqueous melt directly from melting subducted sediment, and the influence of subducted components on the petrogenesis of central and southern Lau Basin lavas (i.e., CLSC, ELSC and VFR) is decreasing with increasing distance from the nearby Tonga trench; (2) due to the propagating and spreading outwards of Samoan mantle into Lau Basin, the lavas from NELSC, NWLSC, MTJ and even the northern part of FSC regions may receive variable influence from the Samoan plume. (3) The migration of Indian-like mantle southwards into preexisting Pacific mantle is consistent with the opening history of the Lau Basin. Accompanied with gradual migration of the Indian mantle into the Lau Basin, there formed a series spreading centers, e.g., NWLSC, CLSC, ELSC and propagating VFR in sequence. This study was supported by National Programme on Global Change and Air-Sea Interaction (nos. GASI-GEOGE-02) and National Natural Science Foundations of China (grants no. 41276003, 41322036, 41776070, 41706060).