

## **Evidence for origin of Caroline plateau from a short-lived mantle plume**

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The Caroline plateau is located to the west of the Caroline seamount chain which is considered to have been formed by a hot spot. However, knowledge on the nature of the Caroline plateau and its genetic relationship with the Caroline hotspot is lacking. In this study, we have analysed whole-rock major and trace elements and Sr-Nd-Pb-Hf isotopes of basalts from the western and central Caroline plateau. The basalts can be classified into two groups, an alkali basalt group (Group 1) and a tholeiitic basalt group (Group 2). Group 2 basalts with similar trace element and isotope compositions were found at all of the western, central and northern Caroline plateau location. Group 2 basalts are slightly more enriched than the Ontong Java plateau, and we suggest that the Group 2 basalts represent the main stage volcanism of the Caroline plateau. The Group 1 basalts have trace element compositions similar to typical alkali ocean island basalt and show isotope compositions similar to basalts of the Caroline islands. The Group 2 basalts can be formed by mixing between Group 1 basalt and a depleted mantle represented by the Caroline basin basalt, suggesting involvement of a significant proportion of depleted components was involved. Based on tectonic reconstruction and K-Ar ages, the Caroline plateau and the Caroline islands decrease in age from west to east. We suggest that the Caroline plateau was formed by a medium-size mantle plume. Overall, the basalts of the Caroline plateau and Caroline islands show increasing alkalinity of basalts, which indicates a decreasing activity of the Caroline mantle plume with time. This work was financially supported by the National Natural Science Foundation of China (91858206, 41876040), and the Senior User Project of RV KEXUE (KEXUE2018G09).

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