

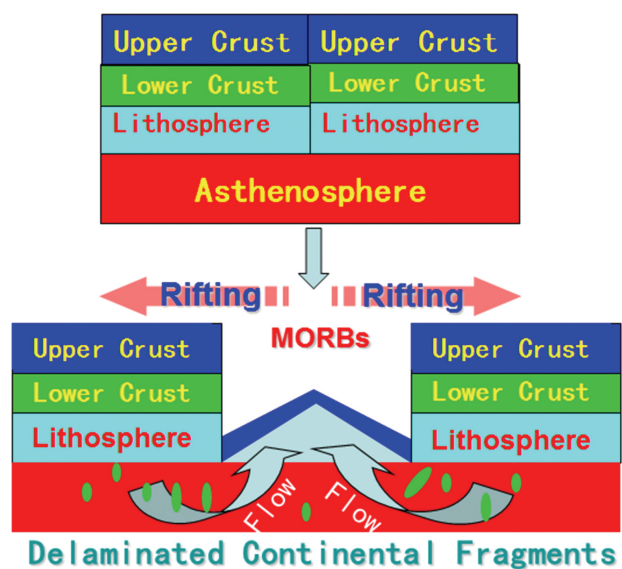
## Geochemical nature of sub-ridge mantle and opening dynamics of the South China Sea

With the support by the National Natural Science Foundation of China (NSFC), the research team directed by Prof. Zhang GuoLiang (张国良) at the Key Laboratory of Marine Geology and Environment & Center of Deep Sea Research, Institute of Oceanology, Chinese Academy of Sciences, recently reported the geochemistry of the oceanic crust basalts of the South China Sea, and reveals that the South China Sea has the Indian-type upper mantle source, which was published in *Earth and Planetary Science Letters* (2018, 489: 145–155).

The South China Sea is located at the junction of the Euro-Asia continent, the Indian Ocean and the western Pacific Ocean, which leads to the extremely controversial formation of the South China Sea. It remains unclear whether the mantle source nature of the South China Sea is Pacific-type or Indian-type. Because the South China Sea is an extensional basin formed during the Cenozoic time, the geochemical nature of sub-ridge mantle and opening dynamics of the South China Sea are faithfully recorded by the seafloor basalts formed during the seafloor spreading, which has been recovered during IODP Expedition 349 in 2014.

This study by Zhang’s team has analyzed the major and trace elements and Sr—Nd—Pb—Hf isotopes of the basalt samples. The results indicate that the basalts of the two sub-basins are Indian-type (termed as Dupal anomaly in geochemistry) MORBs based on Sr—Nd—Pb—Hf isotope compositions, while the Southwest sub-basin basalts show isotopic compositions distinctly different from the East sub-basin. They have modeled the influences of Hainan mantle plume and lower continental crust to interpret the cause of different mantle compositional evolutions between both sub-basins. They found that a significant amount (~40%) of Hainan plume material was involved in the genesis of the seafloor basalts in the East sub-basin, which reflects the influences of Hainan hotspot on the depleted sub-ridge mantle. Furthermore, the geochemical nature of the Southwest sub-basin basalts can be explained as the detached lower continental crust in the sub-ridge mantle of the South China Sea. Both the Hainan hotspot and the lower continental crust have characteristics of Dupal anomaly, thus, this is right the reason of the existence of Indian-type mantle in the South China Sea. In terms of those observations, they propose an opening and spreading model of the South China Sea: the Hainan plume might have played a role in promoting the opening of the South China Sea, during which the Hainan plume contributed enriched components to the sub-ridge mantle and caused thermal erosion and return of the lower continental crust into the convective mantle.

Their findings contribute to better understanding of the formation mechanism of the South China Sea, and have crucial promoting effect of cognition on the formation of Indian-type mantle in the Northern Hemisphere.



**Figure** Model showing detachment of lower continental crust into the asthenospheric sub-ridge mantle during the rifting of the Euro-Asia continent.