



Geochemistry and Sr-Nd Isotope Study of Pingxiang Mafic Dykes in Southwestern Guangxi, SW China: Implication of Tectonic Nature and Mantle Features of Youjiang Basin

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Abstract: Youjiang basin is located at the junction of Yunnan, Guangxi and Vietnam, which belongs to the intersection of Paleo-Tethyan and Pacific tectonic domain in the geotectonic position, and its formation was related to the closure of Paleo-Tethys and the subsequent collision between Indochina block and south China block in indosinian (Yang et al., 2012). In the Late Permian, intense submarine hydrothermal activities occurred in Youjiang basin due to the influence of magmatism of the Emeishan large igneous province (Huang H et al., 2014). The Youjiang basin experienced a strong base subsidence, rifting and volcanic activity in the Late Permian. Some scholars propose that it is the result of back-arc extension caused by the North-East subduction of the Jinshajiang-Ailaoshan oceanic crust (Du et al., 2013), while others believe that this activity is mainly related to the Emeishan mantle plume (Liu et al., 2009). Previous studies on petrology and geochemistry of mafic rock in Youjiang basin showed that the mafic rocks from the central part of the basin formed by intracontinental rift, while rocks from the Napo-Pingxiang area in the southwest margin of the basin had island arc basalt feature, indicating that the nature of the basin had changed (Huang et al., 2014). Especially the occurrence of mafic rocks of intracontinental nature and island arc nature in the Napo and Pingxiang region in the southwest of Guangxi, which may reflect the interaction between Emeishan mantle plume and Paleo-Tethyan oceanic subduction (Huang et al., 2014; Chen et al., 2016; Zhao et al., 2018).

Pingxiang geotectonically lies in the border area of the southern Guangxi and Vietnam, tectonically in the eastern part of the Dian-Qiong Paleo-Tethyan suture and the southwestern end of Youjiang basin. Mafic dykes (diabase) are exposed in Pingxiang area of southwest Guangxi, the geochemistry study of mafic diabases is helpful to understand the petrogenesis and tectonic nature of the Youjiang Basin. In this paper, we present the major, trace element and Sr-Nd isotopes of the whole rock as well as the geochronology of Pingxiang diabase, and further indicate the tectonic attributes and mantle characteristics

of Youjiang basin. The results show the U-Pb dating of zircon from Pingxiang diabase yield the 288 Ma (Fig. 1), indicating that the mafic rocks were mainly formed around the Early Permian. The diabases geochemically belong to alkaline basalt with low SiO₂ and high MgO contents as well as relatively enriched in light rare earth element (LREE) and depleted in heavy rare earth element (HREE). The (La/Yb)_N range from 4.37 to 9.45, δ Eu range from 0.98 to 1.08, thus all samples have no obvious Eu anomaly but positive anomaly on Sr, which geochemically showing the transition from E-MORB to OIB-like characteristics (Fig. 2). The (⁸⁷Sr/⁸⁶Sr)_i of Pingxiang diabase range from 0.705568 to 0.706617, and the $\epsilon_{Nd(t)}$ with from -0.65 to +1.69, showed an enriched mantle II (EMII) affinity, indicating that they derived from a slight depleted MORB-type asthenospheric mantle to OIB-type enriched mantle. Combined the regional geological background, we conclude that Pingxiang mafic dykes may formed in a backarc extension or rift setting which caused by the interaction between the Paleo-Tethyan subduction system and the Emeishan mantle plume. Our study reveals that the formation of the Youjiang Basin may be co-affected by the Paleo-Tethyan subduction system and the Emeishan mantle plume.

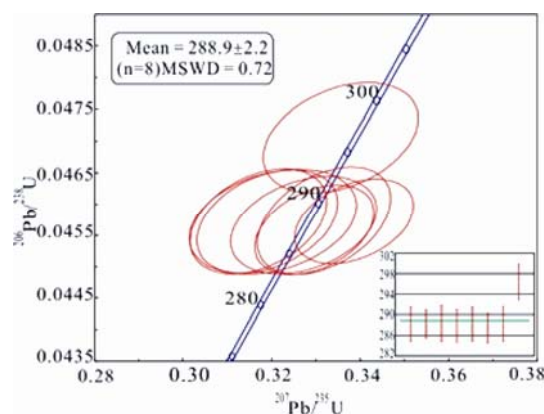


Fig. 1. LA-ICP-MS U-Pb zircon Concordia diagram and weighted average age diagram.

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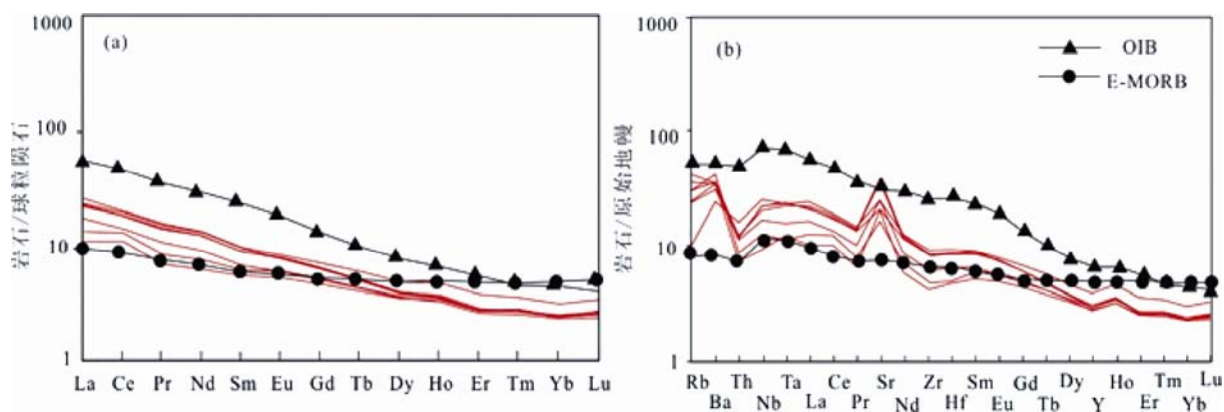


Fig. 2. Chondrite-normalized REE patterns and primitive mantle-normalized trace element patterns for Pingxiang diabase.

With the evolution of the Paleo-Tethys, the interaction between the lateral Paleo-Tethyan subduction system and vertical Emeishan mantle plume induced the Paleo-Tethyan backarc extension, its sub-mantle also was affected by both the Paleo-Tethyan E-MORB type asthenospheric mantle and Emeishan OIB type mantle, which eventually formed the mafic dykes with transition features from E-MORB to OIB in Pingxiang region.

Key words: Youjiang basin, Paleo-Tethys, Pingxiang

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