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## Influences of Tibetan Plateau Uplift on Provenance Evolution of Paleo-Pearl River

YU Ye<sup>1,\*</sup>, ZHANG Changmin<sup>1</sup>, LI Shaohua<sup>1</sup>, ZHU Rui<sup>1</sup>, LIU Jiangyan<sup>1</sup>,  
QIN Chenggang<sup>2</sup> and ZHANG Zhongtao<sup>2</sup>

<sup>1</sup> MOE Key Laboratory of Exploration Technologies for Oil and Gas Resource, School of Geosciences, Yangtze University, Wuhan, Hubei 430100, China

<sup>2</sup> Shenzhen Branch of CNOOC Ltd., Guangzhou, Guangdong 510240, China

Sediment composition changed obviously during the Late Oligocene (23.8Ma) in the northern South China Sea. The sedimentary environments in the Baiyun Depression also changed from a continental shelf with neritic deposition into a continental slope with deep-water deposition. These sedimentary geological phenomena coincided with a series of geological events including the rapid uplift of the Tibetan Plateau during 25~17Ma and the initial uplift of the western Yunnan Plateau during 23~19Ma in the western of the Pearl River drainage. This is a coincidence or they have internal relations? In order to understand these relations, works which referred to comparative analysis of the geochemical characteristics of sediments from Oligocene Zhuhai Formation (32 ~

23.8Ma), Miocene Zhujiang Formation (23.8 ~ 16.5Ma) and Hangjiang Formation (16.5 ~ 10.5Ma) and comprehensive analysis of the geochemical characteristics of rocks of surrounding the paleo-Pearl River drainage had been done to reveal the influences of Tibetan Plateau uplift on provenance evolution of paleo-Pearl River. The results show that the geochemical characteristics of sediments from Oligocene Zhuhai Formation are very different from the geochemical characteristics of sediments from Miocene Zhujiang and Hangjiang Formation. The source rock types are simple and mainly felsic granite during the stage of Zhuhai Formation while the source rock types are complex and mainly alkali basalt during the stage of Zhujiang and Hangjiang Formation.

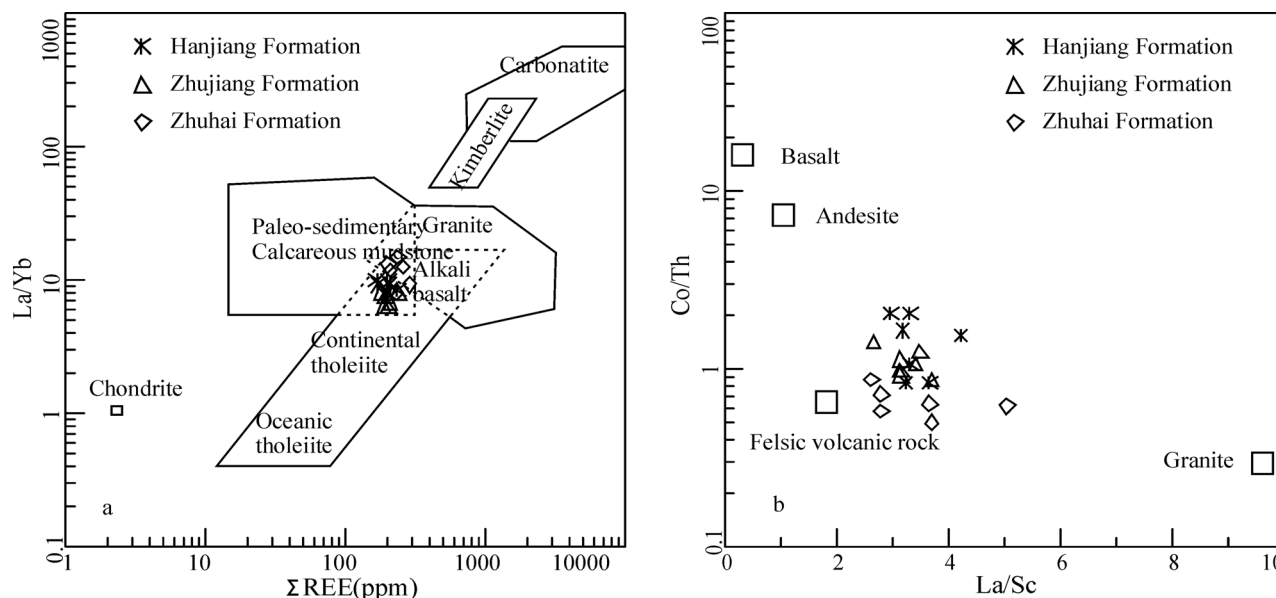


Fig. 1. Source rock discrimination diagrams for the mudstones on (a)  $\Sigma$ REE vs. La/Yb (redrawn from Allegre 1978), and (b) La/Sc vs. Co/Th (redrawn from Gu 2002).

The samples of Zhuhai Formation reflect felsic source rocks and cluster around the composition of granite. The samples of Zhujiang and Hangjiang Formation could be derived from alkali basalt source or mixed felsic/basic source regions.

\* Corresponding author. E-mail: yuye1983@163.com

$\Sigma$ REE of mudstone is relatively high in Zhuhai Formation, which is 204.07 ~ 293.88ppm(average240.46ppm), but  $\Sigma$ REE of mudstone is relatively low in Zhujiang and Hanjiang Formation, which are 181.32 ~ 236.73ppm (average203.83ppm) and 166.84 ~ 236.65ppm (average199.04ppm) respectively. The chemical index of alteration (CIA) has a similar characteristic which indicates that the CIA of Zhuhai Formation is relatively high and CIA of Zhujiang and Hanjiang Formation is relatively low. The CIA of Zhuhai Formation, Zhujiang and Hanjiang Formation is 57.66~71.62(average64.68), 44.93 ~ 60.38(average52.08) and 47.30 ~ 62.44

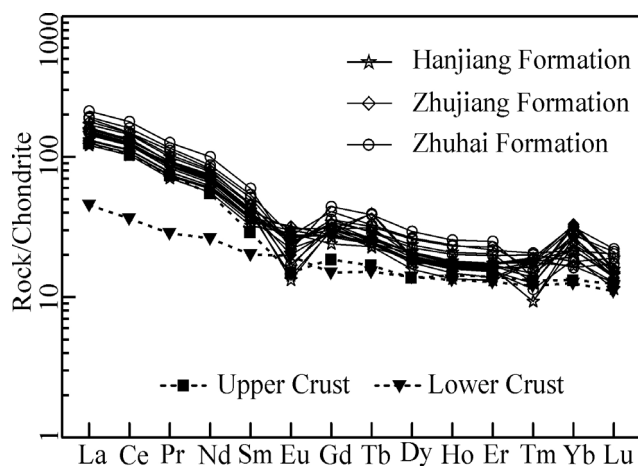


Fig.2.Chondrite normalized REE plot for the mudstones (chondrite normalizing factors from Sum and McDonough 1989). The patterns are similar to upper continental crust, with LREE enrichment, flat HREE, and significant negative Eu-anomalies. The source rocks of the study area could be derived from the upper continental crust. But  $\Sigma$ REE of mudstone is relatively high in Zhuhai Formation and  $\Sigma$ REE of mudstone is relatively low in Zhujiang and Hanjiang Formation. It indicates that the source rocks of Zhuhai Formation are different from the source rocks of Zhujiang and Hanjiang Formation.

(average55.59) respectively. According to the comparative analysis of Isotopic Characteristics of Nd and Sr which is from the surrounding area of paleo-Pearl River drainage, there is a acquisition that the sediments of paleo-Pearl River from Oligocene Enping and Zhuhai Formation has the same  $\epsilon$ Nd(0) and  $^{87}\text{Sr}/^{86}\text{Sr}$  as the granite in the coast of south china do while the sediments of paleo-Pearl River from Miocene Zhujiang and Hanjiang Formation has the same  $\epsilon$ Nd(0) and  $^{87}\text{Sr}/^{86}\text{Sr}$  as the granite in the western Yunnan Plateau and Eastern Tibetan Plateau do. It concluded that the source rocks of paleo-Pearl River are mainly derived from the southern China areas nearby the

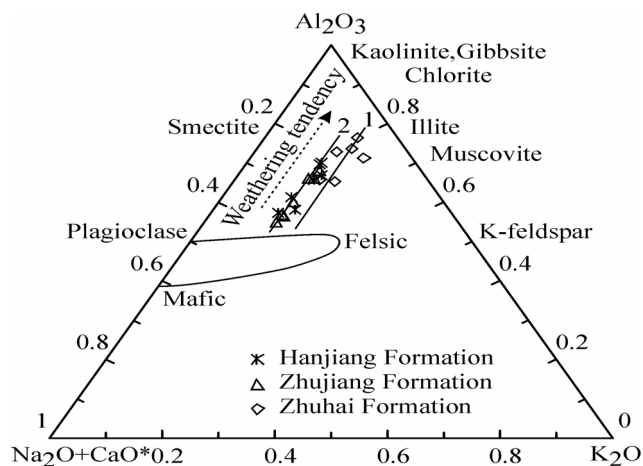


Fig.3.Ternary plot of molecular proportions  $\text{Al}_2\text{O}_3$ -( $\text{Na}_2\text{O}+\text{CaO}^*$ )- $\text{K}_2\text{O}$  for the mudstones (redrawn from Fedo 1995). Along the opposite direction of weathering tendency (dotted line), the samples of Zhuhai Formation are derived from felsic source rocks (solid line 1) and the samples of Zhujiang and Hanjiang Formation are derived from mafic source or mixed felsic/mafic source regions (solid line 2). The samples of Zhuhai Formation locate in the front end of weathering tendency (dotted line), suggesting a strong weathering history for the provenance. The samples of Zhujiang and Hanjiang Formation locate in the middle-tail end of weathering tendency (dotted line), suggesting a moderate-weak weathering history for the provenance.

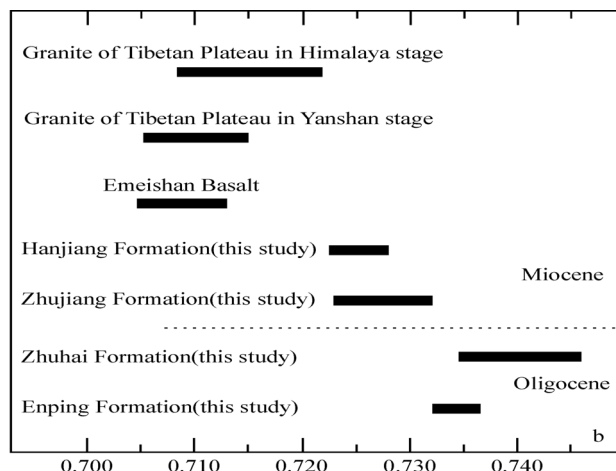
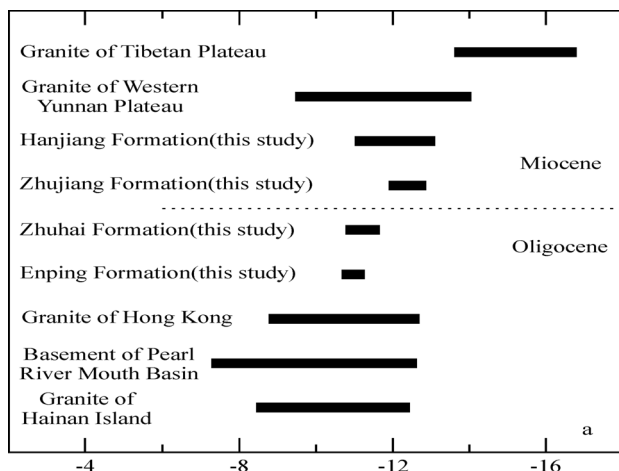


Fig.4.Comparison of the  $\epsilon$  Nd(0) (a) and  $^{87}\text{Sr}/^{86}\text{Sr}$  (b) of sediments in any possible sources surrounding the Pearl River drainage. The sediments of Oligocene Enping and Zhuhai Formation has the same  $\epsilon$  Nd(0) value as the granite in the coast of south china including Hong Kong, Hainan Island and Basement of Pearl River Mouth Basin do while the sediments of Miocene Zhujiang and Hanjiang Formation has the same  $\epsilon$  Nd(0) value as the granite in the western Yunnan Plateau and Tibetan Plateau do. The  $^{87}\text{Sr}/^{86}\text{Sr}$  value of Oligocene Enping and Zhuhai Formation are different from the  $^{87}\text{Sr}/^{86}\text{Sr}$  value of Miocene Zhujiang and Hanjiang Formation which is similar to that of the granite of Tibetan Plateau and Emeishan basalt.

South China Sea in the stage of Oligocene Enping and Zhuhai Formation. Along with the uplift of the Tibetan Plateau and the western Yunnan Plateau, the paleo-Pearl River drainage expanded to western China. The principal source of paleo-Pearl River in the Miocene Zhujiang and Hanjiang Formation may be derived from the Eastern Tibetan Plateau.

**Key words:** Tibetan Plateau Uplift, The northern South China Sea, Paleo-Pearl River, Provenance Evolution, Geochemical Characteristics

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