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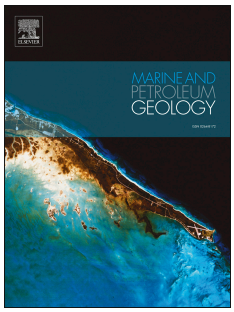

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PII: S0264-8172(18)30063-1

DOI: 10.1016/j.marpetgeo.2018.02.019

Reference: JMPG 3247

To appear in: *Marine and Petroleum Geology*

Received Date: 14 November 2017

Revised Date: 8 February 2018

Accepted Date: 13 February 2018

Please cite this article as: Guoliang, X., Yulin, S., Shugen, L., Weiduo, H., Trace and rare earth element (REE) characteristics of mudstones from Eocene Pinghu Formation and Oligocene Huagang Formation in Xihu Sag, East China Sea Basin: Implications for provenance, depositional conditions and paleoclimate, *Marine and Petroleum Geology* (2018), doi: 10.1016/j.marpetgeo.2018.02.019.

Trace and rare earth element (REE) characteristics of mudstones from Eocene Pinghu Formation and Oligocene Huagang Formation in Xihu Sag, East China Sea Basin: implications for provenance, depositional conditions and paleoclimate

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Abstract: The interpretation of depositional conditions, provenance and paleoclimate provide important information to understand hydrocarbon source rock formation and distribution. The concentrations of trace elements and rare earth elements (REEs) of fifty mudstone samples from Eocene Pinghu Formation and Oligocene Huagang Formation in Xihu Sag, East China Sea Basin were determined by inductively coupled plasma-mass spectrometry (ICP-MS) to test the depositional conditions, provenance and paleoclimate. Evidences from the visual comparisons of the simple bivariate plots diagrams and statistical comparisons of the Mann-Whitney Rank Sum Test suggest that there may be a common source for the Pinghu Formation and Huagang Formation mudstones. Sedimentary provenance from bivariate plots diagrams of Hf versus La/Th and La/Sc versus Co/Th shows that Pinghu Formation mudstones are mainly composed of mixed felsic/basic source and acidic source whereas Huagang Formation is mainly acidic source. Additionally, the ∑REE vs La/Yb discrimination diagram shows that the property of the provenance for the Pinghu Formation mudstones consists sedimentary rock, alkaline basalt and a small amount of continent tholeiitic basalts whereas that of the Huagang Formation is mainly alkaline basalt and sedimentary rock. Discriminant diagrams, consisting of La-Th-Sc and Th-Co-Zr/10, suggest that the mudstones of two formations were deposited in continental island arc and active continental margin tectonic setting. Redox proxies (V/Ni, V/(V+Ni) and δCe) indicate that most of the mudstones of two formations were deposited in a relatively dysoxic/anoxic condition. The cool and humid climate (represented by Sr/Cu and Rb/Sr ratios) were prevailing in Xihu Sag during the Eocene and Oligocene period, and the Oligocene was cooler than Eocene. Moreover, five long term base level cycles (SIII1~SIII5) and four sequence boundaries (Sb2~Sb5) were recognized in the Pinghu Formation and Huagang Formation based on the