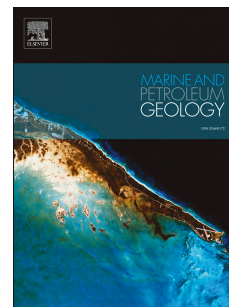


# Accepted Manuscript

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

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