Provenance Analysis and Petroleum Geological Significance of Shallow-Sea Gravity Flow Sandstones from Huangliu Formation in Yinggehai Basin, South China Sea

Yintao Huang[1] and Guangqing Yao[1]

[1]China University of Geosciences

Abstract

The reservoir in upper Miocene Huangliu formation of Yinggehai Basin, which is located between KonTum paleo-uplift and Hainan paleo-uplift, is shallow-marine gravity flow deposits with burial depth from 2600m to 3500m. Analyzing the provenance of the sandbody is significant in understanding its distribution and "source to sink system", hence for the oil-gas exploration and development in this area. The provenance of sediments in upper Miocene Huangliu formation is analyzed by integrating the components of the sandstones, assemblage styles of the heavy mineral, paleo-current direction and geochemistry characteristics of the sandstones. Results show that: (1) there are two provenances, one from west and the other from east, in the study area. Western sourced sandstones form the shallow-sea gravity flow which are mainly sublitharenite having high feldspar (average is 6.1%) and lithic content (average is 11.7%), low shale content (average is 3.8%). However, eastern sourced sandstones, which are mainly subarkose-quartz siltstone having low feldspar and lithic content with averages of 4.6% and 2.7%, respectively, high compositional maturity, high shale content (average is 18.6%), form the neritic sand bar. (2) The shallow-sea gravity flow sandstones exhibit low zircon, tourmaline content, and high magnetite, garnet content, while the neritic sandbar sandstones exhibit high zircon, tourmaline and leucosphenite content, and low magnetite, garnet content. The direction of paleo-current in study area is along the direction from southeastward to eastward. (3) The similar rare earth element (REE) patterns of 28 sandstones from three western wells indicate that they are sourced from the same provenance. The diagrams of Th-Sc and Co/Th-La/Sc and elemental ratios of these sandstone samples show that they were derived from intermediate to felsic source rocks. The measured geochemistry data of these core samples fall into the fields of active continental margin or continental island arc in the diagram of La-Th-Sc, Th-Sc-Zr/10, Ti/Zr-La/Sc and major element discrimination, indicating that the source rocks of the shallow-sea gravity flow sandstones were formed under the tectonic setting of an extrusion environment. (4) The integrated method for provenance analysis indicates that the shallow-sea gravity flow sandstones are derived from the western KunTum uplift.