Provenance, Geochronology and Sedimentary Characteristics of the Campanian M1 Sandstone, Oriente Basin, Ecuador

Sinong Lin[1], Cornel Olariu[1], Ronald Steel[2], Douglas Good[3]
[1]UNIVERSITY OF TEXAS AT AUSTIN; [2]UTAustin; [3]Andes Petroleum Ecuador Ltd.

9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

The Late Cretaceous Campanian (72.1-83.6 Ma) M1 Sandstone is one of the major oil reservoirs in Oriente Basin, Ecuador. The M1 sandstone is found mainly in central and eastern parts of the basin and overall thinning direction is to the west. The relative thinness (usually under 25 meters) makes it difficult to identify the depositional patterns within the M1 sandstone through seismic data. Furthermore, M1 gamma ray logs, and even two adjacent wells with similar gamma ray pattern have different reservoir pressure values suggesting distinct reservoir units. The reservoir behavior suggests the depositional environment of the M1 sandstone is variable and contains complex compartmentalization. Hence, we combined provenance and geochronology study to complement the sedimentological observations and understand the regional deposition of the M1 sandstone. Detrital Zircon Dating has been applied to 21 core samples of the M1 sandstone across the entire basin. The probability density plot (PDP) curves of those samples provide the evidence that sediments are mainly coming from the Amazonian Craton, which are Rio Negro-Juruena Province (RNJ: 1.78-1.55 Ga) and Rondonian-San Ignacio Province (RO: 1.55-1.30 Ga). Moreover, the main M1 and upper M1 have locally distinct signatures either from RNJ or RO, such as Nantu well is missing RO peak in upper M1 while Dorine well has a shift of RNJ peak from main M1 to upper M1. The zircon analyses suggest M1 sandstone in the central and western Oriente Basin is still Craton derived, likely reworked in the basin by tidal currents. Further analysis of the age signal together with well log interpretation and core description allow a reconstruction of the sediment transport

patterns. The M1 sandstone varied in its derivation direction from the Craton, initially being sourced dominantly from the south-east and later from the east. The core description and log correlation indicate that M1 sandstone was deposited in most areas under strong tidal-current influence. At beginning it developed regressively with much sediment bypass to the northwest, but was later reworked (almost completely in places) by tidal currents during transgression. The depositional model generated emphasizes the general transport direction and typical depositional elements (channels, bars, abandoned muddy tracts).