

Source Rocks Variation and its links to Sequence Stratigraphy in the Upper Cretaceous of the Oriente Basin, Ecuador

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The Upper Cretaceous shales are widely distributed in Oriente Basin of east Ecuador. The type, quality and quantity of source rock in the Lower Napo Formation (Upper Cretaceous) are strongly controlled by sequence stratigraphic framework. The highstand systems tract contains organic-rich shales with Type II kerogen, having medium TOC content (1.61–3.27 wt%) and hydrocarbon yield (7.04–21.75 mg HC/g rock), high hydrogen index (427–693 mg HC/g TOC), and low $\delta^{13}\text{C}$ (–27.5 – –27.2‰). Moreover, within the highstand systems tract, the quality and quantity of the lower are better than those of the upper. The transgressive systems tract also has organic-rich shales, mainly Type II-III with minor Type III kerogen, having high TOC content (4.20–5.97 wt%) and hydrocarbon yield (16.04–26.76 mg HC/g rock), medium hydrogen index (376–448 mg HC/g TOC), and medium $\delta^{13}\text{C}$ (–24.3 – –27.4‰). The shelf margin systems tract consists of rich organic matter shales, mainly Type III with minor Type II-III kerogen, having variable TOC content (0.71–5.23 wt%) and hydrocarbon yield (0.68–12.64 mg HC/g rock), low hydrogen index (68–352 mg HC/g TOC), and high $\delta^{13}\text{C}$. On contrast, the highstand systems tract has strong predominance of the amorphous organic matter and the shelf margin systems tract is slightest. Shales developed within the lower part of the highstand systems tract are a potential source rocks for significant oil generation. Therefore, variations in the amount and type of organic matter preserved in the Upper Cretaceous sediments are predictable within a third-order sequence stratigraphic framework.