Geophysical Research Abstracts
Vol. 20, EGU2018-8280-2, 2018
EGU General Assembly 2018

Depositional Environment Interpretation from Organofacies Characterization for Yacoraite Fm. outcrop samples, Cretaceous Salta Basin - Argentina

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The Yacoraite Formation (Maastrichtian-Danian) is one of the main source rocks in North-West Argentina in the sedimentary basins in Salta and Jujuy provinces. It was deposited following Lower Cretaceous rifting, representing the last Cretaceous marine ingression although locally evidence has been found for lacustrine depositional conditions. Here we show preliminary results for depositional environment characterization of Tres Cruces and Metan-Alemania subbasins, based on the organic geochemistry of rock samples and their extracts.

Depending on its depositional environment, the Yacoraite Formation exhibits a wide range of organic content varying from poor up to rich (up to 7% TOC). It contains kerogen Types II and II/III with low sulphur content, consistent with marine organic matter. The presence of Type III kerogen observed in several samples indicates an input of terrestrial organic matter probably related to periods of sea level fall.

Biomarker distributions, like the relative abundance of C27-C29 steranes, have been widely used to differentiate between marine, lacustrine or terrestrial depositional environments. The sterane distribution of our samples indicates an open marine depositional environment for the Yacoraite Fm.

In addition to the shale dominated rock samples, two stromatolite samples from the same formation have been analyzed. Stromatolites are carbonate rocks commonly formed by biomineralization in shallow water. Sterane biomarker abundance indicates deposition in an marine environment. However, previous studies have shown that diatoms, certain alga and cyanobacteria can enhance C29 sterane abundance which can lead to a misinterpretation of the depositional environment. For more precise environment interpretation a comparison with other parameters is planned.

In addition to the broad definition of depositional environment, redox conditions during organic matter deposition are important. The analyzed hopane biomarkers indicate anoxic conditions during Yacoraite Fm deposition favoring organic matter preservation. In this environment, the dibenzothiophene/phenanthrene ratio is low, as is the low dimethylthiophene abundance identified by Py-GC.

Only one sample contains Type I kerogen which is commonly interpreted as being deposited in lacustrian environments. The sterane biomarkers analysis however indicates a marine depositional environment.

While the studied shales of Yacoraite Fm have the potential to generate mixtures of P-N-A oils with variable wax content and some gas or condensates, the stromatolites produce P-N-A oils with low waxy content. Its kerogen, depending on depth of burial in the different subbasins is thermally immature (<0.5% Ro) or thermally mature in oil window (0.5 - 1%Ro).

Further complementary biomarker and petrography analysis are necessary to refine the understanding of the depositional environment of the Yacoraite Fm.