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VIRTUAL EVENT

ORGANIC PETROLOGY AND GEOCHEMISTRY OF THE LOS MOLLES FORMATION (MIDDLE JURASIC) IN THE PICÚN LEUFÚ AREA, NEUQUÉN BASIN

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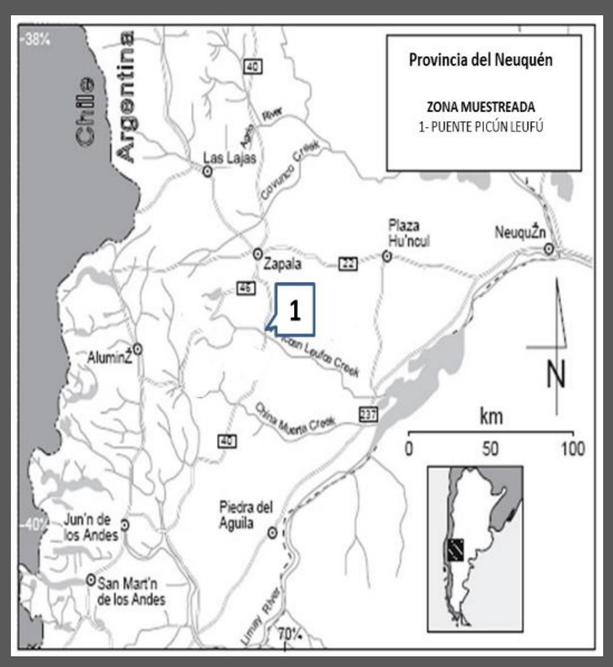
The aim of this study is to estimate the quantity, quality and maturity of the organic matter preserved in the Middle Jurassic Los Molles Formation in relation with the hydrocarbon generation potential and its characterization as a source rock-unconventional play. The unit is considered as an effective source rock in the subsurface of the Neuquén Basin (Uliana et al., 1999; Brisson, 2015); nevertheless, there are few studies that integrate organic and inorganic geochemistry as well as organic petrology, particularly in the southernmost part of the basin (García et al., 2006; Martínez et al., 2005, 2008). The analyzed outcrop section (Matuasto II) is 61 m thick, and it is located near to the Puente Picún Leufú locality. This section of the unit is characterized by thick mudstones interbedded with massive to laminated sandstones, calcareous siltstones and ash-fall tuffs.



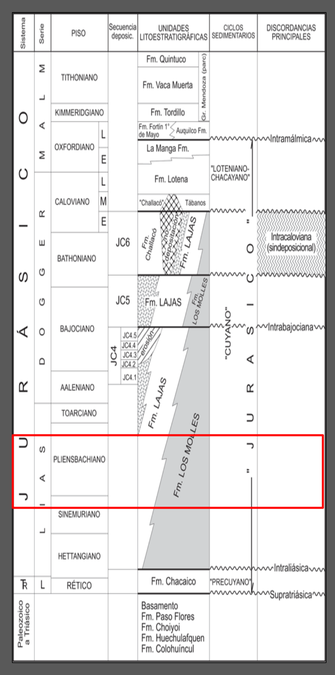


Figure 1.Location map of the studied section and stratigraphic chart.

- Kerogen is in general, terrigenous in origin, with translucid and opaque phytoclasts (mostly tracheophyte fragments), abundant miospores, and subordinated amorphous organic matter. Miospores show strong golden yellow fluorescence and amorphous organic matter show weak dull yellow fluorescence under blue light.
- Vitrinite reflectance values (%Ro) range from 0,40 % to 0,49% and are consistent with Tmax data (425 to 444° C).
- TOC% content varies from 0,5 to 4,2%, whereas the main parameters of the pyrolysis are: S1 (0.1 – 0.7 mg/g), S2 (0.27 – 10.94 mg/g), HI (45 – 269), OI (23 – 166) and PI (0.02 – 0.14). Hydrogen and oxygen indices indicate a kerogen type III and in minor proportion kerogen type II/III. The kerogen shows a low thermal maturity supported by Tmax and Ro% values.

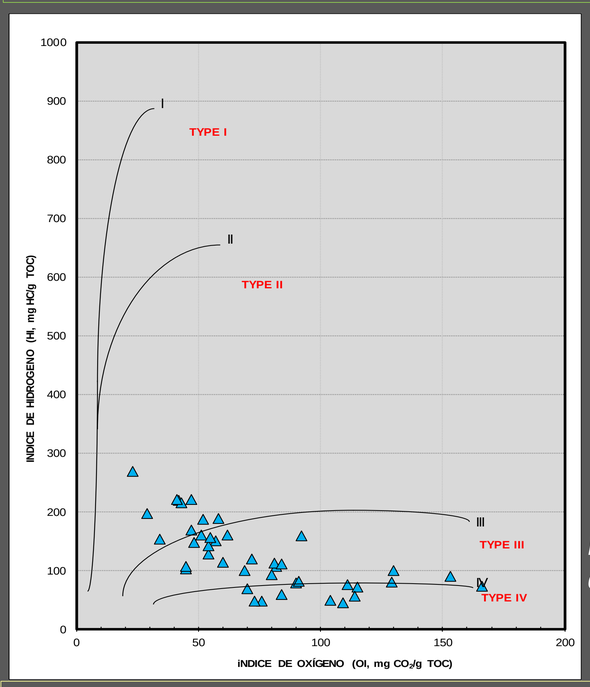


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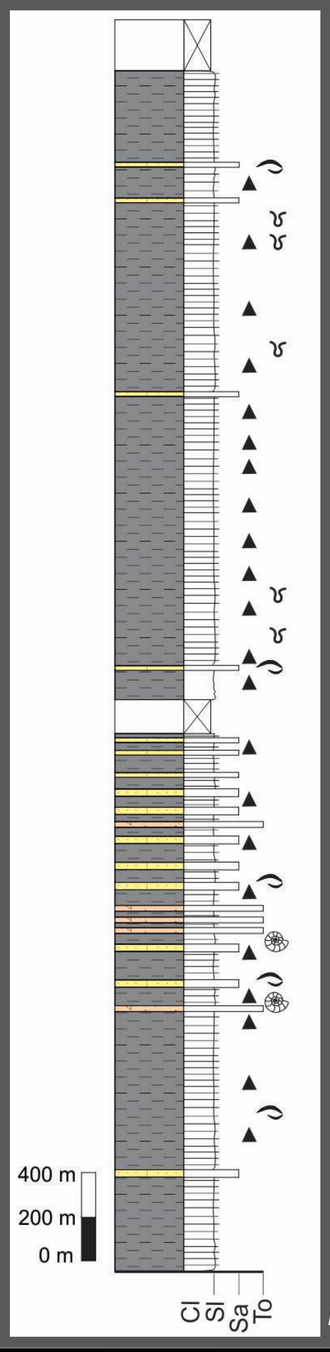
Figure 3. Pseudo Van Krevelen diagram

The moderate correlation between V and TOC (r = 0.61) and in minor degree with HI (r = 0.58) point to an increase of the preservation of algae-derived components (amorphous organic matter) in contrast to miospores, which is interpreted as fluctuating oxygen conditions with changes in the terrigenous input. In the middle part of the analyzed interval there is a decline in the participation of redox-sensitive elements indicating more oxygenated conditions, with only one sample of 4.2 % TOC.
On the contrary, towards the top, there is an increment in the concentration of V, Zn, As, S and Mo which indicate anoxic-euxinic conditions below the sediment-water interface (Tribovillard et al., 2006). The CaCO3 content estimated by the presence of Ca and mineral carbon calculated from the pyrolysis (Min C) does not show important variations through the analyzed interval



- 40 mudstone samples were obtained and processed for organic petrology, geochemistry and handheld X-ray fluorescence (XRF) at the Y-TEC laboratories.
- The determination of the Total Organic Content (TOC%), maximum temperature (Tmax) and S1, S2, S3, HI, OI and PI parameters was made through the pyrolysis of organic matter using a Rock Eval 6 equipment.
- Additionally, major, minor and trace elements percentages were obtained using a handheld XRF after the method described by Muller et al. (2017).
- 4 representative samples were selected to the visual analysis of the organic components in transmitted light and 9 for palynofacies analysis. Tyson's (2005) classification scheme of the dispersed sedimentary organic matter components is followed herein. Transmitted and reflected light as well as blue light fluorescence analysis were carried out with a Zeiss A2m Imager binocular microscope coupled with the CRAIC PV 508 spectrometer and the software CoalPro.

- The studied horizons show GP (genetic potential: maximum quantity of hydrocarbons generated, S1 + S2, measured in ppm or kg of hydrocarbons per ton), values of 0.04 to 1.74 and 0,33 in average kg HC/ ton of rock and constitute a poor to regular source rock with gas prone characteristics.
- XRF values denote an increase in the participation of V, Zn and As in the base of the analyzed interval which suggest sediment deposition under oxygen-depleted settings associated with the preservation of organic matter (relative high contents of TOC)

Figure 2. Selley´s profile

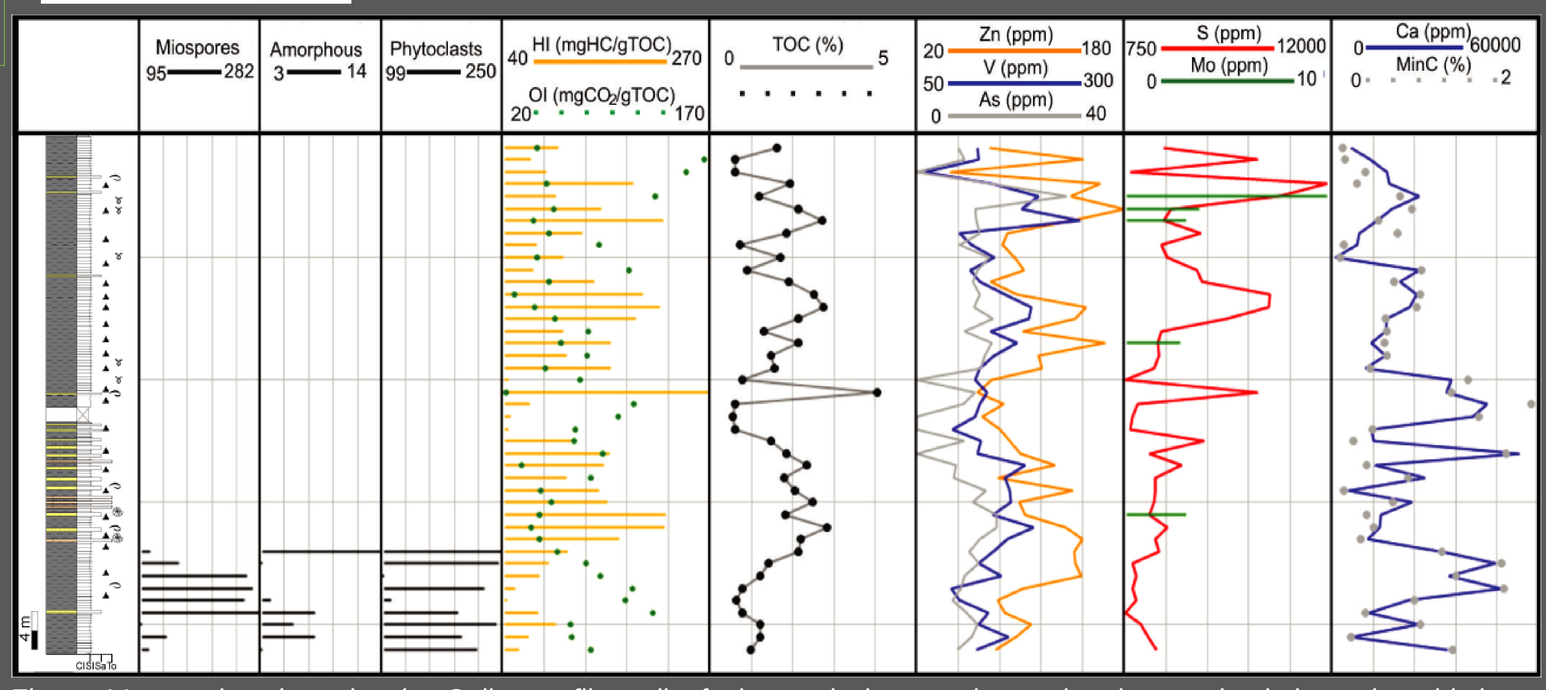


Figure 4.Integration chart showing Selley profile, palinofacies analysis, organic geochemistry and quimiostratigraphic logs

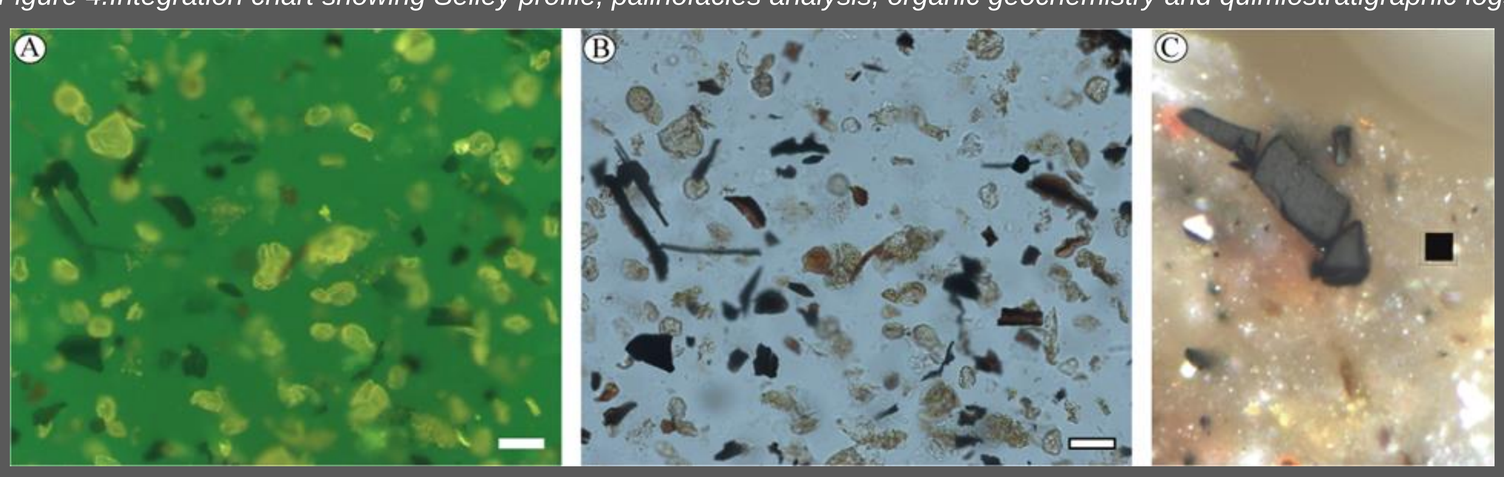


Figure 5. Optical microscopy: blue epifluorescence (A) transmitted light (B) and vitrinite particle (C). Scale: 50 µm.

The use of inorganic elements as proxies to estimate the concentration of organic matter, and to analyze the characteristics of depositional environments and type of preserved organic matter are promissory.
The integrated study of organic geochemistry, organic petrology and chemostratigraphy, might constitute a substantial apport to source rock analysis