

Agrio (Neocomian) Petroleum Systems: Main Target in the Neuquén Basin Thrust Belt, Argentina

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This paper is focused on the petroleum habitat of the Agrio Fm. (Upper Valanginian-Barremian) in the central sector of the Neuquén Basin inner thrust belt. The area presents frequent oil seeps associated to complex structure, widespread exposure of the stratigraphic column and an extensive volcanic cover. Geochemical evaluation was performed on outcrop and bit cuttings samples from three wells that found non-commercial hydrocarbon accumulations, ChE (Chapúa Este, 1995) 37°14'S, 70°14'W; EV (El Vatro, 1996) 36°42'S, 69°55'W and Pe (Pehuenche, 1996) 35°51'S, 70°12'W. The oil, condensate and gas recovered from different reservoirs were analyzed in detail and correlated to their sources.

The Agrio Fm. (with oil-prone type II to II/III kerogen) is usually divided into three members (Fig. 1): *Superior Mb.*, dark-gray shales with TOC contents up to 2.6 wt.% and a thermal maturity ranging from 0.6%Ro in EV to 0.8%Ro in ChE; *Avilé Mb.*, non-marine green shales and fluvio-eolian sandstones representing a Hauterivian lowstand; *Inferior Mb.*, black shales with TOC contents up to 5 wt.% and maturity range from 0.67%Ro in the upper part of EV to 1.16%Ro in the lowermost section of ChE. Because the overburden of the Cretaceous-Tertiary section is similar in thickness (~1700 m) in all localities, the higher maturity in ChE is assumed to originate from a thermal anomaly. Three sections with characteristic stratigraphic signatures are recognized in the Inferior Mb. throughout the study area. These sections, as well as the Superior Mb., have distinctive organic facies and geochemical parameters (Fig. 2) that support a reliable stratigraphic correlation. The Lower and Upper sections of the Inferior Mb. show better petroleum generating conditions and are ranked as high-quality sources. Not only is the Upper section in the oil window in the three wells, but also the Lower section, except in ChE, where it is in the late oil window. The identification of effective petroleum generating sections indicated by their bulk geochemical characteristics, thermal maturity and petroleum-source correlation enable definition of complexly interacting petroleum systems. The Mulichinco (Valanginian) condensate and the Avilé oil in ChE have different sources according to detail C₇ GC and δ¹³C data. Biomarker data show that the oil was sourced from the Upper section of the Inferior Mb. while the condensate can be correlated to the Lower section according to GC profiles and thermal maturities. Thus, two petroleum systems can be considered, Upper Section-Avilé and Lower Section-Mulichinco. Further, as reported by biomarkers and maturity analysis, the oils from Troncoso Mb. (Aptian) in EV and from a Tertiary intrusive in Agrio Fm. in Pe were generated in the Lower section of the Inferior Mb. These last two cases are included in the Lower Section-Mulichinco system despite the different reservoirs. In EV a contribution from Vaca Muerta Fm. (Tithonian-Berriasian), the most prolific source rock in the basin and here mainly in the late-oil to gas window, is not discounted.

Oil discoveries to date have proven to be non-commercial due to poor reservoir quality or non-preserved traps/seals. Better quality of conventional reservoirs, occurrence of non-traditional reservoirs (Tertiary intrusives), and definition of non-depleted structural traps are essential for a successful exploration.

FIGURES

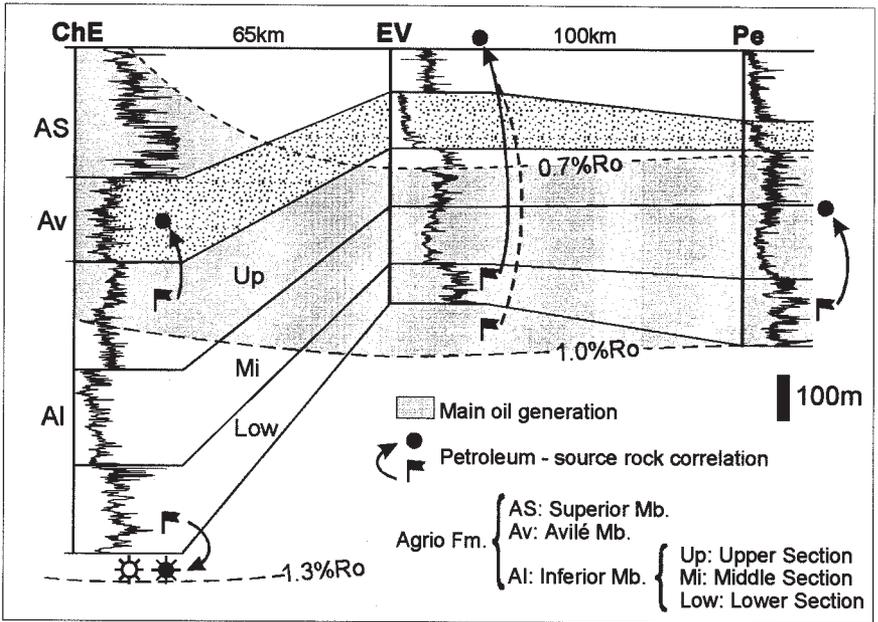


Figure 1

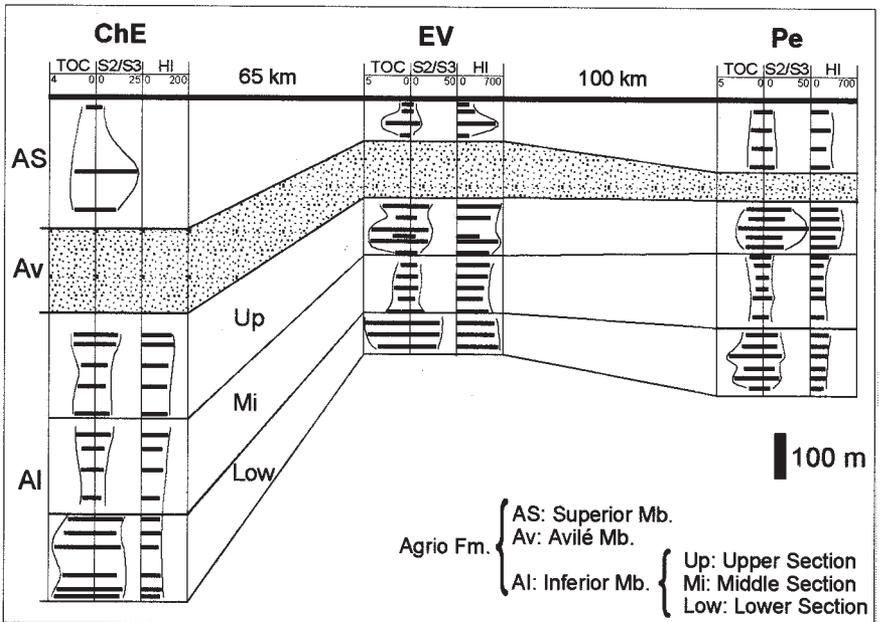


Figure 2