

VARIABILITY WITHIN A TARGET ZONE ANALOG OF THE VACA MUERTA FORMATION, ARGENTINA

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PROJECT OBJECTIVES

- Evaluate lateral heterogeneities of potential landing zones.
- Document the lateral variability along 2 km of outcrop in TOC-rich intervals as analogs for variability encountered during horizontal drilling.
- Illustrate heterogeneity using regularly-spaced, short (20-30 m) vertical sections along a scan line.

PROJECT RATIONALE

Over the last seven years, the CSL has assembled a comprehensive set of reference data from the Vaca Muerta Formation in the Neuquén Basin (Eberli et al., 2017). The dataset comprises over 30 detailed lithologic sections in proximal to distal positions, covering the majority of the basin. The lithologic sections contain meter spaced gamma ray data and over 4000 samples that have been collected at these gamma ray locations. The samples are analyzed for Total Organic Carbon (TOC), carbonate content, and $\delta^{13}\text{C}$ (both org and inorg). Over a hundred 1m short cores were recovered from the Vaca Muerta Formation, targeting the dominant facies present in the outcrops of the Sierra de la Vaca Muerta and the Puerta Curaco area.

In the Puerta Curaco area alone we constructed a formidable framework for the comprehensive assessment of the sedimentological, stratigraphic and petrophysical variability by comparing sections separated by block scale distances of several kilometers (Weger et al., 2017). Although these data provide a good estimate of variability within a block, they do not capture the variability along an individual horizontal well. Yet, the productivity of horizontal or deviated non-conventional wells is significantly impacted by lateral reservoir heterogeneity. Several semi-analytical tools such a technique based on Green's functions called the s-k*method are capable of modeling these heterogeneities (Wolfsteiner et al., 2000). In this project, we propose an outcrop based approach to assess the lateral variability within individual target intervals by measuring several short sections separated by only 10's or 100's of meters along TOC-rich intervals.

APPROACH AND WORKFLOW

We will collect a series of short (25-50m) lithologic sections along a scan line between previously measured long sections (e.g. Fig. 1). These series of short sections will be placed in high TOC intervals that represent outcrop analogs of subsurface landing zones that would represent potential targets for horizontal wells. Each section will be covered by meter spaced gamma ray measurements and geochemical samples. Along the scan line (a high TOC bed) we will collect the same data (gamma ray, TOC, carbonate content, and $\delta^{13}\text{C}$), at 5 – 10 m intervals. The first target area is at Puerta Curaco, Aguada de los Tamariscos, Yesera del Tromen, and Pampa Tril where we measured 13 different sections

with a total length of over 2000 m. Now we will return to several of the High TOC intervals in the above mentioned lithologic sections and measure additional detailed lithologic sections with varying lateral offset (50-500 m).

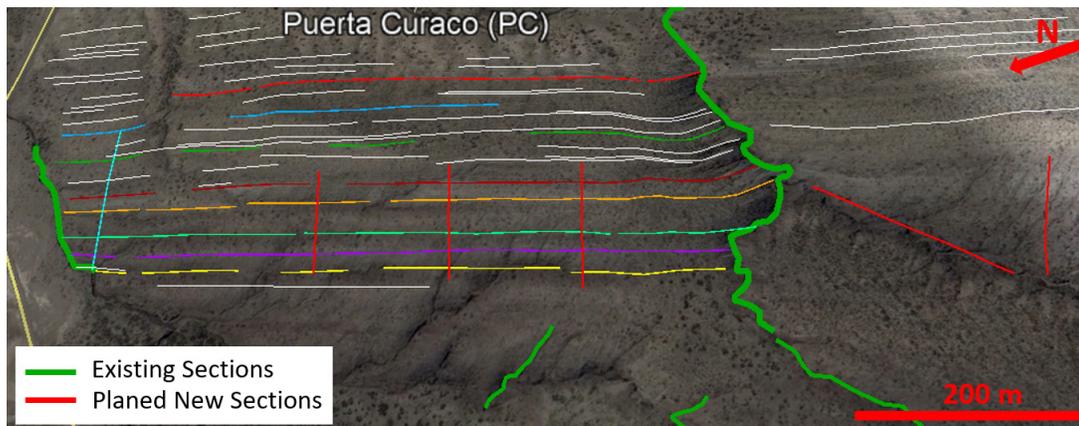


Figure 1: Proposed new Sections in the Puerta Curaco Area

SIGNIFICANCE

The lithologic sections are likely to display many similarities, but will highlight the differences in carbonate and organic content. They will provide the basis for a detailed quantification of the lateral variability that exists along a potential horizontal well path. This quantification of observed lateral heterogeneities will be beneficial in optimizing landing zone approach and designing productive non-conventional well paths in high TOC intervals of the Vaca Muerta Formation.

REFERENCES

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