

LITHOLOGIC AND GEOCHEMICAL CALIBRATION OF THE BASAL CLINOFORMS IN THE SIERRA DE LA VACA MUERTA, NEUQUÉN BASIN, ARGENTINA

Laura E. Rueda, Gregor P. Eberli, Max Tenaglia, Ralf J. Weger, Donald F. McNeill, Larry Peterson, and Peter K. Swart

PROJECT OBJECTIVE

- Document the facies distribution of the early to late Tithonian prograding clinoforms that contain the first high TOC interval in the Neuquén Basin.
- Correlate high-resolution geochemical logs with lithological logs in the different depositional sub-environments to produce a geochemical calibration of the various facies in the southern, proximal portion of the basin located in the Sierra de la Vaca Muerta (SdIVM).
- Produce a detailed model of the depositional processes within the sequence stratigraphic subdivisions.

PROJECT RATIONALE

The Tithonian- Valanginian Vaca Muerta Formation contains the sediments of the foresets and bottomsets of the prograding clinoforms that fill the Neuquén Basin. Facies and cycles change vertically and laterally within the clinoforms. The high-resolution geochemical and lithological study of stratigraphic sections in outcrops complemented with detailed analysis of short cores is required in order to quantify the vertical and lateral variations of the facies and cycles across the clinoforms and to correlate them to log data.

PROJECT DESCRIPTION

In this study, the lithological and geochemical characteristics of sections and cores from the sections in the SdIVM (Fig. 1) will be examined to generate a composite transect across the oldest clinoforms in the basin that contain the first interval of high total organic carbon (TOC). The high-



Figure 1. Location map of the Neuquén Basin and areas of study: Sierra de la Vaca Muerta (SdIVM), and Puerta Curaco (PC) section.

resolution characterization of stratigraphic sections and 1 m cores from outcrops exposed in the SdIVM (Fig. 1) will be completed using detailed lithological descriptions in situ and by performing geochemical analyses in the laboratory that include: isotopic $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ analysis; mineral and components identification using thin sections, X-ray Diffraction (XRD) and Near-Infrared Spectroscopy (NIR). Also, ultra-high-resolution elemental analysis (0.5 mm) in short cores will be conducted in order to find a series of elemental proxies. Correlations between the detailed logs and core descriptions and the geochemical findings will aid in the definition and interpretation of facies and cycles.

PRELIMINARY FINDINGS AND EXPECTED RESULTS

In the proximal position, in the SdIVM (Fig. 1), six stratigraphic sections were measured and described in detail and 27 1 m cores were taken in the sections for this study. The composite transect, with a thickness of around 650 m,

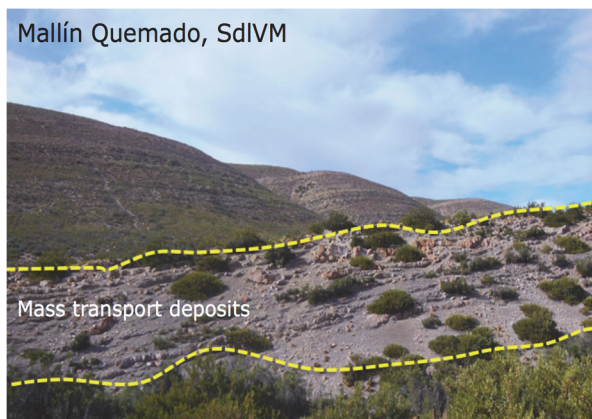


Figure 2. Large mass transport complex in the basal Vaca Muerta Formation was traced along the foothills of the SdIVM for around 2 km in the Mallín Quemado area.

covers the deposits of the Middle to Upper Tithonian. The studied outcrops in the SdIVM (Fig. 1) expose sedimentary structures like cross-bedding, faint and fine-plane and inclined parallel-lamination, and small-scale ripples but also a large mass transport complex (Fig. 2).

The studied transect at the base of the Vaca Muerta will complement the stratigraphic framework assembled by Zeller (2013). The findings of this study, a composite proximal transect section, will be correlated to a more distal section, the Puerta Curaco (PC) reference

section, measured near the town of Chos Malal (Fig. 1). The PC section in the basin center is about 800 m thick and has already been measured and used to define 11 stratigraphic sequences. The PC section and the new section obtained from this study will be correlated in order to study the lateral variations in facies and cycles and to compare sequence thicknesses variations within the clinofolds. This correlation from proximal to distal will give insights into facies, cycles and sequences variability in the Neuquén Basin.

REFERENCES

- Zeller, M., K. Reid, S.B., Eberli, G.P., Weger, R.J., and Massaferro, J.L., 2015. Sequence architecture and heterogeneities of a field scale Vaca Muerta analog (Neuquén Basin, Argentina) - From outcrop to synthetic seismic. *Marine and Petroleum Geology*, 66:829-847.