

THE CARBON ISOTOPIC COMPOSITION OF PROXIMAL AND DISTAL SEDIMENTS IN THE VACA MUERTA

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PROJECT OBJECTIVES

- Evaluate the ability to use $\delta^{13}\text{C}$ values from organic material to correlate between different sections within the basin, located kilometers apart, in both proximal and distal positions.
- Re-validate that the $\delta^{13}\text{C}$ values of organic material ($\delta^{13}\text{C}_{\text{Org}}$) are unrelated to changes in the total organic content.
- Confirm that $\delta^{13}\text{C}$ values of organic material can be used to correlate coeval sections within a basin more accurately than the $\delta^{13}\text{C}$ values of carbonate.

PROJECT RATIONALE

The $\delta^{13}\text{C}$ values of carbonate and organic material within sedimentary deposits have been studied extensively and variations have been interpreted principally as changes in the rates of organic carbon production relative to burial and preservation (Hayes et al., 1999). Previously we studied the $\delta^{13}\text{C}$ values of organics and carbonates from 800 m of continuous, Late Jurassic to Early Cretaceous strata (~ 15 Myrs) exposed in the Neuquén Basin, Argentina (Rodríguez Blanco et al., 2019; Rodríguez Blanco et al., 2020; Tenaglia et al., 2020). The data provided a unique opportunity to compare this high-resolution $\delta^{13}\text{C}_{\text{Org}}$ record to other published organic carbon isotope records from the same time period sourced in Atlantic, Arctic, and Tethyan sections. The data from the Vaca Muerta showed correlation to several globally distributed locations that show a large negative isotopic excursion of organic carbon ($\delta^{13}\text{C}_{\text{Org}}$) of over 4‰ (V-PDB) and to a minimum of -30.3 ‰; an anomaly that has been named the 'Volgian Isotopic Carbon Excursion' (VOICE).

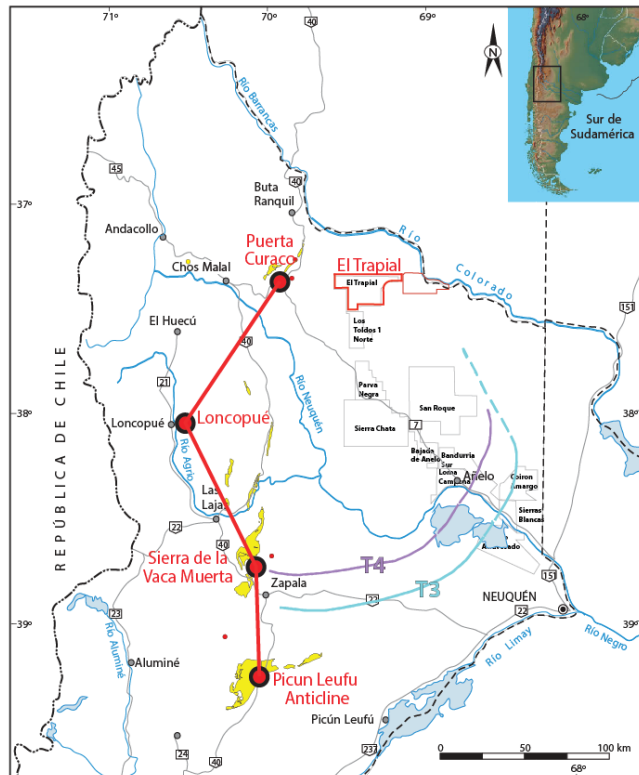


Figure 1: Location of outcrops in the Neuquén Basin, indicating location of outcrops, producing fields, and interpreted shelf breaks during the early Tithonian.

WORK PROPOSED

We have obtained samples from ~350 m of measured section of outcrops at the Picun Léufú anticline, the Tithonian portion of the Vaca Muerta Formation in a proximal setting. We have already carried out several studies of the variation of $\delta^{13}\text{C}_{\text{carb}}$ and $\delta^{13}\text{C}_{\text{org}}$ values on the cores and measured sections in the basinal portions of the Vaca Muerta Formation (Rodriguez Blanco et al., 2022; Weger et al., in press) and plan to perform the same analysis on these newly obtained proximal, time correlative samples.

SIGNIFICANCE

This investigation represents a combined study of the $\delta^{13}\text{C}$ values of organic and inorganic material found within the Neuquén Basin in Argentina. The $\delta^{13}\text{C}_{\text{org}}$ values appear to be unrelated to the global patterns in $\delta^{13}\text{C}_{\text{carb}}$ values, but they show similarity to patterns seen in $\delta^{13}\text{C}_{\text{org}}$ values at several boreal localities. This study will provide a detailed comparison of $\delta^{13}\text{C}$ values of carbonate and organic carbon and their variations between coeval distal and proximal locations. A key question to be answered is if changes in $\delta^{13}\text{C}$ values from proximal and/or distal locations correlate within the Neuquén Basin.

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