BOTTOM CURRENTS IN THE JURASSIC-CRETACEOUS VACA MUERTA FORMATION BLACK SHALES (ARGENTINA): AN EXAMPLE OF BENTHOS RESPONSE TO OXYGEN DELIVERY IN OXYGEN-DEFICIENT ENVIRONMENTS

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The Vaca Muerta Formation represents marine bottomset and foreset facies of a mixed carbonate-siliciclastic ramp developed during Late Jurassic-Early Cretaceous in the Neuquén Basin, Argentina. Mudstone, marl and limestone deposited in low-energy, oxygen-deficient settings constitute the main lithologies of this formation. The present contribution describes mudstone and minor very fine-grained sandstone lithofacies showing variable intensities of bioturbation in cores from two wells (239 m thick in total) from the central Neuquén Basin area. Nine cycles of oxygenation events occur within outer to mid ramp settings and are subdivided in low- and high-energy. Low-energy cycles (30-50 cm thick) are characterized by very thin-bedded, parallel- to ripple cross-laminated, coarse to medium mudstone couplets. Intervals grade from highly bioturbated to sparsely bioturbated, showing *Teichichnus* and biodeformational structures. High-energy cycles (1-10 m thick) show typical coarsening-upward trends in the lower part to fining-upward patterns in the upper part. Their bases consist of a mottled mudstone and minor sandstone, grading towards sharp-based, thin-bedded, current-ripple cross-laminated mudstone. The cycles end with a mottled interval capped by cryptobioturbated mudstone. Bioturbation index displays a distinctive decrease to increase pattern, showing particularly small occurrences of *Asterosoma*, *Bergaueria*, *Conichnus*, *Cylindrichnus*, *Palaeophycus*, *Planolites*, *Phycosiphon*, *Skolithos* and escape trace fossils. Equilibrium behavior is inferred for *Bergaueria* and *Conichnus*. The cycles record bottom current activity at the upper slope, with hydrodynamic energy and oxygenation being limiting factors for the benthos and, therefore, controlling bioturbation. The cycles display increasing to decreasing energy conditions that show an inverse correlation with bioturbation index driven by shorter colonization windows in the higher energy settings (middle parts of the cycles). Bottom currents delivered oxygen to bottom waters, supporting a moderately diverse ichnofauna. Waning of bottom currents towards the end of the cycles generated progressive deoxygenation of the seafloor. Cryptobioturbation on top indicates that smaller organisms were able to thrive in lower oxygen conditions, documenting the last stage of the oxygenation event.