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Black carbonates in the Ediacaran-Lower Cambrian outcrops in Northwest Argentina

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In NW Argentina (Salta and Jujuy provinces), a series of black carbonatic rocks outcrop intercalated in an Ediacaran-Lower Cambrian siliciclastic sequence. Two groups can be distinguished in this sequence: one integrated by the Volcán-León rocks (Jujuy), possibly the older and of Ediacaran age, and another, possibly located in the Lower Cambrian limit, corresponding to the Las Tienditas (Salta) and Tumbaya (Jujuy) outcrops. Chemostratigraphical studies with C, O and Sr isotopes have allowed to verify differences that possibly indicate different chronostratigraphical positions.

The Las Tienditas Formation is conformed by an approximately 250 meters thick succession of black limestones, finely stratified in homogenous layers, where levels were found that can be attributed to laminite type algae deposition. It concordantly rests on a siliciclastic sequence, somewhat marly, and is in the same manner covered by siliciclastic material that contains levels with trace fossils of the ichnoassociation characterized by *Nereites saltensis*. The δ^{13}C contents have positive values of +3.4 $\%_{,PDB}$ at the base while at about 15 meters from the roof a negative excursion exits that reaches –1.6$\%_{,PDB}$ that could be indicating the Ediacaran-Lower Cambrian transition. Studies on the free carbon content carried out in the same column indicate a steady increase of C towards the roof, simultaneous with a notable enrichment in sulphidric material. Close to the base of the sequence a very low (0.22%) total organic content (TOC) has been determined, while towards the roof, and possibly coinciding with the interval of Lower Cambrian age, the values suffer a noticeable increase with values above 2% TOC.

The Tumbaya outcrops are about 85 meters thick and rest on siliciclastic and volcanigenic material. They are gray, pink and black limestones that contain dolomite levels.

They are generally fine grained, with laminations of probable algae origin. Studies on the δ^{13}C contents were also carried out, giving values that vary from the bottom up between 2.28 y –1.33$\%_{,PDB}$, a situation comparable with Las Tienditas.

On the other hand, in the Volcán-León outcrops, the black limestones have a thickness of about 800 meters and are interstratified with the siliciclastic Ediacaran sequence. They are generally fine grained limestones, stratified in rather homogenous layers. They have marly variations and also contain some oolitic levels. The δ^{13}C contents have positive excursions with values that vary between +4.58 y +6.11$\%_{,PDB}$, similar to the typical values of the Ediacaran.

The above situation brings us to the conclusion that in the Pampeana Basin of NW Argentina different stages of carbonate formation existed, specially of black carbonates, during the Ediacaran / Lower Cambrian, whose chronological precision is still difficult to establish because of the tectonic complexity and, until recently, the absence of significant fossils. It is supposed that, being a relatively restricted basin, located at intermediate latitudes, the necessary physico-chemical conditions were reached for the generation of these deposits. The Tumbaya deposits particularly stand out because, being located above oceanic basalts, they form a group related with oceanic ridges or island arcs that provided a large part of the Mg content that enabled the deposition of the dolomites.