Ichnology, sedimentary dynamics, and sequence stratigraphy of the Mesón Group: A Cambrian macrotidal shallow-marine depositional system in northwest Argentina

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The Mesón Group consists of thick and laterally extensive deposits in northwest Argentina and includes, from base to top, the Lizoite, Campanario, and Chahualmayoc formations. Thick-bedded, large-scale, planar and trough crossbedded quartzites of the Lizoite and Chahualmayoc formations mostly represent deposition in high energy, subtidal sandwave complexes dissected by subtidal channels. Trace fossils are relatively rare in both units. Opportunistic assemblages of the *Skolithos* ichnofacies are associated with colonization windows and mosdy consist of monospecific suites of *Skolithos*. The Campanario Formation comprises bioturbated, planar cross-bedded and ripple cross-laminated sandstones, thinly interbedded sandstones and mudstones, and red mudstones, representing deposition in extensive tidal flats and very. shallow subtidal areas. Trace fossils are locally abundant in the Campanario Formation. Shallow subtidal and intertidal sand flat deposits are dominated by vertical domiciles of suspension feeders and passive carnivores of the *Skolithos* ichnofacies (e.g. *Skolithos, Arenicolites, Diplocraterion, Syringomorpha).* Mixed flat deposits contain not only the horizontal feeding, locomotion, and resting traces of the *Cruziana* ichnofacies, but also the vertical dwelling traces of the *Skolithos* ichnofacies. Elements of the *Cruziana* ichnofacies include *Cruziana, Rusophycus, Diplichnites, Planolites, Palaeophycus,* and *Helminthoidichnites*. The Mesón Group is interpreted as having accumulated in macrotidal shallow-marine environments with extensive tidalflat areas and subtidal sandwave complexes. Individual parasequences are hard to detect in the subtidal Lizoite Formation, but are well defined in the overlying Campanario Formation. Individual parasequences in the Campanario Formation fine upward, reflecting tidal flat progradation. In turn, parasequences are stacked forming thinnmg and fining upward packages that record an overall progradational pattern. The contact between the Campanario and Chahualmayoc formations is represented by a co-planar surface of amalgamated lowstand erosion and transgressive ravinement. This contact is evidenced by a change from progradational to retrogradational stacking patterns. The lower interval of the Chahualmayoc Formation is punctuated by several ravinement lags, recording an overall transgressive trend. The upper part of the Mesón Group is erosionally attenuated due to valley incision, followed by accumulation of fluvial to tidal estuarine deposits of the lower interval of the Upper Cambrian to Tremadoc Santa Rosita Formation. Sedimentologic, sequence-stratigraphic, and ichnologic analysis demonstrates that the Mesón Group is a heterochronous unit, and sheds light on the controversy regarding its age. Presence of Syringomorpha nilssoni suggests that the Goup may range into the Lower Cambrian, most likely Atdabanian, and that the discontinuity separating the Precambrian to Lower Cambrian (Vendian-Tommotian) Puncoviscana Formation and the Mesón Group of Early Cambrian age.