

PS Palynology Studies in Lower to Middle Jurassic Red Beds of Northeastern Mexico*

Erika Loyola Martínez¹, Enrique Martínez Hernández², and José Rafael Barboza Gudiño³

Search and Discovery Article #51654 (2020)**

Posted April 27, 2020

*Adapted from poster presentation given at 2020 AAPG Hedberg Conference, Geology and Hydrocarbon Potential of the Circum-Gulf of Mexico Pre-salt Section, Mexico City, Mexico, February 4-6, 2020

**Datapages © 2020. Serial rights given by author. For all other rights contact author directly. DOI:10.1306/51654Martinez2020

¹Posgrado en Geología Aplicada, Universidad Autónoma de San Luis Potosí, San Luis Potosí, Mexico (erikalm272@gmail.com)

²Instituto de Geología, Universidad Nacional Autónoma de México, Mexico City, Mexico

³Instituto de Geología, Universidad Autónoma de San Luis Potosí, San Luis Potosí, Mexico

Abstract

In the Mesa Central and Sierra Madre Oriental provinces in northeastern Mexico, Middle to Upper Jurassic red beds preserved palynomorph that jointly with sedimentological, petrographic and geochemical features, allow to interpret paleoclimates and possible ages that agree with maximal depositional ages previously determined by detrital zircon geochronology of the same units. Our goal is to conform a collection of palynological descriptions of the Lower to Middle Jurassic red beds in the region as well as isotopic data of $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ that provide support to the yet preliminary paleoclimatic and paleoenvironmental interpretations. The studied areas in the Mesa Central province are the Sierras de Catorce and Charcas in the state of San Luis Potosí, as well as Sierra de Salinas, in Zacatecas. In the Sierra Madre Oriental, some outcropping Lower to Middle Jurassic Successions were also sampled in the Huizachal-Peregrina Anticlinorium, west of Ciudad Victoria and Miquihuana-Bustamante areas in Tamaulipas as well as Aramberri, Sierra de Pablillo and San Marcos, Nuevo León.

Red beds, indicative of oxidizing conditions in a temperate to warm climate and arid conditions, represent the Lower Jurassic and Middle Jurassic in the region. such conditions are also in accordance with the presence of palynological material such as *Asteropollis* sp, which is characteristic of a subtropical climate and *Ephedripites* sp. which abundant in Mesozoic arid climates, as well as the occurrence of Algae (incertae sedis) and *Selaginella* sp., indicative of humid, possibly coastal environments in a tropical climate. On the other hand, *Pytiosporites* sp., *Plicatipollenites* sp. and *Classopollis* sp, coming from conifers, are indicative of a cold or mountain climate, which are in the same successions interpreted as allochthonous materials coming from elevated areas, along fluvial systems. In addition to the above, towards the Middle to Upper Jurassic, prior to marine transgression from the Gulf of Mexico, there occurred the deposit of evaporites. The Evaporites are indicative of lagoon and sabkha environments, typical of a regime of high evaporation in shallow seas or intertidal environments with arid surrounding weather conditions. A further indication of arid desert climate is the scarcity of flora and fauna, in the layers studied. In addition, scarce and preliminary isotopic analyzes of $\delta^{18}\text{O}$, show a decrease in values at the end of the Triassic and until the Middle

Jurassic, followed by a subsequent increase from Middle Jurassic to Upper Jurassic. In the same way, the results of $\delta^{13}\text{C}$, show a continuous increase from the Upper Triassic to the Upper Jurassic, always with negative values, which are compatible behaviors, with global interpretations of seawater temperature conditions, higher at the end of the Triassic and gradually descending up to the Jurassic-Cretaceous boundary.

The climatic changes evidently caused transcendent changes in the sediments, from the sedimentation processes themselves and the deposit environments, even in the possible alterations of the clastic components during their transport in an immediate stage after their sedimentation. The flora and fauna fossilized in these sequences are witnesses of these climatic changes, or in general, they are representative of certain climatic conditions and geographical position, in this case, latitude, in analogy with the current floras and faunas. The sedimentation recognized in the study areas is eminently continental in the Lower Jurassic of the region and locally, in the area of Real de Catorce, it is shallow marine, passing during the Late Jurassic to lagoon and intertidal deposits present throughout northeastern Mexico as product of the marine transgression from the Gulf.

References Cited

Barboza-Gudiño J. R., (2000), Últimos datos para la correlación y reconstrucción paleogeográfica de las secuencias triásicas del centro y noreste de México. GEOS, UNIÓN GEOFÍSICA MEXICANA. V. 20, No. 3.

Berner, R.A., 2001, "Modeling Atmospheric Oxygen Over Phanerozoic Time", *Geochimica et Cosmochimica Acta*, v. 65, pp. 685-694.

Loyola-Martínez, Erika., 2015, Datos para la reconstrucción paleoclimática del Jurásico Inferior a Medio en la Mesa Central de México. M S Thesis, Universidad Autónoma de San Luis Potosí, 82 p.



PALYNOLOGY STUDIES IN LOWER TO MIDDLE JURASSIC RED BEDS OF NORTHEASTERN MEXICO.



AAPG

Hedberg Conference

4-6 February 2020 | Mexico City

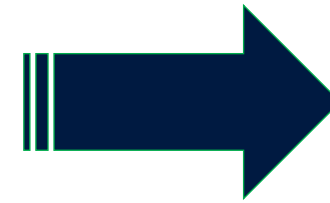
BACKGROUND



The studied areas in the Mesa Central province are the Sierras de Catorce and Charcas in the state of San Luis Potosí, as well as Sierra de Salinas, in Zacatecas (Fig.1). In the Sierra Madre Oriental some outcropping Lower to Middle Jurassic Successions were also sampled in the Huizachal-Peregrina Anticlinorium, west of Ciudad Victoria and Miquihuana-Bustamante Areas in Tamaulipas as well as Aramberri, Sierra de Pabullo and San Marcos, Nuevo León.

SUMMARY

In the Mesa Central and Sierra Madre Oriental provinces in northeastern Mexico, Middle to Upper Jurassic red beds preserved palynomorph that jointly with sedimentological, petrographic and geochemical features, allow to interpret paleoclimas and possible ages that agree with maximal depositional ages previously determined by detrital zircon geochronology of the same units.



OBJETIVE

Our goal is to conform a collection of palynological descriptions of (Image 1-8), the Lower to Middle Jurassic red beds in the region as well as isotopic data of $\delta^{18}O$ and $\delta^{13}C$ that provide support to the yet preliminary paleoclimatic and Paleo-environmental interpretations.

DEVELOPMENT

The Evaporites are indicative of lagoon and sabkha environments, typical of a regime of high evaporation in shallow seas or intertidal environments with arid surrounding weather conditions. A further indication of arid desert climate is the scarcity of flora and fauna, in the layers studied. In addition, scarce and preliminary isotopic analyzes of $\delta^{18}O$, show a decrease in values at the end of the Triassic and until the Middle Jurassic, followed by a subsequent increase from Middle Jurassic to Upper Jurassic. In the same way, the results of $\delta^{13}C$, show a continuous increase from the Upper Triassic to the Upper Jurassic, always with negative values, which are compatible behaviors, with global interpretations of seawater temperature conditions, higher at the end of the Triassic and gradually descending up to the Jurassic-Cretaceous boundary.

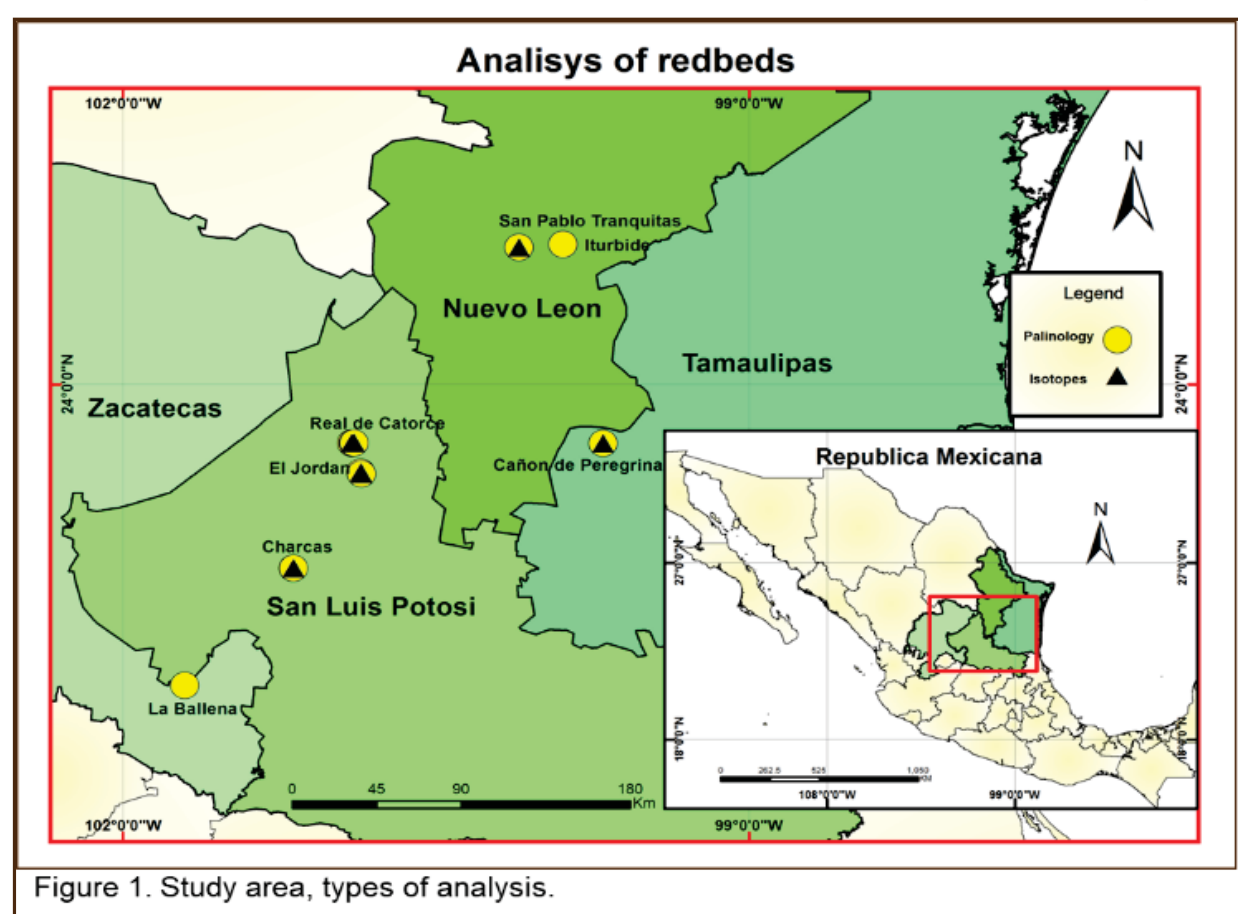
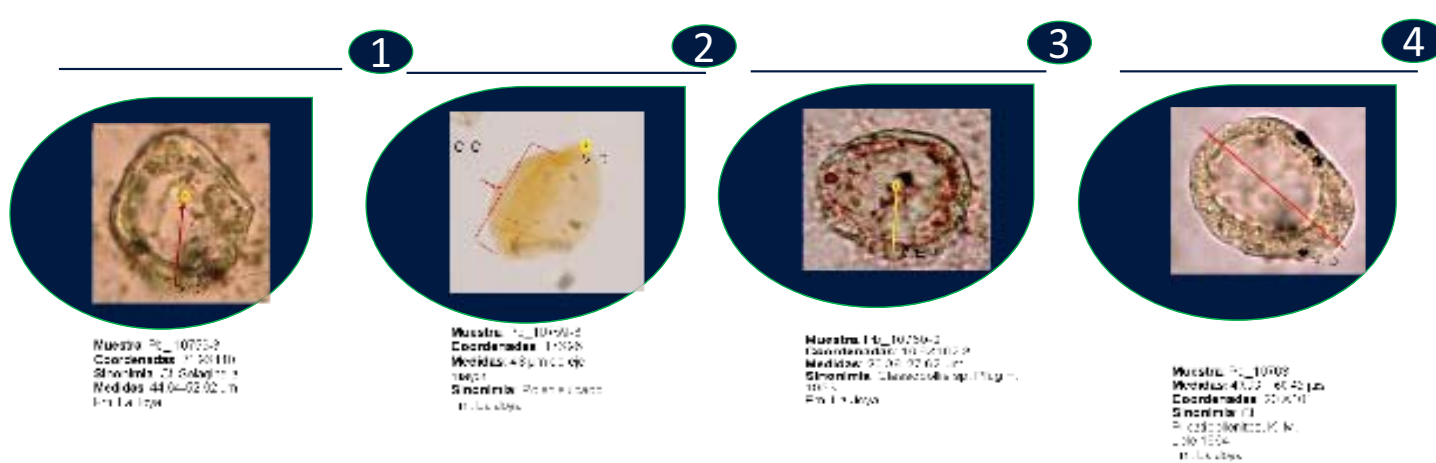
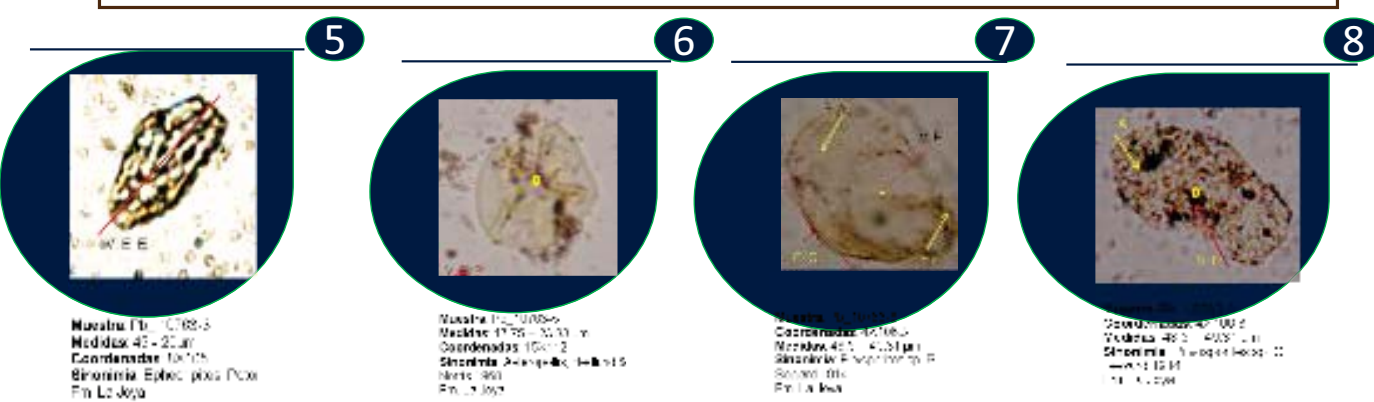


Figure 1. Study area, types of analysis.



CONCLUSIONS



The climatic changes evidently caused transcendent changes in the sediments, from the sedimentation.



The flora and fauna fossilized in these sequences are witnesses of these climatic changes, or in general, they are representative of certain climatic conditions and geographical position, in this case, latitude, in analogy with the current floras and faunas.



The sedimentation recognized in the study areas is eminently continental in the Lower Jurassic of the region and locally, in the area of Real de Catorce, it is hallow marine, passing during the Late Jurassic to lagoon and intertidal deposits present throughout Northeastern Mexico as product of the marine transgression from the Gulf.

BIBLIOGRAPHY

Barboza-Gudiño J. R., (2000), Últimos datos para la correlación y reconstrucción paleogeográfica de las secuencias triásicas del centro y noreste de México. GEOS, UNIÓN GEOFÍSICA MEXICANA. V. 20, No. 3.
Berner, R.A., 2001, "Modeling Atmospheric Oxygen Over Phanerozoic Time", Geochimica et Cosmochimica Acta, v. 65, pp. 685-694.
Loyola-Martínez, Erika., 2015, Datos para la reconstrucción paleoclimática del Jurásico Inferior a Medio en la Mesa Central de México. M S Thesis, Universidad Autónoma de San Luis Potosí, 82 p