



## *The manganese metallogenic province in the state of Chihuahua, Mexico*

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1969, pp. 205-206. <https://doi.org/10.56577/FFC-20.205>

*in:*  
*The Border Region, Chihuahua and the United States*, Cordoba, D. A.; Wengerd, S. A.; Shomaker, J. W.; [eds.], New Mexico Geological Society 20<sup>th</sup> Annual Fall Field Conference Guidebook, 228 p. <https://doi.org/10.56577/FFC-20>

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*This is one of many related papers that were included in the 1969 NMGS Fall Field Conference Guidebook.*

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# THE MANGANESE METALLOGENIC PROVINCE IN THE STATE OF CHIHUAHUA, MEXICO

by  
CARLOS AND LUIS GARCIA-GUTIERREZ

## INTRODUCTION

The State of Chihuahua has been one of the main manganese producers in Mexico. During the past few years it has ranked third in importance—after Hidalgo and Jalisco States—but potentially it may be only second to Hidalgo.

By 1958 nearly 2 million tons of manganese ore were estimated here with an average content of 20% Mn. Because of market problems relatively little has been produced since then, and most of the deposits have been either entirely idle or only producing at a very reduced rate.

## PHYSIOGRAPHY

Most manganese deposits in Chihuahua are located at the bordering zone between two physiographic provinces: the Sierra Madre on the west and the so-called Basin and Range province of the Mexican Plateau on the east. For this reason most manganese occurrences are on relatively low, more or less isolated, mountain chains extending in a general south-southeast to north-northwest direction. These mountains show an advanced erosion cycle. ( See map).

## STRATIGRAPHY

Almost without exception manganese deposits appear in volcanics which have been dated as Middle Tertiary (Miocene ?) . These volcanics were laid on Mesozoic strata of predominantly calcareous character. In only two instances has manganese been found to extend down into the underlying sedimentary rocks.

## PETROLOGY

As expressed above, manganese deposits are enclosed predominantly in volcanic rocks. It is to be noted that, even though basic volcanics are also found on this region, manganese mineralization is restricted to acid flows such as rhyolites and trachytes. Locally also, pyroclastic rocks of analogous acid nature may bear manganese.

Calcareous strata of Mesozoic age may also locally contain minor manganese deposits but, as a rule, manganese mineralization turns to black calcite and to barite as soon as calcareous strata are reached by mine workings.

## STRUCTURAL GEOLOGY

Most, if not all, manganese deposits of this province are in fissure and fault veins striking conformably with the general tectonics of the region: south-southeast to north-northwest. A few are oriented east-west. All the structures

show profuse brecciation which has been cemented by manganese oxides; displacements are in general normal, which seems to point out tensional stresses as the cause of regional fracturing. Their attitude is generally close to vertical; they can be followed for some tens to hundreds of meters along the strike. Locally they may be 4 to 5 meters thick, although average width is in the order of 1 to 2 meters. Depth of mineralization is relatively shallow, with perhaps the only exception at Mina La Venganza, in Terrenates area, where manganese ore is found more than 100 meters from the surface. In the average, strike lengths of 100 to 200 meters, and depths of 35 to 40 meters are found.

## PARAGENESIS

Occurrence of some minerals, such as barite and tungsten-bearing ores, in relation with some manganese deposits, seems to bear out the idea that they originated from ascending hydrothermal solutions. However, their shallowness, the predominance of psilomelane and pyrolusite, their close association with competent acid volcanic rocks, and the fact that all deposits seem of the cavity filling type, with very scarce replacement, seem to suggest that they are rather of the so-called "black calcite" type of deposits in which leaching of this mineral gave rise to important concentrations of manganese oxides by supergenetic processes.

All this may be confirmed by the finding of barite and white and black calcite in places where mining has proceeded to depths at which manganese practically ceases to exist, but which can and have been mined for barite, such as at Talamantes area.

A hydrothermal origin for the manganese-bearing solutions is here suggested, with concomitant deposition in favorable rocks and subsequent concentration by secondary processes.

## CONCLUSIONS

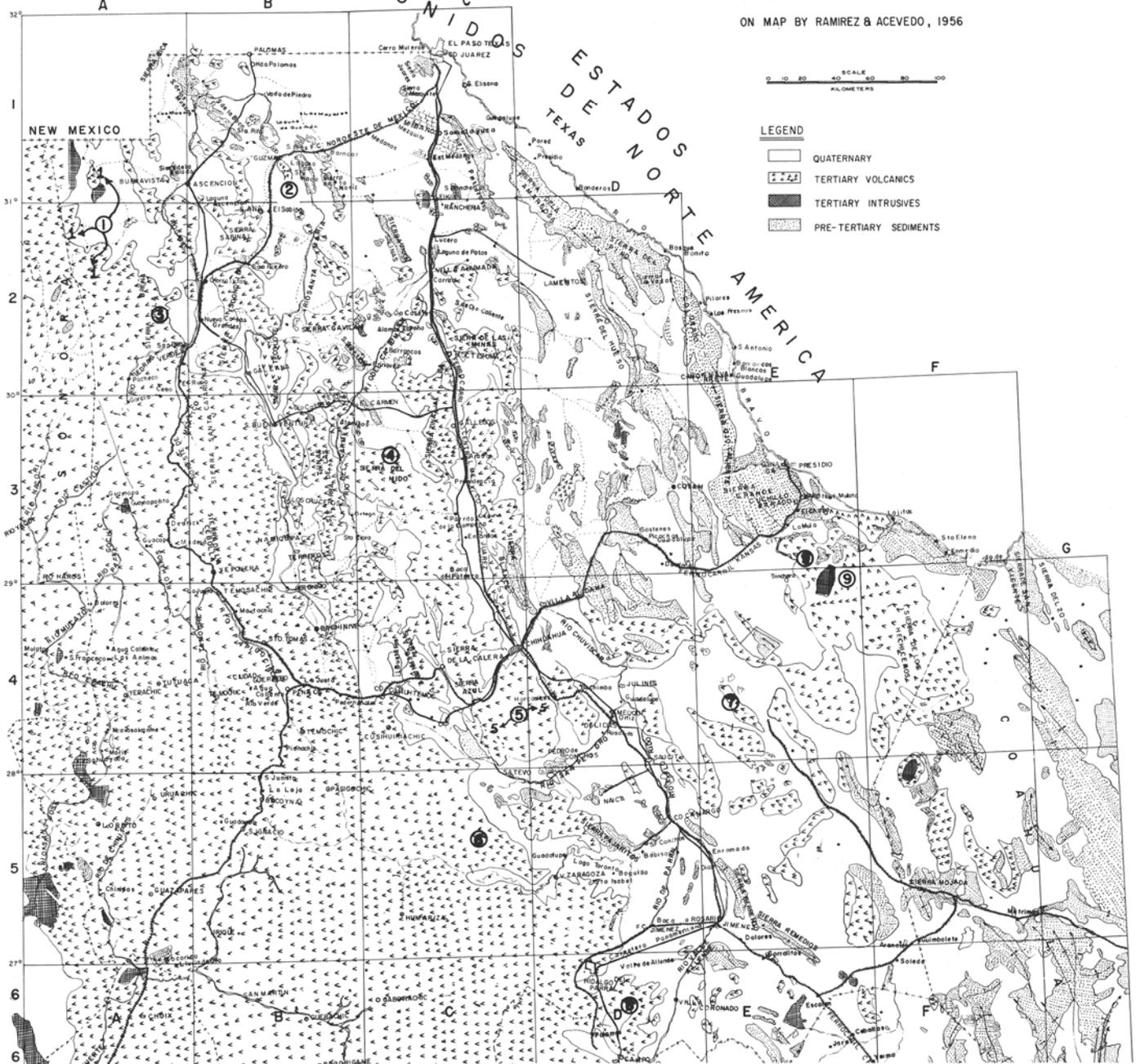
Whichever explanation is accepted, several facts have to be borne in mind when prospecting or exploring for these types of deposits: (1) manganese deposits in this province are always in thin volcanic flows of acidic composition; (2) these rocks are always competent; ( 3) only manganese oxides are found; (4) and such volcanics are always overlying calcareous Mesozoic sediments.

# THE MANGANESE-METALLOGENIC PROVINCE

CHIHUAHUA, MEXICO

CARLOS & LUIS GARCIA-GUTIERREZ

ON MAP BY RAMIREZ & ACEVEDO, 1956



## MINING AREAS

The attached map shows only 9 of the more important manganese areas in Chihuahua State:

Location

- A-1 . . . . . 1—Casa de Janos, Las Vegas and Sierra de Enmedio.
- B-1 . . . . . 2—Los Borregos.
- A-2 . . . . . 3—Casas Grandes.
- C-3 . . . . . 4—Terrenates.
- C-D-4 . . . . . 5—Sierra de la Silla.
- C-5 . . . . . 6—Satevo.
- E-4 . . . . . 7—Los Organos and Tinajas.
- D-6 . . . . . 8—Talamantes.
- E-3, 4 . . . . . 9—Los Volcanes and San Carlos.

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