Are River Basins affected by Climatic Variations?: A study from a major river in Central Mexico, Mexico.

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Variations in climatic cycle during different periods often affect various aspects in the earth, especially it shows more diversity in the aquatic region. Our study focuses mainly on the geochemical aspects of river sediments from River Amajac, Panuco and its lagoons which are located in the north eastern part of the Mexico. The whole system runs through the Sierra Madre Oriental in Central part of Mexico and finally drains into the Gulf of Mexico. The difference in the weathering pattern in the sediments of the river basin could be related to the changes in the climatic cycle in the region [1-2]. The results also clearly indicate that the decrease in rainfall events during the last three decades have affected the farming land and has resulted in deforestation and subsequently it has resulted in erosion of finer particles into the aquatic system. The analysis of major, trace elements and the calculated weathering pattern results suggest that the region is frequently vulnerable to erosion. The concentration and distribution pattern of the geochemical elements also indicate that the higher concentration of toxic elements is mainly anthropogenic, which can be related to the industrialization of the region.

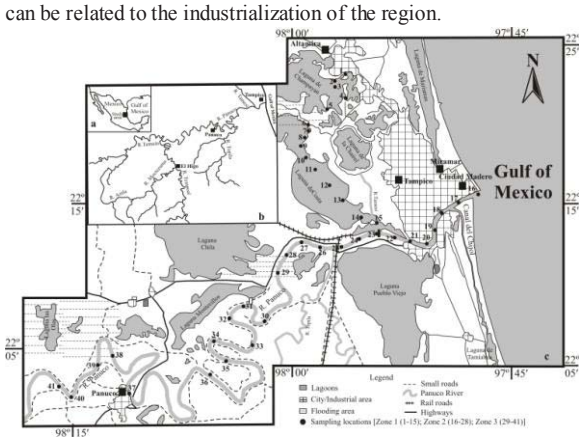

Figure 1. A part of the study area in north eastern part of Mexico.

[1] Hudson (2003) J of Latin Amer Geog **1**, 58-68. [2] Fiechter *et al*. (2006) Estu Coast & Shelf Sci **70**, 297-306.

Evidence for a manganous surface sea at 2.5 Ga

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The Transvaal Supergroup in South Africa hosts one of the most pristine Archean sedimentary successions known, with largely flat lying strata and sub-greenschist metamorphism [1]. The relevant section of this unit records an intertidal carbonate platform deepening upward to a basinal iron formation. The carbonates from the platform, especially the Lower Nauga formation, have relatively high Mn concentrations, but more limited Fe. We propose that this resulted from surface sea waters containing substantial Mn and a paucity of Fe, based on the ideal partitioning coefficients of Mn and Fe into calcite and dolomite lattices [2].

Fe speciation data from deep basin sediments indicate deposition under anoxic, ferruginous conditions, implying that the water column was stratified with manganous surface waters overlying ferruginous bottom waters. Surface sea waters could be devoid of Fe^{2+} for a number of reasons, including photic zone oxygen production, anoxygenic phototrophic Fe^{2+} oxidation, or sulfide scavenging of Fe^{2+}. Dissolved Mn^{2+} can persist through all of these scenarios; however, pervasive oxygenation could be expected to oxidize Mn as well. Had Mn been deposited as oxide, the $\partial^{13}C$-CO_3 should move to more negative values, reflecting the $\partial^{13}C$ composition from the organic matter used during dissimilatory reduction. Platform carbonates of the Campbellrand Subgroup from the intertidal to the lagoonal to the shelf margin have previously been shown to have $\partial^{13}C$-CO_3 compositions around -0.5 ‰ [3], a signal indicative of water column carbonate precipitation. The speciation of Fe present on the carbonate platform also indicates anoxic surface water. The vertical extent of the depositional environments of these Mn rich carbonates from the intertidal zone to the shelf margin together with the roughly 600 m of elevated Mn:Fe ratios in the carbonates suggest a substantially thick manganous surface layer above the more reducing (mostly ferruginous) deep basin.

[1] Beukes (1983) in *Iron Formation: Facts and Problems*, 131-209.
[2] Mucci and Morse (1990) *Aquatic Sciences* **3,** 217-254.
[3] Fischer, Schroeder, Lacassie, Beukes, Goldberg, Strauss, Horstmann, Schrag, and Knoll (2009) *Precambrian Research* **169**, 15-27.