Reconstructing historical trends in hypoxia in a coastal marine system: Alfonso Basin, La Paz Bay, southwestern Gulf of California

K. CHOUMILINE[1], H. PÉREZ-TRIBOUILLIER[2], E. SHUMILIN[2], T.W. LYONS[1] AND L. PÉREZ-CRUZ[3]

[1]University of California Riverside, Riverside, CA, 92521 (*correspondence: constan_ayanami@hotmail.com, timothy.lyons@ucr.edu)

[2]Centro Interdisciplinario de Ciencias Marinas - Instituto Politécnico Nacional, La Paz, B.C.S., Mexico, 23096 (habacuc_tribouillier@hotmail.com, eshumili@ipn.mx)

[3]Universidad Nacional Autonoma de Mexico, Mexico, D.F., Mexico, 04510(perezcruz@geofisica.unam.mx)

Variability of dissolved oxygen in the water column of marine systems has been reported for modern basins through direct measurements and inferred for past geological times through the use of multiple micropaleontologic, organic, and inorganic proxies. Vary oxygen content has proven to be one of the key parameters responsible for changes in biota distribution, water chemistry, physicochemical transformations of dissolved and particulate phases for trace elements in the water column, and formation of authigenic minerals, among other effects. For many recent studies the challenge lies with separating trends that are the products of natural biogeochemical processes from those that are the consequences of human-induced eutrophication. In this study we applied a multiproxy approach for tracing redox conditions and related processes (e.g., Fe and S speciation; redox-sensitive trace elements such as Mo, U, and lanthanides; C and N isotope relationships) to sediment cores collected at contrasting locations within the same system (La Paz Bay, semi-restricted from the Gulf of California). Trends in the cores from the shallow La Paz Lagoon (< 9 m, 6.5 mm/yr sedimentation rate) seem to track the history of sewage discharge into the lagoon as recorded in patterns of organic C accumulation, with a decrease over time reflecting construction of a water treatment plant. However, this is not the case for the deeper La Paz Bay and Alfonso Basin specifically (420 m, 0.54 to 0.61 mm/yr) where the variability seems to be tracking natural changes in the oxygenation history of the water column tied in part to varying primary productivity in response to oceanographic conditions such as ENSO and PDO. Redox evolution will also be discussed within the long-term context of changing sea level and associated patterns of nutrient delivery to the basin.