Ferruginous bioforms accumulations in deep marine environments: an approach to their origin and formation mechanisms in the Transitional Zone province of the Galician Continental Margin (NW Iberian Peninsula)

Ángel Enrique López-Pérez¹, Belén Rubio¹, Daniel Rey¹, and Luís Pinheiro²

¹CIM-Uvigo, Centro de Investigaciones Marinas, GEOMA, Grupo de Geología Marina y Ambiental, Universidade de Vigo, 36310, Vigo, Spain.
²Department of Geosciences and CESAM, University of Aveiro, Campus de Santiago, 3810-193 Aveiro, Portugal

Ferruginous tubular structures concretions are widely distributed over the seafloor surrounding the Gran Burato depression in the Transitional Zone (TZ) province of the Galician Continental Margin (NW Iberian Margin). These bioforms-like structures are created by iron oxides precipitations into the tube-dwelling macrozoobenthos as a result of Fe²⁺ upward diffusion and O₂ ventilation and diffusion acting in the water-sediment interphase in a non-steady state early diagenesis. X-ray diffraction analyses display that goethite is the main mineralogical component of these bioforms-like structures. Furthermore, non-steady state diagenesis has been identified by several oxidations fronts recognised in three piston cores, reflecting that the redoxcline has not achieved the deeper equilibrium in the study area. Afterwards, these ferruginous tubes were eroded, remobilised and redistributed over the seabed by bottom currents. Ocean-floor observations show erosion and sea-bottom current structures as ripples, grooves, erratic blocks, accumulations of pteropods and carbonate crusts associated with hardgrounds. Sedimentation rates calculated in a piston core display very low values for the last 30 cal ka BP (mean of 1.57 cm ky⁻¹) with a marked hiatus between 17.80 to 10.45 cal ka BP, meanwhile abraded surfaces have been identified by high-resolution seismic data confirming erosional processes in this area of the TZ province. We conclude that the ferruginous bioforms accumulation over the deep-ocean floor is indicative of a present-day vigorous seafloor current acting and eroding the sediments of the TZ province. This bottom current is a direct consequence of the general seafloor elevation of the TZ province that causes constriction of the water masses (MOW and LSW) that induces a general intensification of the bottom currents and greater erosional capacity. This erosional process causes the continuous oxygenation of the upper sediments, and it prevents to reach the steady-state diagenesis, playing this fact an essential role in the ferruginous formations and accumulations in the study area.