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Granulometry and geochemistry of micritic carbonates along a Carboniferous and a Jurassic platform to basin transects

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Carbonate ooze, or micrite, its lithified counterpart, forms a main constituent of limestones throughout Earth History. Despite considerable research, the origin of micrite remains a major problem in carbonate sedimentology. In modern tropical environments, such as the Bahamas, the origin of the particles can be determined because of a very limited or no diagenetic overprint. In contrast, in ancient carbonate environments, the source of micrite might be several sources, but without the sedimentological context, the ooze origin is difficult to recognize when altered. Micrite data commonly represent a geochemical average of the depositional environment, but their origin (platform, slope, seawater column, authigenic) and mineralogy (aragonite, (Mg)-calcite) are often poorly constrained as the geochemical and volumetric significance of carbonate precipitates formed during cementation. Depending on primary mineralogy, the volume and geochemistry of secondary (micro-)cement, and the diagenetic regime, the geochemistry and mineralogy of micritic rocks will deviate in variable degrees from the original composition of unconsolidated oozes. In addition, with reference to secular changes in seawater chemistry, the carbonate mineralogy has varied through times. Hence, the original make-up of most ancient micrite is enigmatic and the resulting geochemical values represent an admixture of environmental and diagenetic signals. This study focuses on the origin and geochemical fingerprint of specific component classes within carbonate oozes and lithified matrix micrite. The goal is to physically separate specific components of micrite of experimentally and naturally lithified carbonate muds and to investigate their origin, mineralogy, grain morphology and geochemistry. The study is based on a granulometric separation of fossil micrites from proximal to distal transects representing different time slices. The naturally fully lithified micrites have been collected from a Jurassic transect in Morocco (High Atlas) and from a Carboniferous transect in Spain (Cantabrian Mountains). Precipitation experiments attempting to artificially lithify micrite are carried out on Miocene samples from a transect in Great Bahama Bank. It is acknowledged that neither method can compensate for any post-depositional diagenetic alteration of aragonitic or high-Mg calcitic oozes. However, it is believed that this study represents an important step towards a more complete classification (granulometrical, mineralogical, geochemical) of the various type of components contained in carbonate oozes of different geological settings (age, carbonate factory, biota, chemical composition of the ocean, etc).