Annali dell'Università degli Studi di Ferrara ISSN 1824-2707
Museologia Scientifica e Naturalistica volume 1, 2005

Marine-continental organic input in the "Calcare di Base" Formation

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Organic geochemical and petrographic study have been carried out on the Messinian "Calcare di Base" formation cropping out in northern Calabria and in Sicily. The main aim of this research concerns the deposition causes of this peculiar formation, up to now interpreted as essentially evaporitic limestone.

Thin section observations put in evidence that carbonate layers are characterized by a peloidal fabric and the absence of any kind of metazoan skeletons. The prevailing fabric is characterized by dark peloid clusters, cylindrical or subcylindrical in shape, patchily dispersed into a lighter matrix. The shape, mineral composition, dimensions and context suggest that many elongate bodies can be interpreted as fecal pellets of unknown organisms. In addition carbonate layers show two other facies types: i) a detrital, very finely gradated layer, and ii) a microbialitic, sometimes with stromatolitic fabric. The bright UV-epifluorescence suggests a high content of organic matter in both fecal pellets and stromatolitic fabric.

The study of carbonaceous remains emphasized a great variety of the organic input. Geochemical data (Rock-Eval pyrolysis) indicate a mixed (marine and continental) organic input. These data have been confirmed by organic petrographic observations (palynofacies) which revealed the presence of phytoclasts derived from continental plant tissues, amorphous organic matter, and variable proportions of zooclasts, pollens, spores, phytoplanktonic organisms and filaments presumably attributable to cyanobacteria.

Preliminary results from organic geochemistry and petrography could suggest that the depositional environment became more and more restricted, allowing the survival of organisms adapted to extreme conditions, only. These enigmatic organisms have not been observed yet, however their biological signatures in the sediments are testified by the geochemistry data and palynofacies observation. Moreover, the presence of well preserved and bright-fluorescent spores and pollens indicate that these elements did not undergo degradation and oxidation, suggesting a sedimentary environment characterized by a stratified water column with bottom anoxic conditions.

Such context, combining a good preservation state of organic matter and a typified character (nearly extreme conditions) of the environment, reveals highly favorable for undertaking the biochemical study of organic compounds associated with these sedimentary deposits. The amino-acid analysis of peptide remains may help to understand the influence of soluble macromolecules (mainly derived from microbial EPS) in the formation of authigenic carbonates. We can also expect the GC-MS detection of preserved lipidic biomarkers, providing the molecular signature of microscopically non-identifiable (non-preserved) organisms.

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