

# MIS 5 COASTAL CARBONATE DIAGENESIS IN THE NORTHERN AND SOUTHERN MEDITERRANEAN SEA

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## Abstract

Sea level changes influenced the diagenetic processes of the MIS 5 Mediterranean coastal carbonate deposits of both Sardinia (Italy) and Alexandria (Egypt). Diagenesis in Sardinia took place in two phases. The first occurred during the MIS 5e in shallow marine phreatic environment, while the second took place between MIS 4 and MIS 2 in a meteoric phreatic environment. In Alexandria, diagenesis followed three phases. The first occurred during MIS 5c in a vadose, active phreatic zone, the second, between MIS 4 and MIS 2 in a meteoric phreatic environment; and the final phase took place during the early and middle Holocene MIS 1 in a marine phreatic environment.

**Keywords:** *Mediterranean Sea, Sea level, Paleoceanography, Rocky shores*

Marine Isotope Stage 5 (MIS 5) carbonates, outcropping along the western of Sardinia (Italy - Central Mediterranean) and all along the city of Alexandria (Egypt - South Mediterranean), deposited and underwent diagenetic cycles because of sea level fluctuations related to the last 125 ka glacial and interglacial cycles.

**In Sardinia (locality Porto Alabe)**, the shallow water carbonates are biogenic rims mostly made of the red coralline algae *Lithophyllum byssoides* with intertidal invertebrates encrusted the biggest cobbles and boulders of the lower conglomerates. They have been OSL dated at 125 Ka; thus related to MIS 5e. The diagenetic processes in Porto Alabe followed two phases. The first took place directly after their deposition in the shallow marine phreatic environment during MIS 5e. This assumption is supported by the presence of microcrystalline high-Mg calcite isopachous rims and the crusts of fibrous aragonite cements. The second phase occurred in a period of sea level lowstand, during which subaerial exposure of carbonates allowed fresh water to replace sea water in the pores. Consequently, a meteoric phreatic environment was created, and equant or granular calcite cement were developed. This phase most probably occurred during the glacial period between MIS 4 and MIS 2 when sea level regressed of several kilometers and carbonates were exposed (figure 1).

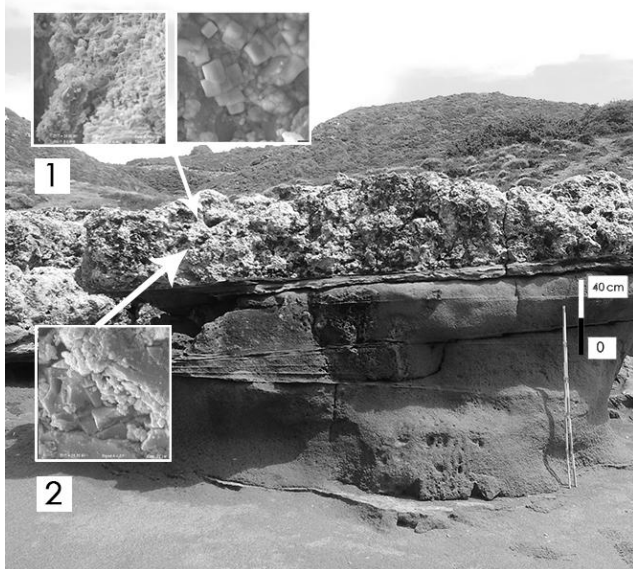


Fig. 1. Phases of carbonate diagenesis represented by two stages of cementation, Porto Alabe, Sardinia.

**In Alexandria (Gabal El-Kor formation)**, shallow marine carbonate made up of ooids, skeletal grains, quartz and others. They have been OSL dated at  $104 \pm 17$  ka [1]; and is therefore related to MIS 5c. These deposits have been

subjected to three phases of diagenetic processes [2]. The first took place directly after their deposition during the MIS 5c. The early stage of cementation occurred in a vadose, active phreatic zone. This is proved by the presence of micritic low Mg-Calcite cements. The second phase started during a marine regression period and with subaerial exposure of the formation. The deposits in the phreatic marine zone started to leach out. This reflects the instability of the earlier formed low Mg-calcite and the partial dissolution of the micrite envelope. Rims of isopachous bladed microcrystalline calcite cement formed representing a stage of meteoric phreatic cementation. This phase of diagenesis most likely occurred during the glacial period between MIS 4 and MIS 2. The last phase has been formed during the post Late Glacial Maximum transgression (MIS 1). In this phase, sea reached the lowermost part of the outcrop affecting it by seawater splash and spray. Fibrous aragonite cements grew on the previously formed low Mg-calcite rhombs in the marine phreatic zone. (figure 2).

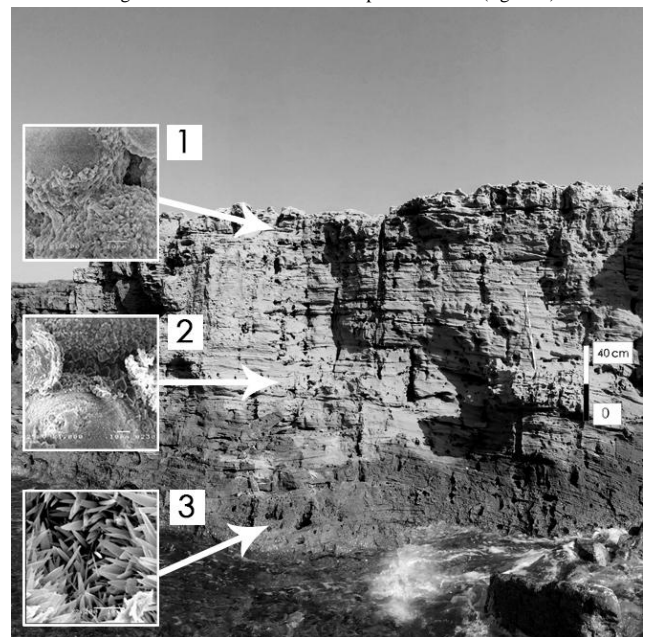


Fig. 2. Phases of carbonate diagenesis represented by three stages of cementation, Gabal El-Kor, Alexandria.

## References

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