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New evidence of Diatomitic occurrences in western Crete, Greece; A preliminary stratigraphic and geochemical approach and its implications

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The geological evolution and conditions that shaped the Neogene paleoenvironmental history of the Mediterranean Sea, have been investigated so far by numerous studies. The Upper Miocene particularly (late Tortonian and early Messinian) was generally characterized by the rapid building of extensive carbonate platforms and basins which included hemipelagic formations (marls/mudstones, sapropels), as well as shallow-marine deposits (evaporitic formations, coral reefs, bioclastic and red algae limestones). The Messinian Salinity Crisis (MSC) was a critical event that affected the general environment of the Mediterranean. A stepwise restriction of the whole basin had already begun prior to the MSC (Kontakiotis et al., 2022) and resulted in the development of marginal basins. In this context, Messinian upwelling resulting in diatomitic strata accumulation was reported from only three locations (two in Crete; Keupp and Bellas, 2000 and one in Gavdos Islands; Frydas, 2006) and six in total from the eastern Mediterranean (four in Greece, one in Cyprus and Turkey respectively; Pellegrino et al., 2018).

In the present study, a synthetic outcrop that includes new diatomitic occurrences in the marginal Neogene basin of Apokoronos area in northwestern Crete, is reported and studied both stratigraphically and geochemically. Our preliminary results point to an Upper Miocene (late Tortonian/early Messinian) pre evaporitic age of the deposits. The studied section is well-laterally extended and presents adequate thickness in relation to other diatomitic occurrences in Crete. It is subdivided into three profiles, the lower, middle and upper one, separated by not recorded parts due to high vegetation density and steepness. Each profile documents various levels with diatomites. Twenty-seven samples were taken in total. Several alternations were observed between fine sands/siltstones/mudstones and laminated diatomaceous beds from bottom to top. The basal part consists of grey/blueish bioturbated fine sand-to-siltstones moderately cemented, including *Pycnodonta* and other bivalve shells (slightly reworked). This part is followed by well-laminated white to slightly light grey diatomaceous deposits, while towards the top part silty mudstones underlie the diatomitic beds. The section closes at the top with thick, cemented sandy mudstone beds. It is evident that the major part of the sections' strata was deposited during a transgressive system tract (TST) [lower and middle profiles], which was developed following the Tortonian deepening in the early Messinian. Yet, at the top part (upper profile), shallowing of the water depth took place, pointing to a regressive system tract (RST) with minor interruptions. Upwelling seems to have been developed in distinct stratigraphic levels illustrating significant changes in the paleo-water-circulation and may well be correlated with the increased variability in climate of Phase 3 after Kontakiotis et al. (2022). Relevant evidence of upwelling during lower Messinian (Late Miocene) in Crete was also previously documented by stable isotope data on *Orbulina universa* by Brachert et al. (2015). Our geochemical results show strong variations in the TOC content. High values of TOC are recorded within the diatomaceous levels, ranging up to 3.33%. A clear negative trend of the values is recognized from the bottom (lower profile, minimum value of 2.2%) to the top of the synthetic section (0.27%). The results of this study, demonstrate that high to fair productivity diatomaceous facies prevail at the basal and middle part showing that a well-developed upwelling system was established prior to the MSC onset, which was undergoing major changes strongly affected by the climate variability.

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