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The Messinian diatomite deposition in the Mediterranean region and its relationships to the global silica cycle

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ABSTRACT

Diatomites constitute a widely represented lithology in the Messinian sections of the circum-mediterranean Neogene marginal basins. Although traditionally interpreted as genuine evidence of the gradually restricted conditions that characterized the Mediterranean just before the Messinian salinity crisis, their coeval occurrence with a global intensification of the opaline production in the world oceans (late Miocene-early Pliocene biogenic bloom) suggests that an integrative analysis of the origins of these sediments is necessary. A comprehensive analysis of the geological and paleontological records suggests that the synergistic intervention of abiotic (tectonic and climate reconfigurations) and biotic (expansion of grass-dominated, opal-rich biomes) controlling factors may have promoted a remarkable enhancement of silica flux from continents to oceans, which in turn can explain the opaline burst that occurred during the late Miocene, at both the global and Mediterranean scale. The finely laminated pattern and the rich fossil content of diatomaceous deposits, that are usually considered to be byproducts of anoxic conditions, are briefly discussed. Some studies seem to indicate that, instead of anoxia, the aggregation and sedimentation of diatom tests may play a critical role in these processes. The lower Messinian diatomites of the Mediterranean region are generally interbedded with organic-rich sediments (sapropels) clearly attesting prolonged, precessionally-controlled periods of basin stratification and bottom water anoxia or hypoxia. A causal relationship between sapropel and diatomite deposition in the

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