

Early Miocene microfossils from Marmorito (Italy)

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In previous studies, the Marmorito sediments in northwest Italy were determined to be Early Miocene (Aquitanian–Burdigalian) in age, based on foraminifera and diatoms. However, there have been few investigations on other microfossil groups. Samples from 28 diatomaceous layers were obtained in February 2019 and prepared as permanent mounts for the light microscope (LM) and stubs for the scanning electron microscope (SEM). Observations on the calcareous nanofossils revealed the presence of coccospheres of *Tergestiella* sp., *Coccolithus pelagicus*, *Reticulofenestra minuta*, *R. haqii*, and *Cyclicargolithus floridanus*, which suggests that these species were deposited *in situ* (i.e., not reworked). However, the assemblages also include reworked Cretaceous and Paleogene forms. Siliceous scales of the putative haptophyte *Macrora stella* were encountered, particularly in the lower Burdigalian. Diverse silicoflagellate assemblages were comprised of *Naviculopsis*, *Mesocena* (*Bachmannocena*), *Corbisema*, *Distephanopsis*, *Dictyocha*, and *Stephanocha*, and they represent a time close to the extinctions of *Corbisema* and *Naviculopsis* and before the first appearance of *Caryocha*. Chrysophyte cysts were also observed and assumed to be associated with river outflow. Diatom assemblages contained a lot of *Chaetoceros* resting spores, as well as attached and benthic taxa, with few (if any) offshore taxa, which collectively suggests a shallow shelf assemblage. Sponge spicule assemblages were mainly composed of oxeas, styles, sigmas, and spherasters that seemingly originating from shallow- and deep-water sponges.

From this holistic approach, our microfossil data show that the Marmorito sediments were likely deposited on the continental slope, given the presence of deep-water (e.g., some of the sponges) and offshore (silicoflagellates) forms, but with significant input from river outflow (chrysophytes), as well as coastal and shelf assemblages (diatoms and some of the coccolithophorids). In addition, monospecific *Ethmodiscus* layers may suggest rapid deposition of seasonally stratified oligotrophic waters or selective preservation through sediment winnowing.