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Temperature and nutrient controls of coralline algal and larger foraminiferal dominated Paleogene Tethyan carbonates

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During the Priabonian to the Chattian, larger foraminifera (LF) and crustose coralline algae (CCA) assemblages dominate thick shallow-water carbonate sedimentary successions while hermatypic corals and green dasycladalean algae played a subordinate role. This time interval is of particular interest because it represents the transition from the greenhouse to icehouse world in the Cainozoic with the initiation of large ice sheets on Antarctica and extensive sea level variations.

This study is based on facies and diversity patterns of late Eocene (Priabonian), early Oligocene (Rupelian) and late Oligocene (Chattian) LF and CCA communities occurring in neritic carbonate settings from the northern margins of the Western Tethys in northeastern Italy. Recent taxonomic re-assessments of coralline algae have shown important differences in species diversity from the Priabonian to the Chattian. During the Priabonian and the Chattian, melobesioids and mastophoroids are diverse and abundant, sporolithaceans are present with a moderately richness, Lithophylloideae are absent. During the Rupelian, although the corallines as a carbonate producer are very prominant, the diversity as such is markedly lower and is restricted to few melobesioid species.

There are also dramatic changes of larger foraminiferal diversities. This is especially evident when comparing the appearance and extinction of different larger foraminiferal groups. The porcelaneous LF such as the alveolinid species, for example, underwent a dramatic decrease from the early Eocene to the middle-upper Eocene

boundary. Rupelian and Chattian porcelaneous LF are represented by single species of a few genera. The Priabonian hyaline LF are represented by rich assemblages of nummulitids and orthophragminids which decrease in species richness to the Chattian. Orthophragminids become extinct at the Eocene-Oligocene boundary, in the Chattian lepidocyclinids and miogypsinids appear.

We discuss possible causes for these mid-latitude shallow-water carbonate benthic communities. We suggest that evolutionary and extinction events together with global and regional changes in temperature and trophic resources provide the key for understanding these dramatic changes in floral and faunal diversities.