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Benthic assemblages, diversity controls and environmental parameters: assessing different scales of complexity in coralline algal and large foraminiferal carbonates in the Paleogene

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The Paleogene encompasses dramatic changes in shallow water carbonate facies and the benthic assemblages which also affected algal assemblages. These changes are related to extinction events, the immigration of new biota and the origination of new facies types, as well as changes in climate and nutrient regimes. Biotic developments during the Paleogene, especially at the Eocene/Oligocene boundary, have been coupled to climatic changes (cooling) attributed to major changes in plate tectonic configurations and/or atmospheric gas concentrations. Shallow water platform environments represent the transition between the terrestrial and oceanic realms, both of which have produced detailed records of climatic and diversity changes during the Paleogene.

In the Upper Eocene, coralline algae dominate, but show a restricted diversity. Larger foraminifera are dominated by nummulites as well as orthophragminids. Corals can also be common. Important extinction events occur at the Middle Eocene/Late Eocene and Eocene/Oligocene boundaries. Coralline algae and large and small benthic foraminifera are associated with hermatypic corals in the Early Oligocene. The Early/Late Oligocene boundary shows a dramatic change of facies character with mixed siliciclastic and carbonate sedimentation in the Chattian. These Chattian carbonates are dominated by highly diverse coralline algae including large rhodoliths and a distinct suite of larger foraminifera including miogypsinids and archaiasinids.

Our studies are based on a compendium of shallow water platform carbonates from the Middle Eocene to Late Oligocene in north-eastern Italy and show that the dominant facies in are controlled by both regional developments (for example tectonics) and global (for example climate and extinction events). The dominant benthic components such as coralline algae, larger foraminifera, bryozoans and corals are controlled by nutrient and temperature regimes. The development from the Eocene to Oligocene shows a transition from oligotrophic to mesotrophic conditions which may go hand in hand with a change from tropical to warm temperate marine temperatures.