

Radiolarian zonation of Barremian to Aptian interval and its constraint on oceanic anoxic event 1a (OAE 1a)

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Based on the phyletic evolution of *Aurisaturnalis* and *Turbocapsula*, two radiolarian zones have been defined: the *Aurisaturnalis carinatus* Zone and the *Turbocapsula costata* Zone. The *Turbocapsula costata* Zone is subdivided into the *Turbocapsula costata multicostata* Subzone and the *Turbocapsula costata costata* Subzone. These zones are defined by evolutionary first appearance bio-horizons (EFABs), which are more reliable than the first and the last occurrence bio-horizons over wide areas. This zonal scheme can be used for identifying episodes, such as OAEs, in the pelagic realms.

These zones are established by the radiolarian biostratigraphic study ranging from the latest Barremian to the Aptian of a pelagic sequence (section BB1) near Babazhadong in southern Tibet. The strata are dominant by siliceous mudstone and chert. No fossils other than radiolarians can be obtained from the strata. Umbria–Marche sedimentary sequence was accumulated in the Middle Jurassic to Eocene at bathyal depths, in a relatively isolated pelagic basin. The lower Cretaceous units are composed of the whitish to medium grey pelagic limestones and dark grey to black cherts nodules or layers of the Maiolica Formation, overlain by the polychrome marls of the Marne a Fucoidi Formation. The section of Gorgo a Cerbara in the northern Umbria–Marche Basin has been constrained by magnetostratigraphy, planktic foraminiferal, and calcareous nannofossil biozones.

Radiolarian biostratigraphic study on pelagic basin of Umbria–Marche can provide better age-constraints for radiolarian zonation and is necessary to testify the applicability of the zonation. Totally, 52 samples from the section BB1 and 15 samples from section Gorgo a Cerbara have been collected for radiolarian biostratigraphic study.

During this period, black shale layers (OAE 1a) were deposited in marine secessions in the Mediterranean Tethys. However, no black shale layers are recorded in the siliceous sequence in southern Tibet.

Comparison of radiolarian assemblages from sections of Gorgo a Cerbara and BB1 proves that this zonation is useful in the whole Tethys. The Early Aptian OAE 1a is located between the first appearance bio-horizon of the genus *Turbocapsula* and the EFAB of *T. costata multicostata*. Radiolarian faunal change before and around the OAE 1a event is analyzed in this study.

Keywords: radiolarian zonation, Barremian to Aptian, Tethys, OAE 1a