

Late Triassic, Early and Middle Jurassic Radiolaria from ferromanganese-chert nodules (Angelokastron, Argolis, Greece): evidence for prolonged radiolarite sedimentation in the Vardar-Meliata Ocean

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In the Argolis, the Basal Sequence constituting the eastern Pelagonian margin which bordered the Vardar–Meliata oceanic domain, includes Late Triassic–Early Jurassic shallow-water carbonates, condensed pelagic limestones of Early–Middle Jurassic age, Late Jurassic radiolarian cherts, siliceous mudstones and sandstones rich in ophiolite fragments. Up-section, coarse breccias, also with clasts of boninites derived from a nearby ophiolite obducted onto the Pelagonian margin in Late Jurassic–Early Cretaceous times crop out.

Along the road from Angelokastron to Sofiko, about 2 km east of the village of Angelokastron, a small quarry exposes pervasively sheared dark reddish-brown, radiolarian-bearing cherty shales with disrupted fragments of chert and chert nodules impregnated by ferro-manganese oxides. These shales occur in the footwall of a thrust bringing them into contact with the Pantokrator Limestone of the Basal Sequence.

We collected more than 30 samples of the nodules and the shaly matrix. 13 nodules and one matrix sample yielded determinable radiolarians. 16 x-ray fluorescence analyses were carried out on 12 nodules that indicated a hydrothermal origin of the ferro-manganese mineralization.

The radiolarian taxa found indicate four age groups for the nodules that are embedded in the siliceous shale matrix that yielded a Middle Jurassic age (middle Bathonian). The first group includes nodules of Late Triassic age (late Norian–Rhaetian); the second group nodules of Early Jurassic age (early Pliensbachian and probably middle–late Toarcian); the third group nodules of early Middle Jurassic age (Aalenian–Bajocian); the last group finally includes nodules of late Middle Jurassic age (Bajocian–Bathonian).

The presence of Late Triassic to Early Jurassic Mn-impregnated chert nodules in a Middle Jurassic matrix indicates a deep oceanic environment prior to the tectonic emplacement of the succession onto the Pelagonian continental margin. We suggest that these nodules, more lithified than their matrix, were exhumed on the slope of an intra-oceanic accretionary wedge and were redeposited in the Middle Jurassic siliceous mudstones on the floor of the remnant Vardar–Meliata Ocean.

Radiolarian ages and geochemical data on the ophiolites from the Koziakas massif (Greece)

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The Koziakas massif, located at the western boundary of the Thessaly plain, consists of a stack of thrust units emplaced westward onto the Pelagonian (s.l.), which in turn thrusts