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New paleontological and geochemical results from Pindos remnants in southern Crete

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The Pindos domain of Greece was a deep-water basin located between the Gavrovo-Tripolitza (Greater Apulia) and the Pelagonian units. In the Peloponnese, the Pindos-Olonos zone exposes a continuous sedimentary sequence of pelagic facies from the Late Triassic to the Paleocene, overlain by a Paleocene-Oligocene flysch. Other remnants of the Pindos Ocean, known as the Ethia-Pindos and Mangassa series, are well documented in Crete, but their stratigraphic relationships with the Lentas series has never been investigated. Indeed, the Lentas unit has been classically described as a Triassic sequence composed of platform carbonates, polygenic conglomerates, sandstones and limestones alternations finally overlain by a flysch of unknown age. However, some authors argue that the Lentas unit could represent an olistolith constituted by an Upper Jurassic-Lower Cretaceous platform fragment into the Oligocene Pindos 2nd flysch. We present new biostratigraphic data (conodonts, radiolarians, foraminifers and algae) from sections logged in the Lentas and Pindos series in southern Crete, in order to provide accurate dating and hence constrain the relationship of these units. For the Lentas series, the platform presented a Paleozoic assemblage of foraminifers and carbonate algae. Reworked pebbles in the conglomerate gave a Permian age. A particular sample yielded the first occurrence in Greece of late Kungurian (latest Early Permian) foraminifers and carbonate algae. The identified assemblage belongs to the Misellina parvicostata Zone and has a North Paleotethyan affinity. The pelagic limestones interbedded with sandstones yielded conodonts species typical for the Lacian (early Norian) Epigondolella rigoi Zone and the Sevatian (late Norian) Mockina bidentata Zone. A newly recognized volcanoclastic series, occurring between the conglomerate and the pelagic limestones, has been characterized by petrological and geochemical analyses. The samples are trachy-andesites showing a weak differentiation and an arc-tholeiite signature. At the base of the Pindos (Ethia) sedimentary sequence, the pelagic limestones yielded Late Triassic (Carnian-Norian) foraminifers and conodonts assemblages belonging to the Sevatian (late Norian) Mockina bidentata Zone. Because of ages and facies similarities with equivalent series in Greece and Turkey, we propose that the Lentas series forms the base of the Pindos sequence. Additionally, reworked shallow marine limestones of late Kungurian age with Eurasian affinities into the Lentas conglomerate, as well as pelagic Famennian conodonts reworked at the base of the Mangassa series support a Paleotethyan affinity for some part of the Pindos series. In summary, the Lentas and Pindos units belong to the same paleogeographic realm and represent the pre- to synrift series as well as the development of the passive margin of the Huğlu-Pindos Ocean, which opened in Late Triassic times within the Paleotethyan active margin.