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Age and metamorphic evolution of metapelites and metagranites from the East Pelagonian Zone, Republic of Macedonia (FYROM): implications for the life span of the Vardar Ocean

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Controversy remains concerning the timing of collision between the Europe and Adria plates and the final closure of the Neotethyan (Vardar) Ocean on the Balkan Peninsula. The East Pelagonian Zone (EPZ) in the Republic of Macedonia is part of the Adria plate and borders the Vardar Zone to the west, where the oceanic suture is located and ophiolites were obducted towards the west in Late Jurassic times. The EPZ consists of Variscan basement overlain by Permian to Early Triassic clastic sediments that contain granitic intrusions. This sequence is overlain by Triassic and Lower Jurassic neritic carbonates. All rocks of the EPZ, including the Variscan basement, were metamorphosed under epidote-amphibolite facies conditions. Metabasites were transformed to rutile-bearing epidote amphibolites whereas metapelitic schists show the assemblage garnet + kyanite + chlorite + staurolite + phengite + rutile ± paragonite ± quartz. Metaluminous to peraluminous granitoids with mafic microgranular enclaves show the paragenesis quartz + perthitic K-feldspar/microcline + albite/oligoclase + epidote + biotite + phengite + garnet + rutile + zircon + apatite. Although the metagranitoids show minor deformation and preserve magmatic porphyritic textures, their mineralogy reacted thoroughly during peak metamorphism. *P–T*-conditions were quantified by thermodynamic modelling and Zr-in-rutile thermometry and are characterized by high pressures (∼1.5 GPa) at medium temperatures (575–600 °C). Garnet in metapelites shows strong growth zonation and hosts inclusions of chloritoid + chlorite + margarite + muscovite + paragonite + rutile + ilmenite + quartz, documenting prograde *P–T* conditions of 0.6–1.0 GPa at 490–550 °C. Secondary ionization mass spectrometry in-situ U–Pb dating of metamorphic zircon from the metapelite yields an age for the metamorphism of ca. 150 Ma, supported by monazite chemical dating. Zircon analyzed in metagranite is entirely of magmatic origin and was used to date the crystallization age of the protolith of ca. 250 Ma. Early Triassic granitic magmatism is related to lithospheric extension, possibly linked to the opening of the Vardar Ocean. In turn, the metamorphic *P–T*-path encountered by the rocks of the EPZ is best explained by subduction of the continental margin of the Adria plate and, therefore, might place the age for the closure of the Vardar Ocean to the Late Jurassic.