



## **New U-Pb ages from dykes cross-cutting the Demirci metamorphics, NW Turkey: Implications for multiple orogenic events**

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A high-grade metamorphic sequence in the Sünnice Mountains, Bolu, NW Turkey, is represented by migmatitic quartzo-feldspathic gneisses in amphibolite facies called the Demirci metamorphics/paragneisses, and a sequence of low-grade meta-volcanics containing meta-andesites with minor meta-rhyolites and meta-sedimentary rocks called the Yellice meta-volcanics. They are intruded by the Dirgine granite with an age of Upper Ediacaran (576-565 Ma) and are considered a part of the İstanbul-Zonguldak Tectonic Unit. The Demirci paragneisses are also intruded by a number of dykes in various directions, traditionally considered without radiometric dating to have been emplaced in a single magmatic phase in the Eocene related to post-collision regime of the Anatolide-Tauride platform.

Mafic-intermediate-felsic dykes cross-cutting the Demirci paragneisses have been investigated in maps of 1/1000 scale, and their U-Pb zircon age, major-trace element and kinematic data have been obtained. The mafics dykes cross-cutting the Yellice meta-volcanics, equivalents of those in the Demirci paragneisses, occur in N40<sup>0</sup>-50<sup>0</sup>E orientations and have calc-alkaline basalt compositions with a subduction signature. The intermediate dykes occur in N65<sup>0</sup>W, N80<sup>0</sup>W orientations and have calc-alkaline basaltic andesite to andesitic compositions with a subduction signature. Some felsics occur in N15<sup>0</sup>W and N80<sup>0</sup>E orientations and have calc-alkaline dacitic compositions with a collisional tectonic setting. Other calc-alkaline granitic dykes occur in N75<sup>0</sup>E orientation and calc-alkaline granitic compositions with a subduction signature.

U-Pb LA-ICP-MS dating of zircons yield ages from 485.7±3.6 Ma (i.e. Cambro-Ordovician) for N80<sup>0</sup>E trending dacite dykes; 443.0±5.4 Ma (i.e. Ordovician-Silurian) for N15<sup>0</sup>W trending dacite dykes; 301.0±1.6 Ma (i.e. Upper Pennsylvanian-Carboniferous) for N65<sup>0</sup>W trending basaltic andesite dykes; 268.2±2.4 Ma (i.e. Guadalupian-Permian) for N40-50<sup>0</sup>E trending basalt dykes; 262.9±3.4 Ma (i.e. Guadalupian-Permian) for N75<sup>0</sup>E trending granitic dykes; and 261.4±1.7 Ma (i.e. Guadalupian-Permian) for N80<sup>0</sup>W trending andesite dykes.

New radiometric ages from the dykes cross-cutting the Demirci metamorphics-paragneisses in the İstanbul-Zonguldak Tectonic Unit imply several consecutive orogenic phases. The Cambro-Ordovician and Ordovician-Silurian ages are concordant with the Caledonian Orogeny-first and second closure phase of the Tersseyre-Tornquist Sea, a branch of the Iapetus; the Upper Carboniferous age with the Variscan Orogeny-late closure phase of the Rheic Ocean, and Permian ages with the Hercynian Orogeny-initial closure phase of Palaeo-Tethys Ocean.