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LA ICP MS and Ion Probe U-Pb dating of igneous and metasedimentary units in the NE Pontides, NE Turkey: evidence of Peri-Gondwanan terrane accretion, Late Palaeozoic magmatism/metamorphism and Early Mesozoic extension along the S Eurasian margin

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The Artvin area is critical to an understanding of the tectonic development of the S margin of Eurasia and Tethys to the south. We have supplemented recent MTA mapping with 1/25,000-scale mapping of a critical area, combined with integrated stratigraphical, sedimentary, geochemical and geochronological studies. Here, we focus on U-Pb zircon dating of igneous and detrital zircons derived from basement units of the Pontide Autocthon and from overlying slice complexes, carried out by LA ICP MS at Frankfurt University and by Ion Probe at Edinburgh University. The Eastern Pontide Autocthon is overlain by north-vergent thrust sheets, mostly of continental margin origin, whereas Mesozoic (Neotethyan) ophiolites form the uppermost thrust sheet. The Autochton basement (Çamlıkaya pluton) is mainly tonalite, cut by granitic dykes. Both intrusions are of within-plate type, without a chemically identifiable subduction influence. The pluton yielded a concordant age of 330.4 $\pm$ 4.2 Ma (Visean), while crosscutting dykes gave an age of 156.3 $\pm$ 2.0 Ma (Oxfordian). The overlying lower slice complex (Slice 1) begins with a low-grade meta-clastic basement unit, intruded by coarse-grained granite. Detrital zircons from the meta-clastics yielded late Neoproterozoic (579-700), early Neoproterozoic (0.9 Ga) and Kibaran/Grenvillian (1.1-1.3 Ga) zircon populations. The oldest known zircon has an age of 2719 Ma. Slice 2 above this (Demirkent Intrusive Complex) is represented by foliated amphibolites, cut by granitic veins and, together, cut by swarms of basic-silicic dykes that postdate regional metamorphism and related deformation. A granitic vein yielded a concordia age of 325.4 $\pm$ 2.8 Ma (Visean-Serpukhovian). Slice 2 was intruded by two small tonalitic bodies, one of which yielded a concordant age of 179.8 $\pm$ 1 Ma (Toarcian). Slice 3 above this begins with granulite-facies gneiss and schist (Karadağ Metamorphics). A representative 1 m-wide meta-granitic stock within paragneiss experienced lead loss, with a lower intercept at 326 Ma. One magmatic zircon from this intrusion gave an age of 358 Ma (early Carboniferous), interpreted as the crystallisation age. Metamorphic rims of these zircons cluster around 330 Ma, viewed as the time of peak Variscan metamorphism. We interpret the E Pontide region (e.g. Artvin area) as part of an active S-Eurasian continental margin during Late Palaeozoic. Accretion/collision of Peri-Gondwanan terrane(s) was likely responsible for Variscan deformation/metamorphism. Newly accreted Peri-Gondwanan crust was intruded by granitic rocks during early Carboniferous, possibly in response to delamination/slab-break off processes. Following exhumation, the Eurasian margin remained relatively inactive and erosional during Late Carboniferous-Triassic. Related to regional northward subduction of Palaeotethys, the S-Eurasian margin underwent tectonic extension and deep-marine basin formation during Early Jurassic. The dyke swarm and Toarcian felsic plutons were emplaced into extended crust behind a continental margin magmatic arc. Short-lived Mid-Jurassic compression may reflect collision of an oceanic edifice (seamount/continental fragment) with the subduction trench. Extension resumed during Late Jurassic associated with Oxfordian magmatism. A S-facing subsiding passive margin existed during Late Jurassic-Early Cretaceous, followed by northward subduction and arc magmatism (E Pontide Arc). SSZ-type ophiolites were regionally obducted during latest Cretaceous, followed by Eocene telescoping of the Eurasian margin during final closure of Izmir-Ankara-Erzincan ocean.