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# 3.8 Ga zircons sampled by Neogene ignimbrite eruptions in Central Anatolia

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Paquette and Le Pennec (2012) presented new zircon U-Pb age data from the ignimbrites in Central Anatolia and determined them as Neogene, while they also detected zircons revealing Paleo-Proterozoic to Archean U-Pb ages (ranging from 2.3 to 3.8 Ga). Their explanation for this circumstance is that the young magmas penetrated an igneous or metasedimentary lower Proterozoic and/or Archean terrane, and postulated the existence of an Early Archean basement terrane in the lower parts of the Central Anatolian crust. This claim has potentially far-reaching consequences for paleogeographic considerations and plate tectonic reconstructions. A noteworthy point of their study is that there are no inherited ages younger than 2.3 Ga in their inherited zircon population. However, a large range of inherited U-Pb zircon ages have been reported from the Late Cretaceous granitoids in the Agaçören and Satansari areas in the Central Anatolian Crystalline Complex (CACC) (e.g., Köksal et al., 2012, 2013).

The granitoids from the Agaçören area do not only show inherited zircon U-Pb ages as old as the Paleo-Proterozoic (2.3 Ga), but also reveal younger ages from ca. 1000 Ma to ca. 550 Ma (Fig. 1). These ages correspond to known Pan-African and Cadomian events detected in Gondwanan terranes (e.g., Stern, 1994; Kröner and Stern, 2005), which is in accordance with the proposition of Gondwanan origin for the CACC (e.g., Göncüoglu et al., 1997). Moreover, our ongoing studies (e.g., Toksoy-Köksal et al., 2009) on similar granitoids within the CACC reveal the presence of Archean ages within the inherited zircon cores, which are enclosed by younger rims from Proterozoic to Cretaceous. Hence, the inherited zircon ages in the CACC are not restricted to the 3.8 Ga–2.3 Ga range as found by Paquette and Le Pennec. In contrast, the metamorphic basement rocks and the intruding igneous rocks may contain inherited zircon cores with a large age spectrum extending back to the Early Archean, suggesting their detrital origin. Naturally, the post-Alpine to recent volcanic rocks in Central Anatolia should be carrying the characteristics of this crust during their evolution, and incorporate inherited zircons derived from these older crustal components. Furthermore, $\varepsilon_{Hf}$ versus U-Pb age data of the AIA granitoids mostly coincide with the fields of Lu-Hf isotope data of detrital zircons from the rocks belonging to Gondwanaland (Köksal et al., 2012, their figure 8), which could be supporting evidence for the Gondwanan signature of these granitoids.

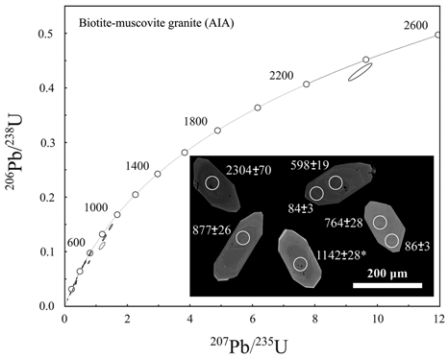


**Figure 1. Concordia plot based on zircon LA-ICP-MS U-Pb analyses from the biotite-muscovite granite of the Agaçören Igneous Association (AIA) within the Central Anatolian Crystalline Complex with BSE images and the LA-ICP-MS U-Pb ages (in Ma) of the selected zircon crystals (Köksal et al., 2012). Age with asterisk is $^{207}Pb/^{206}Pb$ age; others are $^{206}Pb/^{238}U$ ages.**

A wider age range of younger overgrowths may be present in the population of grains analyzed by Paquette and Le Pennec, as multiple overgrowths are visible in the CL images of their figures 2C and 2D in that paper. While these overgrowths have not been analyzed, the outer morphology of these inherited grains are subhedral to anhedral, so it is unlikely that these multiple overgrowths grew during the Neogene magmatic event. These zircons may therefore have had a long Post-Archean history of transport, deposition, overgrowth, and recrystallization that is more in tune with being derived from a Proterozoic fragment of Gondwana.

To conclude, there is no doubt that the igneous rocks within the CACC contain inherited zircon with ages dating back to the Early Archean, but we consider the statement by Paquette and Le Pennec, that there are "lower Proterozoic and/or Archean terranes" in this region an overinterpretation. The large range of inherited U-Pb ages in the widespread Cretaceous granites of the CACC suggests zircons are more likely to be derived from various Gondwanan sources and later reworked by sedimentary (similar to examples from other orogens in the world, e.g., Becker et al., 2005) and/or igneous events.

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