Petrogenetic implications of two contrasting granite types in the Çataldag Plutonic Complex, NW Turkey

O. KAMACI* AND S. ALTUNKAYNAK

Department of Geological Engineering, Istanbul Technical University, 34469, Maslak, Istanbul, Turkey (omer.kamaci@itu.edu.tr)

In late Oligocene and Early Miocene time, western Turkey was the site of extensive magmatic activity that produced voluminous plutonic associations. This magmatic activity was followed the continental collision between the Sakarya continent and Tauride-Anatolide carbonate platform along the Izmir-Ankara-Erzincan suture zone prior to middle Eocene. The Çataldag plutonic complex (CPC), one of the biggest plutonic associations, is a composite intrusive body consisting of both I- and S type granitic intrusions of similar age. $^{39}Ar/^{40}Ar$ dating obtained from CPC yields ages between 20 and 22 Ma as their cooling ages. These two intrusive groups display different textural, structural and also geochemical features. S-type, peraluminous granitic intrusion in CPC is represented by synkinematic, sheet like bodies situated in the eastern border of the plutonic complex. It includes leucocratic two-mica granites and milonitic granites which show petrographical features indicating ductile shear zone deformation. They are composed of quartz, feldspar with minor biotite, muscovite, epidote and garnet. Combined petrographical and geochemical features of this group reveal crustal origin for their genesis. I type granitic intrusion is made up of granite and granodiorite-quartz diorite showing gradational contact to each other. This group is late kinematic weakly deformed intrusion and displays hipidiomophic granular and porphyric textures. Geochemically, it has medium to high-K calc-alkaline and metaluminous compositions. Major and trace element compositions, and Sr-Nd-Pb isotope data indicate collectively that the I type granitic group of CPC has been originated from hybrid magma (s) including mantle and crustal components. Geochronological and petrological findings combined with bimodal character of CPC suggest that CPC is synextensional and therefore there was a close spatial and temporal relations between magmatism and extensional tectonics during the late Cenozoic geodynamic evolution of Turkey.

A combined U/Pb and Hf-isotope study of up to 4.0 Ga detrital zircon from the Wyoming Province

BALZ S. KAMBER, MARTIN J. WHITEHOUSE AND JON D. WOODHEAD[1,2,3]

[1]Laurentian University, Sudbury, Ontario, Canada
[2]Swedish Museum of Natural History, Stockholm, Sweden
[3]School of Earth Sciences, Melbourne, Australia

An extensive dataset (n=750) of new zircon U-Pb dates is presented for two quartz-rich metasediments from the eastern Beartooth Mountains, northern Wyoming craton, Montana. Both rocks yielded detrital zircon dates with comparable age populations, ranging from just under 4.0 Ga to the likely deposition age of ca. 3.0 Ga. Among the Meso-, Paleo-, and Eoarchean zircon there are age groupings. The most prominent population occurs between 3200 and 3325 Ma, followed by less abundant groupings at 3500, 3625, 3725, 3850 and 3950 Ma. A representative selection of grains (n=50) were subsequently analysed for Hf-isotopes by *in situ* MC-ICP-MS. Of these, 44 grains define a clear linear array in a Hf-isotope evolution diagram. The oldest zircon have chondritic initial Hf-isotope composition, with all younger grains defining a clear trend towards less radiogenic compositions. At 3.25 Ga, this trend averages -12 E_{Hf}.

Whereas no rocks of Eoarchean age have yet been found in the Wyoming craton, Pb-isotope signatures of 2.8 Ga ganodiorites have long been known to require involvement of an ancient high U/Pb silicate source. This could have been subduction zone modified mantle or a cratonic substrate. We discovered inherited Mesoarchean zircon in the 2.8 Ga granodiorites and heterogenous Hf-isotopes in zircon from one granodiorite, collectively favoring the *in situ* existence of a cratonic nucleus from the Hadean/Archean boundary but with no isotopic evidence for involvement of even older crust.

In agreement with most other Eoarchean and Hadean detrital zircon occurrences, it appears that the oldest zircon-bearing lithologies of the Wyoming craton became part of the erosional cycle only after a very extensive (ca. 1 Ga) period of residence in the crust. The internal structures of the oldest studied zircon grains reveal repeated reworking, testifying to a long and complex thermal history of the crust. This is consistent with a model of an originally quite zircon-poor mafic crust, whose internal heat, generated by radioactive decay, led to episodic remelting and reworking into a more evolved upper crust in which zircon became more abundant and a more refractory, depleted lower crust.