Zircon Age Constraints on the Basement in East Java, Indonesia

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We report here results of SHRIMP U-Pb dating of zircons from igneous and sedimentary rocks from East Java. Our objectives were to attempt to define volcanic arc evolution in a precise temporal framework as well as ascertaining the age and provenance of crustal contributions to arc magmatism and the sediments.

East Java can be subdivided into three early Cenozoic geological provinces; an Early Cenozoic volcanic arc in South Java (Southern Mountains Arc), a deep Early Cenozoic basin (Kendeng Basin) developed to the north of the Southern Mountains Arc, and upon which the modern arc is situated and, further to the north, an area interpreted as the Early Cenozoic Sunda marine shelf. The character, depth and origin of the basement in most of East Java are unknown as there are limited exposures and these are restricted to the west. These are interpreted to be arc and ophiolitic fragments of Cretaceous age accreted during the Late Cretaceous and have been assumed to extend beneath all of East Java.

Seven samples, comprising volcaniclastic, intrusive and extrusive samples, have yielded dates indicative of igneous crystallization events. However, the majority of samples have yielded inherited dates. Many tuffaceous and volcaniclastic samples are dominated by mixed populations reflecting recycling from earlier and contemporaneous eruptions. The remaining samples have yielded considerably older inherited zircon dates, ranging into the Archean.

There are pronounced frequency peaks in these older inherited dates at Cretaceous time and at 500-750 Ma, 900-1250 Ma and 2500-2700 Ma. The Cretaceous dates are restricted to the western and northwestern parts of East Java close to the limited exposures of Cretaceous basement and hence suggested to be the local source for these zircons.

Samples with inherited zircons of Cambian-Archean age are confined to the Southern Mountains Arc. The peaks in the distribution of these dates are similar to what would characterise basement derived from eastern Gondwana. Permo-Triassic and modern sediments derived from the continental crust of Western Australia have remarkably similar distributions of dates to the East Java data set. The Southern Mountains volcanoes have sampled the deep crust providing evidence for a continental fragment of Gondwanan (possibly Australian) origin beneath East Java, distinctly different from the Cretaceous arc and ophiolitic fragments comprising supposed basement further to the west and north.