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SGC51-03 Room:A04 Time:May 24 15:45-16:00

Ar/Ar Geochronological analysis of Paka volcano, northern Kenya Rift

SUDO, Masafumi[1*] ; STRECKER, Manfred R.[1]

[1]Univ. Potsdam, Inst. Earth Environ. Sci.

The northern Kenya Rift constitutes one of the most prominent examples of young volcano-tectonic processes in a continental rift system. However, the limited amount of geochronologic information on different generations of lava flows and associated eruptive centers, fissures, and extensional faults has been a major problem in assessing the degree of activity in the inner trough of the rift. Here we report on 30 new $^{40}Ar/^{39}Ar$ ages of lava flows associated with the evolution of the composite Paka caldera-shield volcano in the northern sector of the Kenya Rift.

Paka is a composite caldera-shield volcano. It rises ˜650 m above the rift floor and covers an area of ˜280 km^2 with lava flows and pyroclastics of trachyte, mugearite or basalt (Dunkley et al, 1993). Dunkley et al. (1993) suggested that the principal volcanic eruptions on Paka occurred at 0.4 Ma, 0.2 Ma and 10 ka based on their four $^{40}Ar/^{39}Ar$ age determinations. The relationship between the pristine morphology of the summit crater and associated fault systems parallel to the rift orientation suggests that the volcano-tectonic activity at Paka is intimately associated with deformation processes in the inner rift trough, the youngest sector of volcano-tectonic processes in the rift. Thus, knowledge of the timing of volcanic eruptions and the generation of faults is crucial for a rigorous assessment of the youngest tectono-magmatic activity along the volcano-tectonic axis of the northern Kenya Rift.

Thirty-two samples were collected, mostly from lava flows or pyroclastic deposits, for $^{40}Ar/^{39}Ar$ dating at the geochronology laboratory at the University of Potsdam. Sampling was carried out based on the geologic map of Dunkley et al. (1993) and the morphology of lava flows on and around the flanks of Paka. Concentrated groundmass parts of the rocks after acid treatment were sent to Oregon State TRIGA Reactor for neutron activation of samples for four hours at the CLICIT facility, then $^{40}Ar/^{39}Ar$ analyses were performed at Potsdam. In most cases, high-resolution ages were successfully obtained that are broadly consistent with Dunkley's ages after careful evaluation of age spectra and isochrons obtained by stepwise-heating with a CO_2 laser.

A total of thirty $^{40}Ar/^{39}Ar$ ages was obtained, except two negative ages. The age data show protracted volcanic activity during the past 0.6 Ma years, and also three phases of pronounced volcanic activity: (I) between 0.428 and 0.372 Ma, (II) between 0.160 and 0.126 Ma, and (III) between 0.039 and 0.012 Ma (Fig. 1). Based on these three periods, all rocks were grouped in three periods, as (1) 0.6-0.35 Ma, (2) 0.35-0.1 Ma and (3) 0.1-0 Ma. In addition, we obtained geochemical information of the samples and their spatial distribution was investigated. We found that several basaltic lava flows of Dunkley et al (1993) were trachyte or mugearite flows; in addition, we conclude that some stratigraphic positions should be modified. During period (1), only trachyte and mugearite erupted on the western rift floor and the northeastern flank of Paka; instead, the younger trachytes erupted more along a N-S trend on the flank of Paka. Many normal faults affecting flows are only found on the older lava flows in northeastern side of the volcano, which belong to period (1). The trace element ratio of Nb/Zr clearly shows different ratios among the three age groups, which implies a gradual change of magma composition over time. Overall, our new age data are meaningful and consistent with field observations of superposition and cross-cutting relationships and thus help to develop a structural evolution model for the inner trough region of the northern Kenya Rift.

Reference: Dunkley P. M., M. Smith, D. J. Allen and W. G. Darling (1993): International Series, Research Report SC/93/1, 185pp, British Geological Survey

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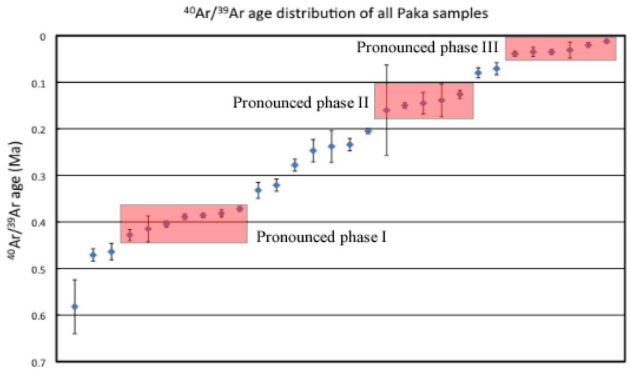

Fig 1. Distribution of $^{40}Ar/^{39}Ar$ ages of Paka samples and three inferred periods of pronounced volcanic avtivity.