Cenozoic Emplacement Age of the Kangmar Granite in South Tibet

Chie Shirakawa[1], Simon R. Wallis[1], Kouki Kitajima[2], Yuji Sano[2]

[1] Department of Earth and Planetary Sciences, Graduate School of Environmental Studies, Nagoya University, Nagoya 464-8601, Japan, shirakawa.chie@f.mbox.nagoya-u.ac.jp
[2] Atmosphere and Ocean Reserch institute, The University of Tokyo, Kashiwa, Chiba 277-8568, Japan

The north Himalayan metamorphic domes have a deformed granite core that is mantled by metamorphic rocks. These domes are situated between the high Himalaya and the Yarlang Tsangpo suture zone and expose rocks formed at mid-crustal levels. Studies of these rocks are important for understanding the relationships between these two geological domains. The Kangmar dome is one of the best studied domes, and previous workers reported two U-Pb zircon ages of granite: 562±4 Ma (Shärer and others, 1986) and about 507 Ma (Lee and others, 2000). Based on these two ages, the Kangmar granite is regarded as a part of the pre-Himalayan Indian basement. However, the granitic core of another well-documented member of the north Himalayan metamorphic domes – the Malashan dome – yields Tertiary zircon ages and shows intrusive relationships with the surrounding Jurassic sediments suggesting it is best interpreted as a granite body related to the Himalayan orogeny (Aoya and others, 2005). Zircons from the Malashan granite show clear differences between old cores that commonly have ages of around 500 Ma and rims of around 20 Ma that represent intrusion age. The complications revealed in the Malashan area suggest that the formation age of the North Himalayan domes including the Kangmar granite may need to be revised. The purpose of this study is to re-evaluate the emplacement age of the Kangmar granite.

In the northwestern area of the Kangmar dome, field observation shows a granite dike cross-cutting pelitic schist that is correlated with Carboniferous (355–295 Ma) deposits. This observation constrains the age of the Kangmar granite to be younger than Lower Carboniferous and suggests, therefore, that the reported ages of around 500 Ma do not represent timing of granite intrusion. We interpret these old ages as probable xenocryst ages. This interpretation can account for the large difference in reported zircon ages of 50 million years.

In order to constrain timing of intrusion, we carried out U-Pb zircon dating for 44 grains of zircon. The zircon grains were separated from two-mica granites sampled from the dyke and core body. Backscattered electron images of zircons show a clear separation into core and brighter but narrow rim domains (Fig. 1). The narrow rims locally show both oscillatory and sector zoning, suggesting an igneous origin. For this study it was important to date the narrow rims and we used a Cameca NanoSIMS 50 instrument (at Ocean Research Institute, University of Tokyo) with which it is possible to analyze spots of less than 10 microns (Takahata and others, 2008). Because of the thickness of rim (about 5–20 μm) and low content of Pb, only a few Pb-Pb data were obtained. Core analyses yielded mainly fell in the range of about 500 Ma to 450 Ma (Fig. 2). Rim analyses show a wide scatter including Tertiary ages (Figs. 2 and 3).

Tertiary zircon age is consistent with the age of the Malashan granite and other young granite in the north Himalayan domes (Lee and Whitehouse, 2007). We propose, the Kangmar granite does not represent the Indian basement, as generally thought, but is a young granite body intruded during the Tertiary Himalayan orogeny. This implies it is necessary to reconsider the formation mechanism of the north Himalayan metamorphic domes.

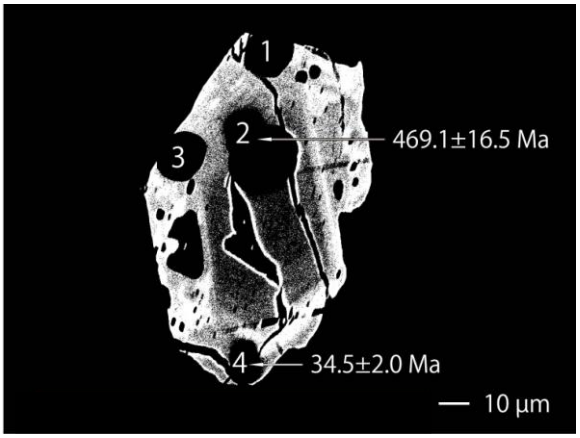

Figure 1. Backscattered electron image of a zircon grain from the Kangmar granite showing analyzed spots and corresponding $^{238}U/^{206}Pb$ ages. Analyses of spots 1&3 were excluded because of interferences of resin.

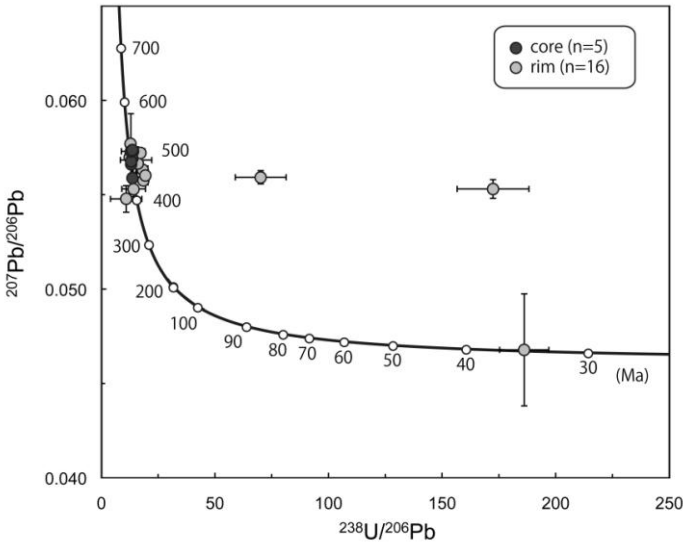

Figure 2. Tera-Wasserburg U-Pb concordia diagram for the Kangmar granite. Data are corrected for common Pb (±2 sigma).

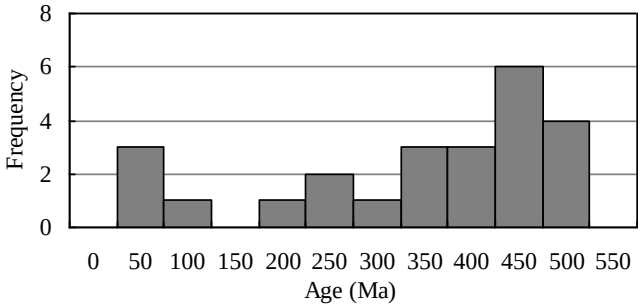

Figure 3. $^{238}U/^{206}Pb$ age distribution for 24 rim analyses.

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