THERMAL AND UPLIFT HISTORY OF THE GANGDESE MAGMATIC BELT IN LHASA AREA, SOUTHERN TIBET: EVIDENCE FROM APATITE FISSION TRACK ANALYSIS

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The E-W trending Gangdese magmatic belt, produced by northward subduction of the Indian plate, outcrops to the immediate north of the Indus-Zhangbo suture. In Lhasa area, emplacement ages of ~110-40 Ma for the plutons and 50-60 Ma for the associated volcanics have been reported by several authors. Rocks from this belt are expected to respond sensitively to the India-Asia collision by crustal shortening and uplift, as well to the later extensional tectonics, marked in this area by the NE-SW trending Yangbajain-Gulu rift system. Twenty seven apatites from 18 locations in Lhasa area of this belt, most of them from granitic rocks, have been studied by fission track analysis and the results are discussed in conjunction with previously reported $^{40}Ar/^{39}Ar$ data.

The FT ages from two locations in northern Quxu area reveal that very rapid cooling (over 70°C/Ma) has occurred around 19-15 Ma. The FT length distribution from one location is consistent with a history of initial fast cooling followed by slower cooling. These data therefore confirm that a pulse of rapid cooling has been experienced by these rocks subsequent to a period of slow cooling prior to 20 Ma. Data from the southern Quxu area (near Quxu village) reveal a slow cooling period from 42-19 Ma at a rate of ~10 °C/Ma. A fast cooling event after 19 Ma is not detectable here, but one of the samples shows a FT length distribution in agreement with a history of rapid cooling at 19-20 Ma down to the upper boundary of a partial annealing zone (~60 °C), followed by a period of prolonged slow cooling.

FT age data from other locations such as at Gu-Rong, Dagze, and Samye are in the range 19-25 Ma. Two apatite samples with 750 m vertical separation from Gu-Rong granite yield identical FT ages of 20.1 and 20.2 Ma, implying rapid cooling at that time. No fast cooling event could be detected from the rest of the locations but the data do not exclude it. Average cooling rates of 4 - 9 °C/Ma (44-0 Ma) are obtained for these locations when combined with $^{40}Ar/^{39}Ar$ data. Assuming a paleogeothermal gradient of 30 °C/km, exhumation rates of 0.1 - 0.3 mm/y can be deduced. These relatively low rates can be viewed as a regional "background" in this mountain-building area, and the fast rate from Quxu (in excess of ~ 2 mm/y) as a "pulse" superimposed on it. Whether this pulse was localized or regional and, if regional, whether it was diachronous along the Gangdese belt, still remains to be conclusively demonstrated.

Apatites from the gneissic granitic rocks of Nyainqentanglha range, west of the Yangbajain graben, yield exceptionally young FT ages of 3.3-5.1 Ma. Together with $^{40}Ar/^{39}Ar$ data, cooling rates of 20 - ~200 °C/Ma (9-0 Ma) at several locations can be deduced. These young ages and fast cooling rates correspond to recent rapid uplift and exhumation of the *foot-wall* of a major normal-faulting detachment zone accompanying the Yangbajain graben.

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ABSTRACTS WITH PROGRAMS

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