Cooling of North China and Yangtze Crust during Mesozoic: $^{40}Ar/^{39}Ar$ geochronology and implications of cratonic destruction under eastern Asia

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Lithospheric destruction of the North China Craton (NCC) is a prominent phenomenon during the Mesozoic but the timing and process are still in dispute. Furthermore, whether the Yangtze Craton (YTC) was also destructed is controversial. Widespread occurrence of Mesozoic granitoids might present record of the cooling history through argon diffusion within their K-feldspars. Samples collected from the NCC and YTC were subjected to high-resolution $^{40}Ar/^{39}Ar$ geochronological and thermochronological studies. Crustal thickness can be roughly estimated by using pure conductive (in situ) cooling showing that the crust of the NCC in the Jurassic was thicker than in the Cretaceous. Nonlinear cooling histories and cooling rates were then obtained by using multidomain diffusion (MDD) theory. Results show that the upper crusts of NCC and YTC had different cooling patterns during the late Mesozoic. This means they underwent different unroofing processes, and therefore had different dynamic settings during the Mesozoic. Combined with the sedimentation rates on the NCC, we argue that lithospheric thinning of the NCC began in the northern portion at ~140 - 135 Ma and peaked in the central and eastern portions at ~125 - 100 Ma, at a cooling rate of ~9.6 ºC/Ma. In contrast, the YTC cooled gently during 200 - 75 Ma at a rate of ~1.2 ºC/Ma, implying that the lithospheric thinning did not happen there during this time although the slower cooling rate could be interpreted to reflect less amount of lithospheric thinning or different thinning mechanism. Pure conductive cooling suggests that the crust of the YTC in the Late Triassic was thicker than that of the NCC in the Cretaceous; therefore, we argue that the lithospheric destruction in the YTC might have occurred after ~75 Ma.