

## Heat flow, thermal structure and lithospheric rheology of Sanjiang orogen and its neighbouring region, SW China

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Sanjiang orogen is located in the southwestern part of China. Tectonically, it is a part of Tethys–Himalayan orogenic system and has a complex geological history. The widespread active strike-slip faults, intensive earthquake activities and late Cenozoic magmatism in the orogen are related to the India–Asia collision. East of the orogen is Chuxiong basin and Kunming block. They also involved into the Cenozoic transpressional deformation induced by India–Asia collision. The boundary of Kunming block and the stable interior part of Yangtze platform is Xiaojiang fault, one of major active strike-slip faults in SW China.

The regional variation of heat flow in Sanjiang orogen exhibits a decreasing trend from NW to SE. The average heat flow value is over  $80 \text{ mW.m}^{-2}$  in the north (Lijiang) and the west (Tenchong); and it is related to the Cenozoic magmatism. Meanwhile, the lower values ( $<65 \text{ mW.m}^{-2}$ ) are observed in the SE part of Sanjiang orogen. The heat flow values in Chuxiong basin and Kunming block manifest the spatial pattern that higher ( $>70 \text{ mW.m}^{-2}$ ) in the region near major active faults (Ailaoshan–Red River and Xiaojiang faults), and lower in basin's interior. The lower ( $<65 \text{ mW.m}^{-2}$ ) heat flow values are also observed in the stable Yangtze platform. The thermal structures of crust and upper mantle in Sanjiang orogen and its neighbouring were calculated by 1-D and 2-D calculations.

The rheological profiles of tectonic units in Sanjiang orogen and its neighbouring regions are constructed using calculated geotherms and crustal models derived from deep seismic sounding. The results reveal the existence of very weak middle and lower crustal layers beneath Sanjiang orogen and its environs. This means the detachment between upper and lower crust. The mechanical uncoupling within crust in combination with major active strike-slip faults results in the 'book shelf' faulting and block rotation within Sanjiang orogen. The rotation of blocks around vertical axis is an important mechanism for active deformation and related seismicity in Sanjiang orogen. The weak middle and lower crustal layers also provide the avenue for southward crustal flow from Tibet plateau, the possible mechanism driven the excursion of Sanjiang orogen. It is noted that the upper and lower crust is also uncoupled beneath Yangtze platform. However, the existence of a strong layer in upper mantle prevents the growth of lithospheric scale penetrative faulting within the stable Yangtze platform. On the other hand, the upper mantle beneath Sanjiang orogen is relatively weak, and favour the development of lithospheric fault. The existence or absence of strong layer in upper mantle is also an important factor to influence the deformation pattern and style in Sanjiang orogen and its environs.

## Geological, thermal and rheological heterogeneity of China lithosphere and their effects on the present deformation pattern

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China consists of three Precambrian platforms, which include the North China platform (NCP), the Yangtze platform and the Tarim platform, surrounded by accreted terranes and orogens of various ages. China continent was first assembled in the Palaeozoic and has been further deformed and rearranged in multiple episodes throughout

the Mesozoic and Cenozoic. These tectonic events resulted in the strong lateral heterogeneity in geological features among major tectonic units of China, such as crustal composition and structure, etc. The heat flow pattern of China also exhibits complicated lateral variation (Wang 1999).

On the basis of over 800 heat flow observations