Thermokinematic Model of Cenozoic Uplift of Danba Anticline, Northeastern Tibet: Implication of Mid-crustal Channel Flow

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We employed finite difference method to simulate the thermokinematic evolution of the Danba anticline, northeastern Tibet near the Sichuan Basin since 25 Ma. The major paradox of the Danba anticline is that its fold axis is subparallel rather than perpendicular to the crustal velocity field based on GPS observations. Recent studies suggested the uprising Tibet may drive the middle and lower crust to flow around the rigid Sichuan Basin. We solved the deflected mid-crustal flow beneath the Danba anticline by employing the corner flow theory and found that the flow is roughly perpendicular to the fold axis. This finding suggested the Danba anticline is formed by injection of mid-crustal material rather than buckling of its upper crust. By introducing a detachment folding theory, we calculated the crustal movement and the corresponding temperature of the Danba anticline since last 25 Ma. With that we computed the theoretical apatite and zircon fission track ages across the Danba anticline and compared them with the observed ones. Our optimal model suggested that since 25 Ma, the mid-crustal flow has accelerated as an exponential function. The optimal fold width is about 140 km with the mid-crust channel thickness of 14 km, which is consistent with a magnetotelluric observation. The amount of exhumation in the hinge of the Danba Anticline we estimate is about 19 km, which agrees well with the amount of exhumation (17~26 km) derived from geobarometry upon the Triassic decollement exposed in the core of the anticline.

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