



Initiation of extension in South China continental margin during the active-passive margin transition: kinematic and thermochronological constraints

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The southern South China Block is characterized by a widespread magmatic belt, prominent NE-striking fault zones and numerous rifted basins filled by Cretaceous-Eocene sediments. The geology denotes a transition from an active to a passive margin, which led to rapid modifications of crustal stress configuration and reactivation of older faults in this area. In this study, we used zircon fission-track dating (ZFT) and numerical modeling to examine the timing and kinematics of the active-passive margin transition.

Our ZFT results on granitic plutons in the SW Cathaysia Block show two episodes of exhumation of the granitic plutons. The first episode, occurring during 170 Ma – 120 Ma, affected local parts of the Nanling Range. The second episode, a more regional exhumation event, occurred during 115 Ma - 70 Ma.

Numerical geodynamic modeling was conducted to simulate the subduction between the paleo-Pacific plate and the South China Block. The modeling results could explain the observation based on ZFT data that exhumation of the granite-dominant Nanling Range occurred at an earlier time than the gneiss-dominant Yunkai Terrane. In addition to the difference in geology between Yunkai and Nanling, the heating from Jurassic-Early Cretaceous magmatism in the Nanling Range may have softened the upper crust, causing the area to exhume more readily.

Numerical modeling results also indicate that (1) high slab dip angle, high geothermal gradient of lithosphere and low convergence velocity favor the subduction process and the reversal of crustal stress state from compression to extension in the upper plate; (2) the late Mesozoic magmatism in South China was probably caused by a slab roll-back; and (3) crustal extension could have occurred prior to the cessation of plate subduction. The inversion of stress regime in the continental crust from compression to crustal extension has shed light on the geological condition producing the red bed basins during Late Cretaceous-early Paleogene in South China. It appears that the red bed basins could have formed during the late stage of the subduction process, accounting for the observations why concurrent volcanic rocks could be found in some sedimentary basin formation. We propose that the extensional events started as early as the Late Cretaceous, probably before the cessation of subduction process.

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