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The Role of Triaxial Strain in Deformation Compartmentalizations of the Tibetan Plateau: Insight from "Scaled"Numerical Models

The collision between the Indian and Eurasian Plates induces simultaneous widespread crustal shortening and extension in the Tibetan Plateau. Collision-induced crustal deformation at regional, orogenic scale is compartmentalized into networks of active faults of locally diverse tectonic regimes. Yet, the correlation between triaxial strain and deformation patterns requires better quantification. We carried out 3D "scaled"numerical models simulating and extending laboratory analogue models of triaxial tectonics involving simultaneous horizontal shortening and orthogonal extension. Our results demonstrate two strain fields, i.e., constriction and flattening strain, which are accommodated by four types of fault networks, respectively: Constriction strain is accommodated by (i) dominant normal faults linking with strike-slip faults and/or (ii) predominant strike-slip faults linking with normal faults, while flattening strain displays (iii) a predominant strike-slip pattern and/or (iv) thrust-dominant regimes with strike-slip faulting. An important implication of our models is that the locally diverse deformation styles are consistent with the regional principal strain tensor in the Tibetan Plateau. Responding to the same overall geological settings, flattening strain is characterized by strike-slip faults in the Shan Plateau and by thrust faults kinematically linked to strike-slip faults in Northern Tibet. Simultaneously, strike-slip as well as extensional regimes accommodate constriction strain in Central-southern Tibet.

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