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Three-dimensional numerical modeling of the tectonic evolution of the series basins in the Hexi Corridor at the NE Tibetan Plateau

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Acting as the forefront area of the NE growth of the Tibet Plateau, the Hexi Corridor which located at the north side of the Qilian Mountain and the south side of the Beishan Mountains becomes a good place to research the deformation mechanism of the growth of the Tibet Plateau in continental dynamics. Interestingly enough, there are a series of Cenozoic basins separated by a number en echelon uplifts and faults along NWW direction in the Hexi Corridor. How did these series basins come into being? Therefore, through three-dimensional finite element numerical simulations based on visco-elasto-plasticity constitutive relation, we try to explore the mechanism of formation and evolution of the series basins in the Hexi Corridor. Here, in order to analyze the roles of the computing influenced factors, we build different models for comparison to discuss the long-term (∼5Ma) accumulation of displacement and fault dislocation of the Hexi Corridor and its adjacent regions. Meanwhile we also analyze the effects of the crustal heterogeneity on the tectonic deformations in this region to explore the dynamics of the mechanism. The initial numerical results reveal that: (1) Harder secondary blocks in the Hexi Corridor turn to four basins in sequence of left echelon arrangement; (2) The intersection parts of the blocks (fault zone) uplift faster; (3) Compared with other regions, the Qilian Mountains, especially, the Northern parts generally uplift faster than that of the Southern Qilian Mountains; (4) Due to the overall compression-torsion, an approximate "pull-apart tectonic structure" gap occurs on the Elm Shan fault around the Northern Qilian fault zone where the uplifting speed is relatively slower; (5) The upper crust sink correspondingly and squeezes lower block in the Hexi Corridor which formed the nowadays tectonic framework. And the calculation of deformation process is helpful for understanding the geological evolution history of the northeastwards growth of the NE Tibetan Plateau.