



The evolutionary model of oblique-rifting basin : Insights from discrete element method

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The geometry of oblique-rifting basin is strongly related with the angle (α) between the trend of rift and that of regional major extensional stress. The main purpose of this study is to investigate characteristics of geometry and kinematics of structure and tectono-stratigraphy during the evolution of oblique-rifting basin.

In this study, we simulated the oblique-rifting basin model of various α with Particle Flow Code 3-Dimensions- (PFC 3D). The main theory of PFC 3D is based on the Discrete Element Method (DEM), in which parameters are applied to every particle in the models. We applied forces acting on both sides of rift axis, which α are 45° , 60° , 75° and 90° respectively, to simulate basin formation under oblique-rifting process.

The study results of simulation models indicated that: 1. the en echelon faults in the rifting basins are sub-orthogonal to the trend of major extensional stress; 2. the density of en echelon faults in rift basins decreases gradually when α is close to 45° ; 3. in these models, the α angles, which are 45° , 60° , 75° and 90° , correspond to the angles of 0° , 15° - 20° , 25° - 30° and 50° - 60° between the rift trend and en echelon faults trend. According to the simulation results, the possible directions of major extensional stresses during the formation of oblique-rifting basin can be speculated.