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 ($\alpha$) 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 $\alpha$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$\alpha$ are 45 , 60 , 75 and 90 degrees ,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 $\alpha$is close to 45 degrees ; 3. in these models, the $\alpha$ angles, which are 45 , 60 , 75 and 90 degrees, correspond to the angles of 0, 15 -20 , 25 -30 and 50 -60 degrees between the rift trend and en echelon faults trend. According to the simulation results, the possible dircetions of major extensional stresses during the formation of oblique-rifting basin can be speculated.

Keywords: oblique-rifting basin, discrete element method, PFC-3D