from the cavern to the ground surface. It seems that the failure paths of lower initial vertical stress (shallower location of cavern) tends to move upward directly to ground surface with different curvatures and inclinations to the vertical axis comparing to the higher initial vertical stress. For the fracture pattern, k is the important factor on the direction of failure path. From the observation, the fracture patterns for the same k of all cases (different σ_v) are slightly different in the near field.

5 conclusion

In this study, shear failure behaviors of rock mass surrounding the underground gas storage cavern under high pressure are numerically investigated by the EFG method. A series of parametric study on effect of depth and in-situ stress ratio was conducted. From the analysis results, it can be concluded as following;

1. The in-situ stress ratio has a strong effect on initial failure point, failure propagation pattern and crack propagation direction, while the vertical stress in the range of this study has an insignificant influence on crack initiation.

2. The failure paths with lower vertical stress tend to move upward directly to the ground surface, with different curvatures and inclinations to the vertcal axis.

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