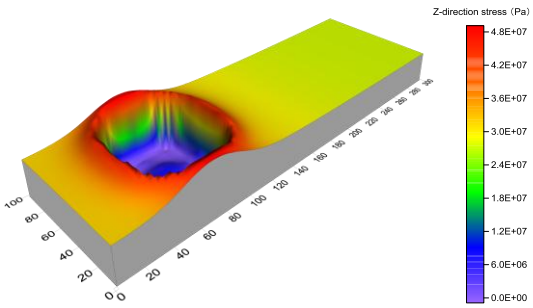
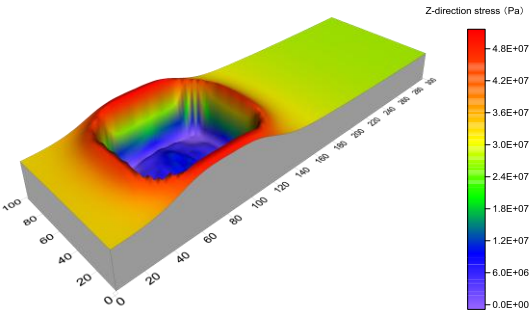
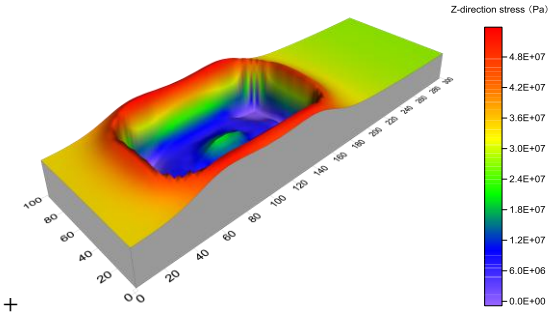


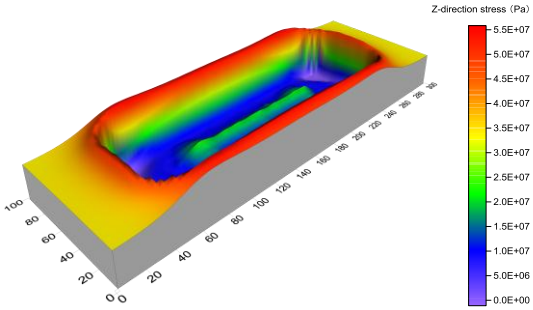
a. working face advanced to 48m



b. working fae advanced to 72m

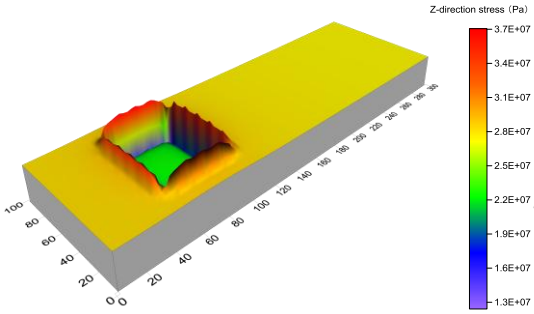


c. working face advanced to 112m

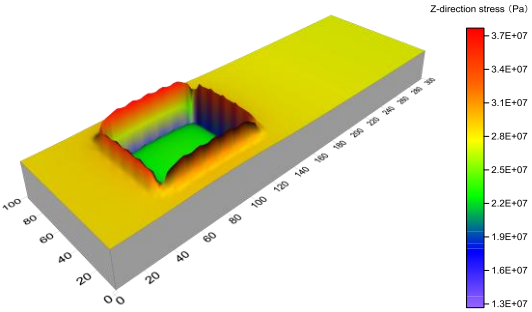


d. working fae advanced to 200m

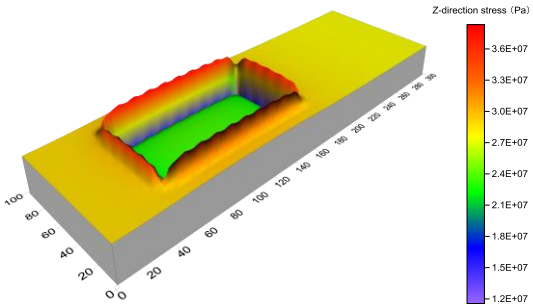
Figure S1 Distribution of z-direction stress at different advancing distanes when using caving mining



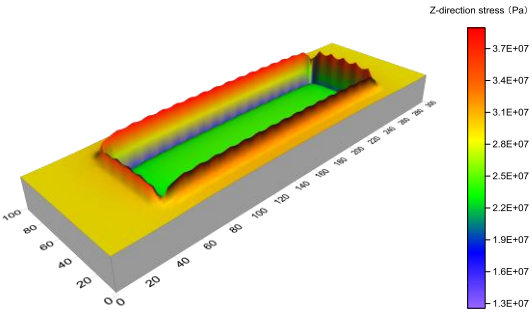
a. working face advanced to 48m



b. working fae advanced to 72m



c. working face advanced to 112m



d. working fae advanced to 200m

Figure S2 Distribution of stress at different advancing distanes when using backfilling mining

Table S1 Physical and mechanical parameters of rock formations in the model

lithology	thickness /m	elastic module/GPa	poison ratio	tensile strength /MPa	cohesion /MPa	internal friction angle / °	density /kN•m^{-3}
mudstone	10	24	0.27	2.5	1.8	35	18.0
medium sandstone	14	20	0.21	8.0	2.5	31	24.0
fine sandstone	12	28	0.26	7.0	2.3	34	23.0
mudstone	12	25	0.25	1.8	2.0	32	20.0
siltstone	18	25	0.33	10.0	2.0	33	24.0
mudstone	8	23	0.27	2.3	1.2	32	21.0
fine sandstone	8	28	0.28	3.8	1.6	30	23.0
mudstone	10	25	0.3	2.0	2.6	29	20.0
sandy mudstone	2	26	0.29	2.5	1.6	28	22
mudstone	3	24	0.3	2.4	1.3	32	18.0
medium sandstone	9	21	0.23	8.3	1.6	31	24
mudstone	2	26	0.25	2.0	1.9	31	16.0
medium sandstone	2	18	0.22	7.5	1.4	30	25
coal	4	3.5	0.27	1.01	0.6	24	14.0
mudstone	1	23	0.27	2.3	1.2	32	19.0
fine sandstone	3	24	0.26	5.5	2.9	31	24.5