

Fracture and fragmentation simulation - Imperial College, Paluszny & Zimmerman

energy consistent
fracture growth
based on stress
intensity factors

finite element
method

predicts fracture
growth direction,
magnitude

realistic fracture
patterns created

permeability can
be estimated

Heterogeneities
accounted for

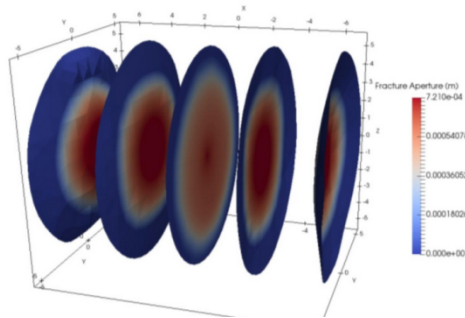
frictional effects
accounted for

field scale (km),
and also small
scale (cm)

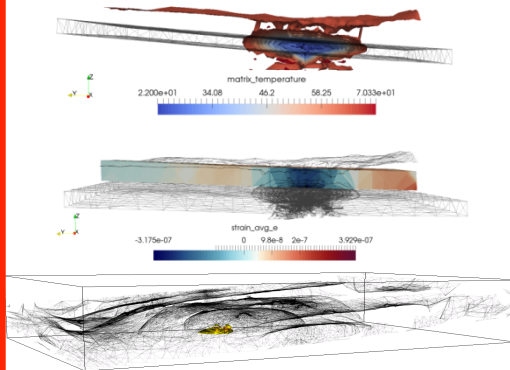
fragmentation,
caving, block
caving

bit-rock
interactions

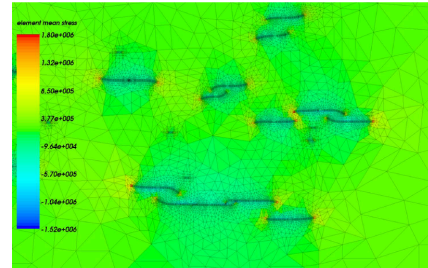
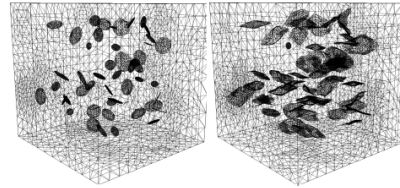
True-scale hydraulic fractures in
poroelastic media



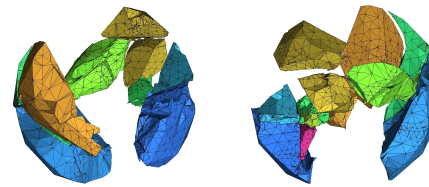
thermo-poroelastic field-scale
regional fracture growth



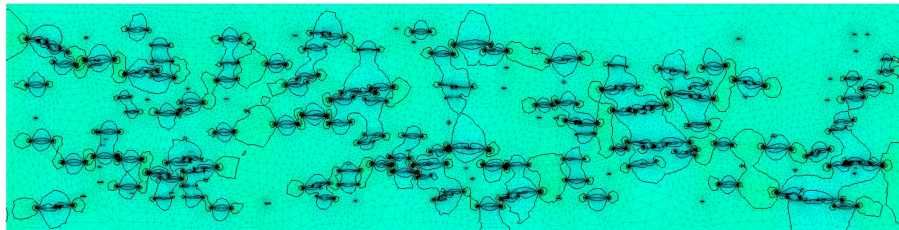
fracture interaction
and coalescence



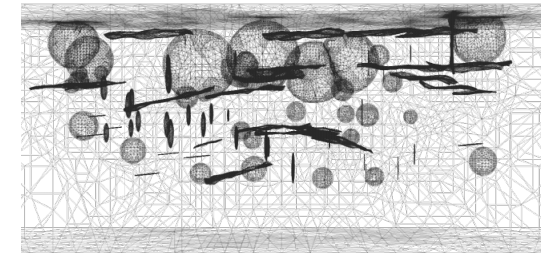
Fragmentation



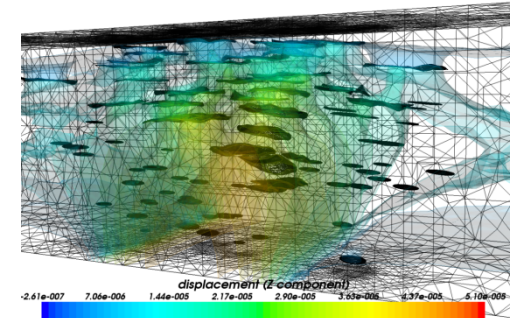
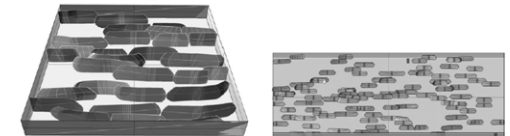
Fracture patterns and stress interactions



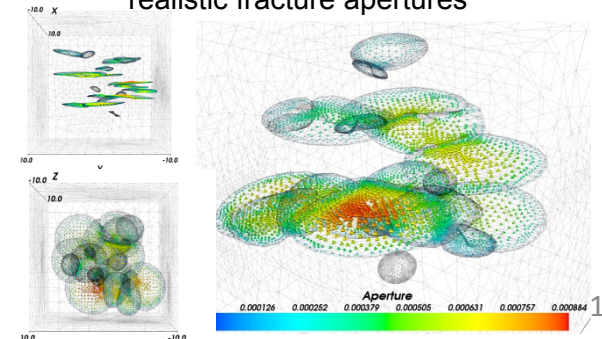
fracture-fracture interaction



fracture pattern formation



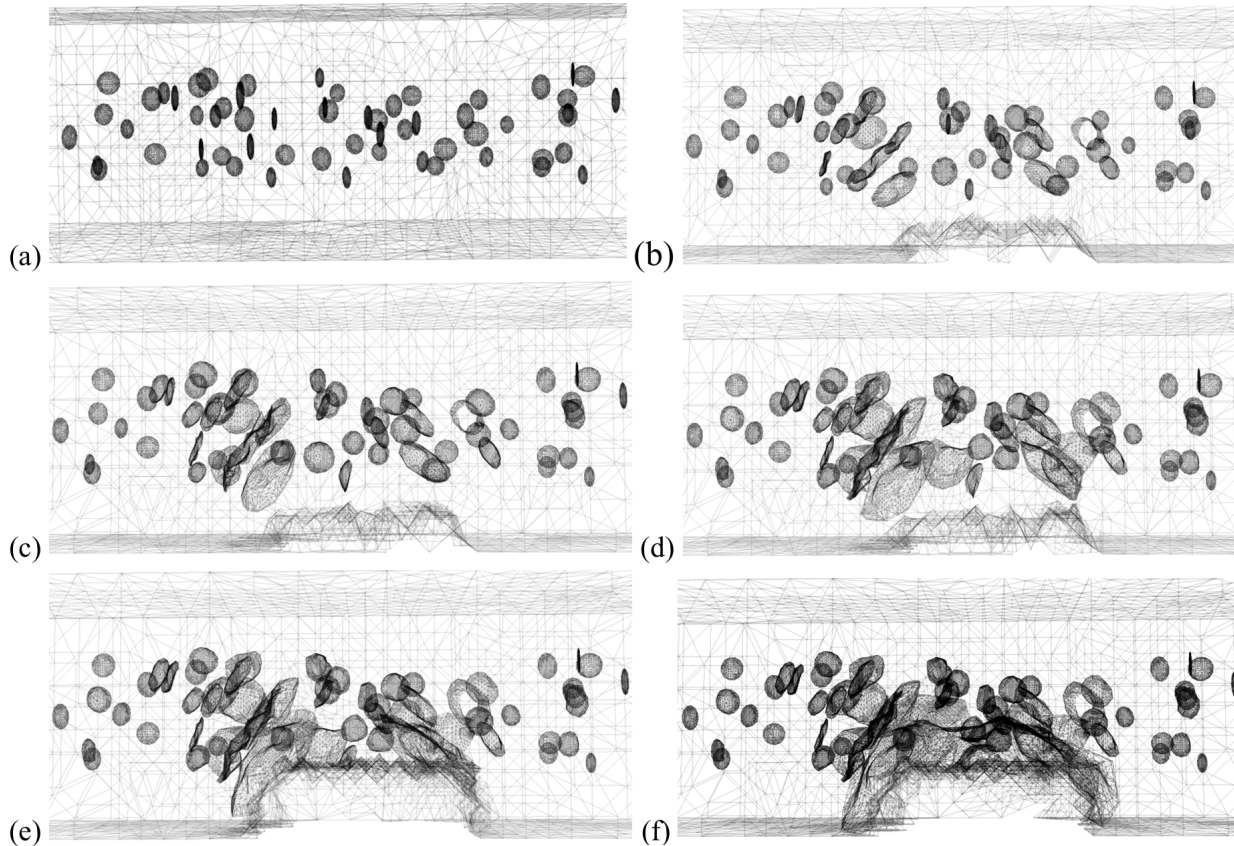
realistic fracture apertures



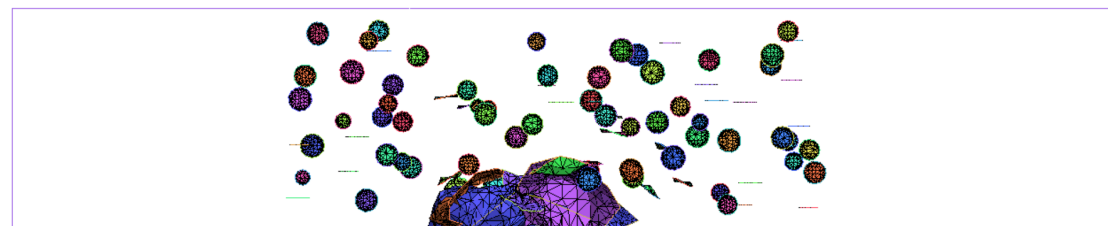
Expertise in accurate
modelling of fracture
growth

Mature finite element
code, for simple or
complex scenarios

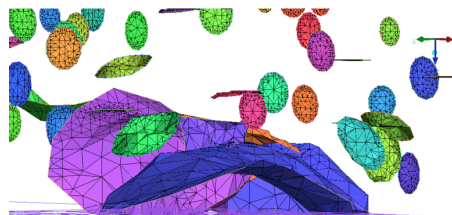
Can model drilling,
caving, and prevention
or enhancement of
fracturing



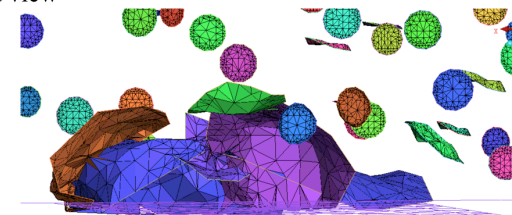
Above: A fracture set
responds to an
undercut. Cave
shapes depend on the
initial fracture pattern
(Amer Rock Mech
Assoc, 2016); funded
by Rio Tinto



(a) front view



(b) side view of rendered fracture surfaces



(c) rotated side view