1. Context

Coalbed Methane (CBM) = Unconventional resource

Unconventional modelling

In particular, 2 remarkable phenomena affecting permeability:

- Pressure depletion
- Gas desorption

Reservoir compaction
Matrix shrinkage

Permeability

2. Model

- Adsorbed gas content = \( f(\text{Reservoir pressure}) \)
  Langmuir’s law to fit experimental data

- Mass Exchange
  Matrix Fractures

- Fluid flow into natural fracture network

- Fracture aperture evolution with stress state
  \( \hat{h}_x = \frac{\sigma'_{xx}}{K_n} \)

3. Production simulation

Initial conditions: The reservoir is water saturated with hydrostatic pressure maintaining gas adsorbed in the matrix

Loading: Fast pressure drop at the well

Production curves: Gas production peaks after water

4. Conclusions

HM couplings are a critical issue in CBM recovery:
Permeability is directly dependent on fracture aperture, which evolves with the stress state.

Permeability is first decreased due to the pressure drop.
Initial permeability may be recovered thanks to the matrix shrinkage.

These phenomena are taken into account with a macroscopic model enriched with microscale considerations.
Perspectives: multiscale model