Non-linear dynamic permeability @model

Small variations of formation pressure p lead to exponential changes in permeability:

(1) $$k = k_0 \, e^{n_k \cdot c_r (p - p_0)}$$

where

c_r	formation compressibility
$n_k = \dfrac{\ln(k/k_0)}{\ln(\phi/\phi_0)}$	power degree of permeability-porosity correlation
k_0	formation permeability at reference pressure p_0
ϕ_0	formation porosity at reference pressure p_0
p_0	reference pressure, usually picked up at initial formation pressure $p_0 = p_i$

The substantial reduction of formation pressure leads to shrinking of numerous pore throats and massive reduction in permeability deviating from exponential.

The substantial increase of formation pressure leads to microfracturing and massive increase in permeability deviating from exponential.