

IORCoreSim

General

- Previously BUGSIM
 - MEOR experiments
- 3D grids (Cartesian, radial)
 - black oil formulation
- Physically and chemically sound models
 - capture EOR mechanisms
- Easy-to-use for different lab setups

Unique approach

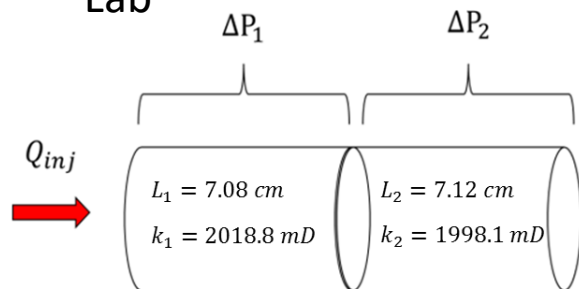
- Targets SCAL type experiments +
- geochemistry and EOR at core scale +
- scaling to small field models

Special

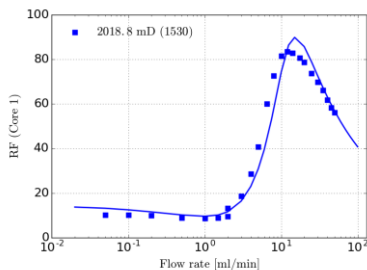
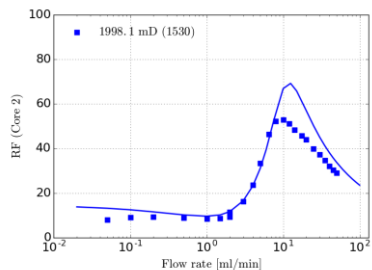
- Components:
 - Bacteria, substrates and nutrients (MEOR)
 - Surfactants
 - Polymers
 - Shear thinning
 - Shear thickening
 - Mechanical degradation
 - Geochemical components
 - Tracers
- Thermodynamic properties of water (HKF EOS)
- Gelation
- Visualization in ResInsight
- Temperature
- Diffusion

Polymer flooding

Lab

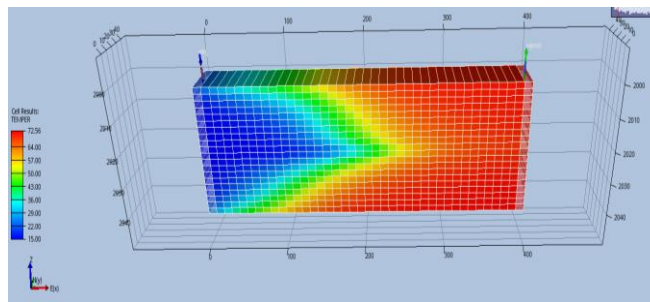
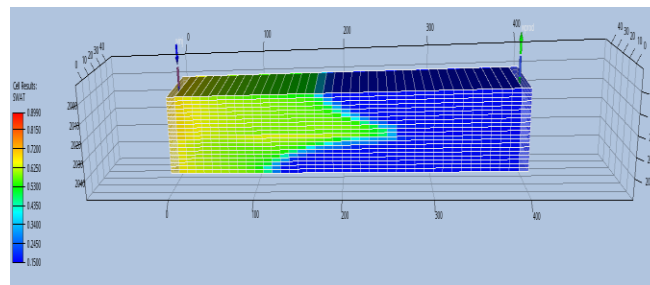


$$\phi_1 = \phi_2 = 0.235$$



- Shear thinning, shear thickening, mechanical degradation

Field

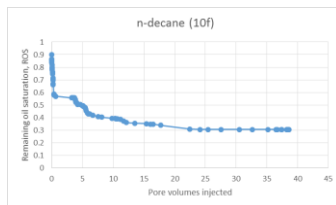
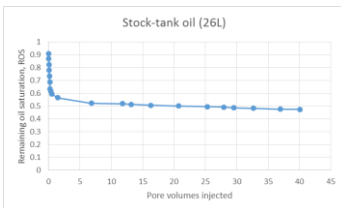
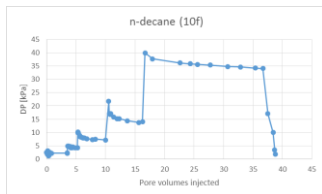
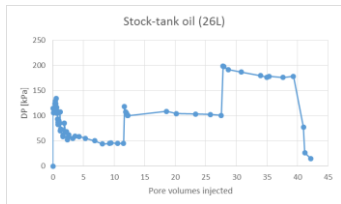


- Capture field degradation, temperature, cold water injection

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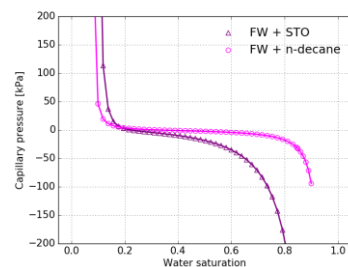
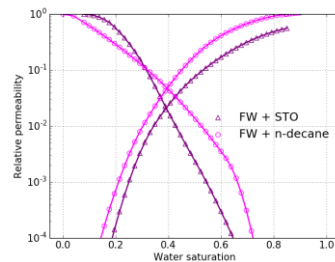
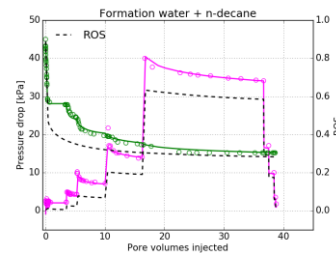
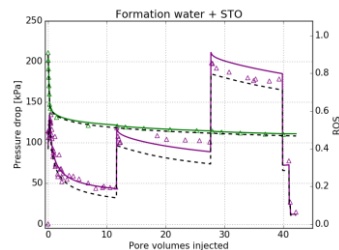
Capillary end effects & wettability

Lab



SPE 174393: Fjelde, I., Lohne, A., Abeyasinghe, K.P. *Critical Aspects in Surfactant Flooding Procedure at Mixed-wet Conditions.* In: EUROPEC 2015. Society of Petroleum Engineers, 2015.

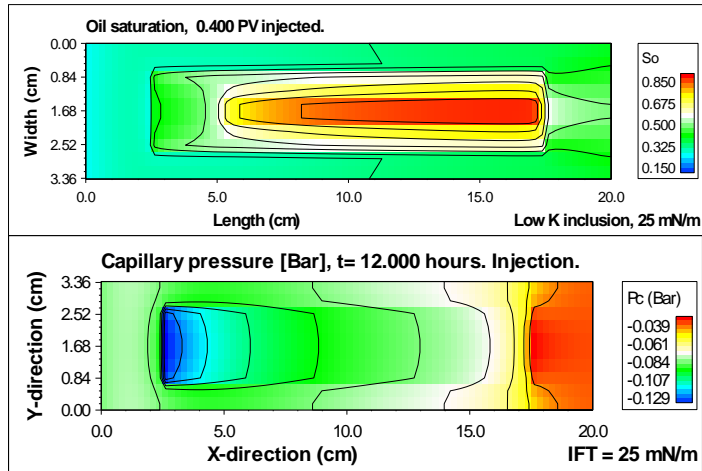
Simulation



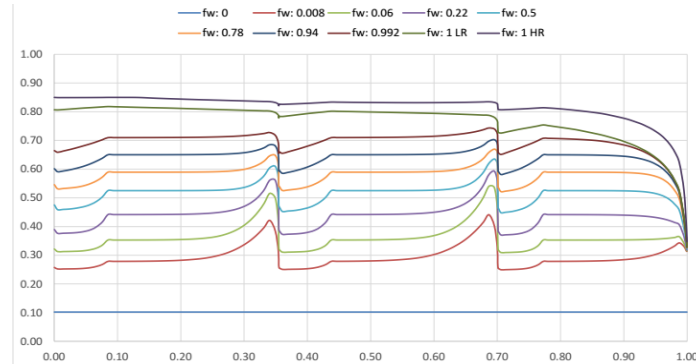
- Manual adjustment of P_c , and rel perm

Heterogeneities

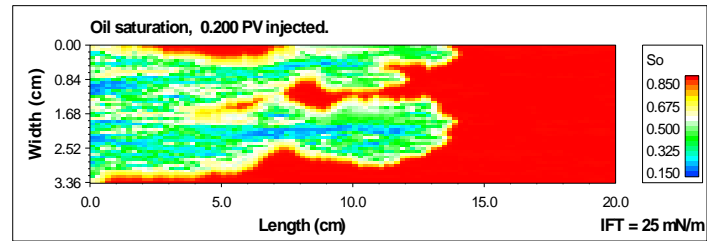
- Core plugs are not homogeneous
- Arbitrary number of rock types with different P_c and K_r
- Relative permeability directional (k_{rx} , k_{ry} , k_{rz}) rate dependency
- P_c - J-scaling



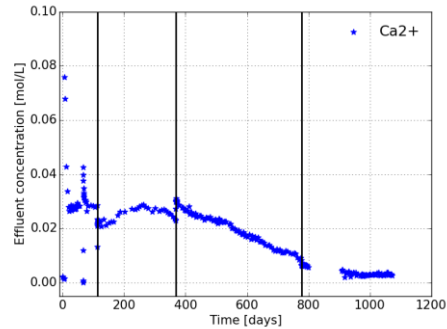
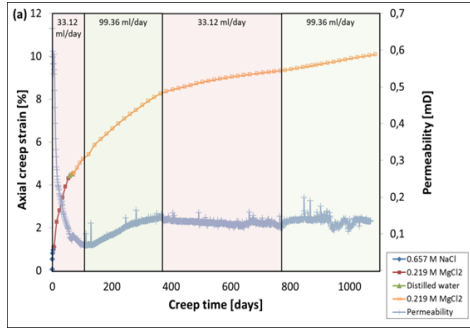
Investigate saturation profiles in composite core



Effects of fine-scale heterogeneity

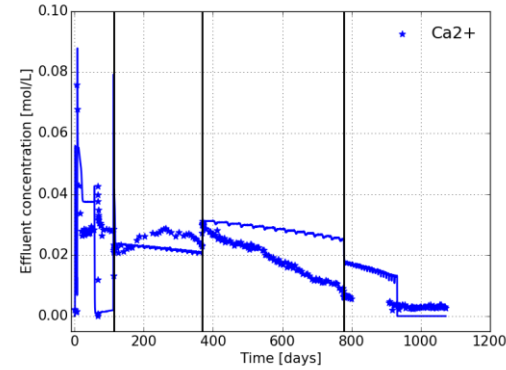


Lab

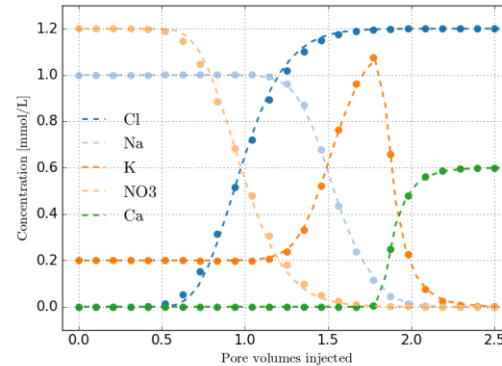


Nermoen et al "Porosity and permeability development in compacting chalks during flooding of nonequilibrium brines: Insights from long-term experiment" *J. Geo. Res. Solid Earth*, 120 (2015).

Simulation



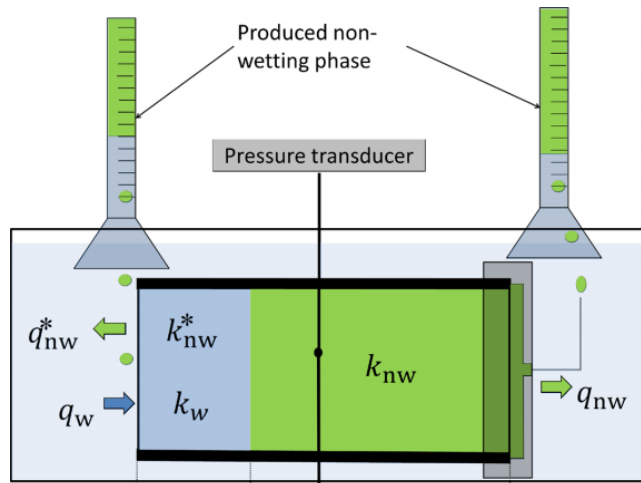
Dissolution/
precipitation



Ion
Exchange

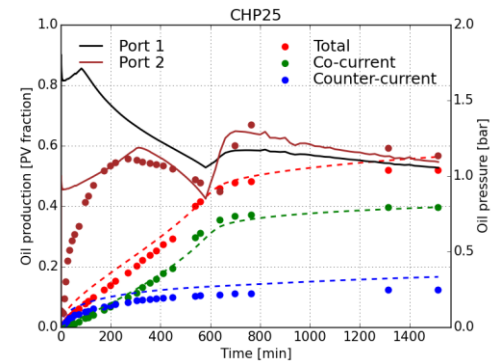
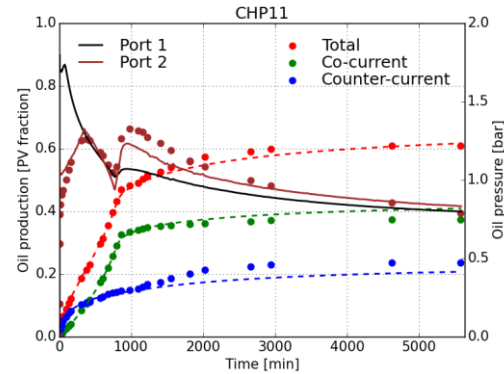
Flexible boundary conditions

Spontaneous Imbibition (left end)
Oil production (right end)



Haugen, Åsmund, et al. "The effect of viscosity on relative permeabilities derived from spontaneous imbibition tests." *Transport in Porous Media* 106.2 (2015): 383-404.

Simulation



Contact information for further questions

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The partners and observers

HALLIBURTON



ConocoPhillips

Lundin
Norway



Schlumberger



DONG
energy



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The National
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of Norway