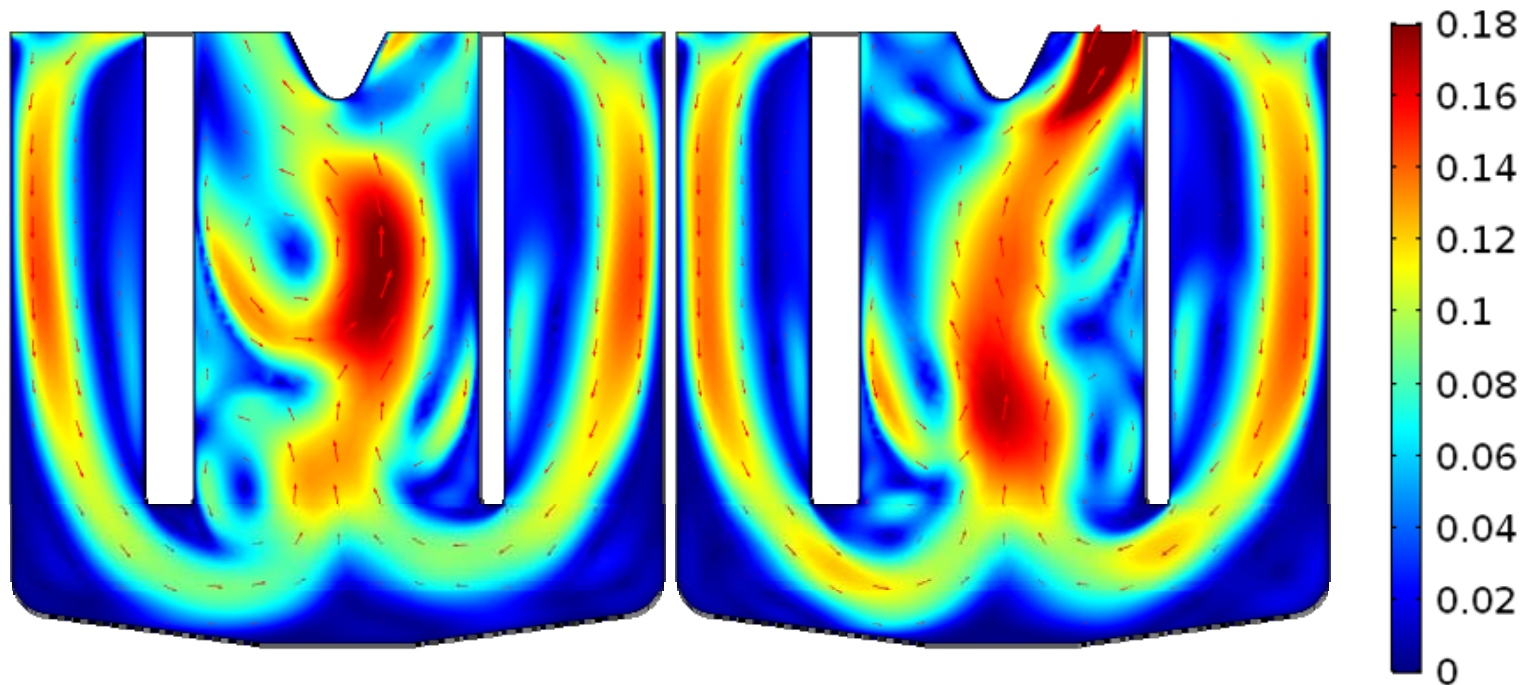


# Fluorine electrolysis cells: transient modelling with spatially-dependent gas properties using COMSOL®

---



# MEng Chemical Engineering, University of Pretoria

---



## Modelling- model set-up

---

1. Secondary current distribution with Butler-Volmer kinetics and double layer capacitance
2. Heat transfer in fluids
3. Electrochemical heating multiphysics
4. Laminar bubbly flow with spatial dependent gas properties



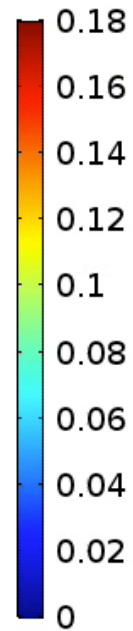
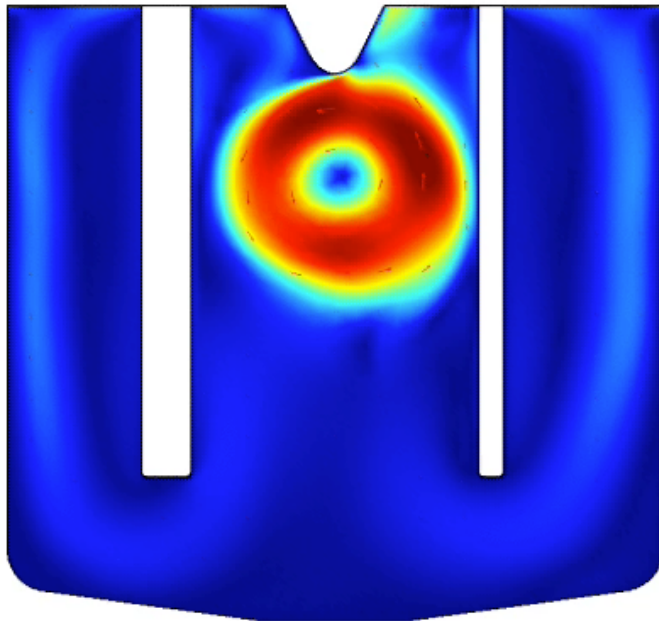
**MEO1**

Table for model here

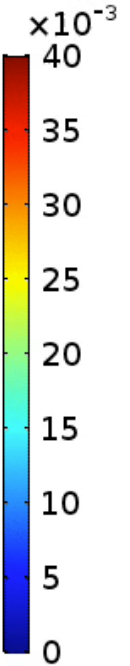
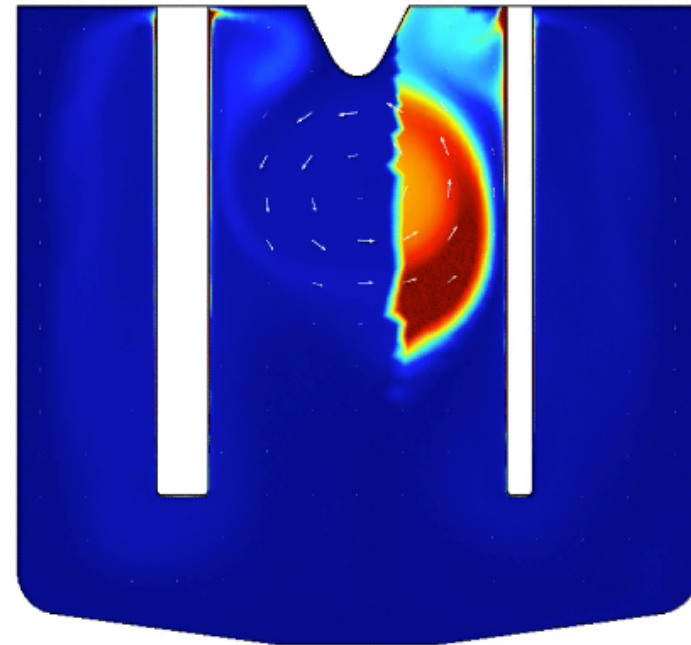
Mr. E Oosthuizen; 18.10.2018

# Modelling- results for 2D parallel plate geometry, spatial gas

Time=0 s Surface: Velocity magnitude, liquid phase (m/s)  
Arrow Surface: Velocity field, gas phase



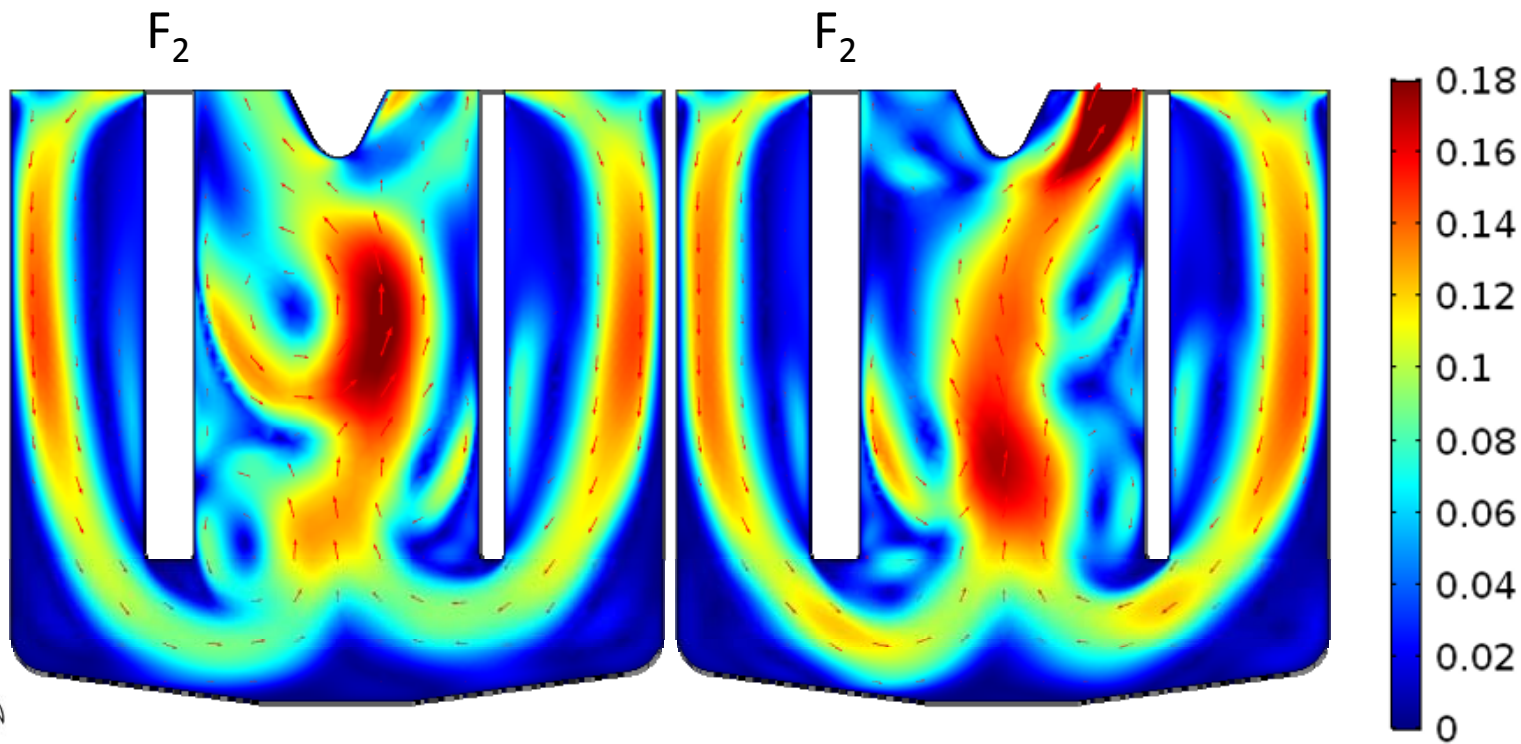
Time=0 s Surface: Volume fraction, gas phase (1)  
Arrow Surface: Velocity field, gas phase



# Modelling- results for 2D parallel plate geometry, spatial gas

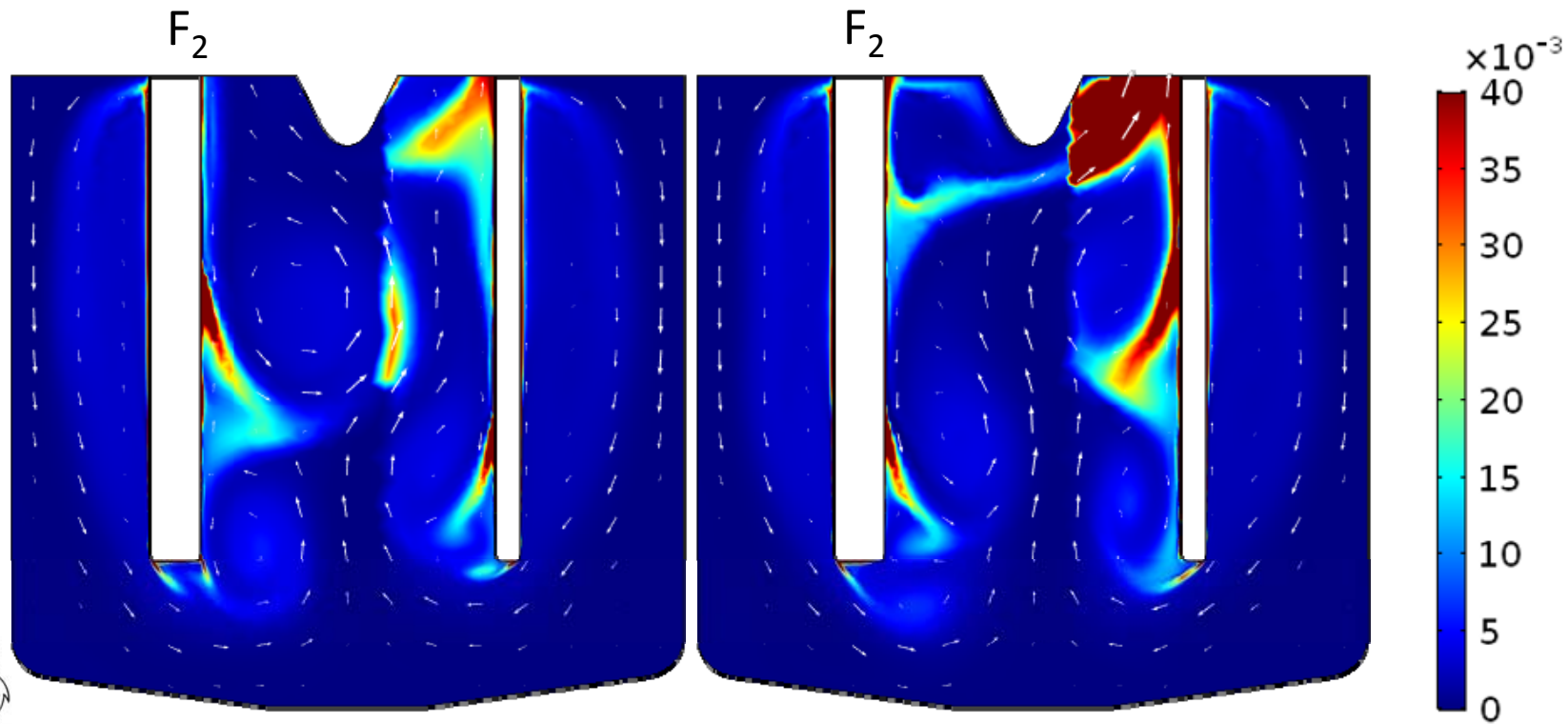
---

Liquid phase velocity magnitude ( $\text{m}\cdot\text{s}^{-1}$ )

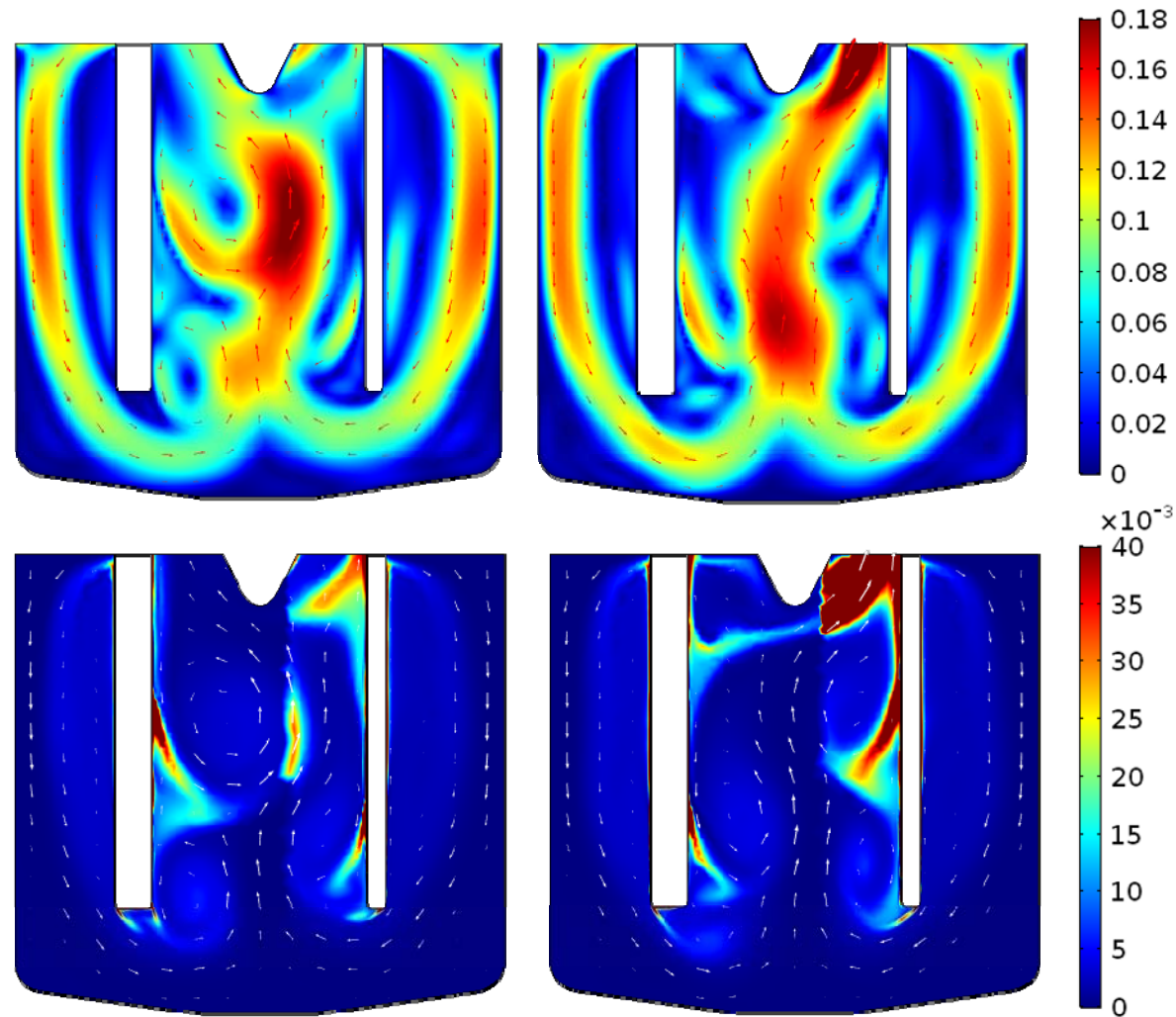


# Modelling- results for 2D parallel plate geometry, spatial gas

## Gas phase volume fraction



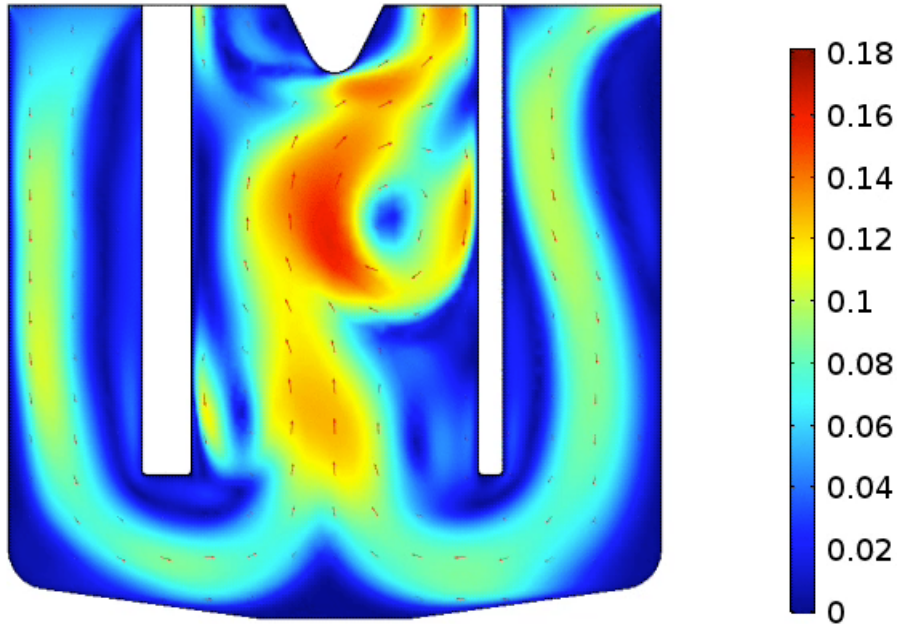
# Modelling- results for 2D parallel plate geometry, spatial gas



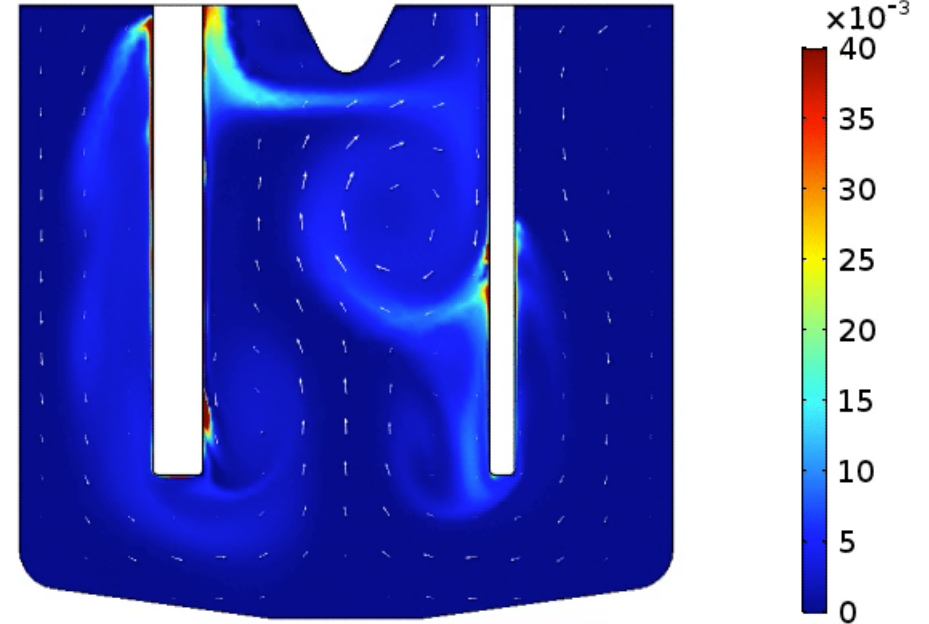


# Modelling- results for 2D parallel plate geometry, non-spatial gas

Time=0 s Surface: Velocity magnitude, liquid phase (m/s)  
Arrow Surface: Velocity field, liquid phase

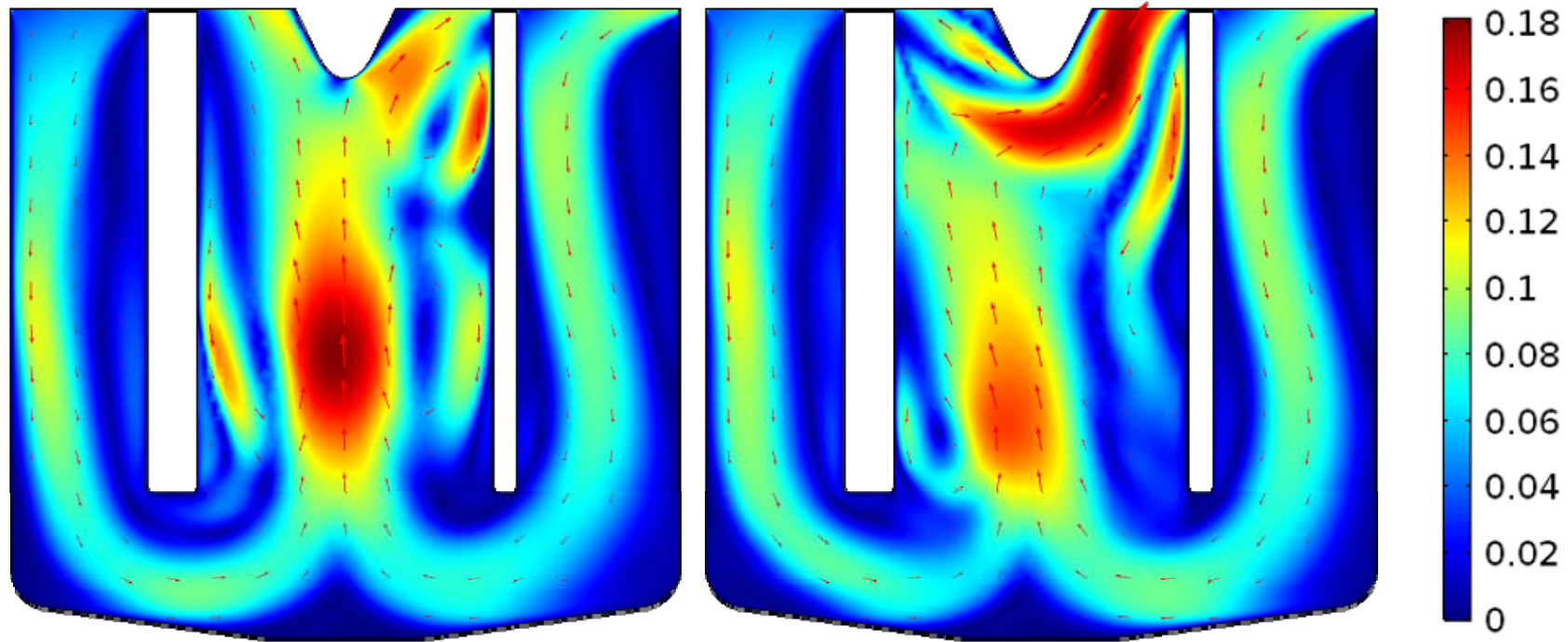


Time=0 s Surface: Volume fraction, gas phase (1)  
Arrow Surface: Velocity field, liquid phase



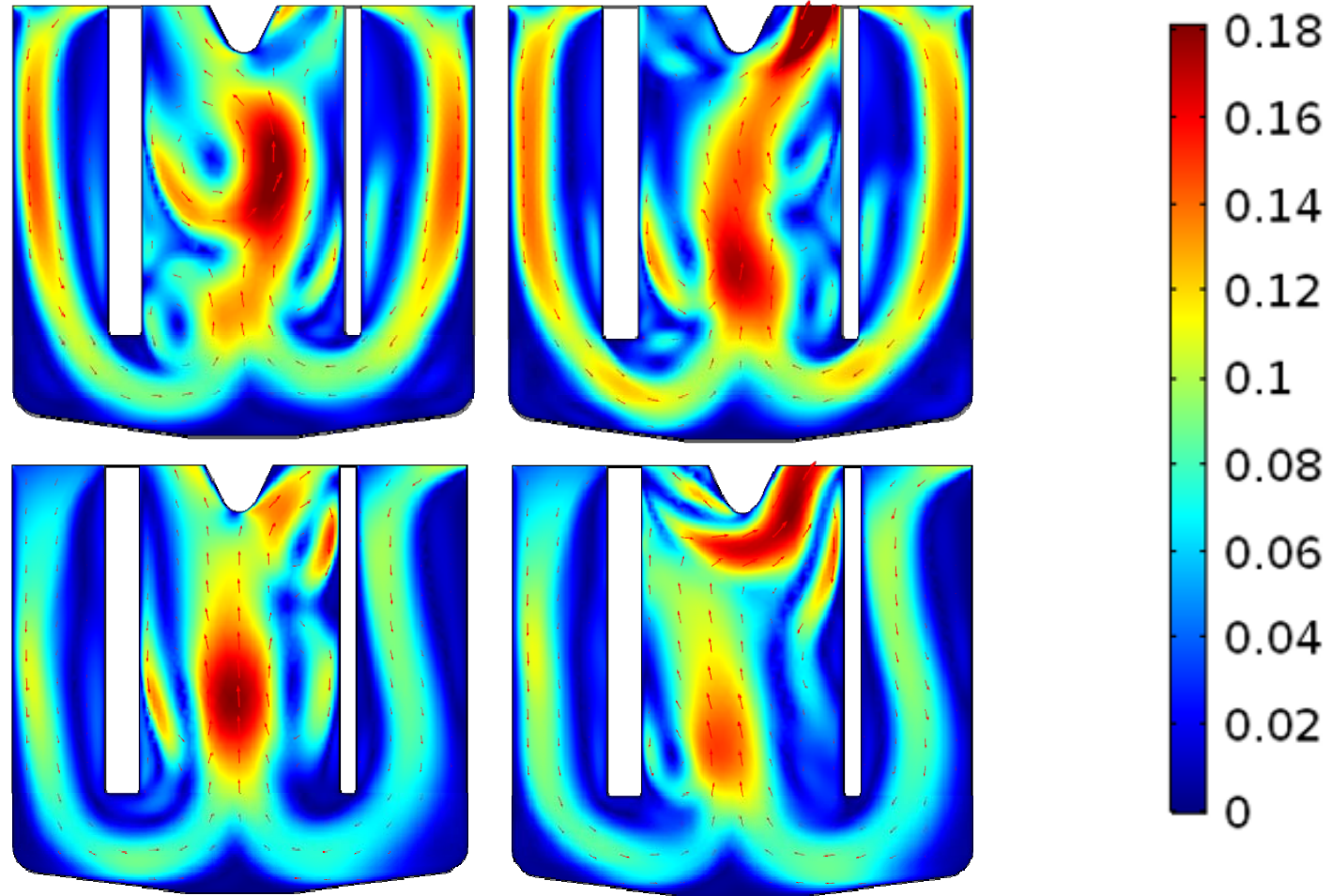
# Modelling- results for 2D parallel plate geometry, non-spatial gas

Liquid phase velocity magnitude ( $\text{m}\cdot\text{s}^{-1}$ )

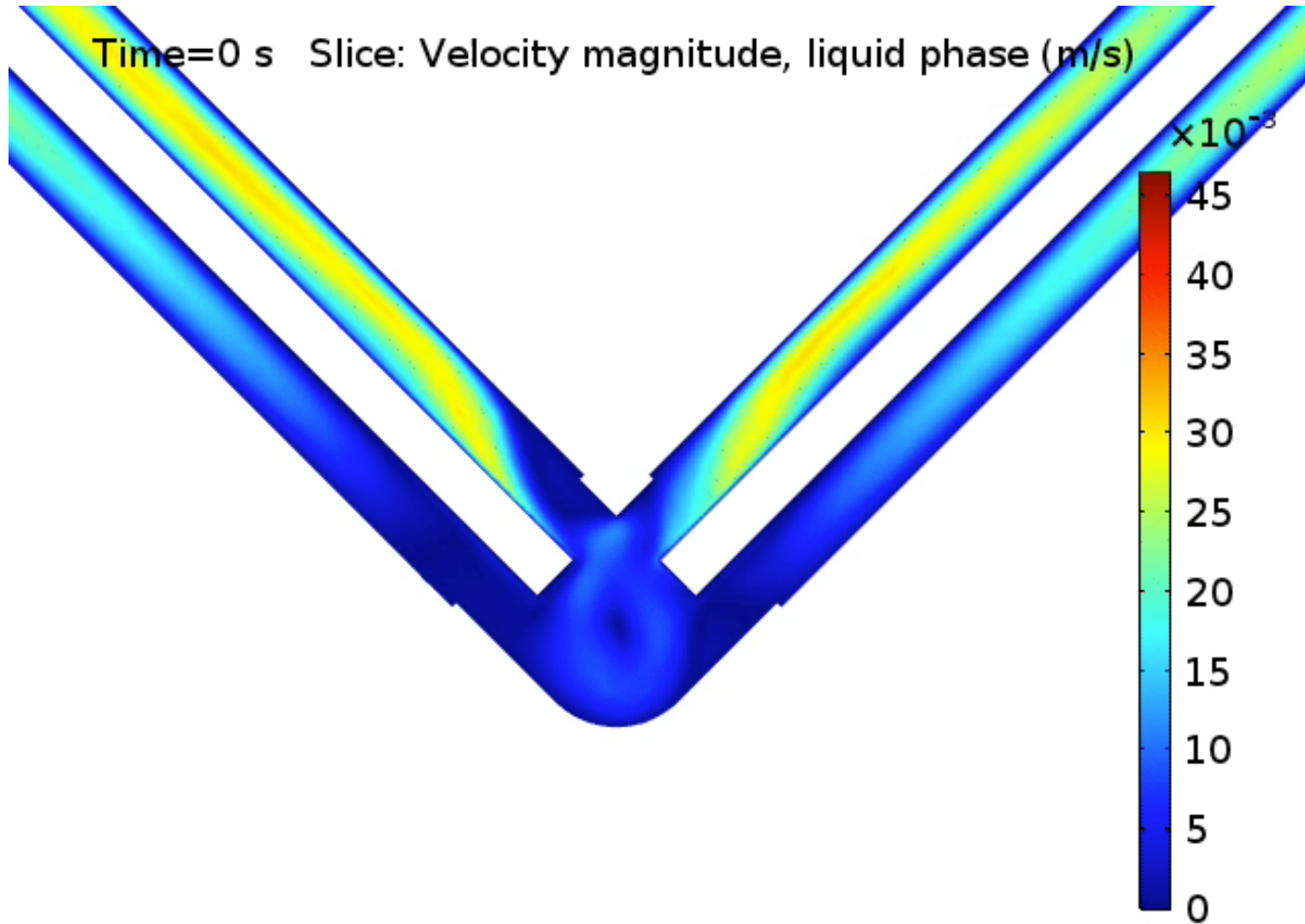


# Modelling- results for 2D parallel plate geometry, spatial gas

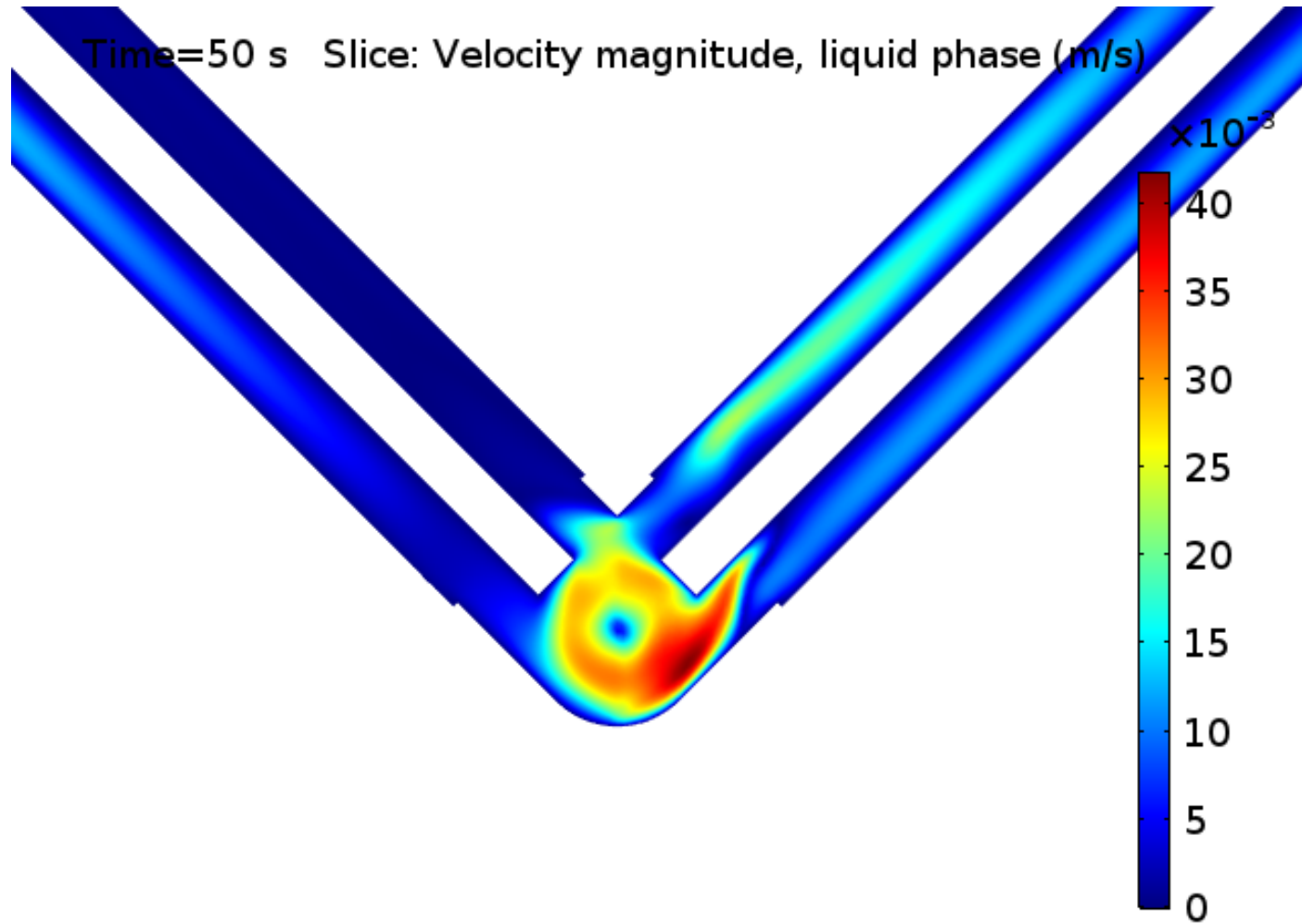
---



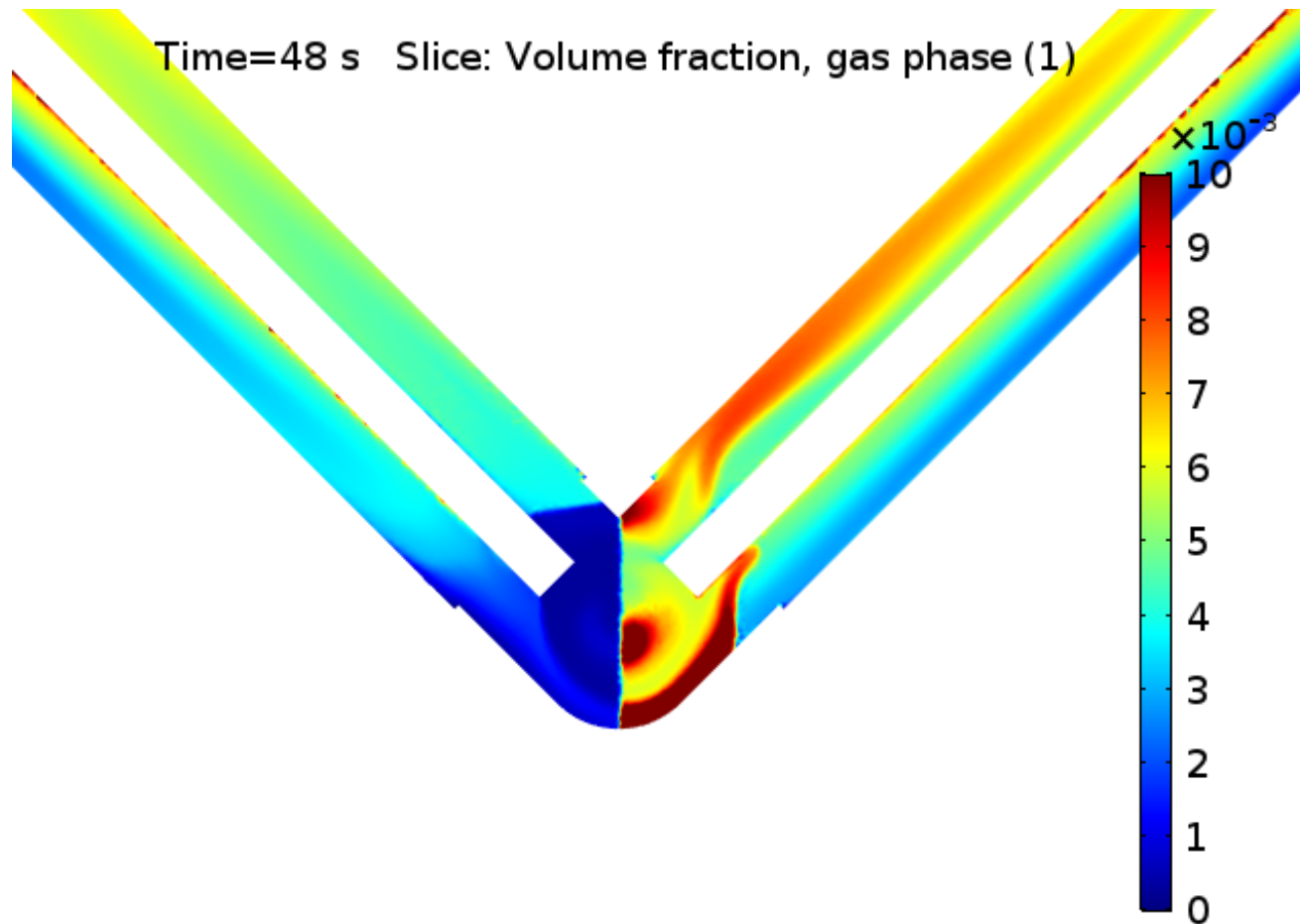
# Modelling- results for 3D Pauling cell geometry, spatial gas

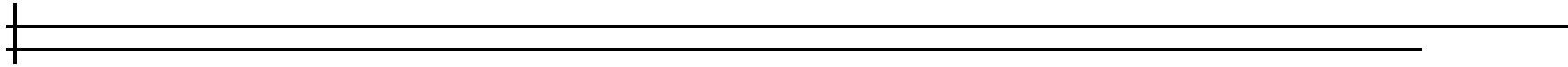


# Modelling- results for 3D Pauling cell geometry, spatial gas



# Modelling- results for 3D Pauling cell geometry, spatial gas





Thank you



# Modelling- results for 3D Pauling cell geometry, spatial gas

---

Surface:  $\text{abs}(\text{cd.ltot}) \text{ (A/m}^2\text{)}$

